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ENERGY CRISIS AND ECONOMIC GROWTH; A STUDY OF PAKISTAN'S ECONOMIC LANDSCAPE

Sarwar Khan[1], Muhammad Ali[*2], Mazhar Hussain[3], Shaban Ali[4], Feroze Ali[5]

[1]Faculty of Economics & Commerce, Superior University, Lahore, Pakistan;
[*2]International Institute of Social Studies (ISS), Erasmus University Rotterdam, the Netherlands;
[3]International Trade & World Financial Institutions, Shahid Beheshti University (SBU), Iran;
[4]UiS Business School, University of Stavanger, Norway;
[5]Lecturer Economics Roots international school and colleges (RISC) Islamabad, Pakistan;

[1]sarwar01khan@gmail.com, [*2]muhaqiq.ali@gmail.com, [3]mazharhussain229@gmail.com,
[4]shabanali.edu@gmail.com, [5]mferoze.iei12145@gmail.com

Corresponding Author: *

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ABSTRACT

In this study, we examine the impact of the energy crisis on the economic growth of Pakistan. Energy is the backbone of the economy and the engine of economic growth and development of any economy. For this purpose, we used time series data from 1975 to 2017, whereas the gross domestic product (GDP) is dependent while energy consumption (EC) and trade are independent variables. The ARDL model technique is employed to observe and analyze the relationship between our dependent and independent variables. The results show that energy consumption significantly increases the GDP of Pakistan in the short and long run while trade significantly increases GDP in the long run. As the amount of energy provided for consumption increases in Pakistan, it ultimately increases the number of industries that increase the employment level, income level as well and GDP of the country, and similarly it also increases the number of exports that enhance the GDP of Pakistan. It is recommended that the government start new efficient energy creation projects and stress the best utilization of energy resources which leads toward economic growth of the economy.

Key Words: Economic Growth, Energy Consumption, Trade

1. INTRODUCTION

Crisis means shortage or scare of resource but we can define the energy crisis is increase in the prices of energy resource and a great gap between supply and demand of energy. Most formally it referred to shortage of electricity, oil, gas and natural resource. Due to change in globalization of world many issues have been emerge among the energy crisis is the one of the most increasing issue of the world researcher. As compare to energy supply the demand for energy is continuously increasing in this recent era. Many developing countries can face serious energy crisis which result effect on economic growth and economic performance. Many economists make and important idea and view that make a strong relationship between energy consumption and economic growth. (Dr Imran Nasser and Jawed Khan 2015). Most of the country development depends on different sector of economy such like Industrial, Agriculture, Service and Manufacturing sector. The economies considered the energy is the backbone of the economy and can play a vital role in socioeconomic development. If energy is not sufficient the industrial process cannot take place, energy is crucial for all sector for running industries unit, and raw material for commercial and transportation purpose etc., due to increase in supply of energy results to achieved a high growth of economy and similar the shortage of energy may retard the process of growth. Shortly we can say that energy is the vital role in running all sector f economy. (Muzammil Khurshid and Waseem Anwar 2013) If we face a shortage of

energy, they can affect all sector of economy like agriculture sector, industrial sectors, unemployment, poverty, lover GDP and high inflation. Pakistan has facing high energy crisis from history. The developing countries like Pakistan is one of the energy intensive growth economy and they can fulfill their need by importing large quantities of oil and other energy resource from energy exporting country like Iran and Saudi Arabia etc. Infrastructure of energy is not well developed and poor management in energy sectored to increase in population the demand for energy is also increase day by day but no serious effort and policy made to overcome the energy shortage. The old and out dated infrastructure have more effect the situation of the energy crisis. (Pakistan Economic Survey 2016-17)

The primary source of energy of Pakistan is oil, hydro, and natural gas which is used to fulfill the need of energy of Pakistan. According to EAW 2013 the 36% of energy can be generated by using hydro and nuclear sources, the 35 % of energy can be generated by using furnace oil fired sources ,29% of energy can be generated by using gas fired source and 0.1% can be generated by using accounted from coal fired plant. (see Figure 1: Source: EAW 2013). Due to limited reserve of energy resource Pakistan imports high quantity of energy resource from UAE like Saudi Arabia.

