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9

The Effect of Energy Prices on Competitiveness of Energy-Intensive Industries in the EU

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Summary

Several factors affect the (national and international) competitiveness of an industrial sector or a company operating in an industrial sector. This study deals with the effect of energy prices on competitiveness from the prospective of EU energy-intensive industrial sectors. After introducing the energy source structure and the proportion of energy costs in the total operational costs, this paper focuses on energy prices and their differences. The aim of this paper is to show the competition distortion effect of differences in energy prices among EU Member States and their main economic partners. The last part of this paper provides an outlook for Visegrad countries.

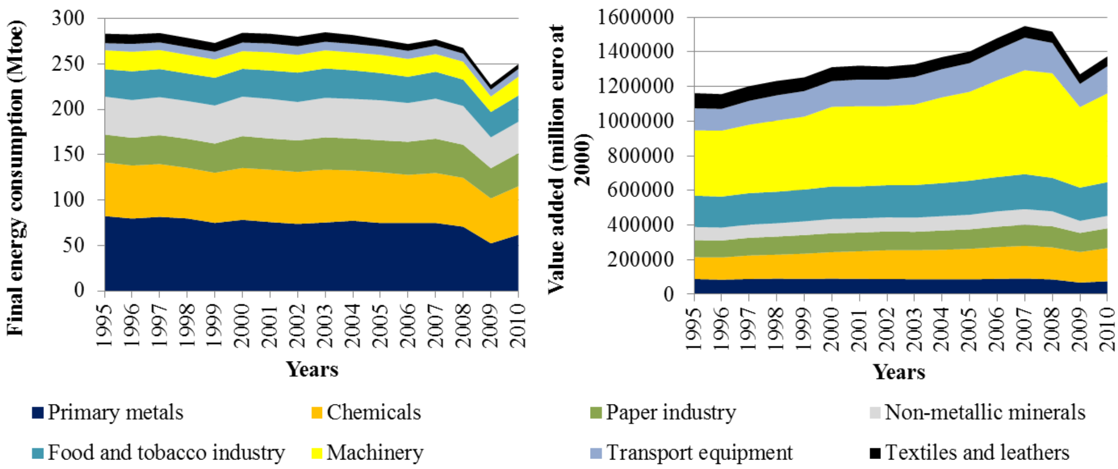
Keywords: energy intensive industries, energy prices, energy costs, competitiveness
JEL classifications: Q43, Q49, L60, L61, L65, L69

9.1. INTRODUCTION

When operating activities of a company are considered, it is of fundamental importance to ensure both the required resources that prevent any disruption of operation and the lowest possible cost impact. Efficient organisation of resource management is one of the key factors of competitiveness. Among the necessary resources – raw materials, assets, human resources, and others – energy plays an increasingly vital role in today’s world. The processes going on in the energy market present huge challenges to companies. Increasing energy prices as well as stricter environmental and climate protection regulations have a considerable impact on the international competitiveness and international presence of certain industries. This is especially true when these processes differ greatly in different parts of the world. The level of priority that industries assign to energy issues also varies. The importance of energy management differs and depends on the classification of companies into sectors, the intensity of their production activities and the proportion of energy costs in the total operational costs.

9.2. FINAL ENERGY CONSUMPTION IN THE EU MANUFACTURING INDUSTRY AND ITS ENERGY INTENSITY

According to Enerdata, final energy consumption in the EU accounts for almost 1200 Mtoe. Total final energy consumption fell by 5.1% between 1995 and 2010. Industrial energy consumption decreased even more, by as much as 11.6%. Thus, its share in the total consumption fell to 25.9% (compared to 30.8% in 1995) and was ranked third after the transport and household sectors. This study investigates industrial energy consumption[1] with a special emphasis on the manufacturing industry in order to identify the sectors where energy or energy management plays a determining role in resource management and competitiveness. Figure 9.1. shows the evolution of final energy consumption in the manufacturing industry (left) and value added (right) by subsectors. Enerdata uses the NACE sectoral classification system in its database to categorise sectors.



*value added at constant prices in 2000 (in million Euros)

Figure 9.1. Evolution of final energy consumption and value added in the manufacturing industry in the EU, 1995-2010
Source: Author's own elaboration based on the Enerdata database

[1] In the Enerdata database, the industrial final energy consumption includes energy used for activities performed by the mining, manufacturing and construction sectors. The energy used by industry for transportation is not included in this group. The database also excludes non-energy use from the industrial final energy consumption. It excludes the energy used by the energy transformation sector as well. It applies a completely different approach to heat and electrical energy production: in the case of heat, the fuel used for heat generation is included in the final energy consumption, but the generated heat is excluded, whereas in the case of electrical energy production, the generated electrical energy is included, but the fuel used for electricity generation is excluded. This principle also applies to the manufacturing industry (Enerdata 2012).

