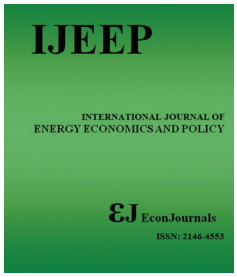

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Economic and Energy Security of the Republic of Kazakhstan

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ABSTRACT

The authors discuss the concept of energy and economic security of the Republic of Kazakhstan, arguing that energy security is a vital part of economic security of any country. Thus, energy security is to be strengthened in order to achieve better economic security. Kazakhstan has a large and pretty developed fuel and energy complex that certainly has a very significant impact on its economy. With the aim of analyzing Kazakhstan's energy security in the period of 2000–2015, we construct an energy security performance index that includes ten quantitative indicators operationalizing the four dimensions of energy security, namely the energy "availability," "affordability," "efficiency," and "environmental stewardship." The analysis clearly shows that Kazakhstan has been able to significantly increase its energy security performance over the 15 years. Due to the precise research design and data collected, the authors also provide insights into the behavior of each energy security dimension, demonstrating how Kazakhstan's energy security has been constantly changing in the period under analysis and identifying the strongest ("availability" and "affordability") and weakest ("efficiency" and "environmental stewardship") energy security dimensions.

Keywords: Kazakhstan, Energy Security, Economic Security
JEL Classifications: Q2, Q3, Q4

1. INTRODUCTION

The availability and use of energy resources is a very important condition for the functioning of the economic and social systems. It is common knowledge that national economies have a very strong dependence on energy resources. Not all countries have a proper reserve of energy resources and, as a result, have to rely on imports of oil, coal, natural gas, electricity, etc. in order to cover their energy needs. Consequently, preservation and proper use of the energy resource potential is a very important element of any state's economic security and is one of the most important priorities in energy policies. The growing research interest in this set of problems might be seen as a result of the increasing dependence of many countries on importing fuel and energy resources, as well as the already increased competition between the key exporting countries, high volatility of prices in world markets, and the strengthening geopolitical factor in energy relations.

In this paper we consider the problem of economic and energy security of Kazakhstan, the leading state of Central Asia. In our opinion, energy security is an integral part of the economic security of the state. Thus, it is impossible to have a strong economic security without proper energy security. Numerous studies show that the Kazakhstan's economy has a great dependence on the fuel and energy complex, and this dependence is only growing (which is to be discussed below in detail). Therefore, the issue of ensuring energy security is highly important for Kazakhstan in order to achieve better economic security.

Our literature review clearly shows that there is no single quantitative study being focused exclusively on the Republic of Kazakhstan with the purpose of analyzing the gradual development of its energy security over the period of 15 years. Thus, this research can fill the existing gap and make a contribution to the scholarly literature.

In the first part of the paper are discussed the concepts of energy and economic security, including the role of Kazakhstan's energy

and fuel complex in the economy of the leading Central Asian country. The research design is outlined in the "Materials and Methods" section. In "Results and Discussion," we analyze the obtained data on Kazakhstan's energy security performance. Than possible limitations and future research agenda are also discussed. Finally, we conclude with a short overview of the research, highlighting main insights and observations.

2. ENERGY AND ECONOMIC SECURITY

2.1. Conceptualizing Economic and Energy Security

The problem of "economic security" is very debated, especially in the context of globalization and new regionalization, the creation of new production and trade chains, active processes unfolding in the digital economy, new industrialization, etc. (Grodach, 2011; Grigoreva and Garifova, 2015; Malle, 2016). Nevertheless, the concept of "economic security" has a large number of different definitions (Cable, 1995; Poirson, 1998; Hacker et al., 2013). We consider "economic security" as a unified concept within the discipline of Political Economy that is closely related to the categories of economic stability and vulnerability, economic pressure, coercion, aggression, and economic sovereignty.

