

ENERGY DEPENDENCY IN THE EUROPEAN UNION AND ROMANIA

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Abstract

This paper analyses the energy dependency rate in the European Union and Romania during 2010-2021. The quantitative research method is used to make a statistical analysis to establish the trend towards increasing or decreasing the energy dependency rate. Thus, analysing the official Eurostat data, we can see an increasing trend of the energy dependency rate between 2010 and 2019, both in the European Union and in Romania. And in 2020 is recorded the sharpest decrease in the entire period under analysis. Therefore, the hypothesis that the sharp decrease in the energy dependency rate is due to the negative effects of the COVID-19 pandemic is verified, which is fully confirmed.

Keywords: *economy, energy, energy dependency rate, sustainable development goals*

DOI: 10.24818/CAFEE/2023/12/13

Introduction

Everyday life depends on reliable and affordable energy services such as power supply. Energy enables all sectors of the economy to function smoothly, from agriculture to business and various industries. Sustainable development of all sectors of the economy, both in the European Union and globally, can ensure a sustainable future. (Black, 2013) Although the sustainable development of the economies of the European Union member countries depends on many factors, primarily it depends on access to energy (Gromada, 2019).

In terms of energy supply at European Union level, we can say that even today it faces a number of challenges to ensure affordable and sustainable prices. Yet, what are the ways in which the improvement of the energy system at European Union level can be achieved? Some of the ways to improve the energy system at European Union level are: increasing energy efficiency, reducing energy dependency rate, improving energy productivity and reducing total energy consumption (Asadov & Asadov, 2022; Black, 2013; Li et al., 2023; Sulaiman et al., 2020).

This paper analyses the energy dependency rate in the European Union and Romania during 2010-2021. Regarding the topic of the paper, the motivation for choosing the energy sector is because it is a key factor in the economy of any country and is a topical subject. The research method used in this paper is quantitative analysis to support decision makers in the energy sector. In terms of structure, the paper has five parts. The first part, entitled Introduction, presents the general context and the current situation. In the second part, the literature review is presented. In the third part, the research methodology is presented, respectively the quantitative analysis, in order to make a statistical analysis, to establish the trend of increase or decrease of the energy dependency rate at the European Union level and in Romania, starting from the hypothesis that the sharp decrease of the energy dependency rate is due to the negative effects of the COVID-19 pandemic. In the fourth section, the data collected on the energy dependency rate in the European Union and Romania, for the period

2010-2021, are analysed, and conclusions are drawn for the pre-defined research objective. In the last section, future research directions are addressed.

Literature review

Current energy policy approaches focus on the importance of achieving energy security, pinpointing the reduction of energy dependency. But what does this actually mean and why is it considered so important? We start from the premise that securing the energy needs of each country is a prerequisite for achieving energy security (Pérez et al., 2019). Regarding the concept of energy security, we can state that it is an interdisciplinary concept and combines three perspectives, namely energy, economic and environmental. The first perspective, namely the energy one, refers to balancing supply and demand, the economic one refers to ensuring an acceptable energy price, and the environmental one refers to maintaining it in an adequate state for future generations as well. (Correlje & Van der Linde, 2006; Ebohon, 1996; Johansson, 2013; Jones et al., 2004; Knopf et al., 2015;)

If we look at the European Union's ambitious goal of being climate neutral by 2050, we can see that a lot of work is needed to achieve this goal. In order to turn this political commitment into a legal obligation at the level of all European Union Member States, the European Commission has drawn up a series of documents on climate legislation. These legislative proposals - Fit for 55 - cover a wide range of policies on energy, climate, taxation and transport, while also addressing the concrete ways in which the European Commission will be able to meet the target. The European Green Deal provides an action plan to boost resource efficiency by moving to a clean, circular economy, as well as restoring biodiversity and reducing environmental pollution. (European Commission, 2021)

In pursuing the European Union's energy strategy, one of the main policy instruments is the Energy Union. (Streimikiene, 2020) The first report on the state of the energy union concluded that there is a need for a transparent monitoring system, based on key indicators as well as biannual reports from Member States on progress in national plans. The European Commission collects this data as it intends to assess the collective progress made on the annual state of the energy union at European Union level and, if necessary, propose further policy actions to meet the targets. (Vavrek, 2020) It should be noted that the use of reliable data to monitor progress will enhance the credibility of energy policy. (Knodt et al., 2020) Official statistics must therefore contribute to this process in order to remain relevant and aligned to the needs of our society and policy makers.

