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Article

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The effect of financial development on energy consumption in the case of Kazakhstan

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ABSTRACT

This study investigates the relationship between energy consumption, financial development, economic growth, and energy prices in Kazakhstan, utilizing VECM technique to the data spanning from 1993 to 2014. Estimation results reveal that there is a positive and statistically significant impact of financial development and economic growth on the energy consumption while, energy prices proxied by CPI has a negative effect on energy consumption in the long run for the Kazakhstani case which are in line with the expectations and with the theoretical findings. This finding also shows that a 1% increase in financial development and economic growth increases energy consumption by 0.11 and 0.39%, respectively.

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1. Introduction

Energy plays an important role in economic growth and development of an economy. Because, energy is used as input in the production, distribution, and consumption of almost all goods and services. In its turn, escalating economic growth requires more energy as a driving force of the production of goods and services. For this purpose, understanding the determinants of energy consumption is one of the hot topics for researchers. Due to this perceived importance of defining the determinants of energy consumption, several studies have been conducted to examine the determinants of energy consumption in the case of different countries.

Financial development is one of the main determinants of energy demand. Financial development stimulates financial efficiency of a country, allows financial capital and foreign direct investment flows, increase banking activities, reduces financial risk and the costs of loans, increases transparency between lenders and borrowers, which can affect the demand for energy by increasing consumption and fixed investment. The energy consumption can be affected financial development in the following ways: (a) financial development can affect the demand for energy is by making it easier and cheaper for individuals to borrow money to buy durable goods such as, new cars, houses, refrigerators, and so on. These goods usually use a lot of energy, which can affect a country's

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aggregate energy consumption; (b) it also allows businesses benefit from well-organized financial infrastructure, because it creates to find easier and less expensive financial fund that can be used to start or improve businesses like, buying or building more plants, hiring more workers, and buying more machinery and equipment. All these factors in their turn will increase the demand for energy (Sadorsky, 2010).

There is a direct relationship between emission and energy consumption. As heavy use of energy and other natural resources cause environmental degradation, also the gas emissions from fossil consumption increases the amount of CO₂, which harms the environment as well as inflicting irretrievable damages on the atmosphere. However, in a certain amount of CO₂ is not harmful, on the contrary, it is one of the main elements of the life of plants. But if CO₂ becomes too much, it begins to play the role of thermal insulation for the planet. Global warming caused by climate change has devastating consequences for some of the most important basic health conditions: water, air, and food. The emissions can be either stable or slightly declining due to the introduction of new energy-efficient technologies and products that are faster than the expansion of production and consumption. The financial development enhances the reduction of energy consumption impact on CO₂ emissions by increasing energy efficiency through the promotion of technological innovation and through the adoption of new technologies (Khan, Yaseen, & Ali, 2017; Nasreen, Anwar, & Ozturk, 2017; Tamazian, Chousa, & Vadlamannati, 2009). Considering all the above-mentioned facts, the current study analyzes the impact of financial development on energy consumption for 11th country in the World, in terms of demonstrated oil reserves, the second largest oil producer among the former Soviet countries in 2014, and the 54th largest country in the world and the second largest country among the post-Soviet countries in terms of GDP–Kazakhstan (IMF, World Economic Outlook database, 2018). Kazakhstan is a resource-rich economy and relies heavily on its oil, gas, coal, uranium, heavy industry, and agricultural sectors. The petroleum and mining industries accounted for 33% of GDP in 2010 and 82% of exports (Hasanov, Mikayilov, Mukhtarov, & Suleymanov, 2019). Kazakhstan's GDP increased 6.9 times from 24.88 billion USD in 1991 to 170.53 billion USD in 2018. But starting in 2015, negative oil price shock (and declining oil revenue) caused a recession in Kazakhstan. Declining economic growth rate in Kazakhstan (from 4.20% in 2014 to 1.20% in 2015 and 1.10% in 2016) was observed (WB, 2018). It was a one of the key indicators that Kazakhstan is less diversified economy, and factors of production (including energy input) have not a significant role in non-oil sectors either because of insufficient and inefficient utilization or less demand for them in these sectors due to Dutch disease forces. To avoid this, we believe that it is necessary to identify and estimate the main macroeconomic determinants of energy consumption, which are believed to have an important role in supporting economic growth in Kazakhstan.

