Energy Crisis, Oil Prices and Manufacturing Sector Growth Nexus: Evidence from Pakistan

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Abstract: The objective of this research is to investigate the relationship between energy crisis, oil prices and manufacturing sector growth in Pakistan by using time series data from1980-2011. The share of manufacturing in GDP, oil prices, human capital and electricity shortfall are the variables used in this study for analysis. Augmented Dickey Fuller and Kwiatkowski, Phillips, Schmidt and Shin unit root tests are used to test the stationary. Johansen Cointegration and error correction techniques are used. The results show an inverse relationship between the energy crisis and share of manufacturing sector growth in GDP and there is long-run relationship between variables.

Key words: Electricity shortfall · Human capital · Oil prices and manufacturing sector's growth

INTRODUCTION

Energy crisis and rising oil prices are critical issues in many developing countries and it badly affects the economic growth of the country [1]. Electricity is most important for socioeconomic development and considered as the backbone for an economy, but in industrial sector growth has declined due to an electricity shortfall [2-5]. The two main components of energy are oil and gas and its contribution in the generation of energy is about 80%, but both are expensive and not achieve the required demand level. Rising oil prices create the budget deficit, puts downward pressure on exchange rates and high inflation in the economy. Balance of payments is negatively affected by high imports of petroleum products and crude oil [6, 7].

Electricity plays important role in production sectors, but electricity shortfall and high oil prices disturb the supply of electricity in the industrial sector, due to this shortfall industry operates less time and production of this sector is also less. In this situation when industries produce private electricity, the cost becomes high and also required a huge quantity of money for this purpose [8, 9]. Major industrial cities of Pakistan like, Faisalabad, Karachi and Sialkot etc are also affected by this severe shortfall of energy and shutting down, people of these cities closed their business and shift abroad, unemployment increased, not only routine life but also

every sector of the country affected by this situation [10-13]. Heath and education are important factors of human capital and it has significant impact on economic growth. Investment in health and education sectors, improve the productivity of the manufacturing sectors. Healthier and educated workers are more productive. But this is the one most neglected sector of Pakistan. Government should provide health and education services for its people to achieve the skillful, better, productive and efficient human capital resources [14].

Electricity Situation in Pakistan: During 1947, capacity of Pakistan electricity generation was 60MW for 31.5 million populations, in 1959 it was 119MW but during the 1960s, it rose significantly due to subsequent construction of Mangla Dam, Warsak Dam and Tarbela dam, their combined capacity is over 4, 700 MW [13]. In the mid of 1980's generation capacity was near 3000MW, performance of KESC and WAPDA was satisfactory during this time period [2]. In 1981, load shedding started again because the demand of electricity became high due to fast increased in population of Pakistan and industrial development, but electricity supply cannot change. In 2000s demand exceeded from supply in industrial sectors and demand-supply gap is increased [13]. Load-shedding increase during this period, Power blackouts and load shedding is more severe in 2008 and a shortage of electricity has increased up to 4000MW.

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Transmission, power distribution, existing power stations and other energy infrastructure are damaged due to the disaster of the 2005 earthquake and the 2010 floods. 2007 was the most horrible power crisis year for Pakistan during this period the production fell down by 6, 000 MW [12]. Electricity shortage increased in 2008 up to 4000 MW, industrial consumers face power deficit. 2011 start and end with the same situation of load-shedding, electricity shortage became a serious problem, in the summer some areas of Pakistan face load-shedding of 16 to 18 hours and in winters they face load-shedding up to 8 hours in a day, prices of electricity become high during this time period, industries face losses and many people lost their jobs due to electricity shortages [13].

The main purpose of this research is to examine the impact of the energy crisis on the manufacturing sector growth of Pakistan. The specific objectives of this research are as follows.

- To find out the relationship between oil prices and manufacturing sector's growth
- To examine the relationship between Human capital and manufacturing sector's growth.
- To give Policy implications.

Pakistan faces the issue of energy crisis and oil prices, its manufacturing sector also adversely affected by both issues. Increase in energy crisis and oil prices badly affect the consumption pattern of consumers. Due to the energy crisis economy faces decline in investment, rising inflation and high unemployment in the whole economy. It is important to check the effects of energy crisis and rising oil prices on manufacturing sector growth and also highlight the importance of human capital in productive sectors.

The paper is arranged in different parts: part 2 is the collection of the literature of the related articles. Part 3 explains the variables and data sources. Part 4 discusses the econometric methodological framework. Part 5 investigates and interprets the results. Finally, part 6 concludes the findings of the study and recommends some policy implications.

