

NEGATIVE SOCIAL EFFECTS OF ENERGY TAXES IN THE EU

Yavor Kolarov

University of Gdańsk, Faculty of Economics, Department of Macroeconomics;
Armii Krajowej 119/121, 81-824 Sopot, Poland; yavor@kolarov.net

Abstract: The EU member states have implemented excise duties on fuel and electricity according to the EU Energy Tax Directive. The purpose of these measures is to motivate a reduction in energy consumption by internalizing external costs of energy. The taxes on energy have success in inciting energy savings. Simultaneously, the price levels of energy in the EU member states have increased to levels significantly higher compared to other countries in the region and the world. The price increase is the result of a cumulative effect of excise duties and other taxes and mechanisms including feed-in tariffs and quota policies. While the Energy Tax Directive gives the member states a level of freedom in setting the exact duty rates, the minimal rates enforced on all member states are relatively high. The policy intends to limit competition between the states on low energy prices and arbitrage trading between countries.

We examine the purchasing power for energy products relative to the *per capita* GDP for a wide set of countries within the EU and in the rest of the world. We can identify several groups or clusters of countries based on their GDP *per capita* and energy prices. The new member states of the EU face a unique combination of low or moderate GDP *per capita* and very high energy prices. Their relative purchasing power for energy is degraded to levels comparable or lower than the purchasing power in developing countries with significantly lower GDP *per capita* and underdeveloped energy infrastructure.

The calibration of energy taxation in the EU at high price levels suitable for Western European economies with high *per capita* GDP is leading to strong negative social effects and increasing poverty in Eastern European member states. The current implementation of these policies does not recognize to a sufficient extent income levels, regional social inequalities, and the low price elasticity of demand for energy.

Keywords: Energy policy, energy poverty, energy taxation, EU, poverty

JEL codes: O13, Q43, K32, H21, I39

Introduction: External costs of energy and carbon taxes

The concept of externalities represents a powerful instrument for modeling and understanding the complex nature of sustainable development. Externalities exist when the private costs or benefits to the producers and purchasers of a product or service differ from the total costs or benefits for society (Johnson 2005). An externality arises as a consequence of economic activities of some parties as experienced by third parties (Scitovsky 1954) and can be technological or pecuniary (Scitovsky 1954; Hackett 2001: 54). Pecuniary externalities can arise, for example, when a new participant enters a market (Hackett 2001: 54). From the perspective of sustainable development, technological externalities are more important since they are highly relevant in terms of scarcity of resources, health, and well-being. Externalities can be positive or negative. A negative externality, also called “external diseconomy” or “external cost”, exists when the product or service creates additional costs for third parties other than the producer or the purchaser (Johnson 2005). A positive externality, also called “external economy” or “external benefit” exists when benefits are created for third parties (Johnson 2005). A wide range of methods can be used for estimating the external costs of energy. A prominent methodology for evaluating externalities of energy, which has been highly recognized by the scientific community and has produced valuable information for the policy-making processes in the EU, is published in a report, “Externalities of Energy Methodology 2005 Update” (33).

Carbon taxes are used for taxing the carbon content of fossil fuels or their carbon emissions (Ian Parry 2015: 7). They are used as a method of internalizing these negative external costs (*ibidem*: 151). Carbon taxes are applied to petroleum products, natural gas, and coal. Their implementation varies between countries and can be applied only to specific types of products. In many cases, tax rates differ between fossil fuels and do not correspond to the relative levels of carbon emissions between fuel types. This can be the case if a specific industry should be protected from the effect of the tax or the government would like to limit the price increase for certain types of consumption for the population, such as heating. Carbon taxes often complement other policies for the internalization of external costs such as emissions trading schemes.

Carbon taxes have been implemented at both national and regional level, including China, India, Japan, Russia, EU member states, US states, and Canadian provinces. The transparent and smart use of tax revenue can be beneficial for the social acceptance of the measure (Charles Komanoff 2015: 8).

The majority of experts agree that carbon taxes efficiently fulfil their most important target of internalizing negative external costs (Hsu 2011: 77; Charles Komanoff 2015). Multiple studies have claimed that increased price levels are influencing consumption patterns and motivating efficiency improvements (Sterner 2007). Countries implementing the legislation are also receiving significant tax revenue (FuelEurope 2014: 30).

1. Energy tax directive and energy prices in the EU

The reduction of energy consumption and the transition to cleaner energy sources motivated by energy duties has positive impacts on the environment and public health due to pollution reduction. However, it is also important to recognize the possible negative effects of taxation. This is especially relevant for products with low price elasticity of demand such as electricity or fuel. The EU defined a common taxation framework for energy in 2003 with the Energy Tax Directive (European Commission 2003). The directive sets minimal tax rates for fuel and electricity, and every member state is obliged to select a tax level on the national level equal or higher than the minimal rate. Tax rates are set not just based on the carbon content of the fuel; they also map additional external costs such as the harmful effects of lead on human health.

