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ANALYSIS OF THE CORRELATION BETWEEN ENERGY CONSUMPTION AND INDUSTRIAL COMPETITIVENESS IN THE EUROPEAN UNION

Methodological
article

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Abstract

In this paper the author analyzes the dependence between energy and industrial competitiveness before and after the 2008 economic crisis in the European Union. The Europe 2020 strategy aims energy major industrial competitiveness and increasing energy efficiency. But the economic crisis of 2008 led to reduced energy consumption and prices have increased considerably, so prices in the European Union in the energy industry are estimated to be twice higher than in the United States and Russia and 20% higher than those in China. According to the 2020 European Strategy for Sustainable Growth proposed increasing share of renewables to 20% increasing 20% energy efficiency and 20% reduction of greenhouse gas emissions greenhouse (or even 30 %, in favorable conditions) compared to 1990. The economic analysis in this paper are based on statistical quantitative method. Indicators used in this analysis are available on major platforms Eurostat data.

Introduction

For centuries Europe lead a struggle for clean and affordable energy. Currently, however, the European energy sector is in the process of giving up fossil fuels import and require massive investments, despite the context of economic uncertainty. In addition, it has widened the gap between energy prices practiced by the European Union and its major economic partners, a number of reasons, many of which depends only slightly from Europe. Actions undertaken to produce electricity without carbon dioxide emissions caused mostly increased production of solar and wind, which had a major impact on energy systems and energy production costs

Meanwhile, the European gas and electricity move from public monopolies to liberalized markets, competitive private company formed in which users, not taxpayers, bear the costs of new investments made in the energy sector.

1. Economic theory

According to Stern energy is a key factor of production (Stern, 1997). The production involves the transformation or movement of matter in a certain way and all these transformations require energy.

Some alternative models of economy says that energy is the only primary factor of production. Understanding the role of energy in mainstream growth theory is not so simple and the role of energy as a driver of growth and production is minimized in economic theory.

An innovation which reduces the amount of energy required to produce a unit of energy services decreases the actual price of energy services. This results in an increase demand for energy services and therefore energy (Binswanger, 2001).

The lower price of energy also results in an income effect (Lovins, 1988), which increases the demand for all goods in the economy and therefore the energy required to produce them.

Energy efficiency has been proven to be one of the main ways of reducing the impact compromise between reducing energy consumption and economic growth. For example, after the crisis of 1970, average productivity increased energy consumption partly due to inefficient capital replacement with energy efficient one (Berndt, 1990).

The relationship between energy and the use of capital productivity indicates that energy efficiency can be increased by optimizing the use of capital (Zaman et al, 2012). Therefore, the efficiency of capital stock increase energy productivity. Energy is essential for productivity and growth environment. This is the cheapest way to reduce emissions of greenhouse (McKinsey, 2007).

2. Changes in European energy policy

The process of making electricity internal market of the European Union was initiated by Britain in 1990 and target training and liberalization. Shortly thereafter, in 1992, the "race" for restructuring the electricity sector have joined, one by one, and other European countries such as Norway, Sweden, Germany, Finland, Denmark or Spain. Increasing extent that he met this movement across the continent persuaded EU bodies need critical analysis of the existing situation and adopting a common view for the whole European community.

After discussions that followed, in December 1996, was born Directive 96/92/EC of the European Parliament and Council on common rules for the internal market in electricity, given in Directive (1996) of the European Parliament and Council Directive which introduced the principle of eligibility for all large industrial customers.

Continuing the market opening, Directive nr.2003 / 54 / EC of the European Parliament and of the Council on common rules for the internal electricity market released a calendar for the full opening of the electricity market to competition. Directive. 2003/54 / EC established common rules on the production, transmission and distribution of electricity, as well as those concerning the modalities of organization and functioning of the sector, market access, the criteria and procedures for tendering, authorizations and on the use of networks (Report The Competition Council, 2014).

To strengthen competition in the electricity market in Europe it was adopted and Regulation no. 1228/2003 of the European Parliament and the Council on conditions for access to the network for cross-border exchanges in electricity. Adoption of this regulation was intended to create a level playing field for cross-border electricity exchanges, framework that takes into account the specificities of national and regional markets and improve competition in the internal market for electricity.

However, Regulation no. 1228/2003 established the principle of transparency tariffs for access to networks that take into account the need to ensure network security and to reflect actual costs incurred.

Directive. 2003/54/EC and Regulation no. 1228/2003 had a significant contribution to creating an internal market in electricity, but it was found that further obstacles exist to the marketing of electricity, the domestic markets still remain isolated (ie. low interconnection or some differences between the technical rules of the Member States).

The process of making electricity internal market of the European Union was continued by adopting Directive 2009/72 / EC of the European Parliament

and of the Council on common rules for the internal market in electricity.