Economic security can be seen as the security of economic relations that has a great influence on the development of the country's economic potential and ensures its increasing economic growth, which also contributes to the growth of the country's independence and defense capability in the economic sphere. Of course, economic security should be considered as one of the types of national security, along with military, environmental, information security, etc., In our opinion, different types of security are very interrelated and mutually complementary. Along with this, we also think and agree with (Blum and Legey, 2012), (Papadimitriou and Pistikou, 2015), (Cohen and Naor, 2013), (Shake, 2017) that economic security is the basis of the national security of any sovereign state. In turn, the effective development and operation of the fuel and energy complex of the country that ensures energy security is the basis of the country's economic security.

It is energy that largely shapes and determines the opportunities for economic development, production efficiency, product competitiveness of s, etc. The fuel and energy complex is a system for extracting natural energy resources, enriching them, transforming them into mobile types of energy, as well as transferring, distributing, and consuming energy in all sectors of the national economy. Technological unity, organizational interrelations, and economic interdependence allow such different elements of the national economy to act as a single national economic complex.

Different types of energy are the most important source of development for all sectors of the economy. Thus, the sustainable functioning of the fuel and energy complex of both the country and its regions is an important factor for the successful development of the entire economic system and enhancing its economic security. In other words, the effective and stable functioning of the economic system is impossible without rationally organizing and successfully developing a complex of industries aimed at the extraction, processing, and use of fuel and energy resources.

The concept of "energy security" is also very debatable and does not have a single definition (Sovacool, 2011; 2014; Gafurov, 2010). As a rule, energy security is understood as a state of protection against threats to fuel and energy supply to the country's economy (Leal-Arcasa, 2015; Tongsopit et al., 2016). Thus, according to this approach, the most important aspect of energy security is to ensure the uninterrupted access of the population and economic agents to energy resources and the reliability of the supply of energy resources to international markets.

Thus, "energy security" is an integral component of the concept of "economic security" and can have a large number of categories, the basis of which is to ensure the uninterrupted energy supply to the domestic and foreign markets. Nevertheless, there are studies examining other aspects of energy security, including not only the availability of energy but also its efficiency and environmental reliability, etc. (Brown et al., 2014; Sovacool, 2011; 2014).

2.2. Kazakhstan's Fuel and Energy Complex: Security Issues

The fuel and energy complex is one of the most important structural component of the economy of Kazakhstan (Karatayev and Clarke, 2016). The economy of Kazakhstan is very dependent on the sale of raw materials, the lion's share of which is hydrocarbons. The volatility of world and domestic prices for energy carriers has a direct impact on the economy of the country, causing unpredictability, slowing economic growth, reducing the volume of production and consumption of energy resources. Proceeding from the above, the problem of energy security of Kazakhstan is very important for the economic and, as a result, national security of this country.

Despite the rather high research of the issue of energy security in Eurasia (Inbrayeva et al., 2018; Mastepanov, 2015; Gracceva and Zenewski, 2014, Kanellakis et al., 2013), we could not find a quantitative study measuring the current state of Kazakhstan's energy security and analyzing the dynamics of the development of its energy security. Many studies focus on the energy security of Central Asia (Akhmetov, 2015), the Eurasian Economic Union (Baev, 2012; Bogoviz et al., 2017), and only a few analyze the energy security of Kazakhstan itself (Baizakova, 2010; Karatayev and Clarke, 2014). This study aims to make a contribution to quantitative studies of energy security in Kazakhstan in particular and Central Asia in general.

3. MATERIALS AND METHODS

We evaluate Kazakhstan's energy security performance with the help of an index that quantitatively measures the concept of energy security being developed by (Sovacool and Brown, 2010) and (Brown et al., 2014), which was later successfully used by (Bogoviz et al., 2017) and (Obadi and Korcek, 2017). In order to better grasp the concept of energy security and measure it, (Sovacool and Brown, 2010) and (Brown et al., 2014) identify the total of four dimensions in energy security, namely

"availability," "affordability," "energy and economic efficiency," and "environmental stewardship." Our research is different from those mentioned above in a number of ways. First, we deeply focus on only one country and analyze all the dimensions of its energy security. Second, the research is built on the original data that were collected and analyzed not just for 2 years (as [Brown et al., 2014] did, for instance) but for the total of 5 years, which eventually allowed us to understand the dynamics within the dimensions of energy security from 1 year to another.