Countries in Eastern and Central Europe with lower income rates tend to set tax rates closer to the minimal rates. Nevertheless, taxes on motor fuel in the EU are significantly higher compared to other countries in the region (Figure 1).

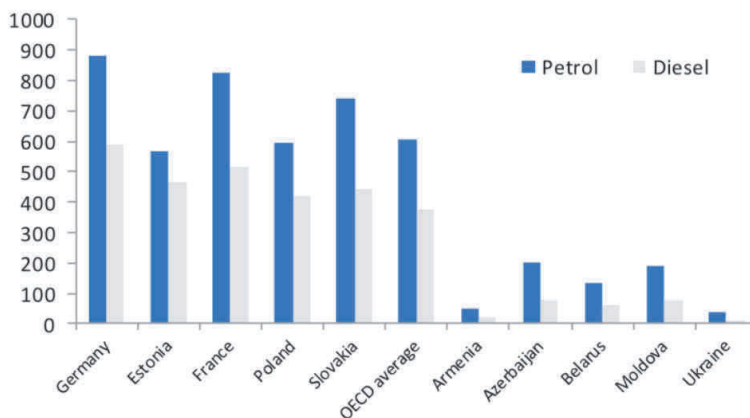


Fig. 1. Excise taxes on motor fuels in selected countries, EUR per ton in 2013
Source: (OECD 2015: 29).

We will analyse diesel and electricity prices in detail. Diesel is the fuel type with the largest share in the total consumption of motor fuels. The effects of energy taxation are similar for other fuel types. While the minimal taxes for electricity defined by the energy directive (European Commission 2003: 6) are moderate compared to motor fuels (*ibidem*: 13), they are additionally increased due to the introduction of EU emissions trading schemes for coal power stations, the implementation of feed-in tariffs, or quota systems in multiple member states. The former policies are not discussed in this article. They vary strongly between the member states and their examination would exceed the range of this article. The focus will be on prices for households, since we would like to analyze the effects of the policy on the population.

A study on the size and breakdown of residential electricity prices in cities in multiple EU countries found that the average share of energy taxes was 13%, the average share of value added tax was 16% (Figure 2).

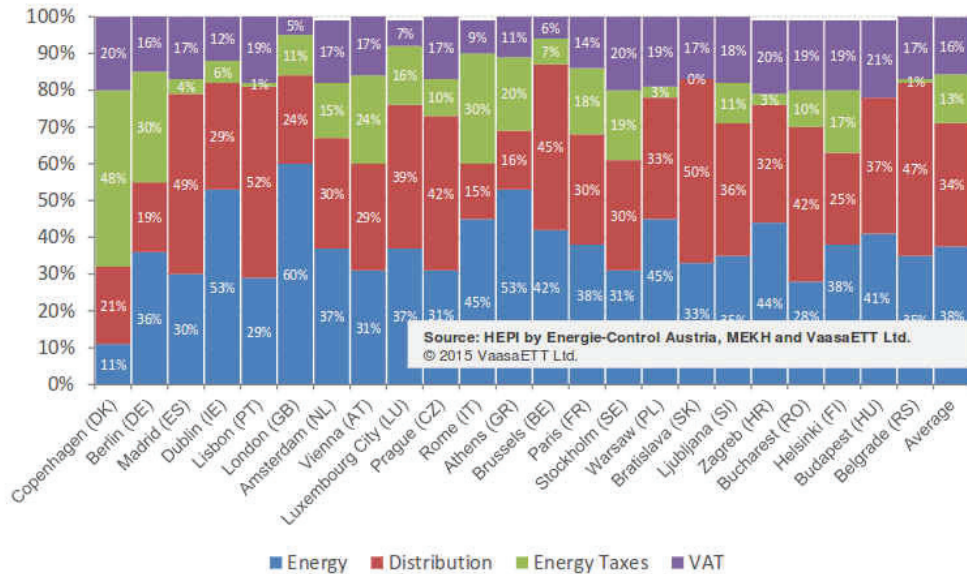


Fig. 2. Residential electricity price breakdown for selected cities (June 2015)
Source: (Energy... 2015: 7).

An analysis of the price structure of diesel fuel in the EU shows that between 41% and 59% of the end price consists of taxes (Figure 3). The larger relative share of energy taxes for fuels compared to the share of energy taxes for electricity is caused by the larger minimal duty rates defined by the EU.

The strongest motive for establishing relatively high common minimal rates for the taxes of fuel is to avoid strong differences in prices between countries. Arbitrage is often present in border areas, and the incentive to purchase fuel in a neighboring country increases when the price difference is larger. Due to the small or medium geographic size of EU countries and their large populations, millions of people live in close proximity to borders and could purchase fuel in another country with relative ease. There have also been arguments that strong energy price differences can lead to the migration of businesses between countries. These fears are especially strong in Western European countries, which have higher energy prices. However, these countries also have more power in the European parliament and could assert their position when needed. The policy has managed to keep fuel prices at similar levels (Fig. 3). There has also not been a significant between-country migration of businesses as a result of differences in energy prices.