With regard to the European Union's dependence on energy imports and the need to improve it, we can see that this is a major area of interest and indeed underpins policy concerns related to security of energy supply (Aslani et al., 2013; Bölük & Mert, 2014; Boneva, 2018; Dogan & Seker, 2016; European Commission, 2019; Ganova & Ayed, 2007; Jeniček & Krepl, 2009; Nowak, 2010; Paillard, 2010; Petcu et al., 2023; Tutak et al., 2021).

Other concerns that address this topic are those presented by Ozturk (2013), according to whom energy security is nothing more than the uninterrupted availability of energy sources at an affordable price, and its improvement can be achieved by increasing energy efficiency as a result of decreasing the energy dependency rate. (Rokicki et al., 2021)

The European Union produces an insufficient amount of energy to meet its own needs, therefore the European Union's dependence on energy imports has long been a matter of concern and an important component of energy security. (Khattak et al., 2018) Efforts have been made over time at the European Union level to improve energy security by building a resilient and interconnected internal market (Vezzoni, 2023) In another vein, the concern for energy security is present not only at EU level but also at global level, as according to the

International Energy Agency, energy security has always been at the core of its mission since its foundation in 1974. (IEA, 2014)

Current geopolitical events highlight the vital importance of maintaining control over this energy sector and decreasing dependence on imports. (Li et al., 2023) The European Union's energy dependence can lead to the exposure of member countries' economies to volatile prices and the risk of supply shortages, for example, due to geopolitical conflicts. (Mišík & Nosko, 2023) The risks of supply shortages also increase as member countries' energy dependence increases. (Wiśniewski, 2023) Therefore, the European Union's energy security strategy must focus on increasing energy production, including renewable energy, increasing energy efficiency and, by analogy, decreasing the rate of energy dependency. (Joița, 2023; Yolcan, 2023; Luty, 2023)

In recent years, the energy deficit in the European Union has been around 50%, which means that in order to meet consumption; this amount of energy had to be imported. (Pérez, 2019) Each individual member country has a different level of energy dependence and a different pace of transition to renewable energy sources. (Elbassoussy, 2019) At EU level, primary energy sources include oil, natural gas and solid fossil fuels. (Rokicki et al, 2021)

The COVID-19 pandemic has had a negative impact on the economies of all countries (Szép et al., 2022). Through the restrictive measures introduced to reduce the spread of COVID-19, the demand for energy has decreased (Gourinchas, 2020), therefore the direct result has been a decrease in the rate of energy dependence through a decrease in imports. From an environmental perspective this impact can be considered a positive one, however, after a long period of restrictions, the recovery of the economies of the European Union member countries has been increasingly difficult, and efforts to increase energy security or diversify energy sources are extremely important or even crucial, for building a more resilient and sustainable future.

Methodology

Energy dependence is calculated according to the following formula:

$$\text{Energy dependence} = (\text{imports} - \text{exports}) / \text{gross available energy}$$

Formula. 1: Energy dependency rate

Source: Eurostat - Energy glossary, 2023

The research methodology used in this paper is a quantitative analysis, to establish the trend of increase or decrease of the energy dependency rate at the European Union level and in Romania, for the period 2010-2021, starting from the hypothesis that the sharp decrease of the energy dependency rate is due to the negative effects of the COVID-19 pandemic. In this regard, the indicator - energy dependency rate - is analyzed as part of the Sustainable Development Goals (SDGs) set of indicators, and is used to monitor progress towards SDG 7 on clean and affordable energy. (UNDP, 2016)