Review of Literature: Hye and Riaz (2008) examined the direction of causality among economic growth and energy consumption in Pakistan uses time series data from the period 1971-2007. They use bounds-testing approach to co-integration and Granger causality test in their empirical analysis. They find that the fluctuation in energy prices affects economic growth and also create uncertainty; they suggest that there is a need to direct investing in the resources in local energy [1].

Chaudhry (2010) analysis the demand for electricity in Pakistan using panel data for 63 countries during the time period 1998-2008. The main objective of his research is to investigate the impact of electricity inputs and electricity prices on manufacturing output and demand for electricity in the manufacturing sector. He found that the electricity shortfall has significant impact on the output of the manufacturing sector [2].

Torul and Alper (2010) examine the association between oil prices and manufacturing industries of a small open economy in Turkey during the period 19991-2007. The main purpose of their study is to investigate the influence of the changes of domestic oil and world oil product price on the manufacturing sectors in Turkey, to check the influence of the oil price change they use multivariate VARs in their study. They find that rising prices of oil products can stop the production of manufacturing sectors [3].

Ilyas *et al.*, (2010) analyze the determinants of manufacturing value-added based on cointegration technique in Pakistan using time-series data from the period 1965-2007; for this purpose, they use auto regressive distributed lag (ARDL) model. In the light of their findings, they suggest that the government must introduce some policies that can increase the level of total factor productivity (TFP) and also control the investment price level and increase total factor productivity of labor through training and education in the manufacturing sector [4].

Alter and Syed (2011) investigate the demand for electricity in Pakistan using time series data during the period 1970-2010. They use cointegration and vector error correction technique in their analysis. They conclude that in the short run electricity is necessary, but in the long run it is a luxury. They suggest that income policies, peak –load pricing policy, effective price and group pricing policy should be important for electricity demand management [5].

Qadri and Waheed (2011) investigate the relationship between human capital and economic growth in Pakistan uses time-series data for the period 1978-2007. They use Cobb-Douglas production function and find that there is positive relationship between economic growth and human capital in the long-run. They conclude that in long-run health and education, sectors are important for economic growth [6].

Kiani (2011) investigates the influence of rising oil prices during the period 1990-2008 in Pakistan's economy. The main purpose of her research is to analyze how rising crude oil prices affect the real GDP and she found that due to increase in oil prices, budget deficit and inflation rises and imports become expensive due to downward pressure on the exchange rate. She briefly highlighted the role of monetary and fiscal policy in her study and she found that the indirect effect of monetary policy is more effective rather than fiscal policy. She suggests that government should control inflation in the country and gave subsidies to farmers and also help poor, needy people to maintain their family budgets [7].

Soneta *et al.*, (2012) investigate the influence of investment, infrastructure and growth in the manufacturing sector of Pakistanare using time-series data over the period 1981-2009, for this purpose, they use time series regression model. They find that in the manufacturing sector the effect of investment in public infrastructure is insignificant. They find that the main reasons of the difference between Pakistan and other countries are due to economic conditions and political instability in our country and in this situation, present investor's transfer their business out of the country and new investors hesitate to invest in Pakistan [8].

Afzal (2012) investigates the influence of interest rate and electricity crisis on the production of textile industry of Pakistan during the period 2000-2010. The main purpose of his research is to find the relationship between electricity crises, interest rate and textile production. He uses multiple regression analysis in his study and he found that textile industry of Pakistan is negatively affected by interest rate and electricity crisis. He suggests that government takes serious steps for removing the problem of electricity crisis and stabilizing the electricity supply for the development of textile sector of Pakistan [9].

Shaari *et al.*, (2013) investigate the impact of oil price shocks in the Malaysian economy sector using quarterly time series data from the period 2000-2011. Augmented dickey-fuller (ADF), Johansen co-integration and Granger causality tests are performed in their analysis. Instability of oil prices also affects the agriculture sector performance. They suggest that the Malaysian government should need to control the oil prices for manufacturing, agriculture and also for construction sectors [10].

Jawad (2013) analyzes the effects of instability of oil prices on the economic growth of Pakistan, using time series data from the period 1973-2011. The main purpose of his research is to find the impact of macroeconomic variables and oil price volatility on GDP; and use Linear Regression analysis in his study. He found that trace balance has an important influence on GDP and investment of private sector has a little effect on GDP, but public investment and oil price volatility has not significant impact on GDP [11].