However, on 13 July 2009 was adopted Regulation no. No 714/2009 of Parliament The European Council on conditions for access to the network for cross-border electricity (which repealed Regulation no. 1228/2003), a regulation which aims, in addition to refining the rules for cross-border exchanges of electricity, and support the establishment of a market functioning and transparent wholesale with a high level of security of electricity supply.

To achieve the objective to achieve the internal energy market have been taken to create an independent body specializing in which the national regulators to cooperate. In this regard, Council Regulation EC No. 713/2009 of the European Parliament and of the Council establishing an Agency for the Cooperation of Energy Regulators (ACER).

ACER is an independent institution with responsibilities at Community level complementary to those of the national regulatory authorities, which are mainly related to infrastructure border transport. Powers Acer concern the process of elaboration, adoption and monitoring of the implementation of the network codes and monitoring internal markets for electricity, particularly for the retail price of electricity and network access (including access of electricity produced from renewable energy).

At the same time, Acer is vested with decision-making powers where the views of national regulatory authorities on cross-border rules on access to infrastructure are divergent. Also, the Agency has been vested with powers to monitor and Regulation (EU) no. 1227/2011 of the European Parliament and of the Council on integrity and transparency of wholesale energy market (REMIT).

By adopting REMIT it was introduced at EU level a specific framework for monitoring wholesale electricity markets, with the stated objective to detect and deter possible attempts to manipulate the market.

To achieve the stated objectives on energy security, environment protection and economic and social cohesion, another EU priority measure is the development of renewable energy sources.

Increased use of electricity produced from renewable energy sources is also an important component of the package of measures needed to comply with the Kyoto Protocol to the Framework Convention of the United Nations Climate Change.

In order to increase the contribution of these sources to electricity production in the internal market and to build a future Community framework in this area in 2001 it has adopted Directive 2001/77 / EC of the European Parliament and of the Council on the promotion of electricity

produced from renewable energy sources in the internal electricity market. The directive essentially defined categories of renewable energy sources and national objectives to be achieved (with indicative) and established the need for systems of national support to promote the consumption of electricity produced from renewable energy sources and measures to guarantee transport and distribution of electricity produced from renewable sources (COM 144 final).

Renewable Energy Roadmap - Renewable energies in the XXI century: building a more sustainable future ", adopted by the Commission Communication of 10 January 2007 Communication from the Commission to the European Council and the European Parliament of 10 January 2007 - An Energy Policy for Europe, COM (2007)., Ruled that a 20% target for the overall share of energy from renewable sources a 10% renewable energy in transport would be appropriate and achievable targets at EU level. Moreover, it emphasized the need for a regulated framework providing for mandatory targets for achieving the targets set in order to ensure business stability and predictability necessary for the rational and sustainable investments in the renewable energy sector.

The Commission has recently presented a framework for climate and energy policies in the period 2020-2030 (COM 2014). This framework proposes ambitious targets on renewable energy and reducing greenhouse gas greenhouse as part of the Union's transition to a low carbon content. It also promotes, low energy affordable for businesses and consumers through a well functioning internal market.

3. Methodology

We believe industrial production and energy index as two ordinal variables and are interested in evaluating the association between them.

The method of calculating the Spearman correlation coefficient is based on a value relative position to each other. It varies between -1 and +1 values.

In the first phase and establish industrial production index ranks of power consumption, and r_c countries for the period 2005-2015.

In the second phase are calculated Spearman correlation coefficient of ranks r_i and r_c , the relationship:

$$r_s = 1 - (6 * \sum d_i^2) / (n * (n^2 - 1))$$

where d_i represents the difference ranks of the two variables r_i and r_c .

4. Measures to reduce energy consumption

By launching the European Commission's communication entitled 'Facing the challenge of higher oil prices (COM, 2008), the Commission asked the European Union to become more

efficient in energy use, and less dependent on fossil fuels - particularly following the approach set out in climate package and renewable energy.

In 2010, the European Council's strategic document "Europe 2020", the efficiency of energy resources occurs as an important goal to achieve. In this context, the European Commission adopted the document Energy 2020 - A strategy for energy competitive, sustainable and secure energy that defines and sets priorities for a period of ten years. Through its energy strategy documents and policies in the area of energy production and consumption, the European Union has proposed 2030 increase energy efficiency by 20% of consumption.

European Commission estimates indicated in 2011, achieving a rate twice as low compared to projected 2020 targets of 20% reduction in primary energy consumption. Consequently, the European Commission developed and adopted "Plan 2011 energy efficiency "(2020 for Europe effective in terms of resources), followed in 2012 by Directive 2012/27 / EU of the European Parliament and of the Council on energy efficiency. It provides for the establishment of indicative national energy efficiency targets for 2020.