Due to the facts listed above, the examination of the energy consumption-financial development relationship in the case of Kazakhstan making it a particular case for this research. To the best of our knowledge, there is no time series study focusing solely on Kazakhstan rather than group of countries. Hence, the aim of the current study is to investigate a long-run relationship between energy consumption and financial development in Kazakhstan, utilizing the Vector Error Correction Model (VECM) to the annual data covering the period ranging from 1993 to 2014. The results of the study are crucial for providing appropriate policy insights. The paper contributes to the current literature in different ways. First, it analyzes one of the hot topics, the long-run impacts of financial development, economic growth, and energy price as proxied by consumer price index on

energy consumption. Second, it is a first study investigating this relationship in the case of Kazakhstan by using time-series data, which allows to observe the country-specific features of this relationship. In addition, the findings of the paper are also, important for other developing oil-rich countries.

The remainder of the paper is organized as follows: [Section 2](#) presents an overview of used variables. [Section 3](#) presents an overview of existing literature. The description of data and description of research methodology are given [Section 4](#). [Section 5](#) presents the explanation of the obtained results of the study. [Section 5](#) presents conclusion and policy implications.

2. Energy consumption, economic growth, and financial development in Kazakhstan

Energy consumption has a crucial role in supporting economic growth in Kazakhstan. Determining how much energy is demanded in Kazakhstan is very important. Thus, it is very significant to analyze the energy consumption firstly. In this framework, annual energy consumption data is illustrated in [Figure 1](#). As it can be seen from the Graph 1, the energy consumption dramatically decreased in Kazakhstan for the period of 1993–2000. This decrease can be explained with different factors, such as the shutdown or weakening of the industry sector after the collapse of Soviet Union. For the period of 2000–2014, the relative increase with some volatility can be observed in Energy consumption. This increase (and decrease in some cases) can be explained with the employed energy policies over the period.

The plot of real GDP per capita is depicted in [Figure 2](#). As a general tendency for the chosen period, GDP has increased persistently since 1996. Before 1996, GDP was decreasing due to the collapse of the Soviet Union and thus the centrally planned economic system. Economic growth in Kazakhstan declined due to slumping oil prices and the financial crisis in Russia. The GDP increased persistently due to higher oil prices during the 2000s coupled with a dominant share of oil and gas sectors, particularly exports, in the Kazakhstani economy, but it was hit

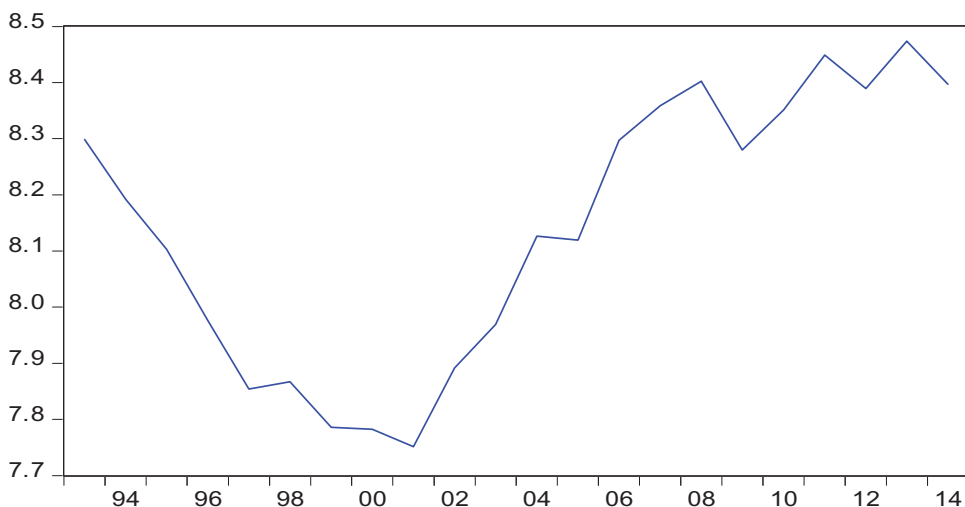


Figure 1. Energy consumption in Kazakhstan (logarithmic form, 1993–2014).

