

Contemporary Issues in Business, Management and Education 2013

Impact of energy prices on industrial sector development and export: Lithuania in the context of Baltic States

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Abstract

The sustainable development of a country depends on rates of economic growth. Economic growth, in its turn, is related to use of energy in terms its intensity and price. This paper aims to reveal if increasing prices of gas and electricity retard development of industrial sector of Lithuanian economy. A question, if international competitiveness of industry, measured by industrial export, remains unaffected in result of increase of energy resource prices is being raised. Energy intensity issues are not being tackled; during considered period energy intensity did not changed significantly. The object of research is industrial sector of Lithuanian economy. The method used is a correlation analysis, and the time span of data is 2000–2011. An economic interpretation of obtained results would lead to the conclusion that an increase of energy prices has not had significant malign impact on industrial sector development and export.

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Selection and peer-review under responsibility of the Contemporary Issues in Business, Management and Education conference.

Keywords: industrial sector; exports; energy price; Lithuania; Baltic States.

1. Introduction

The researches linked to economic growth and energy consumption are seen as the growing trend in scientific literature (Dudzevičiūtė, 2012; Vosylus et al., 2013). A lot of attempts have been made to investigate the causal relationship between economic growth and energy consumption. The seminal study carried out by Kraft and Kraft (1978) has indicated that causality run from GNP to energy consumption in the United States. The studies were

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extended to investigate other industrial countries like the United Kingdom, Germany, Italy, Canada, France, Japan, and China (Yuan et al., 2007). One stream of scholars argues and their studies confirm that economic growth depends on energy consumption (Narayan & Smyth, 2008; Akinlo, 2009). For instance, Narayan and Smyth (2008) have observed the situation in the G7 countries and concluded that “capital formation and energy consumption have had a positive effect on real GDP in the G7 countries”. Meanwhile, Akinlo (2009) has analysed a case of Nigeria and has confirmed similar assumptions. The scholars state that the long-run causal relationship “present mixed and conflicting results across different developing countries” (Chen et al., 2007). However, some scientific researches prove that economic growth caused energy consumption (Chen et al., 2007; Jinke et al., 2008). For instance, research, carried out by Chen et al. (2007) in 10 Asian countries, allowed to conclude that a uni-directional short run causality runs from economic growth to electricity consumption. Besides that, a bi-directional causality between energy consumption and economic growth was indicated in developed countries in both short and long run (Mahadevan & Asafu-Adjaye, 2006).

The vast literature on economic growth distinguishes various determinants. Not going deep into elaborate discussions regarding different determinants the authors adopt the view that one of the main driving forces of economic growth is international competitiveness (or growth in volume) of export. Discussions in the prevailing literature strive to emphasize the obvious importance of export for the country’s competitiveness (Travkina & Tvaronaviciene, 2011; Bruneckiene & Paltanaviciene, 2012). A main underlying premise adopted by scholars is that the country’s increase in exports (not related with increase in imports), increasing revenues and diversity within the exports structure are seen as the main contributors to the increase of country’s competitiveness. On the other hand, increase of export is essential for small countries and contributes to the increase of cash flow, employment indicators and the growth of production basis. Hence, international competitiveness of export is directly linked to country’s ability compete in international markets and sustainable economic grow.

Taking into account the fact, that separate economic sectors are more open in sense of trade than the wholly taken national economy, competitiveness measuring embraces ability to export (Travkina & Tvaronaviciene, 2011). Hence, a special focus on the industrial sectors, which are seen as the major contributors to the international trade, has to be put. On the other hand, the industrial sectors are seen as the major consumers of energy resources. The scholars state that in line with industrial output growth, the energy resources also grew substantially in observed countries (Hartono et al., 2011). Notably, energy is essential input to industrials’ sectors growth and its competitiveness in modern economies. The relationship between industrial sector’s energy intensity (as input indicator) and industrial sector’s output growth (as output indicator) is analyzed by various scholars. Discussions presented above led to several research questions. The first research question is if an increase in energy prices, when energy intensity remains rather unchanging affects development of industrial sector. The second research question is if an increase in energy prices is neutral, or retards growth of exports, which are generated mainly by industrial sector. The remainder of the paper is organized as follows. In section 2 the overview of Lithuania’s economy in the context of the EU is provided. In section 3 the overview of Lithuania’s energy consumption and energy prices is analyzed. In section 4 the methodology and results are presented and economic interpretation provided.