All these four dimensions of energy security, following (Sovacool and Brown, 2010) and (Brown et al., 2014), were operationalized in order to gather quantitative data and measure the concept. The "availability" dimension focuses on how well a particular country diversifies its fuel and how much the nation is dependent on the foreign supply. It is based on the three following indicators: (a) "Oil import dependency," (b) "coal import dependency," and (c) "natural gas import dependency." We collected the data on Kazakhstan with respect to all these three indicators from the International Energy Agency (IEA, n.d.). The dependency on a particular fuel was estimated by ourselves according to Scinner (1995), Eurostat (2017), and Cambridge Econometrics (2016).

Another dimension of energy security, energy "affordability," stands for the existence of low prices on energy sources and their low volatility over time. This dimension was operationalized with the help of just two indicators (a) electricity prices for households (US$ 100/kWh) and (b) pump price for gasoline (US$/l). The data on Kazakhstan came from the World Bank (n.d.).

The third dimension focuses on energy "affordability," i.e., on energy equipment and consumer behavior. We use such indicators as (a) "renewable energy consumption," (b) "GDP per unit of energy use," and (c) "electric power consumption" to measure energy "affordability" in Kazakhstan. We collected the data from the World Bank (n.d.) and adjusted the numbers for purchasing power parity. And finally, the fourth dimension of energy security is called the "environmental stewardship" and focuses on how well the environment is actually protected from the use of energy resources. The two widely used indicators captured well this dimension, namely (a) SO_2 emissions and (b) CO_2 emissions, the data on which came from the Committee on Statistics of the Republic of Kazakhstan (2017) and the World Bank (n.d.), respectively.

The collected data on all the four dimensions of energy security (being quantitatively operationalized with the help of 10 indicators) are presented in Table 1. Our time frame is between 2000 and 2015, which is limited because of our impartial access to the data. With the aim of evaluating relative magnitudes of changes in the indicators and make insights on how energy security of Kazakhstan has been changing over the years, we use another analytical tool presented in (Sovacool and Brown, 2010), namely the z-score normalization. Being used under the framework of our analysis, the z-score normalization allows to identify how Kazakhstan's energy security performance was changing in the period under analysis and which years were more successful for each dimension of energy security.

4. RESULTS AND DISCUSSION

Table 2 contains results of the z-score normalization used to capture Kazakhstan's energy security performance in 2000, 2004,

Table 1: Energy security performance index of Kazakhstan (2000–2015, Z-scores)

Year	Availability			Affordability	
	Oil import dependence (%)	Coal import dependence (%)	Natural gas import dependence (%)	Electricity prices for households (US$ 100/kWh)	Pump price for gasoline (US$/L)
2000	−433.7	−379.38	−31.32	17.25	2.31
2004	−489.3	−324.66	−72.12	15.12	2.78
2008	−577.3	−218.80	−110.47	13.41	2.17
2012	−688.9	−187.29	−139.94	12.54	1.87
2015	−745.9	−112.36	−195.54	10.21	1.62
Median	−577.3	−218.8	−110.49	13.41	2.17
Mean	−587.9	−244.498	−109.882	13.71	2.15
SD	131.12	107.25	69.93	2.66	0.44
Year	**Energy and economic efficiency**			**Environmental stewardship**	
	Renewable energy consumption (% of total final energy consumption)	GDP per unit of energy use (constant 2011 PPP $ per kg of oil equivalent)	Electric power consumption (kWh per capita)	SO_2 emissions (1000 tons per year)	CO_2 emissions (tons per capita)
2000	2.510	4.150	3169.523	1080.0	7.93
2004	1.880	4.151	3859.193	1492.1	11.53
2008	1.154	4.324	4689.167	1078.5	14.85
2012	1.328	4.998	5180.654	769.6	14.47
2015	1.558	5.319	5600.208	710.6	14.36
Median	1.558	4.324	4689.167	1078.5	14.36
Mean	1.685	4.588	4499.749	1026.16	12.63
SD	0.53	0.537	986.196	311.504	2.94