Source: World Bank Data (WB, 2018).

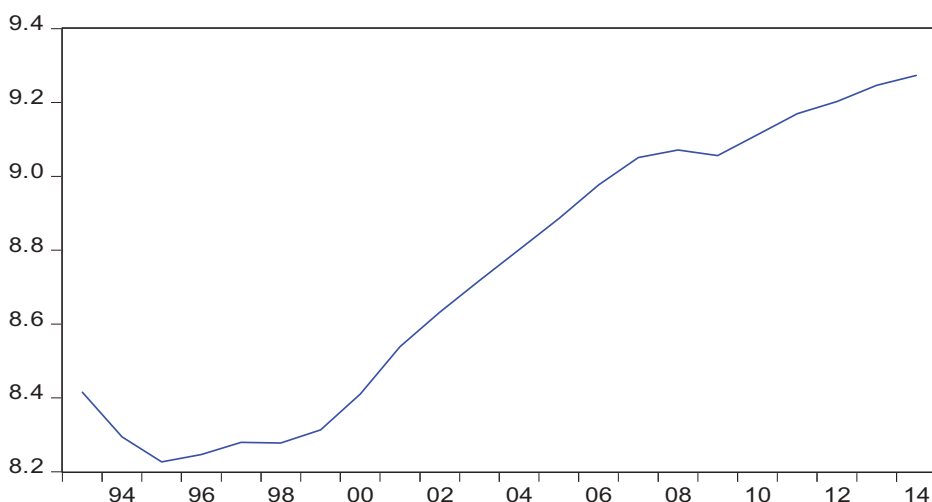


Figure 2. Real GDP in Kazakhstan (logarithmic form, 1993–2014).

Source: World Bank Data (WB, 2018).

again by the 2008 global financial crisis. The economy recovered again as oil price recovered and raised significantly. This growth has been driven mostly by expansion of the extractive sector and increasing commodity prices which have supported growth in consumption and government expenditures.

As it can be seen from Figure 3, there was a significant increase in credits for the period of 1997–2007. Its highest value over the past 23 years was 58.94 in 2007, while its lowest value was 5.17 in 1997. The main reason behind this situation is the economic growth in Azerbaijan during this period. For the 2015–2017 time span the relative decrease can be observed in credits. This decrease can be explained with 2008 global financial crisis led to an important decline in foreign exchange revenues and owing to this issue, GDP growth went down for the appropriate time intervals.

3. Literature review

In the recent year, the relationship between credits and economic growth in the case of different countries has been investigated by several studies in economic literature.

Sadorsky (2010) evaluated the financial development influence on energy consumption in the case of 9 CEE frontier economies by employing GMM to the data spanning from 1996 to 2006. The results show a positive impact from financial development to economic growth. Coban and Topcu (2013) studied the relationship between financial development and energy consumption in EU countries by utilizing GMM technique to the data ranging from 1990 to 2011. They found a positive effect from financial development to energy consumption. The relationship between energy consumption, financial development and economic growth was also investigated by Mukhtarov, Mikayilov, Mammadov, and Mammadov (2018) for Azerbaijan. They used different cointegration techniques (Autoregressive Distributed Lags Bounds cointegration test, Gregory–Hansen cointegration test and Johansen cointegration test) for empirical analysis. The results