However, relatively high energy prices established in all EU member states have strong negative effects on citizens with low incomes. The GDP varies widely

between EU countries and regions (The World Bank 2016). The common policy fails to recognize to a sufficient extent the income differences between individuals, social inequality, and divergent social security systems in different parts of the EU. Fuel and energy poverty have become large problems, especially in Eastern Europe (Buzar 2007: 39–41; *The World Bank* 2010: 39; Bouzarovski 2012; Benjamin & Sovacool 2013: 91; Boardman 2013: 15). A significant number of EU citizens have to spend a large share of their income on fuel, electricity, and heating services. Many have problems affording the energy required for covering their basic needs. The price elasticity of demand for energy products is low (Tomas Havranek 2012).

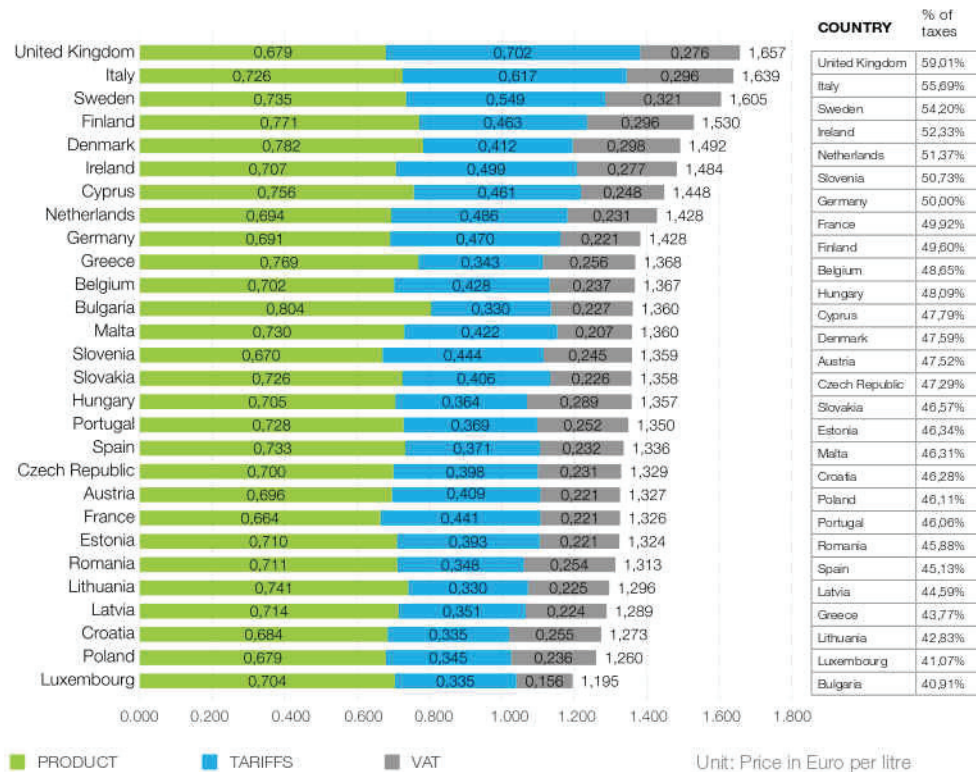


Fig. 3. Breakdown of automotive diesel prices across the EU (December 2013)
 Source: (FuelEurope 2014: 32).

Still, one can argue that existing differences in energy prices (Figure 3) achieved under the Energy Tax Directive and national tax models effectively compensate for differences in purchasing power. It is also relevant to compare the situation in Eastern EU member states with countries outside of the EU that have a comparable GDP.

2. Diesel prices and GDP

We have selected a set of countries for evaluation of diesel prices (Fig. 3), including:

- EU members from Eastern and Central Europe: including Bulgaria, Romania, Hungary, Poland, the Czech Republic, and Latvia;
- EU members from Western and Europe including Austria, France, Belgium, the UK, Germany, and Austria;
- a wide spectrum of countries outside the EU including Bolivia, the USA, Mexico, the Russian Federation, Kazakhstan, Australia, Thailand, Chile, Brazil, Sudan, and Gabon;
- mean values for the entire world.

We will pay special attention to the selected Eastern and Central European member states of the EU (Figure 4). In terms of GDP *per capita*, Poland, Hungary, the Czech Republic, and Latvia outperform most of the selected countries with mid-range GDPs. Only Chile demonstrates a value lying in the same range. Bulgaria and Romania have significantly lower GDP *per capita* and lie in the middle of the range of countries with relatively low GDPs (Figure 4).