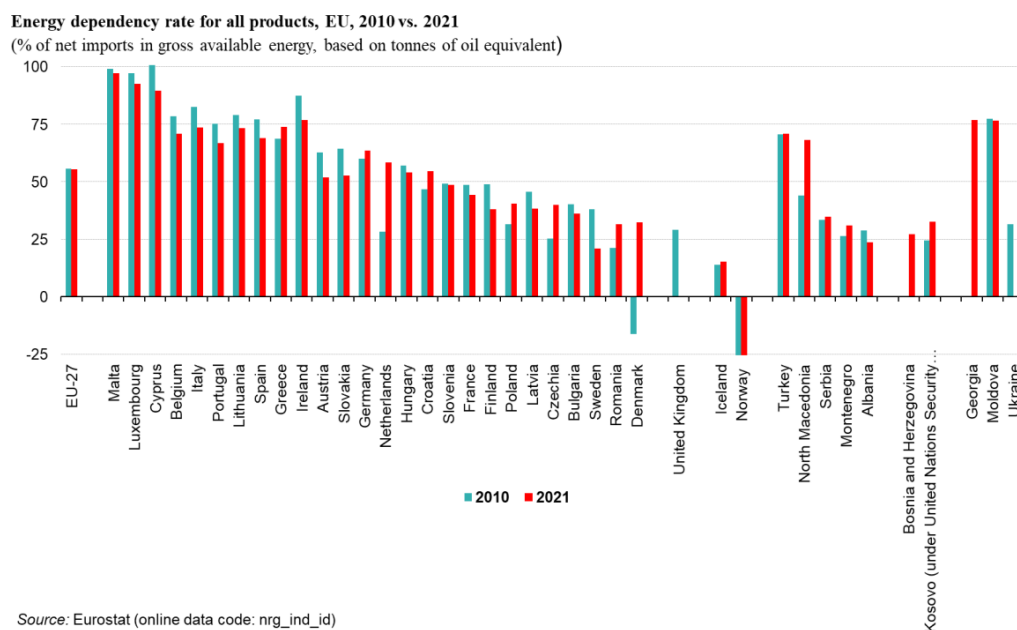
Energy import dependency shows the share of imported energy needs in a country's total available energy. (Eurostat, 2023) The energy dependency rate is the proportion of energy that a country needs to import and is defined as the ratio of net energy imports to gross energy available, expressed as a percentage. In other words, it shows how dependent a country is on energy imports. It can be calculated at the level of total energy products or separately for each energy product (e.g. for natural gas). Gross available energy is the amount of energy needed to meet a country's energy needs. (UNDP, 2016; Eurostat, 2023)

A negative dependency rate indicates a net exporter of energy, while a dependency rate exceeding 100% indicates that energy products have been stored.

Results

This paper aims to test the hypothesis that the sharp decrease in the energy dependency rate in the year 2020 within the period under analysis, respectively 2010-2021, is due to the negative effects of the COVID-19 pandemic.

Therefore, conducting a quantitative analysis at European Union level regarding the energy dependency rate, presented in Fig. 1, shows us for each state, the level recorded by the indicator, both at the beginning of the reference period and at the end of the period, to identify the progress made, respectively the level of dependence on primary energy imports. Among all the member countries of the European Union, in 2010 Cyprus had the highest energy dependency rate and Denmark had the lowest energy dependency rate. (Dacko et al., 2020) In 2021, the highest value of energy dependency rate was recorded for Cyprus, and the lowest energy dependency rate was recorded for Sweden. (Dacko et al., 2020) As for Romania, in 2010 the energy dependency rate was 21.39% and in 2021 it was 31.65%.