Dar *et al.*, (2013) explore the effects of energy conservation policies on economic growth of Pakistan during the period 1980-2009. The main purpose of their search is to find the relationship between industrialization, electricity supply and economic growth. They find that with rising energy price, major emerging economies like Bangladesh, Philippines, China, Indonesia, Malaysia and India has bad effect on small manufacturing sectors of Pakistan. They find that for the desire of huge production and consumption and for growing economy the demand for energy remains high. They suggest that the Government of Pakistan must promote energy efficiency, various energy sources and renewable energies for the need of energy [12].

Nadeem and Hafeez (2013) investigate the relationship between coal, electricity generation and economic growth in Pakistan uses time series data from the period 1981-2011. The main purpose of their research is to check the impact of coal on electricity generation and also investigate the impact of electricity on economic growth. Co-integration and Auto Regressive Distributive Lag Model technique are used in their analysis. They suggest that by using coal reserves Pakistan can solve the problem of electricity, to achieve effective and cheap electricity, private sectors should invest in Thar coal projects [13].

Muhammad *et al.*, (2013) investigates the relationship between energy consumption and economic growth using time series data from the period 1971-2013. ADF Unit Root Test, Johansen cointegration Test, ECM, Granger Causality Test and ARDL techniques are used in this study, there results show that long-run relationship exists between energy consumption and economic growth. Their results suggest that government should take steps in the development of energy sector and make policies to use all alternative resources of energy [14].

Shah *et al.*, (2013) analyze the influence of the crucial energy crisis on the production of textile sector of Pakistan during the period 2005-2010. The main aim of their research is to explore the effects of the electricity crisis, interest rate and financial crisis on the textile sector of Pakistan. They use horizontal ratio analysis in their study to examine the performance of any industry.

They conclude that due to energy crisis, production of the textile industry has been declined. Their findings help full in the management of textile sector [15].

Shakir *et al.*, (2014) examine the effects of energy shortages in Pakistan, the main purpose of their research is to explore the alternative resources of energy, they suggest that Pakistan use nuclear energy, wind energy and solar energy to generate electricity, they also suggest that in Pakistan government should build small scale hydro dams to solve the problem of energy crisis. They also explore the benefits and utilization of available resources [16].

Naseem and Khan (2015) investigate the impact of the energy crisis on economic growth of Pakistan using time series data from the period 1982-2011. They use two variables energy consumption and GDP as economic growth, to find out the relationship between these two variables, descriptive statistics, correlation and regression analysis are employed in their analysis. They found that energy consumption and economic growth are positively related to each other and also found that energy shortage badly affect the economic growth of every sector. They suggest that the government produces energy from hydro, wind and solar instead of oil and also produce energy from nuclear and coal reserves to overcome the energy deficit [17].

MATERIALS AND METHODS

To find out the relationship between energy crisis, oil prices and manufacturing sector growth of Pakistan, time series data is used in this study from the period 1980-2011. The share of manufacturing sector growth in GDP, oil prices, (Health and Education as a proxy variable of) Human capital and (Electricity shortfall as a proxy variable of) Energy Crisis used in this study. Data will be collected from different publications of the Pakistan Economic Survey, State Bank of Pakistan, IFS, Oil and gas regularity authority (OGRA) and International Energy Statistics-EIA.

$$Y = \alpha_0 + \beta_1 OP + \beta_2 HC + \beta_3 ES + \mu$$

Description:

Y = Share of manufacturing growth in GDP; α_0 = constant term; OP = Oil prices; HC = Human capital; ES = Electricity shortfall; μ = error term.

Econometric Methodology: In any time-series econometric model, it is necessary to check the stationarity or non-stationarity of data. If data are non-stationary, then we have to make it stationary. Firstly, detect the order of integration, before applying any cointegrating technique. Augmented Dickey Fuller (ADF) and Kwiatkowski, Phillips, Schmidt and Shin (KPSS) unit root tests are used to test the stationary of variables in this study [18].

Unit Root Test
Augmented Dickey Fuller (ADF) Unit Root Test: To check unit root Dickey and Fuller [19] suggested a new test, after the Dicky Fuller unit root test. It is important to check whether data is stationary or non-stationary. If data is non-stationary, then it is essential to solve the problem of non- stationarity of variables. There are following three possibilities of ADF test.

$$\Delta X_t = \phi X_{t-1} + \Sigma \gamma_i \Delta X_{t-1} + e_t \tag{1}$$

$$\Delta X_t = \alpha_0 + \phi X_{t-1} + \Sigma \gamma_i \Delta X_{t-1} + e_t \tag{2}$$

$$\Delta X_t = \alpha_0 + \phi X_{t-1} + \alpha_2 t + \Sigma \gamma_i \Delta X_{t-1} + e_t \tag{3}$$

- In the first equation, there is no trend & intercept.
- In the second equation, there is only intercept and has no trend.
- In the third equation, both intercept & trends are included.