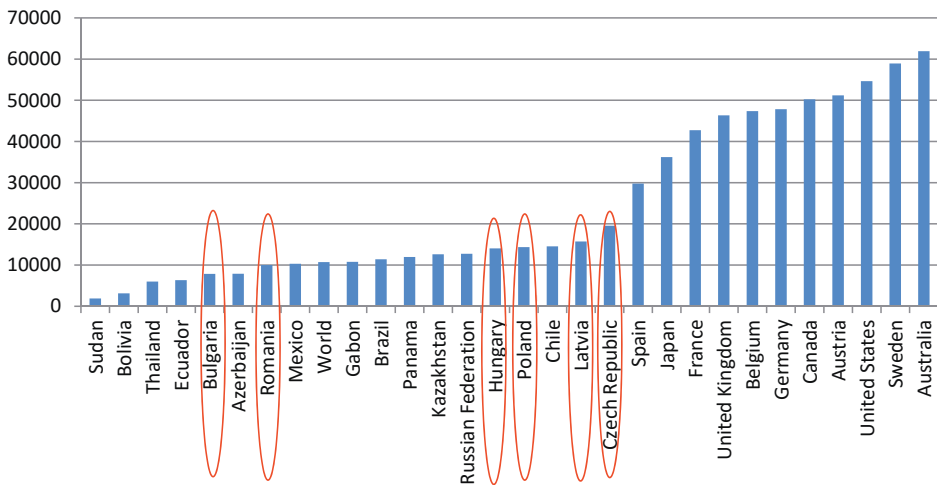


Fig. 4. GDP *per capita* in USD for selected countries in 2014

Source: Own elaboration, based on datasets from the World Bank.

Using datasets from the World Bank for 2014 (The World Bank 2016), we calculated the quotient GDP *per capita* (USD) divided by the end price for one liter of diesel fuel in USD (Figure 5).

The quotient is an approximate indicator for the amount of fuel that could be purchased on the domestic market of a country for a sum corresponding to the *per capita* output of the economy. It is important to note that this indicator should be considered with care since it does not account for multiple factors, such as

income inequality and the level of general living costs in a country. Nevertheless, it provides valuable insight into the relationship between the relative performance of an economy and the domestic price of diesel fuel.

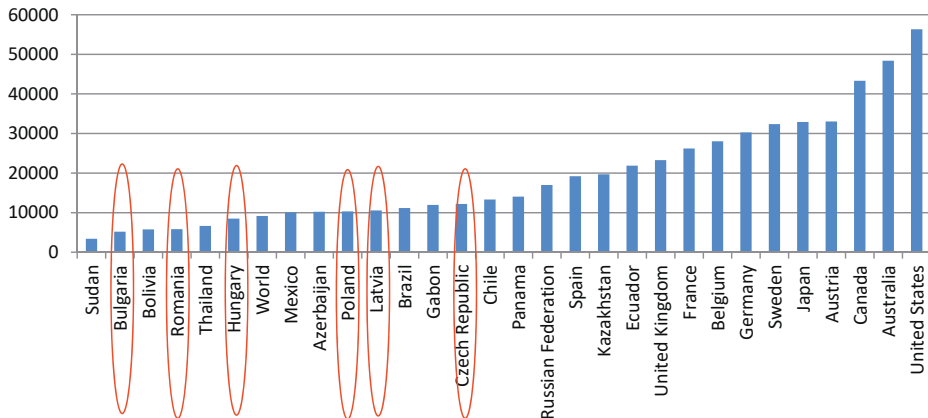


Fig. 5. Ratio GDP *per capita*/diesel price (one liter) for 2014

Source: Own elaboration, based on datasets from the World Bank (2016, 2016a).

The values show a strong degradation of the relative position of the selected EU member states. Bulgaria is outperformed by all countries except for Sudan. Hungary, whose GDP *per capita* is significantly higher than the world average, is outperformed by Mexico and Azerbaijan and positioned lower than the world average. Moreover, Chile, Panama, the Russian Federation, Ecuador, and Kazakhstan outperform all selected Eastern EU member states. The Czech Republic, which has the highest GDP *per capita* in the group, is rated between Gabon and Chile.

High-GDP countries such as Sweden also have a different relative position (Figure 5) compared to their GDP ranking (Figure 4). However, it is important to note that these changes are unlikely to result in social problems and energy poverty due to the relatively higher incomes in these countries and the lower share of income dedicated to energy spending.

We will consider the relationship between fuel prices and GDP *per capita* in all selected countries in order to gain a better understanding of the problem (Figure 6).

Considering the relationship between diesel prices and GDP (Figure 6), one can observe clear patterns. The majority of the countries are concentrated into four groups:

- countries with high GDP *per capita* and high fuel prices (including Sweden, Germany, France, and Austria)
- countries with high GDP *per capita* and average fuel prices (including Canada, Japan, the USA, and Australia)
- countries with low or average GDP *per capita* and average or low diesel prices (including Brazil, the Russian Federation, Kazakhstan, Panama, and Mexico)

- countries with low or average GDP *per capita* and high diesel prices (including all Eastern European member states of the EU, such as Poland, Hungary, the Czech Republic, Romania, and Bulgaria)

The taxes imposed on energy in the EU strongly affect the purchasing power in Eastern European EU member states belonging to the last group. The purchasing power for energy products relative to the *per capita* GDP in these countries is often significantly lower than in many developing countries in Africa and South and Central America (Figure 5). In this context, one can note that the United Nations has considered energy subsidies as a measure for reducing poverty (United Nations 2016: 63), and energy subsidies have been implemented in multiple low-GDP countries. This also contradicts the EU Strategy for Sustainable Development (European Union 2001, 2006), which recognizes regional imbalances and poverty as main threats to a sustainable future for the EU.