Source: Eurostat (online data code: nrg_ind_id)

Figure 1. Energy dependency rate for all products, EU, 2010-2021

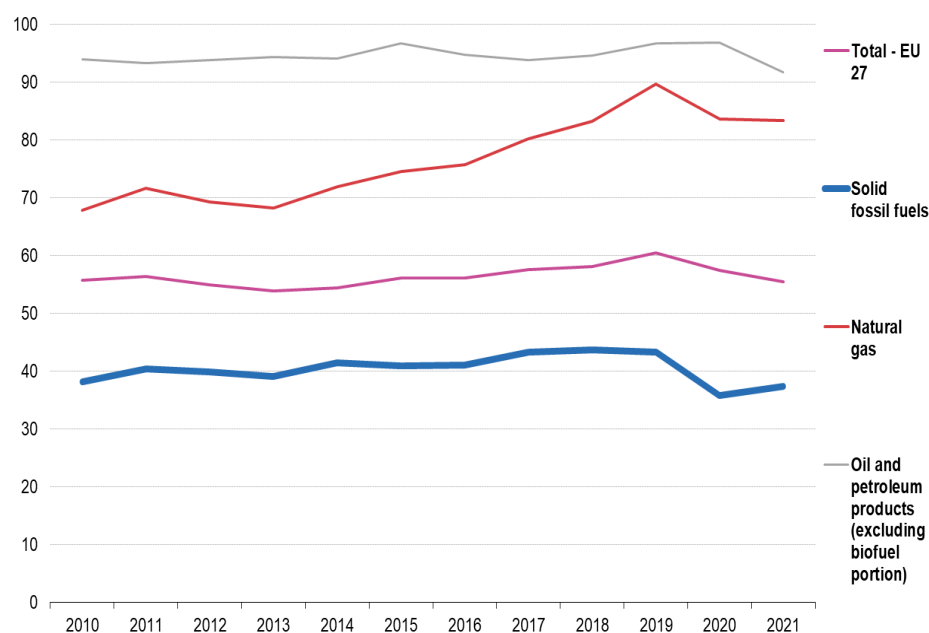
Source: Eurostat (online data code: nrg_ind_id)

By performing a quantitative analysis at European Union level, presented in Fig. 2, we can observe the trend of increasing or decreasing the energy dependency rate, over a period, respectively between 2010 and 2021. In 2019, the energy dependency rate recorded the highest value, namely 60.48%. Therefore, it can be stated that more than half of the energy needs of the European Union are covered by primary energy imports. (Elbassoussy, 2019) If we refer to primary energy sources, respectively solid fossil fuels, natural gas and oil, we can observe an upward trend until 2019, followed by an accelerated decrease until 2021. In 2019, the highest growth was recorded for natural gas, followed by solid fossil fuels and oil. Thus,

it can be concluded that in the last decade (2010-2020) at the level of the European Union, the energy dependency rate registered an increasing trend, as a direct result of the increase in imports of solid fossil fuels, oil and natural gas. (Rokicki, 2021; Pérez, 2019)

Energy dependency rate, EU, 2010-2021

(% of net imports in gross available energy, based on tonnes of oil equivalent)



Source: Eurostat (online data code: nrg_ind_id)

Figure 2. Energy dependency rate, EU, 2010-2021

Source: Eurostat (online data code: nrg_ind_id)

If we refer to Romania, by carrying out a quantitative analysis it is possible to observe the trend of increase or decrease in the energy dependency rate, in a time interval, respectively in the period 2010 - 2021. In 2014, the lowest value of the energy dependency rate was recorded, respectively of 16.66%. In the year 2021, the energy dependency rate recorded the highest value, respectively of 31.64%. Therefore, it can be stated that more than a quarter of the energy demand in Romania is covered by primary energy imports. If we refer to primary energy sources, namely solid fossil fuels, natural gas and oil, we can see an increasing trend until 2019, after which there is an accelerated decrease until 2020, and an increase again from 2021. In 2015, the sharpest decrease was recorded for natural gas, followed by solid fossil fuels and oil. Thus, it can be concluded that in the last decade (2010-2021) at the level of Romania, the energy dependency rate registered an increasing trend, as a direct result of the increase in imports of solid fossil fuels, oil and natural gas. (Dacko et al., 2020)