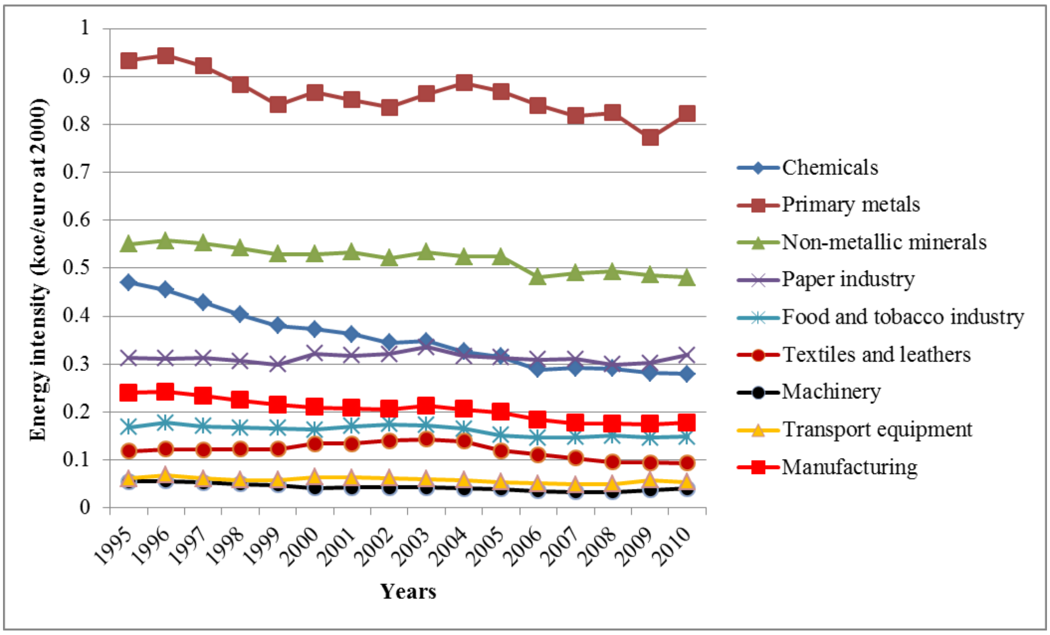
The total final energy consumption of manufacturing industry amounted to about 250 Mtoe in 2010. Primary metals had the largest share (22.14%) in the total energy consumption of the manufacturing industry, with 18% for the iron and steel industry and 4% for the non-ferrous industry. According to the data, the chemicals sector was the second largest energy consumer with its 19.1% in 2010. The paper industry (13%) and the production of non-metallic minerals (12.4%) also belong to energy-intensive sectors. The most significant non-metallic minerals industries, those requiring a substantial amount of energy, are the cement and glass industries. Over the period 1995 to 2010, the energy consumption of the manufacturing industry fell by 12%. The most striking decrease in the energy consumption occurred in the manufacture of basic metals and fabricated metal products.

The right-hand graph in Figure 9.1. illustrates the evolution of value added by subsectors of the manufacturing industry. The graph shows that the performance of the manufacturing industry actually improved by 19.6%. The sectors are listed by their value added on the basis of 2010 data. A considerable increase was experienced in the chemical (52%), machinery (36%) and transport equipment (23%) manufacturing sectors, whereas the value added in textile and fabricated metal production decreased significantly.

When the two graphs in Figure 9.1. are compared, it becomes obvious that the sectors with larger ratio and growth (machinery and transport equipment) in value added figures perform less energy-intensive activities in terms of delivered energy consumption. In contrast, energy-intensive sectors, which produce basic metal and fabricated metal products, chemicals and non-metallic minerals, have a smaller value added.

The energy intensity indicator is calculated by dividing the final energy consumption by value added. This indicator measures how much energy is required to generate one unit of value added. The decrease in this indicator expresses a favourable trend. Figure 9.2. shows the energy intensity of manufacturing sectors in the EU between 1995 and 2010.

In the period from 1995 to 2010 the energy intensity in the manufacturing industry, or more specifically in most of its sectors, experienced a slight recovery with larger or smaller fluctuations. There are two sectors whose energy intensity considerably differs from others. The energy intensity of the production and processing of metals (primary metals) far exceeds other sectors' energy intensity (iron and steel as well as non-ferrous industries perform highly energy-intensive activities). The other large energy-consuming sector is non-metallic minerals, which includes cement and glass. There was a significant fall in terms of energy intensity in the chemical industry.



*value added at constant prices in 2010 (in Euros)

Figure 9.2. energy intensities in manufacturing industry and in some of its sectors in the EU

Source: Author's own elaboration based on Enerdata database

Table 9.1. shows changes in energy intensities in subsectors. The sectors which managed to achieve both an increase in value added and a decrease in energy consumption are highlighted.

Table 9.1. Changes in energy intensities by subsectors, 1995 to 2010 in the EU

Subsector	Change in final energy consumption (%)	Change in value added (%)	Change in energy intensity (%)
	(from 1995 to 2010)		
Chemicals	**-9.6**	**52.2**	**-40.6**
Primary metals	-25.0	-14.9	-11.8
Non-metallic minerals	-17.0	-5.2	-12.4
Paper industry	18.7	16.1	2.3
Food and tobacco industry	**-4.4**	**7.9**	**-11.4**
Textiles and leathers	-48.7	-35.0	-21.2
Machinery	**-0.6**	**35.7**	**-26.7**
Transport equipment	8.5	23.0	-11.8
Manufacturing	**-11.7**	**19.6**	**-26.2**

Source: Author's own elaboration based on Enerdata database

Table 9.1. shows a significant improvement in energy intensity (over 40%) in the chemical industry in the period under analysis. This improvement is due to an increase of over 50% in value added and to a decrease of 10% in energy consumption. Energy intensity fell by 26.2% in the manufacturing industry. This can be because the energy efficiency of some subsectors increased between 1995 and 2010. The

performed calculations (which are not presented here due to space limitations) confirm this improvement, the changes the shares in value added and the comparison of energy intensity measured at a real structure and at a constant structure show, that there was no significant structural reform in the manufacturing industry. The fact that there might be structural changes in specific subsectors and classes within particular sectors should not be neglected; however, this study does not investigate these structural changes because of the lack of data.