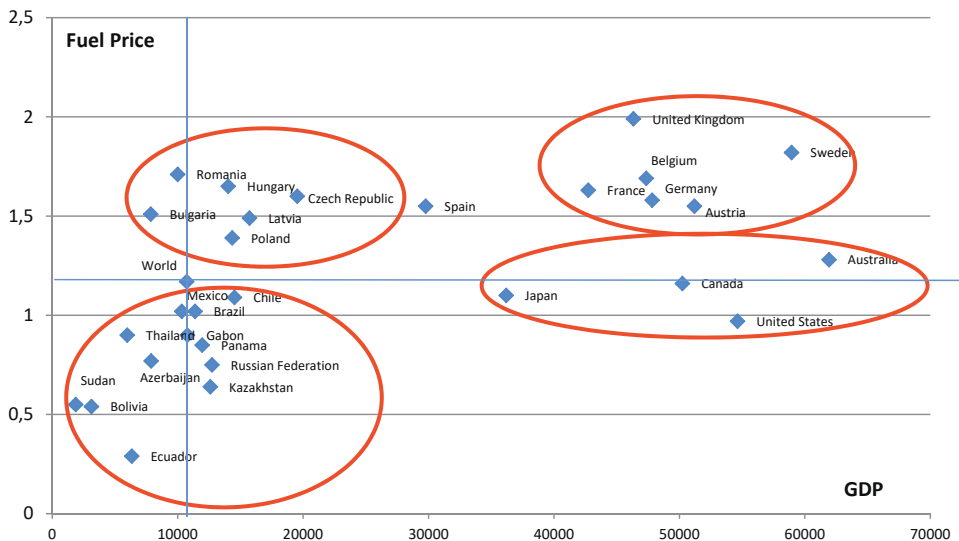


Fig. 6. Diesel end price (one liter) in USD and GDP *per capita* in USD for 2014
Source: Own elaboration, based on datasets from The World Bank (2016, 2016a).

3. Electricity prices and GDP

After analyzing the relationship between the GDP and diesel fuel prices, it is valuable to conduct a similar analysis for electricity prices. We have collected information from different sources in order to examine the relation between GDP and electricity prices for households (Figure 7 and Figure 9). Since the availability of reliable data was limited for some countries such as Gabon and Sudan, the set of non-EU countries has been modified. It is important to note, that the accuracy and precision of electricity price data may suffer due to several factors:

- Unlike fuel, a significant share of the annual costs for a consumer can consist of a base fee for having access to the grid or covering a specific amount of energy for a time period.
- Electricity prices can strongly vary between different regions in a country and between energy providers.
- The methodology for calculating the average prices may vary between the sources.
- In cases when the data was limited, the calculation may be based on the closest available data such as 2013 or 2015. We assume that the prices do not vary strongly between these years.
- When only range information was available, the calculation was done based on the middle of the range.

When taking into account the potential sources of inaccuracy, one should note that the evaluation is focused on identifying large differences between countries.

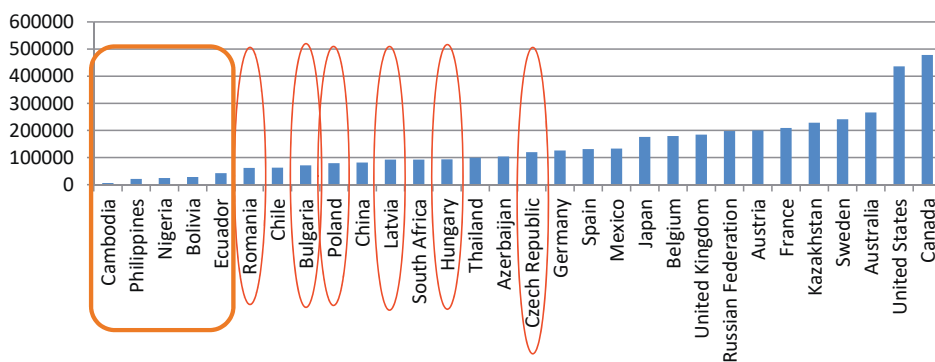


Fig. 7. Ratio GDP to electricity price per kWh in selected countries for year 2014
 Source: Own elaboration, based on data from multiple sources (The World Bank 2016; Eurostat 2016; Energypedia 2015; Thailand... 2015; Climatescope 2015; Baku... 2016; Australian... 2014: 179; Realstate... 2015; Cost to Travel; China... 2015; Statista; Suryadi 2014) (Fig 7 and 9).