Note: α_0 and α_2 differentiate the above three equation form each other.

It is important to know the following two things. First, the lagged first difference can be specified while using the ADF unit root test. When zero lagged differences can be selected, this will be DF test. In ADF unit root tests, sufficient lags are included to remove serial correlation. Secondly, critical values also changed in ADF test when we chose above three different possibilities. Mckinnon (1996) P-values table is used to accept or reject the null hypothesis.

Kwiatkowski, Phillips, Schmidt and Shin (KPSS) Unit Root Test: KPSS (1992) test is different from the other unit root test, which is based on residuals obtained from ordinary least square (OLS). Suppose that we use W_t as endogenous variable and Y_t as exogenous variables.

$$W_t = Y_t{}'\delta + \mu_t$$

LM statistics can be expressed as:

$$\text{LM} = \Sigma_t \delta(t)^2 / T^2 f_0)$$

where;
S (t) is a cumulative residual function and f_0 is an estimator.

$$S(t) = \sum_{r=1}^{t} \hat{\mu}_r \text{ based on residual } \hat{\mu}_t = W_t - Y_t'\hat{\delta}(0) \cdot$$

Specify the method of estimating f_0 and exogenous regressor x_t under KPSS.

Johansen Co-Integration Approach: To find the co-integration between more than two series, Johansen (1988) introduced a new approach that removes all drawbacks which Engle-Granger approach has. ECM also extended into Vector Error Correction Model (VECM) in case of Johansen's approach. Suppose that there are three endogenous variables, *P*, *Q* and *R*. This can be written in matrix form as;

$$Y_t = [P_t, Q_t R_t]$$

$$Y_t = \alpha_1 Y_{t-1} + \alpha_2 Y_{t-2} + \dots\dots\dots\dots\dots + \alpha_k Y_{t-k} + \mu_t$$

In the context of VECM, we can written as:

$$\Delta Y_t = \Omega_1 \Delta Y_{t-1} + \Omega_2 \Delta Y_{t-2} + \dots\dots\dots + \Omega_k \Delta Y_{t-k-1} + \Pi Y_{t-1} + \mu_t$$

whereas,

$$\Omega_i = (1 - \alpha_1 - \alpha_2 - \dots\dots\dots - \alpha_k)(i = 1,2,3 \dots\dots\dots, k-1)$$

And

$$\Pi = -(1 - \alpha_1 - \alpha_2 - \dots\dots\dots - \alpha_k)$$

Π Shows the 3*3 matrix, which illustrates the true long run correlation between

$$Y_t = [P_t, Q_t R_t].$$

The $\Pi = \phi\chi'$ in which ϕ shows the speed of adjustment towards equilibrium and long run coefficient matrix is χ'. In the case of single equation $\chi'Y_{t-1}$ is the error correction term. Now assume $k = 2$ for a multivariate case so the model is:

$$\begin{pmatrix} \Delta P_t \\ \Delta Q_t \\ \Delta R_t \end{pmatrix} = \Gamma_1 \begin{pmatrix} \Delta P_{t-1} \\ \Delta Q_{t-1} \\ \Delta R_{t-1} \end{pmatrix} + \Pi \begin{pmatrix} \Delta P_{t-1} \\ \Delta Q_{t-1} \\ \Delta R_{t-1} \end{pmatrix} + e_t$$

We can also say that;

$$\begin{pmatrix} \Delta P_t \\ \Delta Q_t \\ \Delta R_t \end{pmatrix} = \Gamma_1 \begin{pmatrix} \Delta P_{t-1} \\ \Delta Q_{t-1} \\ \Delta R_{t-1} \end{pmatrix} + \begin{pmatrix} \phi_{11} & \phi_{12} \\ \phi_{21} & \phi_{22} \\ \phi_{31} & \phi_{32} \end{pmatrix} \begin{pmatrix} \chi_{11} & \chi_{21} & \chi_{31} \\ \chi_{12} & \chi_{22} & \chi_{32} \end{pmatrix} \begin{pmatrix} P_{t-1} \\ Q_{t-1} \\ R_{t-1} \end{pmatrix} + e_t$$

