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The Influence of Fiscal Progress on Energy Consumption in Kazakhstan

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ABSTRACT

Among the strategic goals of the European Union (EU) is to upsurge the consumption of green energy in its member states, bringing together financing, technological, and innovations around customer engagement. Most researchers have been conducted around the green economy in Kazakhstan, but petite examination has been done on the influence of the fiscal sector on renewable consumption of energy. This research paper centers on the link between energy usage, economic progress, fiscal expansion, and energy prices in Kazakhstan using the Vector Error Correction Model Technique. The valuation results revealed a positive and substantial influence on economic and financial development on the consumption of energy. Prices of energy represented by the Consumer Price Index had an indirect influence on the consumption of energy. These two analyses are in tandem with theoretical findings and expectations. Further, the findings depict that a percentage increase in fiscal and economic growth leads to increased energy usage by 0.11% and 0.39%, respectively.

Keywords: Financial Development, Economic Progress, Energy Consumption, Renewable Energy
JEL Classifications: Q16, 016, 044

1. INTRODUCTION

Since power is used as an input of manufacture, supply, and use in majority products and services, it has a vital part in the development and growth of any economy. According to Sadorsky (2010), there are two significant factors of financial development that increase the demand for energy: (a) Individuals can borrow money at discounted rates to purchase durable commodities like washing machines, houses, cars, cookers, among others. That consumes a lot of energy and, in return, increases the country's cumulative energy consumption; (b) organized financial structures will benefit businesses by creating efficient and less expensive finances that businesses can use to buy plants, machinery, and equipment and increase their operations.

There is a direct correlation between how energy is used and the emission of CO_2 into the environment as substantial usage of power and natural resources increase the emission of CO_2. However, the emissions of CO_2 can either be steady or decline marginally due to the technological innovation of products consuming less energy (Khan et al., 2017; Nasreen et al., 2017).

Kazakhstan was ranked 11th in the world for its oil reserves, the second-largest producer of oil and 54th biggest country in the globe (IMF, 2018). The country heavily relies on coal, oil, uranium, gas, and agriculture with energy and mining economies, accounting for 33% of the gross domestic product (GDP) and 82% of the country's exports (Hasanov et al., 2019). By 2018, the Kazakhstan economy had grown by 6.9 times to \$170.53B from \$24.88B recorded in 1991. However, from 2015 there was a declining oil process that led to a recession in the country, and the economic development percentage declined from 4.2% in 2014 to 1.1% in 2016 (World Bank, 2018). The recession was an indicator that Kazakhstan was a less diversified economy, with the other factors of production playing an insignificant role in non-petroleum sectors. The reason could be either there is inefficient and insufficient utilization of factors in the non-petroleum sectors or the Dutch forces disease creating less demand for them. In avoidance of repeating the same scenario, it is vital to recognize and appraise the macroeconomic factors of energy usage, which have a crucial part in the economic development of Kazakhstan.

2. LITERATURE REVIEW

There have been numerous researches on the link between economic development and credits for various countries. Coban and Topcu (2013) researched the association amid fiscal expansion and energy usage in the European Union (EU) economies by using Theoretical maximum specific gravity (GMM). The result was a positive connection between how energy is consumed and financial development. Their research was congruent with Mukhtarov et al. (2018), who researched Azerbaijan using different cointegration techniques. By utilizing a GMM analysis, Sadorsky (2010) evaluated the influence of fiscal growth on the usage of energy in nine countries with data dating from 1996 up to 2006. The outcomes indicated a direct association between fiscal and economic development and energy usage. Other studies that resolved on a direct correlation amongst fiscal growth and energy usage were done by Mahalik et al. (2017); Komal and Abbas (2015); Shahbaz et al. (2016); Saud and Baloch (2018); Furuoka (2015); Alam et al. (2015); Shahbaz et al. (2017).

Contrary to the above studies that showed a positive correlation, other researchers concluded with a negative correlation between energy usage and fiscal development. Islam et al. (2013), studied in Malaysia, concluding a negative relationship between the two. Other researchers, including Ali et al. (2015); Gómez and Rodríguez (2018); Kahouli (2017); Farhani and Solarin (2017), all found an inverse correlation between consumption of energy and fiscal progress.