The new member states included in the analysis (Bulgaria, Czech Republic, Latvia, Poland, and Romania) have higher ratio GDP to electricity price per kWh than some developing economies such as Cambodia, Nigeria, and Bolivia. However, the countries with the lowest ratios belong to the economies with underdeveloped electrical infrastructure, a fact which is reflected by the low share of the population that has access to electricity (Figure 8).

All countries included in this analysis that have lower electricity price to GDP ratio than the eastern members of the EU belong to the countries with underdeveloped electricity infrastructure (Figure 8 and Figure 9). Mexico, a country with less than 100% of population with access to electricity surpasses all new EU member states and some old member states included in the analysis in terms of purchasing power of electricity.

The vast majority of the countries with average level of GDP and access of the complete population to electricity, such as Russia, Kazakhstan, Thailand, and

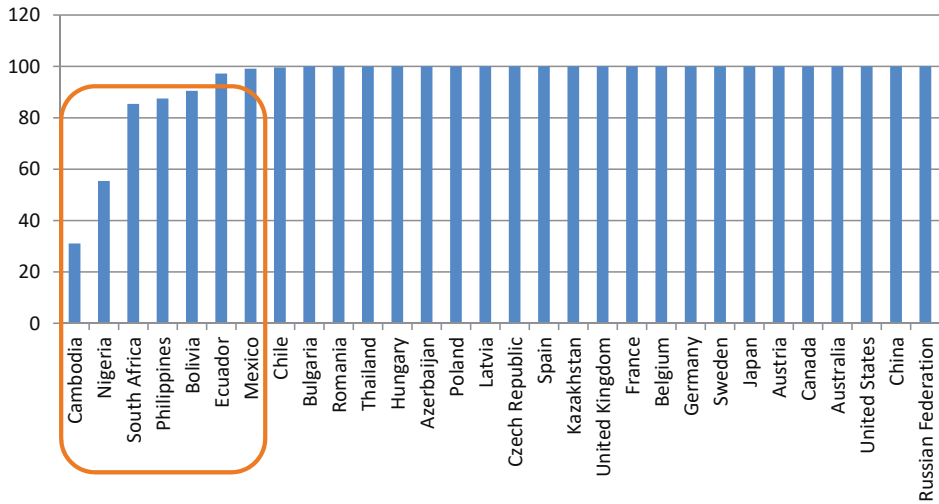


Fig. 8. Access to Electricity (percent of population) in 2012
 Source: Data set by the World Bank (The World Bank n.d).

Azerbaijan surpasses the new member states of the EU. China ranks better than Bulgaria, Romania, and Poland and worse than Latvia, the Czech Republic, and Hungary.

The relationship between GDP and electricity price for households in the selected countries can be better reviewed with the help of a chart (Figure 9).

Considering the data (Figure 9), one can identify several significant clusters or groups of countries:

- Countries with low or average GDP *per capita* and electricity prices higher than 0.1 USD per kWh. This group includes Cambodia, Ecuador, Philippines, Nigeria, Bolivia, and Bulgaria. Except for Bulgaria, all countries in this group have underdeveloped electricity infrastructure and electricity access rates of less than 100% (Fig. 8). This group includes the countries with the lowest purchasing power of electricity. They have low GDP *per capita* and relatively high electricity prices.
- Countries with low or average GDP *per capita* and low electricity prices for households – under 0.1 USD per kWh. This group includes Russia, China, Kazakhstan, Mexico, Thailand, and South Africa. Most of these countries have good GDP to electricity price ratios due to average GDP *per capita* and very low electricity prices.
- Countries with GDP larger than 35000 USD *per capita* and electricity prices between 0.2 USD and 0.27 USD. This group includes France, Japan, Belgium, Austria, United Kingdom, Sweden, and Australia. Germany does not fall directly into this group because the electricity price in the country is even higher. However it is also characterized by high energy prices and high GDP *per capita*. The