2. Lithuania’s economy in the context of the EU

Lithuania became an independent state in 1990, what has led to radical political, social and economic changes. On the other hand, Lithuania’s accession to the EU in 2004 has impacted liberalization of trade due to a number of unilateral decisions and treaties.

Table 1. Gross Domestic Product (bln. EUR). *Source:* Eurostat

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Estonia	8.718	9.685	11.181	13.39	16.069	16.235	13.761	14.322	15.951
Latvia	9.942	11.154	12.927	15.981	21.026	22.889	18.521	18.521	20.211
Lithuania	16.576	18.244	20.969	24.104	28.738	32.414	26.654	27.607	30.806
EU (27)	10104	10605.77	11072.17	11701.01	12406.2	12473	11754.74	12278.34	12649.79

Notably, in 2004–2008 Lithuania as well as other Baltic States, namely Latvia and Estonia has been the fastest growing region in the EU. Examination of data (GDP) provided in Table 1 illustrate the growth of Lithuania's economy in 2003–2008 and sharp decline in 2009, impacted by financial crisis.

The Baltic countries responded to economic crisis through internal adjustment of prices and wages, which impacted the growth of GDP in 2010–2011. As concerns Lithuania's economy in a short-term prospect, according to the latest official surveys Lithuania's GDP is expected to grow at a slower rate due to a slowing down global economy (Bank of Lithuania 2012).

Analysis of data, indicating development tendencies of the Baltic States by comparison gross value added by major economic sectors (Table 2) confirms that industry and service sectors play an important role in countries' economies. Meanwhile, a share of agriculture has been diminishing.

Table 2. Gross Value Added (% of all branches). *Source:* Eurostat

	2003	2004	2005	2006	2007	2008	2009	2010
Industry								
Estonia	22.7	21.9	21.5	21	20.3	20.3	19.6	23.1
Latvia	16.8	16.5	15.6	14.6	14.3	14.1	14	16.7
Lithuania	24.4	25.7	25.2	23.9	22.2	21.5	20.4	22.1
EU (27)	20.5	20.4	20.2	20.3	20.2	19.8	18.1	18.7
Agriculture								
Estonia	4	3.9	3.5	3.2	3.1	2.7	2.6	3.5
Latvia	4.1	4.4	4	3.5	3.6	3.1	3.3	4.1
Lithuania	5	4.6	4.8	4.3	3.9	3.7	3.3	3.4
EU (27)	2.1	2.1	1.8	1.7	1.8	1.7	1.6	1.7
Construction								
Estonia	5.8	6	7.1	8.7	9.3	8.6	7	5.8
Latvia	5.6	5.6	5.8	6.2	7.4	9	6.6	5
Lithuania	7	7	7.2	7.5	8.7	10	6.4	5.6
EU (27)	5.7	5.9	6	6.2	6.4	6.4	6.3	6
Trade, transport and communication service								
Estonia	28.5	28.5	27.7	27.3	25.7	25	25.5	25
Latvia	34.8	35.3	36	34.3	31.9	29.6	28	30.1
Lithuania	32.1	31.5	31.3	30.7	30.6	30.5	31.9	33.2
EU (27)	21.5	21.5	21.3	21.1	21	21.1	20.8	20.8
Business activities and financial services								
Estonia	22.6	23.1	23.9	24.1	23.9	24.6	25	24.2
Latvia	18.7	18.9	20.3	21.8	22.4	23.6	26.1	3.5
Lithuania	12.3	12.3	13.7	14.9	16.2	16.6	16.4	16
EU (27)	27.3	27.5	27.7	28	28.4	28.5	29.2	29
Other services								
Estonia	16.5	16.6	16.3	15.7	15.9	17.9	20.9	19.4
Latvia	20.3	19.2	19	18.8	19.1	21.1	22	20.1
Lithuania	18.7	18.1	17	16.9	16.3	17.4	21	18.9
EU (27)	22.7	22.7	22.8	22.6	22.2	22.5	24	23.7

It is noticeable, that gross value added of industry of Latvia and Estonia has decreased in 2003–2009 and started to grow in 2010 (Fig. 1). Meanwhile, gross value added of Lithuania increased in 2003–2004 and decreased in 2004–2009. On the other hand, patterns of moderation in industry expansion began surfacing in the fourth quarter of 2011, more distinct in Estonia (Bank of Lithuania, 2012).