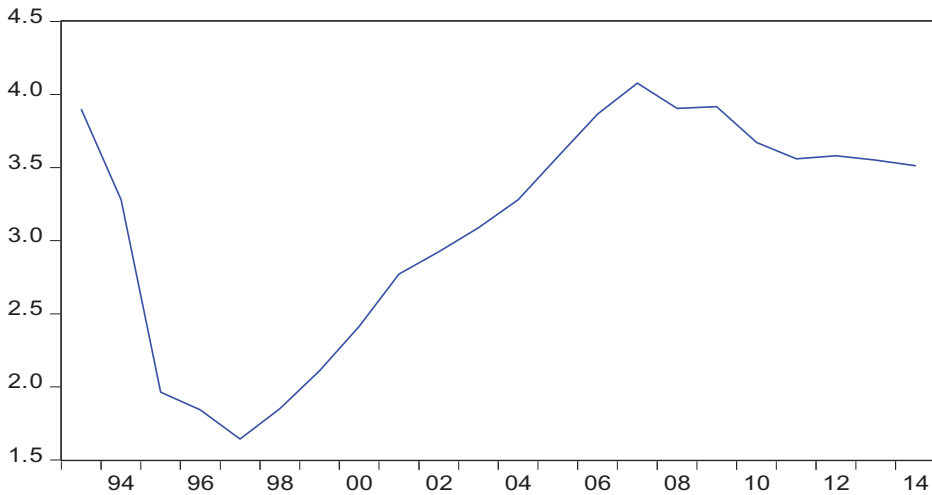


Figure 3. Bank credits to private sector in Kazakhstan (logarithmic form, 1993–2014).

Source: World Bank Data (WB, 2018).

approve the presence of long-term relationship between financial development as proxied by bank credit, energy consumption, and economic growth. In addition, they found that a 1% increase in financial development increases energy consumption by 0.19 %.

Parallel to above mentioned studies, a positive relationship between financial development and energy consumption are obtained by Komal and Abbas (2015), by Alam et al. (2015), by Furuoka (2015), by Shahbaz et al. (2016) by Shahbaz et al. (2017), by Mahalik, Babub, Loganathan, and Shahbaz (2017), by Saud et al. (2018).

On the other hand, Islam, Shahbaz, Ahmed, and Alam (2013), examined the relationship between financial development and energy consumption for Malaysia. For this purpose, they used ARDL and VECM techniques. The study concluded a negative and statistically significant effect from financial development to energy consumption. In addition, numerous studies conducted by Ali, Yusop, and Hook (2015), by Farhani and Solarin (2017), by Kahouli (2017), by Gómez and Rodríguez (2018) found a negative link between financial development and energy consumption.

Table 1, summarizes the findings on the financial development-energy consumption nexus in the case of different countries. The table includes only papers studied after 2010, and we tried only to review the country cases similar to Kazakhstan.

In the outcomes of the above-mentioned studies, there is no study has been conducted on the relationship between financial development and energy consumption in Kazakhstan. Therefore, the main purpose of this article is to fill in this gap by employing VECM method to observe the long-term impact of financial development on energy consumption. The results of this article will suggest to researchers and policy makers to comprehend the financial development, economic growth, and energy consumption nexus for macroeconomic stability and sustainable development goals in Kazakhstan and other developing oil-rich countries.

Table 1. Summary of similar empirical studies in the literature.