Identification of Energy-Intensive Industrial Sectors

The aim of these analyses was to identify the industrial sectors where energy plays a key role in energy management. There is no universally accepted definition for energy-intensive sectors. The proportion of energy consumption and energy intensity indicator help to identify the range of energy-intensive sectors. However, other criteria should also be used to allow us to identify whether the sector is energy intensive. One further criterion might be the proportion of energy costs in production costs. The European Commission uses several criteria to identify energy-intensive sectors (see EC, 2014). The calculations in this study and the EC report (2014) both identify four energy-intensive sectors: primary metals (with iron and steel, and non-ferrous industries), chemicals, non-metallic minerals (glass, cement), and the paper industry. This study focuses on further investigation of these four sectors.

Energy Source Structure of Energy-Intensive Industrial Sectors

Gas and electric energy (over 30%) dominate in the energy consumption of the manufacturing industry. Coal and oil are used in a lesser extent; however, their share amounts to over 10%. Although we have no information about the means of electricity energy generation, it may be claimed that fossil fuels still remain heavily dominant energy sources. The distribution of energy sources by sectors varies. However, gas and electric energy are the most dominant sources (Table 9.2.). (The dominant energy sources of sectors are written in bold).

Table 9.2. Share of energy sources (%) of energy-intensive industrial sectors in the EU, 2010

Subsectors (year 2010)	Coal	Oil	Natural gas	Heat	Biomass	Electricity
Chemical industry	6.2	**13.6**	**35.3**	12.7	1.6	**30.5**
Primary metals	**38.1**	5.0	**30.3**	1.1	0.0	**25.6**
Steel industry	**44.8**	*4.2*	**30.9**	*0.8*	*0.0*	**19.3**
Non-ferrous metals	*4.5*	*9.0*	**27.0**	*2.4*	*0.1*	**57.0**
Non-metallic minerals	14.2	**25.6**	**38.5**	0.6	3.1	**18.0**
Paper, pulp and printing industry	3.1	3.2	**22.9**	5.9	**33.9**	**31.0**
Total manufacturing	**12.6**	11.2	**32.3**	5.5	7.7	**30.7**

Source: Author's own elaboration based on Enerdata database

9.3. SHARE OF ENERGY COSTS IN THE PRODUCTION COSTS OF ENERGY-INTENSIVE INDUSTRIES

In addition to materials, labour, machinery, equipment and other resources, energy is also an important input in company operations. Generally speaking, all company forms need energy, irrespective of their fields of activities. Manufacturing, service and commercial companies use energy for their operation, however, the amount of the required energy and its forms vary. Apart from main (production, services and logistics within the company), auxiliary and supporting (IT, repair, maintenance, cleaning and safety) processes, overhead-related processes (building energetics: lighting, heating, cooling and ventilation) also play a vital role in corporate energy management. Mention should be made of energy use in transport and shipping, namely, the supply and shipping of raw materials and finished goods (fuel consumption of vehicles).

The energy demand for main production processes in energy-intensive sectors is high. The energy resources used for non-energy purposes, such as the amount of energy resources used as raw materials or feedstock in production, are excluded from energy demand. (For example natural gas, which is a raw material used in production in the chemical industry, is excluded from calculations in order to ensure comparability.)

Figure 9.3. shows the share of energy-related costs in the production costs of selected energy-intensive industrial sectors. Energy expenditures are made up of costs of both energy resources and energy products purchased for production purposes, which include network tariffs, taxes, and levies, as well as incidental reliefs and exemptions. Total production costs are costs required to purchase goods for production including energy and costs of labour. In other words, total production costs are 'the difference between the total production value (gross annual turnover adjusted by changes in stocks and other correction items) and the gross operating margin in a given industry'. (EC, 2014, p.135)

According to an EC study, the share of energy-related costs in total production costs ranges from 4% to 10% in energy-intensive industrial sectors in the EU Member States (EC, 2014). The fact that there are several classes with different energy intensity and energy demands within specific subsectors should also be taken into account. It is clearly seen that the share of energy costs in production costs of specific classes can be as high as 40%, whereas in other classes these costs are under 5%. Thus, the energy intensity of some industrial subsectors can be influenced by subsector structures. Figure 9.3. shows the divergent ranges of performance by classes within subsectors.

Figure 9.3. also shows the lowest and the highest Member State values and EU averages. It should be highlighted that the share of energy-related costs compared to production costs varies greatly by classes. This may be because of different product structures in Member States, and differences in energy prices, energy efficiency and technological procedures in sectors.