There are numerous explanations behind the energy emergency in Pakistan a couple of will be quickly contacted upon here in this segment as there is a different segment committed to the power emergency in Pakistan which investigates and clarifies this profoundly dug in issue in Pakistan. The starting points of the energy emergency were delegated in 1994 when it was seen that there is a lack of 2,000 MW (PPIB 1994) in Pakistan and to connect this hole the Administration of Pakistan issued its energy arrangement in 1994 (PPIB 1994) which proceeded to change the energy blend elements of Pakistan and the nation moved far from the prevailing wellspring of intensity generation (hydro) to warm, on the grounds that the energy approach 1994 empowered what's more, invited remote ventures for warm power plants and among the warm plants furnace oil based plants picked up acknowledgment which were less demanding to set up and interface with the national power lattice framework. This move in strategy what's more, the tilt towards furnace oil and petroleum gas-based power plants and the disregard towards coal fueled power plants are one reason behind the energy emergency. Furnace oil is the costliest source among other warm sources of Intensity and it should be transported in which is another weight on the national exchequer, due the weight of high installments for this energy source, installments were deferred to the free power plants, which began task at lower than ideal dimensions of generation and this set off a chain of occasions which brought about the round obligation. Other explanations behind the energy emergency that will be featured with in this exploration include widespread power burglary with in the nation, non-installments of power levy, endorsement of rental power plants, absence of long-haul making arrangements for the energy blend, and issuance of endowments which bring down the drive for upgrading profitability and effectiveness among the control organizations. Right now, because of the issues referenced above it was recorded amid the pinnacle request period of summer of 2016 the power hole among free market activity floated around 4500 MW to 5500 MW (Kiani 2016).

1.1. Objective of study:

The main objective of this study is to explain the impact of energy crisis on economics growth of Pakistan. we also explain to direction of both energy consumption and economic growth which have positive relation between them. If energy consumption is increase automatically economic growth is also increase and vice versa. If the economy faces high energy crisis there are negative relationship between energy crisis and economic growth.

2. Literature Review:

At this time the energy crisis is the main issue and particularly government policy maker is mainly focus on this issue .They can get a high empirical outcome of study to examining a relationship between energy consumption and economics growth by using different sample period ,variables studies of countries and different technique of econometric can be used to find the causality .In first article the higher consumption of energy which lead to economic growth .The

study relate energy consumption and economic growth for Pakistan and take a sample data for the period of 1982-2011.The impact of energy crisis on economic growth of Pakistan. Dr. Imran Naseem Jawed Khan. In article 2 they can use the GMM technique to find the impact of energy crisis of on economic growth of Pakistani case of Pakistan we use growth hypothesis which show a strong relationship between energy consumption and economic growth. Impact of Energy Sources and the Electricity Crisis on the Economic Growth: Policy Implications for Pakistan.
ShafeiMoiz Hali1* Sumera Iqbal2 Dr. Wang Yong 3 Shah Muhammad Kamran.In article three the author tries to explain the impact of energy crisis on economic performance of different industries in Pakistan. In the study the Performance of industry has been measured by Return on Assets ratio. Energy Crisis and Performance of Industry of Pakistan: And Empirical Study of KSEListedCompanies.MuzammilKhurshid(Correspondiauthor)DokuEylüUniversity, Izmir, Turkey In article four the author show the relationship between energy and economics growth in Pakistan. The prices of energy resource rise the growth of economy will be decrease and if the price of energy resource decrease the economic growth will be increasing and vice versa. Energy and Economic Growth in Pakistan. Rehana Siddique. In Pakistan, increase in energy supply will increase the economic growth while any crisis in energy supply will lead to barrier in economic growth. The impact of petroleum products and electricity is significantly high (Siddiqui, 2004.Applying co-integration and Hsiao's version of Granger causality on time series data from 1956 to1996, results show higher electricity consumption leads to economic growth while there is no feedback relationship. Increase and decrease in petroleum consumption does not affect economic growth but economic growth causes petroleum use. And there is no co-integration between gas consumption and economic growth (Aqeel & butt, 2001). Bound testing approach to co-integration and Granger causality test results bidirectional causality in short-run between economic growth and energy consumption, while in long-run unidirectional causality exists that flow from economic growth to energy consumption. Frequent changes in energy price also impact economic growth (Adman & Riaz, 2008). In prospective of Pakistan many studies can be carried out by using different economic model and econometric test such as multiple regression analysis, Johansen co-integration test, VECM and correlation analysis, and all of them show that a great and positive relationship between energy consumption and economic growth. GDP of Pakistan can highly base on consumption of energy source like oil, natural gas, coal and electricity.

3. Methodology:

In this study we examine the impact of energy consumption on economic growth of Pakistan. following function examine the relationship between these variables.

Economic Growth = f (Energy Consumption, Trade) …….1

This function represents that GDP is the function of energy consumption and trade. In this function our variable of interest is energy consumption while trade is used as a control variable. This function represents in the form of equation in equation 2

$$GDP = \beta o + \beta 1 EC_t + \beta 2\, TRADE_t + e_t \ldots\ldots\ldots\ldots\ldots 2$$

In this equation GDP is the real GDP per capita in dollar consider as dependent variable, EC is energy consumption per capita in kg of oil and TRADE is the Trade (% of GDP) as independent variables. *Bo* is intercept while $B_1$and $B_2$are coefficient of energy consumption and trade respectively. $e_t$is error term. For this study data from 1972 to 2017 from world development indicator (WDI). To analyze the relationship between these variables we use Auto Regressive Distributed Lag (ARDL) model. We use ARDL model because it shows the result by dividing into short run and long run and it is applicable whether all variables are stationary at level or first difference or mix order mean some variables are stationary at first level and some variable are stationary at first difference.