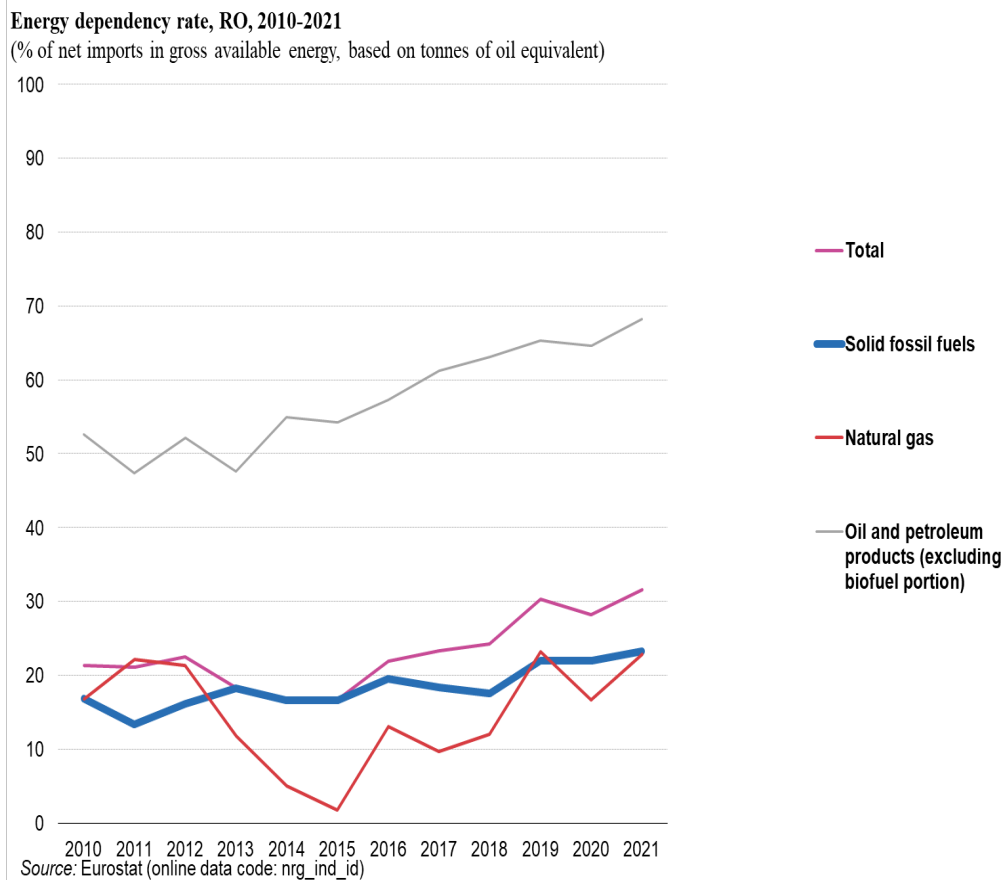


Figure 3. Energy dependency rate, RO, 2010-2021

Source: Eurostat (online data code: nrg_ind_id)

By continuing this quantitative analysis at the level of Romania, presented in Fig. 4, 2010 was set as the reference year, so that the progress recorded in the energy dependency rate can be followed throughout the period under analysis, respectively 2010-2021. The year 2011 begins with a decrease in the energy dependency rate, followed by an increase until 2012, after which a sharp decrease can be observed until 2015. Up to 2019, an accelerated growth follows, followed by a decrease in the energy dependency rate in 2020, which is due to the negative effects of the COVID-19 pandemic. Regarding the minimum level and the maximum level of the energy dependency rate, they have been established already, following the analysis carried out in Fig 3, respectively 16.66% in 2014 and 31.64% in 2021. In Fig 4, it is proposed to offer an overview regarding the evolution over time of this indicator - the energy dependence rate. Therefore, we can see that in 2014 the energy dependency rate decreased by 22.08% compared to the reference year, and in 2021 the energy dependency rate increased by 47.97% compared to the reference year.