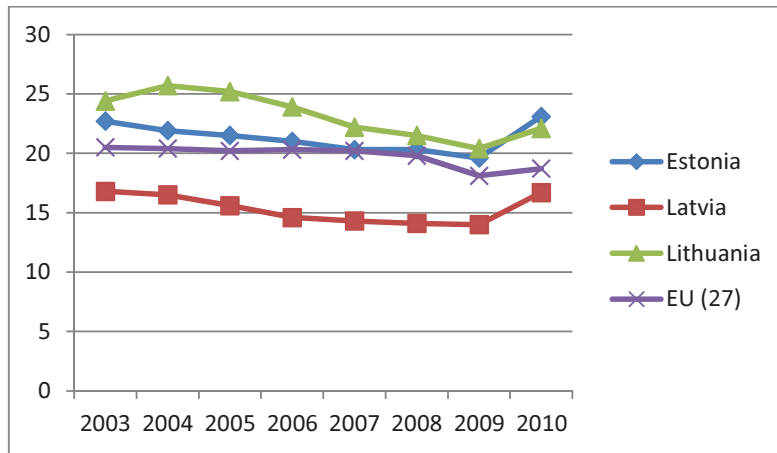


Fig. 1. Gross value added – Industry, including Energy (% of all branches). *Source:* Eurostat

A close look at data presented in Table 3 confirms the growth of export in the Baltic States in 2003–2008, which was interrupted in 2009. On the other hand, the recovery of export is observed in 2010–2011. The assessment of longer term data allow to conclude that Lithuania's export was growing more than the import of the main trading partners – EU states and Russia. The observations carried out by official authorities indicate, that in short term due to further slowdown of the economies of main trade partners exports growth rate should slacken but its decrease is not expected so far (Bank of Lithuania, 2012).

Table 3. Export (bln. EUR). *Source:* Eurostat

Year	Estonia	Latvia	Lithuania	EU (27)
2003	4.003	2.557	6.158	869.23
2004	4.769	3.223	7.478	952.955
2005	6.202	4.149	9.49	1057.56
2006	7.719	4.902	11.263	1161.884
2007	8.034	6.062	12.509	1242.927
2008	8.47	6.897	16.077	1317.503
2009	6.487	5.522	11.797	1099.158
2010	8.745	7.191	15.651	1356.684
2011	12.022	9.436	20.17	1553.923

Scientific researches confirm that the Baltic States are competing exporters of similar sectors of commodities (Bernatonyte & Normantiene, 2009). Lithuania's export of goods and services grew significantly: in 2004 it was 52% of GDP, while in 2011 it was 78% of GDP (The World Bank, 2012). As concerns the Baltic States, only Estonia had the higher export share of GDP in 2011 – 93%. Taking into consideration implications of Lithuania's accession in the EU on foreign trade, we can draw a conclusion that Lithuania's industry went through considerable transformations in terms of its ability to compete in international markets.

On the other hand scientific surveys confirm that some industrial sectors gained competitiveness and some other lost it, respectively. For instance, textile, leather and clothing industries have lost a share in export structure and chemical, engineering and equipment industries strengthened their competitiveness (Travkina & Tvaronavičienė, 2011). In 2011 the greatest percentages of exporting goods were observed in mineral fuels, lubricants and other materials (25%), machinery and transport equipment (18%) and chemical and related products (14%) (Eurostat, 2012). Taking into consideration the classification of the EU energy intensive industries (Ecorys, 2009), the goods of the highest volume of export are considered to be as energy intensive.