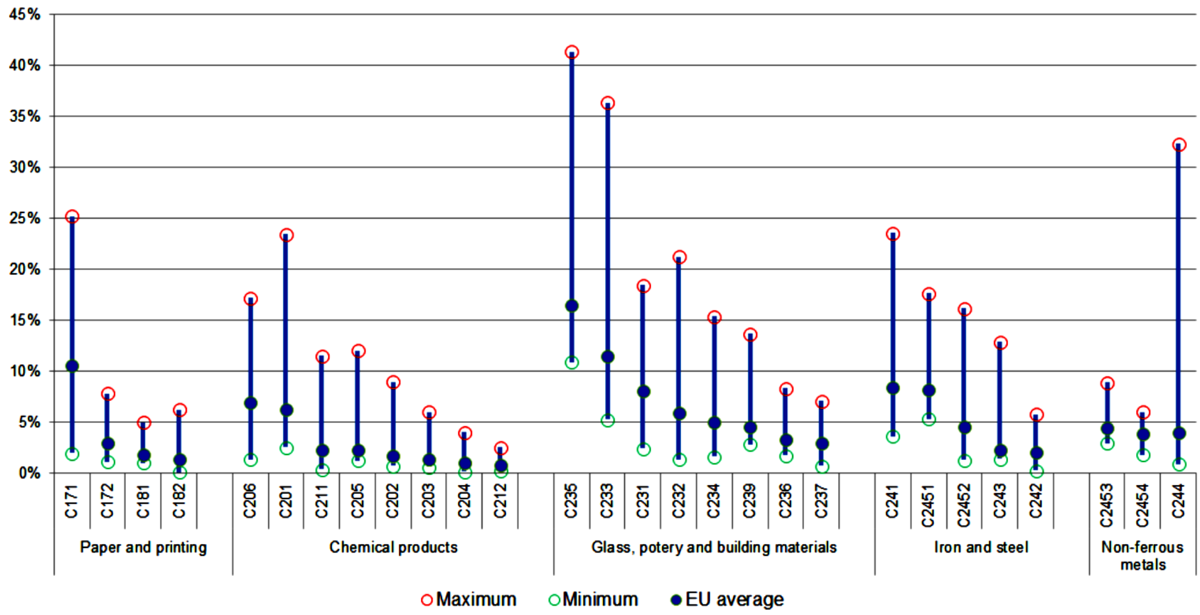


Figure 9.3. Share of energy-related costs in the production costs in selected sub-sectors[2] of energy-intensive industries in the EU

Source: Eurostat, Structural Business Statistics in EC 2014, p.137

The EC study (2014) also investigates the evolution of electrical energy and gas intensities in industrial sectors between 2008 and 2011. The study mentioned analyses sectors' gross value added, electricity and gas use, and changes in electricity and gas expenditures, as well as their extent compared to changes in gross value added. The performed calculations are not presented here due to limited space (see EC, 2014, p. 141, Tables 32 and 33). Only the main conclusions drawn from the EC tables are presented in this paper. In general, electricity and gas intensities declined in the five sectors from 2008 to 2011, which is a favourable trend. When the electricity intensity was analysed, it was observed that the largest drops were experienced in paper and printing (-7.6%), iron, steel and non-ferrous metals (-5.6%). In the case of natural gas, this decline was seen in iron, steel and non-ferrous metals (-8.9%), and the glass, pottery and building material industry (-6.4%). The changes in the intensity indicators result from the fact that the decline in gross value added of some sub-sectors was less significant than the decline in energy consumption. (The gross value added fell in all sectors in the period under analysis). However, annual electricity and gas expenditures fail to reflect this positive trend. For electricity, the decline in energy consumption in all sectors was larger than the decline in annual electricity expenditures. What is more, despite a 6% to 10% decrease in energy

[2] Codes: C171 - Pulp, paper; C172 - Articles of paper; C181 – Printing; C201 - Basic chemicals, fertilisers, plastics and synthetic rubber; C203 - Paints; C204 - Soap, cleaning-, perfumes and toilet preparations; C206 - Man-made fibres; C211 - Basic pharmaceutical products; C212 - Pharmaceutical preparations; C231 - Glass and glass products; C232 - Refractory products; C233 - Clay building materials; C234 - Other porcelain and ceramic products; C235 - Cement, lime and plaster; C241 - Basic iron, steel and ferro-alloys; C242 - Tubes, pipes, hollow profiles; C244 - Basic precious and other non-ferrous metals; C2451 - C2454 Casting. For a full list of codes see EC (2014, p. 137).

consumption in the paper and printing and chemical sectors, there was a 1.6% to 3% increase in annual electricity expenditures. For natural gas, the situation is more favourable. The difference between the decrease in gas consumption and gas expenditures is less than that of electricity. Moreover, the decrease in gas expenditures in chemical sector was larger than the decrease in gas consumption. The huge difference between the two energy resources is seen when the differences between divergent ranges of gross value added and those of energy expenditures are assessed. The decline in gross value added of electricity was larger than the decline in electricity expenditures in all sectors, whereas the decline in gas expenditures was larger than the decline in gas consumption in all sectors (see details in EC, 2014).

9.4. IMPACTS OF ENERGY COSTS ON NATIONAL AND INTERNATIONAL COMPETITIVENESS OF COMPANIES OPERATING IN ENERGY-INTENSIVE INDUSTRIES

The literature available on competitiveness is fairly extensive. The concept can be interpreted both at macro and micro levels. There is competitiveness of national economies and regions, sectors and companies and even products. This study applies a micro-level approach. The basis for competitiveness analyses is the two Porter models: Porter's Five Forces of Competitive Analysis (Porter, [2006]) and Porter's Diamond model (Porter, 1990). Porter's Diamond model describes the possible sources of competitive advantages of nations, industries and companies. One of the elements of competitive advantages is the availability of input factors[3], which include all the inputs required for efficient operation of companies within a specific industrial sector. The availability and the amount of input factors as well as their related costs are taken into account when input factors are analysed (Czakó & Reszegi, 2010). As globalisation spreads across the world and companies go international, companies face new opportunities. Developments in IT, transportation and shipping infrastructure have shrunk the world and opened new purchases and sales markets to companies. The flow of financial capital followed by production capital made it possible for companies to relocate their production facilities to countries that offer a cheap workforce, raw materials and tax advantages. Globalisation has placed competitiveness in an international context. According to Grant (2008), three main factors determine an international competitive advantage: corporate resources and abilities, factors of the recipient country and home country as well as the micro environment.