Author(s)	Time Period	Country	Method(s)	Result
Sadorsky (2010) Shahbaz and Lean (2012)	1996–2006 1971–2008	9 CEE frontier economies Tunisia	GMM 1. ARDL 2. VECM, GCT	Strong and positive impact of FD on EC 1. CR among FD, EG and EC 2. LRC between FD and EC
Coban and Topcu (2013) Islam et al. (2013)	1990–2011 1971–2009	EU Malaysia	GMM 1. ADL 2. VECM, GCT	Positive relationship between EC and FD 1. CR between FD, EG and EC 2. Negative relationship between FD, and EC
Tang and Tan (2014)	1972–2009	Malaysia	1. ARDL 2. Johansen CT	1. CR between FD, EG and EC 2. LRC between FD and EC
Omri and Kahouli (2014) Furuoka (2015)	1990–2011 1980–2012	65 countries Asia	GMM Panel CT	UC from FD to EC
Komal and Abbas (2015) Chang (2015)	1972–2012 1999–2008	Pakistan 53 countries	GMM 1. IPAT 2. PTM	FD has a positive effect on EC Positive and significant impact of FD on EC Positive relationship between EC and FD
Ali et al. (2015) Shahbaz et al. (2016)	1972Q1–2011Q4 1985Q1–2014Q4	Nigeria Pakistan	ARDL 1. ADF and FADF 2. Asymmetric ARDL	Negative effect of FD on EC in the short-run Strong and positive impacts among FD, EC, EG and CO ₂ emissions
Bekhet, Matar, and Yasmin (2017) Farhani and Solarin (2017)	1980–2011 1973Q1–2014Q4	GCC countries US	ARDL 1. RALS regression 2. Bayer-Hanck CR 3. LRC	Equilibrium LRR among EC, FD, real GDP and CO ₂ in all GCC except UAE FD, real GDP reduce EC
Kahouli (2017)	1995–2015	6 SMCs	1. ARDL 2. VECM	1. Existence of LRR among EG, EC and FD 2. Negative relationship between FD and EC
Mahalik et al. (2017)	1971–2011	Saudi Arabia	1. CT 2. VECM	UC from FD to EC
Shahbaz et al. (2017a) Shahzad et al. (2017) Burakov and Freidin (2017)	1960Q1–2015Q4 1971–2011 1990–2014	India Pakistan Russia	ARDL, ACT ARDL for CT 1. Granger 2. Wald	AR between EC and EC by FD Positive bi-directional causality between EC and FD No causality among renewable EC and EG, FD
Saud et al. (2018) Mukhtarov et al. (2018)	1990–2014 1992–2015	Next-11 countries Azerbaijan	DSUR method 1. CT 2. VECM	FD stimulates EC Existence of positive LRR among EC, FD and EG
Gómez and Rodríguez (2019)	1971–2015	NAFTA Countries	1. Fully Modified OLS 2. Dynamic OLS	Existence of negative LRR among EC, FD and EG

Abbreviations: ARDL = Autoregressive Distributed Lags Bounds Testing, AC-Asymmetric Cointegration, ACT Asymmetric Causality Test, AR-Asymmetric Relationship, DSUR = Dynamic Seemingly Unrelated Regression, GMM = Generalized Method of Moments and VECM = Vector Error Correction Method. CT = cointegration test, GCT = Granger causality test, CR = cointegration relationship, IPAT model-Impact of Population size Affluence and Technology, UC = Unidirectional causality, NC = No causality, LRC(R) = Long-run causality (relationship), SRC(R) = Short-run causality (relationship), PTM-Panel Threshold Model

GCC = Gulf Cooperation Council, SMCs = South Mediterranean Countries, CEE = Central and Eastern Europe, FD = Financial Development, EG = Economic Growth, EC = Energy Consumption, EQ = Environmental Quality

4. Model and data

4.1. Data

For empirical analysis, our study uses annual data over the period of 1993–2014 for the, energy consumption, financial development, economic growth and energy prices in this study. All data set have been obtained from World Development Indicators of World Bank (WB, 2018). Our dependent variable is energy consumption per capita. Energy consumption per capita (*EC*) is measured in kg of oil equivalent per capita. Financial development is our main independent variable, and measured by domestic credit (*Crd*) as percentage of GDP. Prior literature such as, Sadorsky (2010), Mehrara and Musai (2012), Chang (2015), Polat, Shahbaz, Rehman, and Satti (2015), Shahbaz et al. (2016), Mahalik et al. (2017), Kahouli (2017) and Shahbaz, Thi, Mantu, and David (2017), Mukhtarov et al. (2018) used this variable as a proxy for financial development. Economic growth (*GDP*) is measured by real GDP per capita (2010 US \$). The Price is measured in the consumer price index (*CPI*) (2010 = 100). Because energy prices data are not easily available for all countries (include Kazakhstan) and all years, following previous studies by Mahadevan and Asafu-Adjaye (2007) and Sadorsky (2010), Chang (2015), Komal et al. (2015), Mukhtarov et al. (2018) energy prices is proxied by consumer price index. We have transformed all variables into the natural logarithmic form for empirical analyses.