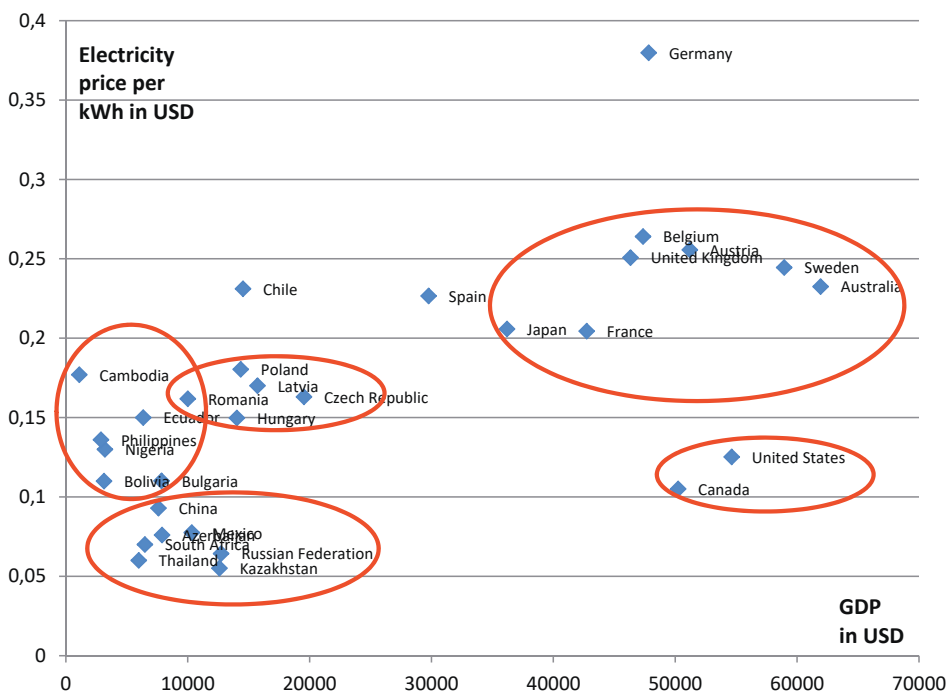


Fig. 9. Residential electricity prices per kWh in USD and GDP *per capita* in USD for year 2014

countries in this cluster have high purchasing power of energy because the high prices are compensated by high GDP *per capita*.

- United States and Canada form a group of the countries with the highest purchasing power of energy. They are characterized by a unique combination of high GDP *per capita* and moderate energy prices of under 0.15 USD per kWh.

Citizens of the new member states of the EU have significantly lower purchasing for electricity than countries outside of the EU with developed electrical infrastructure and similar or lower GDP *per capita*. We have also recognized very low purchasing power of fuel in the Eastern European member states in the first part of the analysis.

Conclusion

Carbon taxes are a very cost-efficient method for internalizing the external costs of energy. However, the current uniform calibration of energy taxation in the EU at high price levels suitable for Western European economies with high *per capita* GDP is leading to strong negative social effects and increasing poverty in Eastern European member states. The purchasing power for energy in the new member

states of the EU is artificially degraded to levels comparable or lower than the purchasing power in developing countries with significantly lower GDP *per capita* and underdeveloped energy infrastructure.

A detailed study of policies enhancing sustainable development in the field of energy listed carbon taxes as one of the types of policies with highest cost-efficiency (Kolarov 2017: 172–173). Taxes on energy should be implemented as a component of mix of policies supporting sustainable development along with policies for increasing the share of renewable energy in the energy mix such as improved quota policies, measures for improving the energy efficiency, and education supporting sustainable behavioral patterns (*ibidem*: 199–203). It is critical that the implementation of these policies recognizes to a sufficient extent income levels, regional social inequalities, and the low price elasticity of demand for energy. Carbon taxes should be calibrated by taking into account the structure of the income of the population in order to avoid energy poverty.

References

- Australian Energy Market Commission (2014) *Residential Electricity Price Trends*. [<http://www.aemc.gov.au/getattachment/ae5d0665-7300-4a0d-b3b2-bd42d82cf737/2014-Residential-Electricity-Price-Trends-report.aspx>, Accessed 15 August, 2016].
- Baku.ws (2016) *Тарифы на электроэнергию и газ в Азербайджане останутся прежними*. [<http://baku.ws/40180-tarify-na-elektroenergiyu-i-gaz-v-azerbaydzhane-ostanut-sya-prezhnimi.html>, Accessed 15 August, 2016].
- Benjamin K., Sovacool R.V.S.B.R.J. (2013) *Energy Security. Equality and Justice*, s. 1., Routledge.
- Boardman B. (2013) *Fixing Fuel Poverty. Challenges and Solutions*, s. 1., Routledge.
- Bouzarovski S.S.P.R.S. (2012) *Energy Poverty Policies in the EU: A Critical Perspective. Energy Policy*, Issue 49.
- Buzar S. (2007) *Energy Poverty in Eastern Europe. Hidden Geographies of Deprivation*. s. 1., Ashgate Publishing.
- Charles Komanoff M.G. (2015) *British Columbia's Carbon Tax: By The Numbers – A Carbon Tax Center Report*. [http://www.carbontax.org/wp-content/uploads/British_Columbia's_Carbon_Tax_By_The_Numbers.pdf, Accessed 01 February, 2016].
- China National Energy Administration, 2015, [http://www.nea.gov.cn/2015-09/14/c_134621671.htm, Accessed 21 August, 2016].
- Climatescope (2015) *Climatescope Bolivia*. [<http://global-climatescope.org/en/country/bolivia/#/details>, Accessed 17 August, 2016].
- Commission E (2005) *Externalities of Energy Methodology 2005 Update*, s. 1.: s.n.
- CostToTravel, n.d. *Electricity Price in Ecuador*. [<https://www.costtotravel.com/cost/electricity-in-ecuador>, Accessed 20 August, 2016].
- Energie-Control Austria, The Hungarian Energy and Public Utility Regulatory Authority, Vaasa-ETT Global Energy Think Tank (2015), *Household Energy Price Index for Europe*. [<https://www.e-control.at/documents/20903/-/-/4c0e230b-3ef4-4eeb-b696-3b6a4467eac8>, Accessed 25 August, 2016].
- Energypedia (2015) *Mexico Energy Situation* [https://energypedia.info/wiki/Mexico_Energy_Situation, Accessed 19 August, 2016].