Competition is influenced by a combination of several factors. Competitive advantages can be achieved by cost efficiencies (cheaper inputs, loss identification and cost reduction), price advantages, innovation advantages and quality advantage. Other factors contributing to a competetive edge are increased specialisation, economies of scale, application of automated and robotised flexible manufacturing

[3] Apart from input factors there are further factors such as demand factors, corporate strategies, industrial structures, competition intensities, related and supporting industries, government and incidental opportunities.

systems allowing quick changeovers to meet constantly changing consumer demands, and keeping pace with technical developments. Concentration of human resources and knowledge, application of efficient organisational solutions (organisational slimming, taking advantage of synergy impacts and decentralisation), development of the immaterial supply chain and decrease of lead time further increase competitiveness (Hoványi, 1999, 2001).

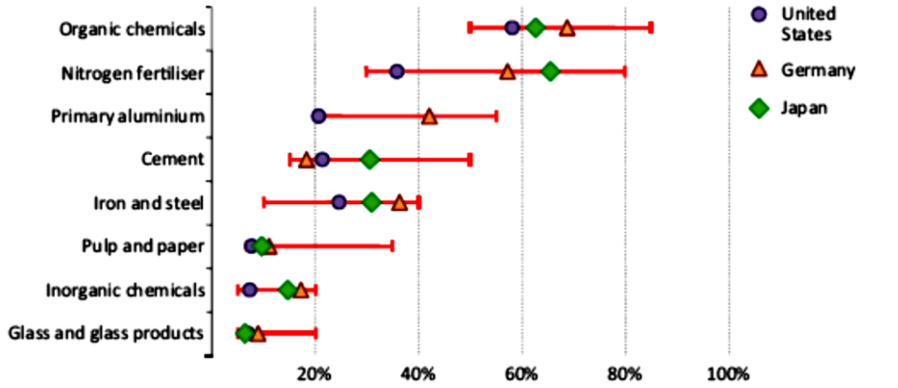
In the scientific literature, there is no strong consensus about priorities of key drivers. The relative order of factors ensuring a competitive advantage has changed over the time. The resources which used to generate a competitive advantage currently act as factors that keep companies in competition. Which primary resource is considered to be a competitive advantage varies by industrial sector.

According to Hoványi (2001), intellectual outcomes prevail over production of material goods. The key to business success lies in innovation. Assets and capital are of secondary importance. Venture capital plays an increasing role in success. Hoványi (1999) believes that immaterial assets play an increasing role in achieving competitive advantages when companies are under pressure to ensure high quality at a low price, which forces companies to provide more and more homogenous quality and follow extremely strict cost management. From this aspect, strict cost management is rather a condition for retaining the company in competition than an opportunity to achieve a competitive edge.

Némethné Gál (2010), Somogyi (2009), and Tóth & Tóth (2003) also highlight the central role of new types of competitive advantages such as the ability to innovate, immaterial assets (a qualified and trained labour force, patents, know-how, software, customer relations, brands, unique organisational models) as well as technical developments. However, none of them denies that the evolution of costs considerably affects competitiveness, even if costs are not considered to be principal factors. Setting competitive prices is of essential importance in international markets. However, low prices ensure a competitive advantage over competitors only if these prices cover corporate costs and meet profit requirements (Némethné Gál, 2010).

Cost factors in the internationalisation of companies act both as motivation factors – if companies get access to cheap resources in the international markets – and as hindering factors – if a high cost level undermines export abilities of products (Antalóczi and Éltető, 2002; Csáki, 2004; Csernenszky 2003; Gubik 2011a,b; Mikesy 2013). This is especially true for energy-intensive industrial sectors, where energy costs have a considerable impact on corporate competitiveness both in national and international markets, since they increase production costs and affect companies' profitability. It is quite obvious that both national and international competitive advantages of a product decreases if it is produced at a higher cost than products of competitors. Studies investigating specific energy-intensive sectors consider increasing energy prices and stricter environmental regulation to be great challenges in terms of competitiveness of industries (Bruxinfo, 2014; EC, 2010; ICEG EC, 2004; Zbořil & Chruszczow, 2009)

Figure 9.4. shows the share of energy costs in production costs of different energy-intensive industrial sectors in Germany, the USA and Japan in 2011. It is clearly seen that the USA had the lowest share of energy costs in all subsectors (aside from cement production).



Notes: Red horizontal lines show typical ranges for the world. In chemical industries, energy is used both in the production process and as a feedstock. Pulp and paper excludes printing. There are no data for primary aluminium in Japan as production there is minimal.

Figure 9.4. Share of energy costs in total production costs by subsectors, 2011
Source: IEA WEO 2013 and sources therein in EC 2014, p. 191.

Note: To calculate the share of energy in total production cost, IEA has used official sources for the USA, Germany and Japan for all industrial sub-sectors apart from primary aluminium in Germany (estimated based on the US data accounting for differences in electricity prices and specific energy consumption).

The evolution of energy costs is affected by two factors. The first is the price of energy and the second is the volume of energy consumtion. This study also deals with energy price evolution in a global context.

Energy Price Evolution

Energy prices have consistently been rising in the past few years. This price rise has been experienced for gas and electricity as well as for coal and oil. The difference between coal and oil prices is lower in different countries, than the price gap between national electricity and natural gas prices. This is because electricity and natural gas prices are regulated by several contracts where, apart from energy prices, other contractual obligations are stipulated. Taking into account that in most energy-intensive industrial sectors, the share of electrical energy and natural gas consumption is high compared to total energy consumption, this study focuses on the price evolution of these energy resources.