4.2. Methodology

In this study, we analyze the impact of financial development, economic growth, and energy prices on energy consumption by employing the VECM method. In empirical part first, we will test the variables for unit root. The Augmented Dickey Fuller unit root (Dickey & Fuller, 1981, ADF), and (Phillips & Perron, 1988, PP) tests will be employed for checking non-stationarity characteristics of variables. We also, use Fourier ADF with structural break (Furuoka, 2017, FADF-SB) test to get more robust results. The FADF-SB test is performed due to its capacity taking into account of structural breaks and non-linear components in the time series (Furuoka, 2017).

Second, if the orders of integration of the variables are the same, then the cointegration test(s) will be applied to see whether they are cointegrated. For testing the cointegration relationship the Johansen test (Johansen, 1988) is utilized.

Finally, after approving the presence of cointegration between the variables, we will apply the Vector Error Correction Model (VECM) assumption to investigate the long-run relationship among the variables. The above-mentioned methods are widely used techniques in similar studies, we do not describe them but the detailed discussions can be found in Dickey and Fuller (1981), Philips and Perron (1998), Johansen (1988) and Johansen and Juselius (1990), Enders and Lee (2012), (Furuoka, 2017) *inter alia*.

4.3. Empirical results and discussion

First, the stationarity properties of the employed variables are tested using ADF, PP, and FADF-SB unit root tests. The results are presented in Table 2. As can be seen from ADF and PP tests results, all the variables are non-stationary at their levels but they are stationary at first difference. In current study *F* tests are applied to determine the best estimation model among the alternatives for FADF-SB. The purpose of the first *F*-test is

to compare the findings from the FADF test with the results of the ADF test. The results of F tests suggested that the FADF–SB test was the best method to examine for the stationarity properties of the variables. As shown in the Table 2, the FADF–SB test cannot be rejected the null hypothesis (there is a unit root with a structural break) of a unit root at level but rejected the null hypothesis at first difference form. Thus, we can conclude that our variables are non-stationary in levels but stationary in their first differences. Our conclusion that the variables are I(1) allows us to proceed to the cointegration test.

So as to apply the Johansen procedure firstly, the optimal lag number should first be defined. In order to determine the optimal lag interval in the study, A Vector Auto Regressive (VAR) model was initially specified including the endogenous variables of EC, Crd, GDP, and CPI with a randomly selected lag interval and determination test of lag interval was applied to the residuals. The details of this test are presented in Table 3. Both lag selection criteria and lag exclusion tests statistics propose that a lag of order three is optimal in this study because four different criteria indicate this aspect.

Panels A through D in Table 4 report that the VAR has worthy features as it is stable, the residuals do not demonstrate serial correlation and heteroscedasticity issues, and they are normally distributed. The Johansen cointegration test results are presented in Panels E and F of Table 4.

The Johansen approach to cointegration was employed for testing the cointegration relationship. The Johansen cointegration test results are presented in Panels E and F of Table 4. Both the trace and the max-eigenvalue test statistics indicate one cointegration relationship among the variables. Therefore, we conclude that there is a cointegrating relationship among the variables. Furthermore, Toda and Yamamoto causality (Toda & Yamamoto, 1995) test under VAR assumptions was performed to see whether there is a causality relationship between the variables. The results of this test are given in Table 5.

Table 2. Results of unit root tests.

Variable	The ADF test				The PP test		The FADF-SB test		
	Level	k	First difference	k	Level	First difference	λ	Level	First difference
EC	−0.692	0	−3.928**	2	−0.917	−3.940***	0.44	−3.602	−6.490***
Crd	−1.811	1	−3.331**	2	−1.819	−3.426**	0.23	−3.727	−5.513*
GDP	−0.416	1	−3.654**	2	0.942	−4.079***	0.32	−4.063	−4.431*
CPI	0.532	0	−2675*	2	0.308	−2.655*	0.18	−2.066	−15.330*

ADF, PP and KPSS denote the Augmented Dickey-Fuller, Phillips-Perron test and FADF = Fourier Augmented Dickey-Fuller test respectively. Maximum lag order is set to two and optimal lag order (k) is selected based on Schwarz criterion in the ADF test; ***, ** and * indicate rejection of the null hypotheses at the 1, 5, and 10% significance levels, respectively; The critical values are taken from MacKinnon (1996) for the ADF and PP tests, respectively. The critical values are taken from Furuoka (2017) for the FADF-SB. One is chosen as k (selected frequency) for FADF-SB due to the small number of observations. λ is the break-position.