3. Energy consumption in Lithuania

The Baltic States have a high level of import dependency on such energy resources like gas and oil, which are imported exclusively from Russia. In comparison to other Baltic States, Lithuania is the largest and provides some industrial infrastructure, such as oil refining and chemicals. Notably, Lithuania's energy dependence has increased significantly: in 2000 it was 59.82% and in 2010 it was 81.92% (Eurostat, 2012). On the other hand, the increase was the highest of all Baltic States. Starting in 2010 Lithuania imports a significant amount of electricity due to decommissioning of Ignalina nuclear power plant and fluctuations in domestic supply and prices. The observed situation allow to conclude about increased economic dependence on imported energy resources (Janeliunas, 2008; Tvaronavičienė, 2012).

Closer look at final energy consumption of the Baltic States indicates the growth in 2003–2007 and decrease in 2008–2009 (Figure 2). On the other hand, final energy consumption started to growth in 2010. Tendencies of energy consumption are perceived as being determined by the growth of countries' economies.

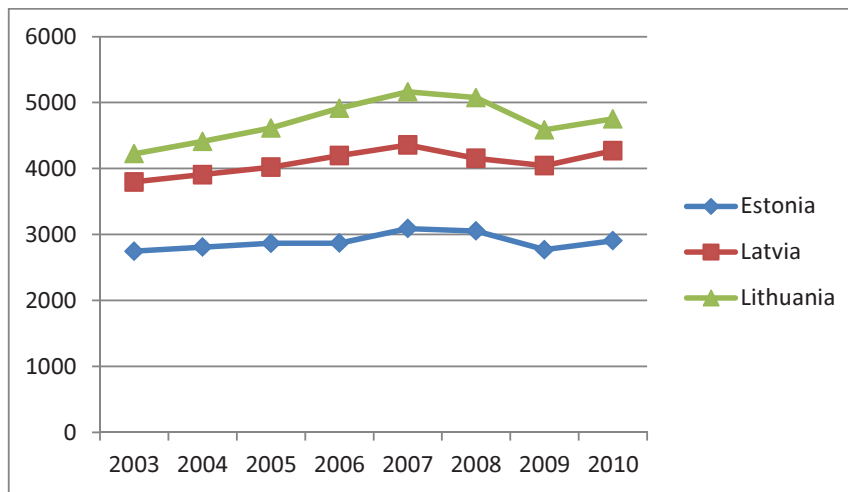


Fig 2. Final energy consumption (thousand tonnes of oil equivalent (TOE)). Source: Eurostat

The final energy balance of Lithuania is dominated by the household and transport sectors, consuming 33.37% and 32.61% of energy respectively (Eurostat). Meanwhile, the industry consumes 18.90% of energy.

Taking into consideration the research, carried out by Travkina and Tvaronavičienė (2011), we can assume that there will be a tendency for use of the vast majority of energy inputs to increase the production if the industrial sector is based on high or medium-high level of energy intensity. On the other hand, the issue seems more urgent taking into account Lithuania's dependence on external oil, gas and electricity suppliers. Analysis of gas, electricity and oil prices revealed following situation.

Gas prices for industrial consumers in Lithuania were the highest than in Latvia and Estonia in 2011 (Fig. 3). If compared to other the EU member countries, gas prices for Lithuania’s industrial consumers were higher than for consumers of Euro area (Eurostat, 2012).