Table 2: Energy security performance by year: Results of the z-score normalization

Year	Availability	Affordability	Energy and economic efficiency	Environmental stewardship	Total
2000	−1,16014263	−1,68	0,62	1,4284303	−0,79
2004	−0,59793697	−1,96	1,0982846	0,20	−1,26
2008	−0,30406881	0,0635306	1,296956	−2,251967844	−1,195
2012	0,7212524	1,0717556	−0,78270599	0,20	1,21
2015	1,340896	2,51	−2,23733202	0,423463965	2,04

2008, 2012, and 2015. Also, we visualize the obtained results in Figures 1 and 2. What trends does our statistical analysis clearly demonstrate?

First, the research clearly demonstrates evidence that the overall energy security index of Kazakhstan has grown by 2.83 points over the 15 years under analysis (Figure 1). More than that, the index was negative in 2000, 2004, and 2008, falling over −1 on the index scale in 2004. The index rose sharply in 2012 by 2.4 points and continued rising in 2015, reaching the highest point of 2.04 in the period observed. Therefore, we can state that Kazakhstan has significantly increased its energy security since 2000.

Second, there are noticeable changes in the dimensions of energy security (Figures 2 and 3). Since we decided to analyze the total of 5 years over the period of 15 years, unlike other authors who relied on the same method and used data only for 2 years, the 1st one and the last one (Brown et al., 2014; Bogoviz et al., 2017), our data allows us to observe how each dimension was gradually changing in the period under analysis.

The "availability" and "affordability" dimensions have been constantly rising from 2000 (expect a slight decrease in energy "affordability" in 2004), making these dimensions mainly responsible for the overall increase in Kazakhstan's energy security. The energy "availability" has been rising by 0.5 points each year, making an impressive increase of 2.5 points by 2015. According to IEA (n.d.), Kazakhstan has significantly increased the production (and export) of oil, coal, and natural gas. The same applies to the energy "affordability" dimension, which has been able to almost constantly rise by 0.838 points in each year under analysis, excluding the year of 2004 when it slightly decreased by 14%. In overall, the energy "affordability" dimension of our index has risen by the total of 4.19 points.

Third, other two dimensions of our index has decreased in the analyzed period. The most severe decline has experienced the energy and economic "efficiency" dimension, with the total decline of 1.6 points. Our data clearly show that this dimension was constantly rising from 2000 (0.62) up to 2008 (1.3), but it decreased in the next two years. The environmental stewardship dimension also experienced a decline of 1 point by 2015, starting with a positive value of 1.428 in 2000 and having 0.423 in 2015. We also note that the most severe decline was experienced by this dimension in 2008 when it lost 3.68 points.

If one is to compare the structure of the energy security performance index in 2000 and 2015, it is clear that the leading dimensions in 2000 are the energy "efficiency" and "environmental

Figure 1: The shift in energy security performance index (in total, Z-scores, 2000–2015)

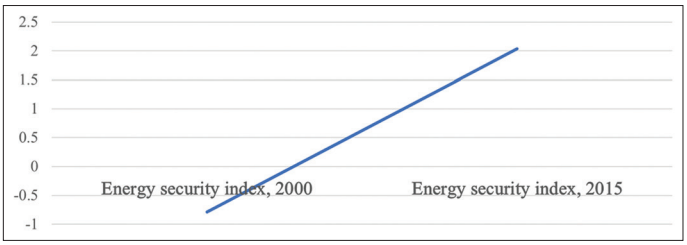


Figure 2: Shifts in energy security performance index (in total, Z-scores, 2000–2015)