Table 3. Lag interval tests.

Lag	LogL	Information Criteria				
		LR	FPE	AIC	SC	HQ
1	−331.5621	NA	9.33e+10	36.58548	37.38080	36.72008
2	−311.9664	22.68979	7.79e+10	36.20698	37.79762	36.47618
3	−282.9808	21.35778	3.91e+10*	34.84008*	37.22604*	35.24388*

*indicates lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion.

Table 4. VAR residual diagnostics, stability and cointegration tests results.

Panel A: LM test for Serial Correlation				Panel E: Johansen Cointegration Rank Test (Trace)			
Lags	LM-Statistic	P-value	Null hypothesis	Eigenvalue	Trace statistics	Critical value	P-value
1	18.520	0.294	None *	0.8335	60.426	47.856	0.002
2	16.176	0.440	At most 1	0.5444	24.559	29.797	0.177
3	14.800	0.539	At most 2	0.3359	8.8329	15.494	0.381
4	13.545	0.6326	At most 3	0.0317	0.6457	3.8414	0.421
Panel B: Normality Test ^b				Panel F: Johansen Cointegration Rank Test (Maximum Eigenvalue)			
Statistic	AAA	d.f.	P-value	Null hypothesis:	Eigenvalue	Max-Eigen Statistic	Critical value
Jarque-Bera	2.984	8	0.935	None *	0.8335	35.866	27.584
				At most 1	0.5444	15.726	21.131
				At most 2	0.3359	8.1872	14.264
				At most 3	0.0317	0.6457	3.8414
Panel C: Test for Heteroscedasticity ^c							
White	AAA	d.f.	P-value				
Statistic	169.93	160	0.317				
Panel D: Test for Stability							
Modulus	Root						
0.9334	0.8564 + 0.3711i						
0.4523	-0.3196 - 0.3201i						

^a The null of the LM Test is no serial correlation in residuals at lag of th order; ^b The Normality Test is the Urzua (1997) system normality test, for this test the null states multivariate normality of residuals; ^c The null for White Heteroscedasticity Test claims that there is no cross terms heteroscedasticity in the residuals; ^d VAR stability test results conclude that all roots of characteristic polynomial are inside of the unit circle; χ^2 stands for the Chi-square distribution; d.f. = degree of freedom.

Table 5. Toda Yamamoto Causality Test Results.

Null Hypothesis	Chi-square test	Conclusion
LOGCrđ does not Granger cause LOGEC	60.15003 ^a (0.0000)	Reject
LOGEC does not Granger cause LOGCrđ	2.152355 ^a (0.5414)	Accept
LOGGDP does not Granger cause LOGEC	131.3565 ^a (0.0000)	Reject
LOGEC does not Granger cause LOGGDP	120.6410 ^a (0.0000)	Reject
LOGCPI does not Granger cause LOGEC	137.6558 ^a (0.0000)	Reject
LOGEC does not Granger cause LOGCPI	2.545274 ^a (0.4672)	Accept

^a Significance at the 5% level.

According to Toda Yamamoto causality test there are unidirectional causality running from bank credits and CPI to energy consumption while bi-directional causality between energy consumption and economic growth.

Finally, after confirming the presence of cointegration among the variables, we used VECM method to estimate coefficients of the long-run relationship among the variables. If between variables exist one cointegration relationship among the variables, the first-best solution would be using VECM model. Furthermore, we applied diagnostic tests to residuals of VECM. The results of VECM are given in Table 5.

As it can be seen from Table 6, residuals of VECM have no issues with instability, serial correlation, and heteroscedasticity problems. Thus, the residuals of the estimated specifications successfully pass the residuals diagnostics tests, which is indication of the robustness of the estimation results.