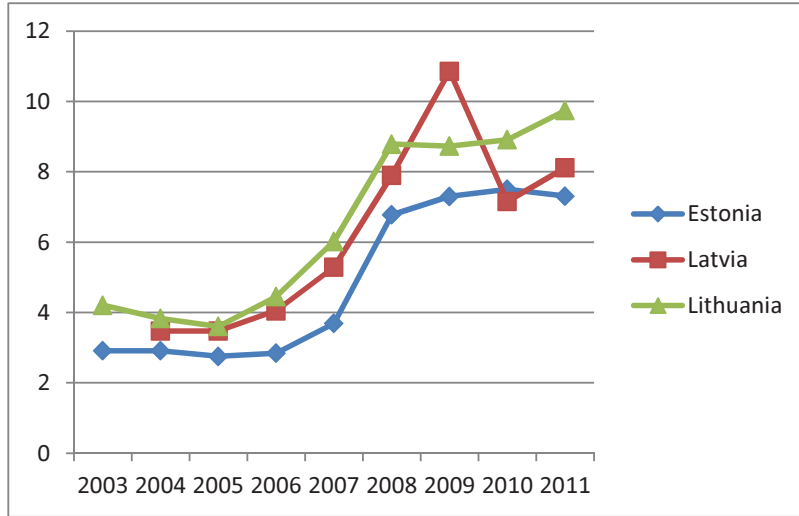


Fig. 3. Gas prices for industrial consumers (EUR/Gigajoule). Source: Eurostat

Similar trends are observed taking into consideration electricity prices for industrial consumers of the Baltic States (Fig. 4). Notably, electricity prices for industrial consumers in Lithuania were higher than for consumers in Euro area in 2011 (Eurostat, 2012).

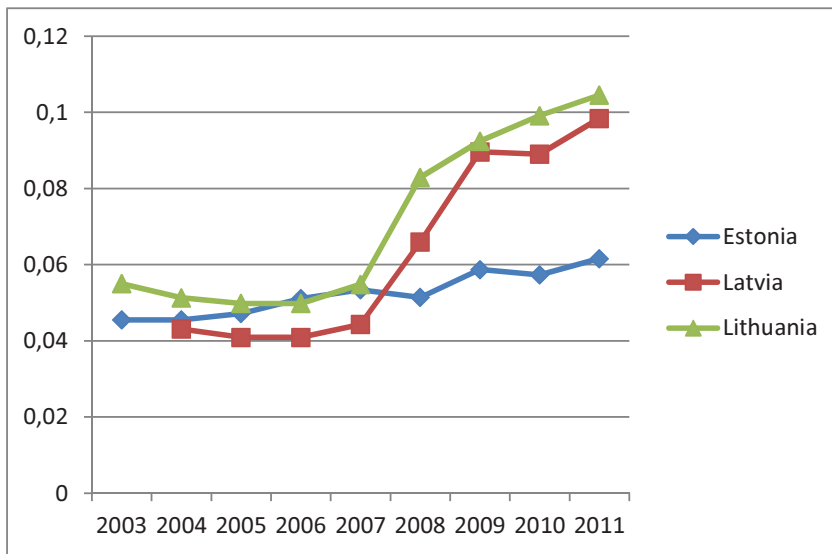


Fig. 4. Electricity prices for industrial consumers (EUR per kWh). Source: Eurostat

Energy prices are seen as important determinants of production, impacting its volume, growth rates and quality. Hence, the growth rates of energy prices directly impact the profit level of companies and significantly decrease their competitiveness, both in domestic and international markets.

The conclusion we can draw is that Lithuania's dependence on fluctuations of energy prices can hinder country's development due to direct impact on export competitiveness and GDP rates.

4. Methodology and results

The above discussions lead to the conclusion that an increase in energy consumption of industrial sectors affects economic development of country. According to some scholars (Hopwood et al., 2005), the concept of sustainable development is "the result of the growing awareness of global links between environmental problems, socio-economic issues to do with poverty and inequality and concerns about the healthy future for humanity". Not going deep into elaborate discussions regarding sustainable development, let us recall that sustainable development of country depends on rates of economy growth. We categorize economy growth indicators into two measures: GDP and export. We test the following hypotheses: first that the associations between GDP and energy prices are positive and second, that the associations between export and energy prices are positive. The purpose of this research is to analyze and determine the relationships between the Baltic States' GDP and energy consumption, and export and energy consumption. Energy intensity did not change significantly during the analyzed period (Miškinis et al., 2013), hence, in our analysis we keep it constant. We use country level data for the period of 2003-2010, which are provided by the European Commission.

Table 4 provides correlation coefficients for associations between GDP and final energy consumption and export and final energy consumption. We define a correlation coefficient of seven and above as portraying a relatively strong relationship and a coefficient between three and six as portraying relatively a weak relationship. Any correlation coefficient below three is considered as extremely weak relationship.