In the researches mentioned above, none of them conducted a study on the relationship between fiscal progress and usage of power in Kazakhstan. Consequently, the prime objective of this research is to complement other research work by the use of VECM to elaborate on the influence of fiscal growth on the consumption of energy in Kazakhstan. The findings will be an eye-opener to the strategists and other scholars to appreciate the financial evolution, fiscal growth, and usage of energy nexus on the macroeconomic strength and sustainable development goals (SDG) in the country of research and other oil-developing countries.

3. MODEL AND DATA

For the experimental analysis, the research used data acquired from the World Bank (World Bank, 2018) for the period 1993 to 2014. The dependent component is the usage of energy per capita (EC) weighted in oil kg per capita. Fiscal progress, weighted by domestic credit (Crd) as a proportion of the gross domestic product (GDP), is the leading independent variable. The use of domestic credit as a proxy for fiscal development could be supported by previous works done by Kahouli (2017); Chang (2015); Polat et al. (2015); Mehrara and Musai (2012); Shahbaz et al. (2017). Economic growth will be measured by GDP per capita. Since energy costs statistics are not readily obtainable for most economies, the price of energy was represented by the Consumer Price Index (CPI) (2010=100). Previous researchers, including Sadorsky (2010); Mukhtarov et al. (2018); Komal and Abbas (2015), all used CPI to represent energy prices. Conceptual framework is presented in Figure 1.

The research analyzed the consequence of fiscal and economic expansion and the prices of energy on energy consumption by using the VECM model. Empirically, tests were done to the variables for unit root and non-stationarity of characteristics by the use of PP (Phillips and Perron, 1988) and Augmented Dickey Fuller (ADF) (Dickey and Fuller, 1981). Fourier ADF will also be employed to get more reliable results due to its ability of accounting the structural breaks and non-linear constituents in the time series (Furuoka, 2017, FADF-SB).

Secondly, when the integration orders of the variables are similar, the cointegration test using the Johansen test (Johansen, 1988) can be employed. Finally, after appreciating the existence of cointegration among the components of the research, the VECM was applied to conclude on the long-term link among the elements.

4. EMPIRICAL RESULTS

To begin, the stationarity features of the components are subjected to PP, FADF-SB, and ADF unit root assessments. The outcomes are as shown below in Table 1, where it indicates that all the components are not fixed at their first level. They are, however, fixed at the difference using the PP and ADF outcomes. The F-test application was used to decide the best model of estimation within the variables for ADF-SB and to associate the results from the FADF test and the ADF test.

The statistics for the PP and ADF trials were taken from Mackinnon (1996), while those of the FADF-SB test were taken from Furuoka (2017). λ is the break-position.

As depicted in the table above, the null hypothesis did not reject the FADF-SB test since there was a break of a component root but had rejection of the null hypothesis at the initial difference. Therefore, it was concluded that the components are non-static in levels but static in their primary difference, enabling us to continue to the next test.

Figure 1: Conceptual framework

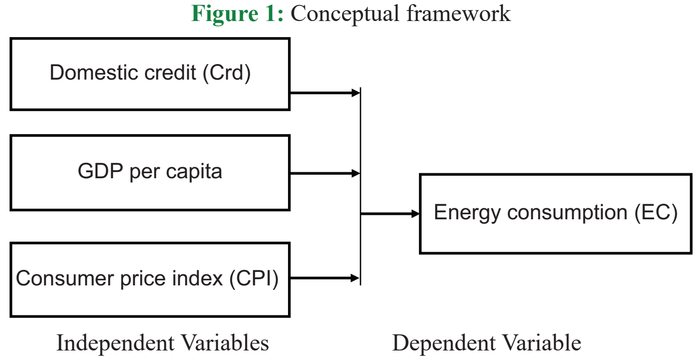

Table 1: Element root trials results

Components	ADF trial				PP trial		λ	FADF(SB) trial	
	Level	k	Initial difference	k	Level	Initial difference		Level	Initial difference
GDP	−0.42	1	−3.65**	2	0.94	−4.08***	0.32	−4.06	−4.43*
EC	−0.69	0	−3.93**	2	−0.92	−3.94***	0.44	−3.60	−6.49***
Crd	−1.81	1	−3.33**	2	−1.82	−3.43**	0.23	−3.73	−5.51*
CPI	0.53	0	−2.66*	2	0.31	−2.66*	0.18	−2.07	−15.33*