In order to find solutions to Europe's energy sovereignty, the European Commission launched, in 2014 "European energy security strategy "to reduce dependence on energy imports. In 2014 they accounted for more than half of its needs.

At the same time develop other tools to control and incentive to increase energy efficiency globally with positive social impact as initiative Sustainable Energy Action Plan.

The goods in the European Union that require high energy consumption continues to dominate global export markets despite growing disparities in energy prices in 2005 - 2015. According to the IEA (International Energy Agency), the discrepancy becoming greater in the prices and costs of energy between the European Union and other regions of the world has resulted in a decrease of the European Union export to world markets for goods with a high energy consumption.

In recent decades, industry in the EU has been restructured in order to reduce energy consumption and products with high added value, which partially mitigated the increase in energy prices. In addition, there were many other factors that have played a role, including labor costs and attractiveness of markets outside the EU, who directed investment towards those markets.

Certain energy-intensive industries were geared towards global markets to offset the effects of the recession and falling demand in Europe through exports and international investment. These companies are still subject to international competition and must decide whether to invest in Europe or abroad, in countries with a more promising market dynamics. Given that

competitors in other countries are trying to improve their energy efficiency, energy price differences have a bigger impact on investment decisions and the ability of companies to withstand competition and grow.

As can be seen in Table 1 energy consumption in the European Union was increasing until 2010 when they were introduced energy efficiency measures. Between 2005-2015 industrial productivity experienced a peak in 2010 of 6.9.

5. Results

It is used in the first stage, a test of rank correlation (Spearman) between the index of industrial production and consumption.

The method of calculating the Spearman correlation coefficient is based on a value relative position to each other. It varies between -1 and +1 values.

Spearman correlation coefficient between the indices of industrial production and energy consumption is calculated using the equation:

$$r_s = 1 - (6 * \sum d_i^2) / (n * (n^2 - 1))$$

where d_i represents the difference ranks of the two variables r_i and r_c .

$$r_s = 1 - (6 * 170) / (11 * (11^2 - 1))$$

$$r_s = 1 - (6 * 170) / (11 * 120)$$

$$r_s = 1 - 0.772$$

$$r_s = 0.228 \text{ is obtained in the range } (-1, 1).$$

The value of this coefficient shows that there is a direct correlation, of low intensity between energy consumption and industrial production index calculated for the period 2005 - 2015 in the European Union.

Conclusion

Market liberalization is likely to increase competition, which would ensure a more efficient energy production at lower prices.

In pre-crisis period, 2005-2008, with the implementation of new energy policy in the European Union, energy consumption began to decline, with the result increases in industrial productivity. After the economic crisis of 2008, while reducing energy consumption as a result of closing or reducing the activity of industrial enterprises, and by introducing new legislation on energy efficiency in 2012, energy consumption continued to decline. Industrial productivity continued growth so far, the EU has kept its global leadership in energy-intensive exports of goods. European industry is bound to make even greater efforts to offset the higher costs of energy through continuous improvement in efficiency, taking into account physical limitations, given that competitors strive for efficiencies and European industry decides to invest abroad to be as close in expanding markets.

Additional efforts are needed for market liberalization, increased investment and

competition and more efficient to generate price reductions.

In addition, increased production of renewable energy and energy efficiency contribute to reducing fossil fuel import bills.

For industry, the EU should continue its efforts to ensure a level playing field in terms of energy prices. It's especially energy subsidies granted to local industries and export restrictions on energy products, topics that should be discussed with international partners, both bilaterally and within the WTO. These measures will also help to improve the international competitiveness of European industry, despite recent increases in European prices relative to energy and cost for undertaking the necessary investments. Where these measures are not adequate, fiscal transfers, exemptions or reductions of taxes and excises could serve as a way of protecting certain industrial consumers faced with higher costs for energy, to the extent that such measures are compatible with the rules on state aid and internal energy market rules.

Europe can therefore establish a practical example for how to build a competitive economy based on sustainable and affordable energy system.

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[25] Regulation no. 1227/2011 of the European Parliament and of the Council on integrity and transparency of wholesale energy market (REMIT).

Appendices

Table No. 1
Index values and ranks industrial productivity and energy consumption in the European Union

Year	IPI	Gross inland consumption (MTOE)	ri	rc	di	di ²
2005	1,5	1,831	6	1	5	25
2006	4,1	1,839	2	2	0	0
2007	3,7	1,810	3	3	0	0
2008	-1,8	1,805	9	4	5	25
2009	-13,9	1,701	11	5	6	36
2010	6,9	1,763	1	6	-5	25
2011	3,2	1,697	4	7	-3	9
2012	-2,1	1,684	10	8	2	4
2013	-0,5	1,666	8	9	-1	1
2014	1,1	1,606	7	10	-3	9
2015	1,7	1,574	5	11	-6	36

Note. Results obtained by calculations based on Eurostat data.