4. Results:

The table 1 show the descriptive statistics of all the variable include in this study. In descriptive statistics mean median maximum minimum and measure of normality are included. The Jarque-

Bera test probability value of all variable are more than 0.1 that confirm that all the variable include in this study are normal. Furthermore, the correlation matrix tells the association between the variables. The correlation between GDP and EC are positive and high that is 94.1% while the correlation between GDP and TRADE are negative but week that is only 20.5% however the relationship between EC and TRADE are negative and very week that is only 4.9% that confirm that there is no multicollinearity present in this model.

Table 1: Descriptive Statistics

Table 1	GDP	EC	TRADE
Mean	805.5762	415.1899	33.14891
Median	815.3359	435.8736	33.33360
Maximum	1222.524	523.7635	38.90949
Minimum	472.5862	291.2893	25.30623
Std. Dev.	214.3603	73.29599	3.290628
Skewness	0.093120	-0.338216	-0.482879
Kurtosis	1.970561	1.665578	2.787718
Jarque-Bera	2.052055	4.196704	1.833288
Probability	0.358428	0.122658	0.399859
Sum	36250.93	18683.55	1491.701
Sum Sq. Dev.	2021814.	236381.3	476.4423
Observations	45	45	45
Correlation Metrix			
	GDP	EC	TRADE
GDP	1		
EC	0.941	1	
TRADE	-0.205	-0.049	1

Table 2 show the result of the unit root test by using Augmented Dickey-Fuller test. The ADF test show that all of the variables are non-stationary at first level however at first difference all of the variable are stationary. When all of the variables are stationary at level then we can use Johnson cointegration but it only tells use the results of long run while ARDL model tell use the results of long run and short run.

Table 2: ADF Unit Root Test

	Level		1st Difference	
Variable	**t-Statistic**	**Prob.***	**t-Statistic**	**Prob.***
GDP	0.644086	0.9894	-3.800612	0.0057
EC	-1.997576	0.2868	-4.916658	0.0002
TRADE	-2.339414	0.1647	-7.608276	0.0000

To run ARDL model we need to know the maximum number of lags that we can use to run the ARDL model. For this purpose, we use var lag order selection criteria. The results of var lag order selection criteria present in table 3. In this table different lag selection criteria were used to check the optimal lag length for the variable use in this study in which sequential modified LR test statistic (LR), Final prediction error (FPE), Akaike information criterion (AIC), Schwarz

information criterion (SC) and Hannan-Quinn information criterion (HQ) included. the significance of optimal lag length considers at 5% significance level. The result of LR, SC and HQ show that one lag is optimal lag length to run ARDL model while AIC and FPE show that two lags are optimal lag length to run ARDL model. However, because of the better explanation we select higher lag length criteria showed by any test. So, in this study two lag as optimal lags used to run ARDL model.

Table 3: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-566.3739	NA	2.32e+08	27.77434	27.89972	27.82000
1	-386.8205	324.0721*	56550.74	19.45466	19.95619*	19.63729*
2	-377.6228	15.25466	56472.82*	19.44501*	20.32270	19.76462
3	-370.5636	10.67493	63332.64	19.53969	20.79352	19.99626
4	-364.4146	8.398662	75586.06	19.67876	21.30874	20.27231
* indicates lag order selected by the criterionat 5% significance level						

Table 4: ARDL Bounds Test

Test Statistic	Value	k
F-statistic	8.242513	2
Critical Value Bounds		
Significance	**Lower Bound**	**Upper Bound**
10%	3.17	4.14
5%	3.79	4.85
2.5%	4.41	5.52
1%	5.15	6.36

ARDL Bound test used to confirm the exitance of long run relationship between these variables. When variables are stationary at first difference or at mix order calculated value of F-statistics of ARDL Bond test higher then upper bond critical value show the presence of significant long run relationship. In table 4 the calculated value of F-statistics of ARDL Bond test is 8.24 that is higher than upper bond critical value even at 1% significance level that is 6.36 that confirm the existence of long run relationship between these variables at 1% significance.