A closer look at the correlation coefficients and stochastic dependence of correlation coefficients provided in the Table 4 confirms that there are strong positive associations between GDP and final energy consumption for Estonia, Latvia and Lithuania. Based on the magnitude and direction of the correlation coefficients, we make the following interpretation: strong positive associations imply that large values of GDP tend to be associated with the large values of final energy consumption. Similar conclusions we can draw taking into consideration the correlation coefficients and stochastic dependence of export and final energy consumption. There are strong positive associations between export and final energy consumption for Estonia, Latvia and Lithuania. Hence, large values of export tend to be associated with the large values of final energy consumption.

Table 4. Correlation coefficients of GDP, export and final energy consumption

	GDP and final energy consumption			Export and final energy consumption		
	Correlation coefficient	Tst	Tkr	Correlation coefficient	Tst	Tkr
Estonia	0.808445528	3.364554168	2.446911851	0.748490695	2.764733908	2.446911851
Latvia	0.812348509	3.412095245	2.446911851	0.850216021	3.956043045	2.446911851
Lithuania	0.862699367	4.17856779	2.446911851	0.776269336	3.016274695	2.446911851

The above discussions allow assuming that country's economic dependence on energy resources impact energy prices and consequently hinder competitiveness of companies. Taking into consideration the highest increase of energy dependence of Lithuania, we expect that the associations between export of products and energy prices are negative in Lithuania.

The purpose of this research is to analyze and determine the relationships between the export of mineral products, machinery and transport equipment and chemical products and electricity and gas prices for industrial customers and oil prices. We use country level data for the period of 2003–2010, which are provided by the European Commission and the Lithuanian Department of Statistics.

Table 5. Correlation coefficients of export of goods and energy prices

	Gas price	Electricity price	Oil price
Mineral products			
Correlation coefficients	0.76413476	0.779204519	0.899090153
Tst	3.134159733	3.289216468	5.433913179
Tkr	2.364624252	2.364624252	2.364624252
Machinery and transport equipments			
Correlation coefficient	0.7282774	0.62358515	0.975170942
Tst	2.81174703	2.11044418	11.65057353
Tkr	2.36462425	2.36462425	2.364624252
Chemical and related products			
Correlation coefficient	0.911818271	0.843359178	0.966839216
Tst	5.875498235	4.152447369	10.01627991
Tkr	2.364624252	2.364624252	2.364624252

The correlation coefficients and stochastic dependence of correlation coefficients provided in the Table 5 show that, despite expectations, positive relation between export of mineral products and energy prices have been found. Notably, the strongest positive relationship is between export and oil prices. Hence, large values of export tend to be associated with the large values of energy prices. Similar situation is observed when relationship between export of machinery and equipment and energy prices was tested. The performed analysis allows us to conclude that increase in electricity prices has not significantly affected export of machinery and transport equipment. Additionally, there are positive associations with export of chemical and related products with energy prices. Hence, the conclusion we can draw is that the growth of energy prices do not impact export competitiveness of observed product groups.

5. Conclusions

The research, based on prevailed scientific literature, analyzed the relationships between economy growth indicators such as GDP and export and energy prices using data from the Baltic States for the period of 2003-2010. Based on the presumption that an increase in energy prices of industrial sectors affects economic development of country, we find that, despite opposite expectations, there are strong positive relationships between GDP and final energy consumption and export and final energy consumption for Estonia, Latvia and Lithuania. Taking into consideration the growth of Lithuania's dependence on energy resources, we analysed the relationships between exports of some products such as mineral products, machinery and transport equipment and chemical and related products and energy prices such as gas price, electricity price and oil price. Our findings show that energy prices do not impact export competitiveness of observed product groups. It means, that increased energy prices have not affected international competitiveness of indicated above exporting industrial sectors. Let us recall, that energy intensity did not improve significantly during the analyzed periods, which make relationship found rather temporary. The findings have very significant policy implications for policy makers responsible for export development and implementation strategies: export has to be supported until stabilization of energy prices, otherwise deteriorating effects, which yet had not showed, can appear in the nearest future. The limitations of the presented research were related with the scope: the situation of Lithuania in the context of the EU and other Baltic States was observed. Further research should therefore concentrate on a deeper analysis of differences between countries and industrial sectors.

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