- European Commission (2003) *COUNCIL DIRECTIVE 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity*. [<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:283:0051:0070:EN:PDF>, Accessed 10 February, 2016].
- European Union (2001) *A European Union Strategy for Sustainable Development*. [<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52001DC0264&from=EN>, Accessed 20 December, 2015].
- European Union (2006) *Renewed EU Sustainable Development Strategy*. [<http://register.consilium.europa.eu/doc/srv?l=EN&f=ST%2010117%202006%20INIT>, Accessed 20 December, 2015].
- Eurostat (2016) *Electricity Prices for Domestic Consumers – Bi-annual Data (from 2007 onwards)*. [http://ec.europa.eu/eurostat/en/web/products-datasets/-/NRG_PC_204, Accessed 15 August, 2016].
- FuelsEurope (2014) *Statistical Report 2014*. [https://www.fuelseurope.eu/uploads/Modules/Resources/statistical_report_fuels_europe-v25_web.pdf, Accessed 11 February, 2016].
- Hackett S.C. (2001) *Environmental and Natural Resources Economics: Theory, Policy, and the Sustainable Society*, s. 1., *M.E. Sharpe*.
- Hsu S.-L. (2011) *The Case for a Carbon Tax – Getting Past Our Hang-ups to Effective Climate Policy*, s. 1., *Island Press*.
- Ian Parry A.M. (ed.), R.C.W.I. (2015) *Implementing a US Carbon Tax: Challenges and Debates (Routledge Explorations in Environmental Economics)*. s. 1., *Routledge*.
- Johnson D.P.M. (2005) *A Glossary of Political Economy Terms*. [<http://www.auburn.edu/~johnspm/gloss/externality>, Accessed 25 May, 2013].
- Kolarov Y. (2017) *Economic Aspects of Energy Policies Supporting Sustainable Development*. University of Gdańsk, Sopot.
- OECD (2015) *OECD Green Growth Studies Creating Incentives for Greener Products A Policy Manual for Eastern Partnership Countries: A Policy Manual for Eastern Partnership Countries*, s. 1., *OECD Publishing*.
- Realestate-Tokyo (2015) *Residential Lifeline Utility Prices in Japan (Electricity, Gas, Water)* [<http://www.realestate-tokyo.com/news/utility-prices-in-japan/>, Accessed 17 August, 2016].
- Scitovsky T. (1954) Two Concepts of External Economies. *Journal of Political Economy*, Vol. 2. Statista, n.d. *Average Retail Electricity Prices in Africa in 2014, by Select Country (in U.S. dollars per megawatt hour)* [<http://www.statista.com/statistics/503727/retail-electricity-prices-in-africa-by-select-country/>, Accessed 20 August, 2016].
- Sterner T. (2007) Fuel Taxes: An Important Instrument for Climate Policy. *Energy Policy*, 35(6).
- Suryadi B. (2014) *ASEAN Electricity Tariff 2014*. [<http://asean.bicaraenergi.com/2014/05/asean-electricity-tariff-2014/>, Accessed 25 August, 2016].
- Thailand Board of Investment, (2015) *Utility Costs*. [http://www.boi.go.th/index.php?page=utility_costs, Accessed 18 August, 2016].
- The World Bank (2010) *The Crisis Hits Home: Stress-testing Households in Eastern Europe and Central Asia*. s. 1., *World Bank Publications*.
- The World Bank (2016) *GDP per capita (current US\$)*. [<http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>, Accessed 01 February, 2016].
- The World Bank (2016a) *Pump Price for Diesel Fuel (US\$ per liter)*. [<http://data.worldbank.org/indicator/EPPMRDESL.CD>, Accessed 01 February, 2016].
- The World Bank, n.d. *Access to Electricity (% of Population)*. [<http://data.worldbank.org/indicator/EG.ELC.ACCS.ZS>, Accessed 30 August, 2016].

- Tomas Havranek Z.I.K.J. (2012) Demand for Gasoline is More Price-inelastic than Commonly thought. 34(1).
- United Nations, (2016) World Economic and Social Survey 2014/2015 – Learning from national policies supporting MDG implementation, s. 1., *United Nations publication*.

To cite the article:

- Kolarov Y. (2016) Negative social effects of energy taxes in the EU. *Studia Regionalia* 48: 53–66. doi: 10.12657/studreg-48-03