Wholesale prices: the EC study (2014) shows that wholesale electricity benchmarks decreased by 35-45% between 2008 and 2012. As for the trading points, the OTC market (Over-The-Counter Market) remains dominant with its two-thirds share. However, its volume significantly decreased. In contrast, spot trading was on the rise. Around 14% of the total traded volumes were executed on the Stock

Exchange. Wholesale natural gas prices still heavily depend on oil-indexed long-term gas import contracts. Data for 2012 show that 51% of traded gas consumption was oil-indexed, as opposed to 80% in 2005. In 2012 about 44% of gas consumption in Europe was priced on a gas-on-gas competition basis compared to only 15% in 2005.

Mention should be made of regional differences in price formation mechanisms. In North-West Europe 70% of natural gas was priced on a gas-on-gas basis compared to only 40% in Central Europe. Different wholesale benchmarks (Stock Exchange prices and oil-indexed prices) showed similar trends over time. However, oil-indexed prices were higher. Gas market benchmarks constantly and dramatically increased in the period between 2009 and 2012, and was followed by a slight decrease. The difference between natural gas wholesale prices within the EU is still considerable.

Retail prices: EU retail prices for electricity for industrial consumers (excluding VAT and tax exemptions) increased by 3.5% over the period 2008 to 2012. In some countries (Hungary, the Slovak Republic and the Czech Republic) the retail prices declined, whereas in other countries (Estonia, Latvia and Lithuania) these prices rose by over 8%. EU retail prices for gas for industrial consumers remained stable between 2008 and 2012.

The dominant price elements in retail prices were energy and energy supply. However, in the past few years, the taxation and levy component's share has risen in prices, especially in the case of electricity prices. As a matter of fact, the considerable increase in retail electricity prices did not result from the increase in energy prices, but rather from taxes built into prices of final goods (Based on EC, 2014).

Comparison of Energy Prices at a Global Level: EU, USA and Japan

There are abundant sources of information available about energy prices (Buchan, 2014; EC, 2014; IEA, 2013; OECD, 2013). Instead of presenting tables, charts, trends, and concrete price data, this study will describe differences in energy price among EU Member States and their main economic partners, the USA and Japan. As for the main price categories, this study attempts to show how much more industrial consumers pay for energy in the EU and Japan than in the United States.

Wholesale prices:

- Natural gas: Wholesale gas prices seemed to follow similar trends in different coutnries until 2009, with only slight differences. However, the gap started to increase from 2010 and reached an all-time high in April 2012. The Stock Exchange wholesale prices in the UK were 4.2 times higher than in the USA. Prices in Germany were 5.8 times higher than those in the USA and the Japanese prices were 8.6 times higher than the US Stock Exchange wholesale prices. In April 2013 the gap shrank considerably; however, the differences were still large. This was because of exploration shale gas resources in the USA (for details see EC 2014, p.170. Figure 108).
- Electricity: The data in September 2013 showed that the wholesale electricity prices varied between 30-50 euro/MWh. US prices were considerably lower than

European prices. The differences between prices were smaller (maximum 1.7 times), than in case of natural gas prices. (For details see EC, 2014, p.176, Figure 113).

Retail prices for industrial consumers in 2012:

- Natural gas: the average EU retail prices were 4 times, EU maximum prices 7 times, EU minimum prices 2.6 times, Japanese prices are 4.8 and Chinese prices are 3.6 times higher than in the US (see EC, 2014, p.180, Figure 116).
- Electricity: the average EU retail prices were 2.25 times, EU maximum prices 4.4 times, EU minimum prices 1.4 times, Japanese prices 2.7 and Chinese prices 1.8 times higher than in the US (EC, 2014, p.178, Figure 114).

There are several reasons for price differences and one of them is shale gas consumption in the USA. (Shale gas is a cheaper energy resource, than natural gas.) Another factor, taxes levied on energy products, has to be highlighted. The price of the final energy consumption contains an energy price element, network costs, taxes and levies imposed by the state. When the proportion of taxes and levies in the price is examined, it can be observed that energy products bear a higher tax burden in the EU Member States than in Japan or in the USA (See: IEA, 2013; OECD, 2013). Some part of these tax revenues is usually channeled into the national general budget and the other part is spent on financing energy and climate policy measures. The EU is more strongly committed to energy and climate policy than the USA, Japan or developing countries.

Export Data of Energy-Intensive Industries

Part 1 of Table 9.3. illustrates the share in the world export of the EU, the USA, Japan and BRICS countries (Brazil, Russia, India, China and South Africa) in 2012, while Part 2 shows the differences in share between 2000 and 2012 in the world export of all energy-intensive industrial sectors.

The data in Table 9.3. (Part 1) confirm that the EU plays a vital role in the export of products of energy-intensive industrial sectors. The EU export share exceeds 30% in all products. What is more, in the case of chemical products (47%) and paper (55%), this share is even higher. Hence, the EU is a dominant exporter of these products. Note should be taken of the trend that between 2000 and 2012 the decline in the EU share in the global export of all sectors was much more significant than that of the USA and Japan (Table 9.3., Part 2)[4]. This phenomenon can be explained at least partially by the unfavourable increase in the EU energy prices. If this huge gap in energy prices grows even further over the next few years, it will have an unfavourable effect on exportability of products of energy-intensive industrial sectors and erode the EU competitive advantage, which will result in further decrease in exports of energy-intensive products.

[4] While the export share of the EU, USA and Japan in these sectors decreased, the export share of BRICS countries considerably increased.