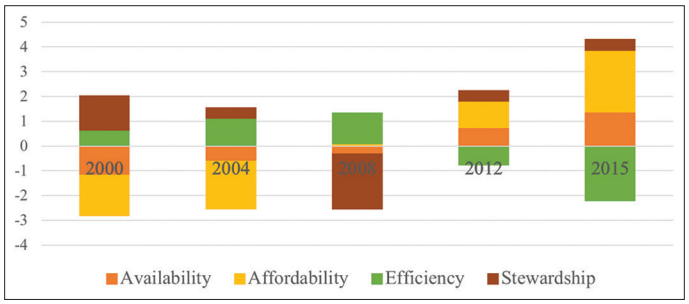
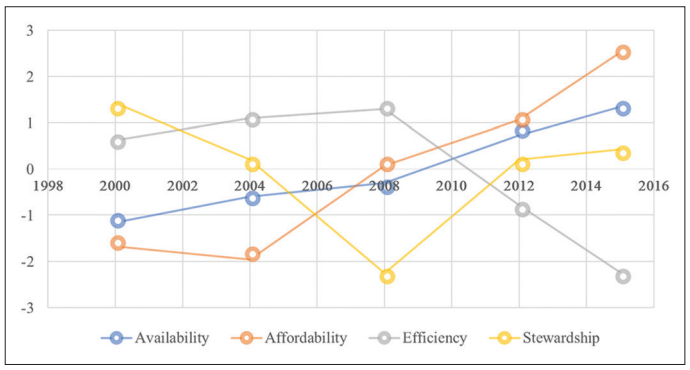


Figure 3: Sifts in energy security performance index (Z-scores, 2000–2015)



stewardship" dimensions, since only they have positive values. In turn, the leading dimensions in 2015 are the energy "affordability" and "efficiency" dimension. However, the "environmental stewardship" dimensions occupies almost the same value in 2015 after experiencing a severe decline in 2000–2008. In contrast, the energy "efficiency" dimension has an opposite trajectory. It is rising from 2000 to 2008 and is sharply decreasing in the period from 20008 till 2015. Therefore, the energy "efficiency" dimension is the weakest one in Kazakhstan's energy security performance. "Environmental stewardship" is another relatively weak dimension that should be strengthened in Kazakhstan, along with the energy and economic "efficiency" dimension.

In sum, Kazakhstan has been able to increase its energy security over the 15 years under analysis mainly due to the energy "availability" and "affordability" dimensions. However, the other two dimensions have declined, namely the "environmental stewardship" and energy "efficiency" dimensions. The most severe decline (by 2.8 points) is observed in the energy and economic "efficiency" dimension.

5. LIMITATIONS AND FUTURE RESEARCH

In our opinion, this research can be advanced in a number of ways. First, for instance, other indicators better capturing the concept of energy security in Kazakhstan can be used to make more precise measurements. Second, one may analyze the behavior of energy security dimensions. We just briefly outlined some of their behavioral patterns, without going deeper into causal relationships existing within each dimension and the overall energy security performance. We also believe that a robust qualitative analysis is much needed to understand certain trends in Kazakhstan's energy security performance over the last 15 years, especially with respect to the energy "efficiency" and "environmental stewardship" dimensions.

6. CONCLUSION

There is a strong dependency existing between energy security and economic security of Kazakhstan, which is caused by the large influence the fuel and energy complex of the country has on the whole national economy. Consequently, the issue of energy security is of highest importance for Kazakhstan. Our analysis of energy security performance Kazakhstan clearly demonstrates that the country's overall energy security has been constantly rising. However, this growth is mainly due to the rising performance in the energy "availability" and "affordability" indicators, while one observes a sharp decline in the energy and economic "efficiency" dimension and a much slower decline in the "environmental stewardship" dimension.

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