The most lag was set at two; *, **, and *** represents rejecting null hypotheses at 10%, 5%, and 1% significance levels

Table 2: Cointegration test results (trace)

LM test for serial relationship			Cointegration rank trial (trace) using Johansen				
Delays	LM-Statistic	P-value	Null hypotheses	Eigenvalue	Trace statistics	0.05 Critical value	P-value
1	18.52	0.29	0	0.834	60.426	47.856	0.002
2	13.545	0.633	Maximum 1	0.032	0.646	3.841	0.421
3	16.176	0.44	Maximum 2	0.544	24.559	29.797	0.177
4	14.8	0.54	Maximum 3	0.336	8.833	15.494	0.381

Table 3: Cointegration Test results (maximum eigenvalue)

Panel 2: Normality test	Panel 4: Cointegration rank test (maximum eigenvalue) using Johansen				
Statistics	Null hypotheses:	Eigenvalue	Maximum eigenvalue Statistic	5% Critical rate	P-value
Jarque-Bera	0	0.834	35.867	27.58	0.003
	Maximum 1	0.544	15.73	21.13	0.24
	Maximum 2	0.336	8.187	14.26	0.36
	Maximum 3	0.032	0.646	3.841	0.42

Table 4: Long run coefficients as depicted by the VECM model

Variables	Co-efficient of correlation	Standard of error	t-statistic
GDP	0.390**	0.12	3.130
Crd	0.110***	0.02	5.520
CPI	-0.160**	0.07	2.270
Residuals analytical trial outcomes and adjustment coefficient speed			
LMS	17.660	(0.34)	
JBN	58.820	(0.33)	
χ2HETR	104.70	(0.14)	

In testing the cointegration relationship, the Johansen approach was used. The results from the test are as per the Tables 2 and 3, indicating that both test statistics had one cointegration link amid the components. The conclusion was a cointegrating association amongst the components.

In the final assessment, after checking the incidence of cointegration within the components, the VECM module was used to approximate the coefficients of the long-term link amongst the components. From Table 4, the results of VECM had no concerns with correlation, instability, or heteroscedasticity. These results indicated the robustness of estimations since the results of the estimated provisions productively passed the diagnostic test.

EC_t is the dependent component; *, **, and *** are significant levels at 10%, 5% & 1%, LMS is the Lagrange multiplier indicator of testing correlation; χ^2_{HETR} = Chi-square statistic for testing heteroscedasticity; the probabilities are in brackets JBN is the Jarque-Bera statistics testing normality.

The results from VECM indicate that domestic credit has a direct and significant influence on power usage at a 1% level. Further, percentage growth in bank loans to private sectors causes a 0.11% upsurge in power usage. The influence of economic development on the usage of energy was direct and significant at 5%. This can be translated to mean that energy usage increases by 0.39%, with a percentage increase in economic development. Finally, the impact of energy prices, which was represented by CPI, was significant with an indirect relationship, which was still congruent with the other results.

5. CONCLUSION AND RECOMMENDATIONS

The research examined the influence of fiscal development, energy costs, and the development of the economy on the consumption of energy in Kazakhstan. All the tests conducted and verified by VECM concluded that there was a direct impact of economic progress and fiscal development on the usage of energy in the country. Still, there was an indirect influence of energy costs on energy usage. In a holistic approach, the results could be interpreted to mean that the Kazakhstan monetary system tolerates households and firms to obtain cheap and more accessible funds to begin or expand their operations. While the funding is more comfortable and the energy prices are lower, businesses will expand their operations and harm the environment since their ultimate goal is profit maximization.

With reference to the findings, policymakers of Kazakhstan may introduce policies and guidelines to encourage the financial sector to support the energy sector financially. This support should include funding of energy-efficient projects to produce clean energy and reduce the negative impact on economic degradation. Therefore, the policymakers must consciously introduce proper policies and make considerable efforts to well-manage their financial sector to propel growth in the energy sector. Furthermore, Kazakhstan, just like other less diversified economies, is susceptible to goods-price fluctuations and should instrument an extensive range of structural modifications to attain higher standards of living and production in the long run. To achieve sustainable development, Kazakhstan and other less diversified economies should contemplate on economic development, fiscal development, and energy connected guidelines.

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