Table 9.3. Export data of energy-intensive industries

Part 1	Share in world export in 2012 (%)				
	BRICS	Japan	United States	EU27	All these together
Chemicals and related products	9.92	4.06	10.64	46.85	71.46
Paper and paper manufactures	11.23	1.74	9.32	55.31	77.61
Non-metallic mineral manufactures	23.29	3.39	9.11	30.10	65.89
Iron and steel	21.45	8.98	4.27	36.86	71.56
Non-ferrous metals	14.89	4.06	5.19	30.18	54.32
Part 2	Changes of share in world export between 2000 and 2012 (%-point)				
	BRICS	Japan	United States	EU27	All these together
Chemicals and related products	4.97	-2.08	-3.33	-5.22	-5.66
Paper and paper manufactures	7.40	-0.78	-1.84	-0.24	4.53
Non-metallic mineral manufactures	10.58	-1.06	0.63	-15.68	-5.53
Iron and steel	8.59	-1.47	-0.19	-8.99	-2.06
Non-ferrous metals	0.13	-0.06	-1.83	-2.34	-4.09

Source: Author's own elaboration based on UNCTADSTAT database

9.5. OUTLOOK FOR VISEGRAD COUNTRIES

This study presents an outlook for energy-intensive sectors of the countries of the Visegrad Group (V4). Table 9.4. illustrates the V4 export share in energy-intensive products (Part 1) in 2012 and the changes in their export share (Part 2) between 2000 and 2012. Table 4 also shows the V4 export ratio compared to EU and global total goods exports in 2012.

Within the Visegrad countries, the share of Poland in the export of energy-intensive goods is the highest, apart from the export share in iron and steel, where the Czech Republic is ranked before Poland. It is clearly seen that Poland's share in almost all sectors within the V4 increased in the period from 2000 to 2012, whereas the share of the other three countries declined. The share of the V4 countries in EU total exports in most energy-intensive industrial sectors increased between 2000 and 2012, amounting to almost 10% in 2012. The export share of the countries of the Visegrad Group in the global market ranged between 2% and 5%. It is noteworthy that, despite the fact that the EU export share of all sectors considerably declined in the world market, the V4 export share increased in all sectors under analysis.

Table 9.4. Export data of energy-intensive products in the V4 countries

Part 1	Share in V4 export in 2012 (%)				Share in EU export in 2012 (%)	Share in world export in 2012 (%)					
	Czech Republic	Hungary	Poland	Slovakia	V4	Czech Republic	Hungary	Poland	Slovakia	V4	EU27
Chemicals and related products	23.4	26.1	41.6	8.8	4.3	0.5	0.5	0.8	0.2	2.0	46.8
Paper and paper manufactures	20.3	15.0	52.0	12.7	9.6	1.1	0.8	2.8	0.7	5.3	55.3
Non-metallic mineral manufactures	32.6	16.1	39.5	11.8	8.8	0.9	0.4	1.0	0.3	2.7	30.1
Iron and steel	32.9	8.6	31.1	27.4	9.3	1.1	0.3	1.1	0.9	3.4	36.9
Non-ferrous metals	13.7	7.9	62.4	16.0	10.1	0.4	0.2	1.9	0.5	3.0	30.2
Energy-intensive products total	24.6	18.1	43.2	14.2	6.1	0.6	0.5	1.1	0.4	2.6	42.4
Part 2	Changes of share in V4 export between 2000 and 2012 (% point)				Changes of share in EU export between 2000 and 2012 (% point)	Changes of share in world export between 2000 and 2012 (% point)					
	Czech Republic	Hungary	Poland	Slovakia	V4	Czech Republic	Hungary	Poland	Slovakia	V4	EU27
Chemicals and related products	-5.23	-2.60	12.26	-4.43	1.9	0.12	0.17	0.48	0.01	0.8	-5.22
Paper and paper manufactures	-2.46	-0.35	11.11	-8.30	5.7	0.58	0.46	1.87	0.22	3.1	-0.24
Non-metallic mineral manufactures	-16.03	2.86	12.71	0.46	4.4	-0.13	0.16	0.50	0.08	0.6	-15.68
Iron and steel	-0.33	-0.55	2.72	-1.84	3.5	0.24	0.05	0.31	0.16	0.8	-8.99
Non-ferrous metals	0.95	-12.29	8.40	2.94	4.1	0.17	-0.15	0.84	0.23	1.1	-2.34
Energy-intensive products total	-5.12	-1.62	9.86	-3.12	2.6	0.13	0.13	0.55	0.07	0.9	-6.28

Source: Author's own elaboration based on UNCTADSTAT database

Table 9.5. Energy Prices for industry in V4 countries in comparison with some other countries' data in 2012, PPPs