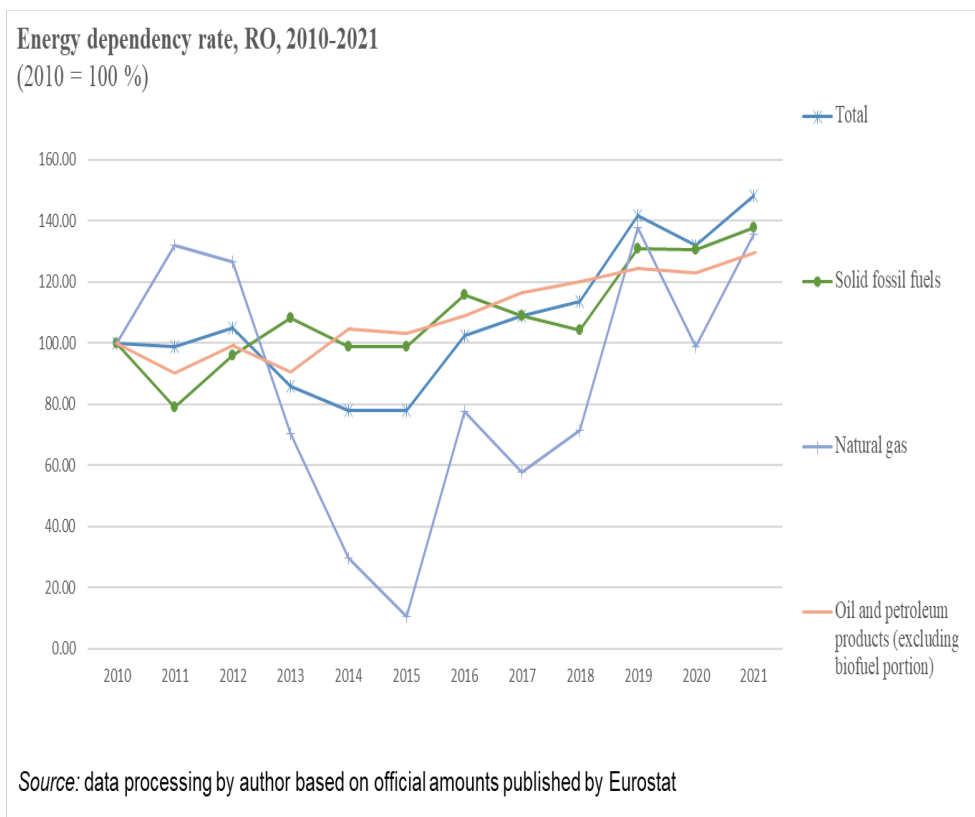


Figure 4. Energy dependency rate, RO, 2010-2021

Source: data processing by author based on official amounts published by Eurostat

Conclusions and proposals

Thus, analyzing the official Eurostat data, we could observe an increasing trend in the energy dependency rate in the period 2010-2019, both in the European Union and in Romania. If we refer to the European Union, more than half of the energy needs are covered by primary energy imports and the year 2020 will see the sharpest decrease in the rate of energy dependence in the whole period under analysis. Therefore, the hypothesis that the sharp decrease in the energy dependency rate is due to the negative effects of the COVID-19 pandemic can be fully confirmed.

As far as Romania is concerned, it can be concluded that in the last decade (2010-2021) the energy dependency rate has shown an increasing trend, as a direct result of the increase in imports of solid fossil fuels, oil and natural gas. In 2014, the sharpest decrease in the whole period under analysis is recorded, and in 2019 we can see a large decrease compared to previous years.

The most important conclusion of this quantitative analysis of the indicator - the energy dependency rate - is that decreasing energy imports and increasing production capacity, especially from renewable sources, directly contribute to achieving Sustainable Development Goals 7 and 13 of the 2030 Agenda (SDG7 - Clean and affordable energy and SDG13 - Climate action).

Given that no research can completely elucidate a particular topic, the limitations of this quantitative research include, among others, not considering some socio-economic factors that could have an influence on the rate of energy dependence, by building an econometric model. Moreover, the objectives of this statistical analysis could be extended to an econometric model, considering other factors. Based on this quantitative analysis and taking other elements into account, future research could focus on a comprehensive socio-economic analysis, which can be developed on environmental performance at the European Union level and how it is influenced by various socio-economic factors.

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