The results of VECM show that *Crđ* has a positive and statistically significant impact on energy consumption at 1% level. The results reveal that a 1% increase in bank credits to private sector results in 0.11% increases in energy consumption. These results are important in establishing that financial development affects energy consumption in Kazakhstan in a positive and statistically significant way when financial development is measured by bank credits to private sector indicator. Having positive and significant impacts of financial development, our finding is in line with the results of many previous studies like, Sadorsky (2010), in the case of developing countries, Sadorsky (2011) for Central and Eastern Europe, Shahbaz and Lean (2012) in Tunisian case, Coban and Topcu (2013) in case of European countries, Tang and Tan (2014) and Islam et al. (2013) in Malaysian and, Mallick and Mahalik in Indian case, Shahbaz in the case of Pakistan and Mahalik et al. (2017) for the Kingdom of Saudi Arabia, Mukhtarov et al. for Azerbaijan. In addition, the effect of economic growth on energy consumption is

Table 6. Long-run coefficients from the VECM method.

Regressor	Coefficient	Standard Error	t-statistics
<i>Crđ</i>	0.11***	0.02	5.52
<i>GDP</i>	0.39**	0.12	3.13
<i>CPI</i>	−0.16**	0.07	2.27

Panel B: Residuals diagnostics tests results and Speed of Adjustment Coefficient

LM_{SC}	17.66 [0.34]
χ^2_{HETR}	104.7 [0.14]
JB_N	58.82 [0.33]

Dependent variable is EC_t ; ***, ** and * show significance levels at 1, 5, and 10%; Probabilities are in brackets; LM_{SC} = Lagrange multiplier statistic of serial correlation test; χ^2_{HETR} = Chi-squared statistic for heteroscedasticity test; JB_N = Jarque-Bera statistics for testing normality; In VECM, Jarque-Bera statistics was taken from the option of Orthogonalization: Residual Correlation (Doornik-Hansen)

a positive and statistically significant at the 5% level. This indicates that energy consumption responses by 0.39% increase to a 1% increase in economic growth. It means that an increase in economic growth raises energy consumption. We also find that, the impact of the energy price proxied by consumer price index is statistically significant with negative sign, which is consistent with the theory.

5. Conclusion

The study examines the impact of financial development economic, growth and energy prices on energy consumption. First, we tested variables for a unit root, the results showed their stationarity at first differenced form, hence the variables can be tested for common long-run trend. The Johansen cointegration test concluded cointegration relationship among the variables. This implies that there is a long run relationship between financial development, economic growth, energy prices, and energy consumption Kazakhstan. The VECM approach is used to estimate the long run relationship among these variables. Estimation results of VECM indicates that there is a positive impact of financial development and economic growth on energy consumption while there is a negative impact of energy prices on energy consumption.

The obtained positive impact of financial development, proxied by bank credits to private sector, reveals that the Kazakhstani financial system allows firms and household to find easier and less expensive financial fund to start or improve their businesses and to buy durable goods. Both economic growth and financial development have a positive effect on energy demand, it gains a special importance for policy makers to formulate appropriate energy policies to take into account cheaper oil/energy prices. If the energy prices are cheaper and financial environment is good enough then it allows businesses to access easier financial capital, which can help create a new business or expand existing scale. As the profit maximization is the main goal of companies, they might harm environment in their activities by increasing social costs.

Considering this finding, policymakers may want to introduce guidelines that encourage the financial sector to give appropriate and sufficient financial support to the energy sector in Kazakhstan. These should include energy-efficient project to produce clean energy. These policies can help to reduce negative impact of energy consumption on environmental degradation by promoting financial development and economic growth. Therefore, proper policies must be introduced and considerable efforts must be made to maintain a well-managed financial sector. Without sustainable well-managed financial sector, the financial sector may not be able to stimulate the energy sector's development. Moreover, Kazakhstan is vulnerable to commodity-price fluctuations and other problems associated with resource-based development such as, other less diversified economies. For this reason, Kazakhstan needs to implement wide-ranging structural reforms to achieve higher level of living standards and productivity over the long term. Hence, policymakers in Kazakhstan and similar economies should consider the economic growth-financial development and energy-related measures/policies in balance for achieving sustainable development.

Disclosure statement

No potential conflict of interest was reported by the authors.

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