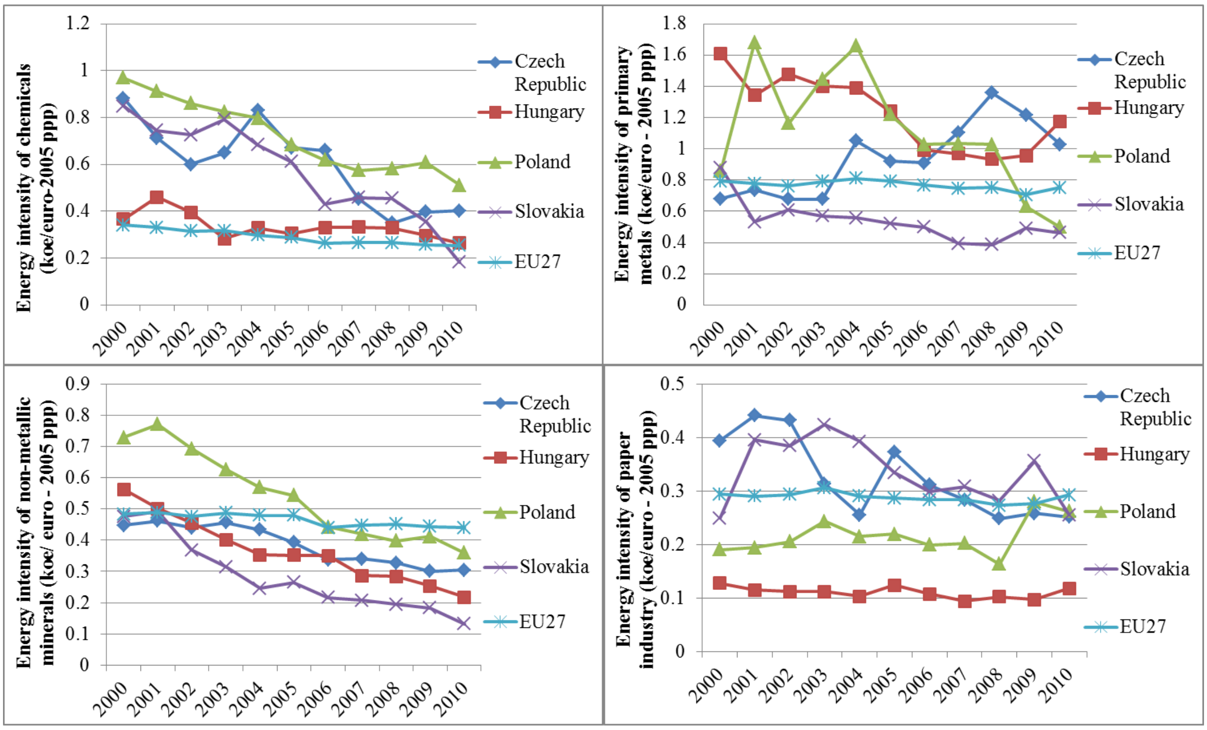
	Light fuel oil (USD/1000 litres)	Gasoline (95 RON) (USD/litre)	Natural gas (USD/MWh)	Electricity (USD/MWh)
Czech Republic	1346.4	2.662	69.2	205.3
Hungary	n.d.	3.239	73.9	224.6
Poland	1720.8	3.014	75.7	197.2
Slovakia	1572.3	2.929	77	254.7
Germany	912.5	2.066	49.7	144.7
UK	931	1.989	35.7	117.1
USA	796.6	0.994	12.7	66.8
Japan	770.8	n.d.	52.6	149.2
OECD Europe	1067.2	2.133	44.8	145.4
OECD	862.4	1.25	29	118.6

Source: Author's own elaboration based on IEA 2014, pp. 360, 366, 369, 375.

Table 9.5. illustrates the relative expensiveness of energy in the V4 in terms of PPPs (purchasing power parities). The price of specific energy sources and that of petrol is substantially higher than in either of the EU industrial countries (Germany, the UK), the USA or Japan. Hence, improving both energy efficiency and energy intensity in the V4 is fundamental.

Figure 9.6. shows the evolution of energy intensities of industrial sectors in the V4 between 2000 and 2012. It can be seen that the energy intensity in chemicals and non-metallic minerals fell in all countries of the Visegrad Group, which is a positive trend. However, the intensity of the non-metallic industrial sector was low in V4 compared to the EU average and this indicator was above the EU average in the

chemicals industry. In the case of primary metals and paper industry, this trend is not so clear. The graphs in Figure 9.6. present the degree of intensity in the V4 energy-intensive industrial sectors compared to each other and to the EU. The disparities in the intensity degree can be explained by the level of energy efficiency in particular countries and subsectors, and by structural reforms and the product mix within particular sectors. (The analysis of these issues do not belong to the aim of this study).



*value added at PPPs in 2005 (in Euros)

Figure 9.6. Energy intensity of energy intensive industries in V4 countries between 2000 and 2010
Source: Author's own elaboration based on ENERDATA database

9.6. CONCLUSIONS

The EU has realised that it can lose its competitive advantage against its main economic partners, primarily to the USA, due to high energy prices. The production costs of energy intensive products and the transportation costs will increase compared to its competitors, which will result in substantial adverse effects not only on product export ability, but also on national competitiveness. The EU has introduced several measures to control price growth and to protect its climate. By creating a competitive environment and liberalising the energy market, EU expects a reduction in energy prices. However, the principle of undistorted competition is sometimes infringed and the actual results are below expectations (See Kádárné Horváth, 2012a).

The development and deployment of energy-efficient technologies is on the rise. There has been a shift towards clean energy in electricity generation. Energy efficiency in transport has increased. The Directive on Energy Efficiency has been adopted where energy savings potential of specific sectors is identified. In the case of natural gas, efforts have been made to diminish infrastructural shortcomings and dependence on gas import, and to seek new purchasing directions and alternatives. The EU Emission Trading System (ETS) aims at increasing energy efficiency and reducing CO_2 emissions. In order to attain EU energy policy objectives, new environmental protection measures and regulatory instruments will be introduced. Apart from regulations at EU level, energy policies in the Member States also regulate energy prices (imposed taxes, levies, etc.). However, resolving global environmental problems is not primarily the EU's task. As long as the main climate polluting countries make little effort to combat climate change, the EU's competitive disadvantage will further increase.

Apart from energy prices, the amount of consumed energy is another factor that affects energy costs. If energy prices are considered to be constraints from sectortial points of view, the efforts targeting improving energy efficiency are vital for reducing energy costs. Increasing energy efficiency is also important at the company level. Conscious energy management is playing an increasingly important role in corporate resource management, especially in energy-intensive setors. Exploring opportunities for rationalising energy is fundamental in maintaining the competitive advantage of companies (See Kádárné Horváth, 2012b).

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