Table 5: ARDL Short and Long Run Form

Selected Model: ARDL(1, 2, 1)				
Sample: 1972 2017				
Included observations: 43				
ARDL Short Run Results				
GDP	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(EC)	1.023889	0.237273	4.315242	0.0001
D(EC(-1))	0.525855	0.252679	2.081116	0.0446
D(TRADE)	-0.607394	0.812984	-0.747117	0.4598
ECM (-1)	-0.101734	0.033149	3.068973	0.0041
ARDL Long Run Results				

GDP	Coefficient	Std. Error	t-Statistic	Prob.
EC	2.147049	0.293334	7.319480	0.0000
TRADE	16.955726	9.934099	1.706821	0.0965
C	-764.3111	326.551681	-2.340552	0.0249
R-squared	0.997383	Mean dependent var		820.9927
Adjusted R-squared	0.996947	S.D. dependent var		206.5512
S.E. of regression	11.41296	Akaike info criterion		7.855277
Sum squared residual	4689.208	Schwarz criterion		8.141984
Log likelihood	-161.8885	Hannan-Quinn criteria.		7.961006
F-statistic	2286.750	Durbin-Watson stat		2.196064
Prob(F-statistic)	0.000000			

The result of ARDL Model in the form of short run and long run represent in table 5. The result of short run show that due to one-unit increase in energy consumption (EC) increases GDP 1.023 unit at 1% significance level while the increase of EC increases GDP 0.525 unit at 5% significance level in the next year. The result of TRADE show that due one-unit increase in trade GDP insignificantly reduces by 0.607 units.

The result of the long run show that due to one-unit increase in energy consumption (EC) increases GDP2.147unit at 1% significance level while one-unit increase in trade GDP increases by 16.955units at 10% significance level. The value of lagged error correction term is negative and statistically significant at 1% level of significance.

The lagged value of ECM shows the speed of adjustment from disequilibrium to equilibrium from short run to long run. The value of lagged ECM is -0.10 which shows the speed of convergent toward equilibrium which mean that short run disequilibrium towards long run equilibrium is corrected by almost 10 percent by every year. The $R^2$and adjusted R^2value are 0.99 shows that 99% of dependent variable is explaining by independent variables and because the Durbin-Watson statistics are greater than $R^2$and adjusted R^2 that confirm that the regression were not spurious.

Table 6: Diagnostic Tests

Name of Test	F-Statistics	Prob*
Breusch-Godfrey Serial Correlation LM Test	0.452982	0.6395
White Heteroskedasticity Test	0.638234	0.8496
Ramsey RESET Test	1.122323	0.2967

Some of the diagnostic test presents in the table 6 to fulfil the assumption of Auto or serial correlation, Heteroskedasticity and accurate functional form of the model. In this table to check the that is there is Auto or serial correlation present in the model Breusch-Godfrey Serial Correlation LM Test were used the insignificant probability value of F-statistics show that there is no Auto or Serial Correlation present in this model. To check that heteroskedasticity white heteroskedasticity test were used the insignificant probability value of F-statistics of white heteroskedasticity test show that there is no problem of heteroskedasticity present in this model. To check the functional form of this model Ramsey RESET Test were used. The insignificant probability value of F-statistics of Ramsey RESET Test show that the functional form of this model is accurate.

5. Discussion:

Energy play very crucial role in every country however in Pakistan. The result show that the energy consumption significantly increases the GDP of Pakistan. In Pakistan due to energy crisis many of the industries were close because of not

having electricity for the production purposes. The reduction of industries in Pakistan. Similarly, because of the reduction of industries the employment level in the country and income level of the people go down that ultimately reduce the amount of GDP that people pay to the government in the form of taxes. If the amount of energy provides for the consumption increase in the Pakistan then it ultimately increases the amount of industries, employment level, income level as well as GDP of the country.

Trade is also an important factor to boost country economic growth. The result show that trade it is insignificantly reduce GDP of Pakistan in short run while it significantly increases the GDP of Pakistan in the long run. As the industry produce more of the product and export it to the foreign the income generated from foreign market increase the income of industries that ultimately increase the income level of the people and GDP of the country while it also improves the exchange rate of the country. On the other hand, the imports from other country adversely affect the exchange rate of Pakistan butt government its GDP by imposing heavy tariff on imported goods.

6. Conclusion:

This study tries to relate consumptions of energy on economic growth of Pakistan economy. To elaborate this relationship, we can take a data of Pakistan for the period of 1972- 2017. In this study we use three variables in which gross domestic product (GDP) as dependent while energy consumption (EC) and trade as independent variables. To analyze data descriptive statistics, correlation and ARDL model technique used. The results show that energy consumption significantly increases the GDP of Pakistan in short and long run while trade significantly increase GDP in long run. As the amount of energy provides for the consumption increase in the Pakistan it ultimately increases the amount of industries that increase the employment level, income level as well as GDP of the country and similarly it also increases the amount of export that enhance the GDP of Pakistan.

6.1. Policy Recommendation:

Government need to start new energy creation project by increasing the amount of budget allocating for the energy projects.

There is a need to start new research and development project to identify efficient energy resources and develop new efficient energy creation techniques.

Government also need to stress the companies, who produce energy consumption goods, to create research and development department in their companies to create products that are efferently work by consuming less energy.

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