It is analyzed the first equation as error correction part for simplicity and first row of the matrix is as:

$$\Pi_1 Y_{t-1} = ([\phi_{11}\chi_{11} + \phi_{12}\chi_{12}][\phi_{11}\chi_{21} + \phi_{12}\chi_{22}][\phi_{11}\chi_{31} + \phi_{12}\chi_{32}]) \begin{pmatrix} P_{t-1} \\ Q_{t-1} \\ R_{t-1} \end{pmatrix} + e_t$$

We can also write this:

$$\Pi_1 Y_{t-1} = \phi_{11}(\chi_{11}P_{t-1} + \chi_{21}Q_{t-1} + \chi_{31}R_{t-1}) + \phi_{12}(\chi_{12}P_{t-1} + \chi_{22}Q_{t-1} + \chi_{32}R_{t-1})$$

[1]These equations obviously express two cointegrating vectors and their speed of adjustment and.

There are three cases, regarding the rank of a matrix;

- When Π has full rank, then Y_t is I (0).
- When Π is zero, no cointegrating relationship is there.
- When Π has a reduced rank, there are r ≤ (n - 1) cointegrating relationships.

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[1]The larger part of this methodology is taken from Waqas and Awan (2011) [20]

Granger Causality Test: Suppose that if there are three terms Ut, V$_t$, W$_t$. Firstly forecast U$_{t+1}$ is using past terms of U$_t$ and W$_t$ and now forecast U$_{t+1}$ using past terms of U$_t$, V$_t$, W$_t$. If second forecast is more effective than the past of V$_t$ is more helpful in forecasting U$_{t+1}$ that it is not in U$_t$ and W$_t$. In particular, W$_t$ could be a vactor of possible explanatory variables. Thus V$_t$ would Granger cause U$_{t+1}$ if:

- V$_t$ occours before U$_{t+1}$.
- It contains information useful in forecasting U$_{t+1}$ that is not found in a group of other appropriate variables.

$$F(U_{t+k}|\Omega_t) = F(U_{t+k}|\Omega_t - V_t)(\forall K > 0)$$

- Ω_T Is all the information in time period t
- V_t and U_t are two time series.

If this condition exists, then V_t does not Granger cause U_t, if this condition does not exist, then V_t can be said to cause U_t because it gave special information.

RESULTS AND DISCUSSION

Unit Root Results: To check the stationarity of variables, Augmented Dickey Fuller and Kwiatkowski, Phillips, Schmidt and Shin (KPSS) unit root test has been applied in this study. Normally time series have trend and intercept, but this study estimated the stationarity tests by using both situations: with trend and without trend. Results of ADF under trend and intercept show that all variables are stationary at first difference. In KPSS under trend and intercept all variables are stationary at level. After stationarity check the study utilized the Johansen cointegration approach to find out the long-run relationship among variables.

Results of Cointegration Test: In order to determine the long-run relationship between variables Johansen and Juselius (1990) [21] cointegration test has been used in this study because all variables are stationary at same order of integration. Results of Johansen co-integration test have two test statistics trace test and maximum Eigenvalue.Compare the trace test and Eigen test values with the critical values, if the calculated values are greater than the critical values, then there must be a long run relationship exist among the variables. In Johansen cointegration test trace and maximum eigenvalue is suggested to obtain the co-integrating vectors, if the result of both two tests (trace and maximum eigenvalue) is not same, then Johansen and Juselius (1990) recommend the use of the trace statistics [22]. In this model, there is long-run relationship between the variables. Trace test indicate two Cointegrating equations at 5% level of significance. Value of trace test (53.98) is greater than 5% critical values, so trace test rejected the null hypothesis of no cointegration.

Table 5.1: Results of ADF and KPSS unit root tests

Variables	ADF			KPSS		
	Trend and Intercept					
	Level	Difference	Type	Level	Difference	Type
Y	-3.033058	-6.325246*	I (1)	0.139833*	0.052461*	I (0)
LOP	-1.333736	-5.562353	I (1)	0.194325*	0.451850	I (0)
LHC	-4.374225	-4.271065*	I (1)	0.087026*	0.071867*	I (0)
ES	-0.803937	-5.037700*	I (1)	0.127401*	0.136311*	I (0)
Variables	ADF			KPSS		
	Intercept					
	Level	Difference	Type	Level	Difference	Type
Y	-2.633407*	-6.047758*	I (0)	0.303836*	0.060114*	I (0)
LOP	-1.308094	-5.709228*	I (1)	0.197801*	0.598665*	I (0)
LHC	-2.188098	-3.959194*	I (1)	0.749303	0.267609*	I (1)
ES	-1.256577	-5.121399*	I (1)	0.562894*	0.270316*	I (0)

NOTE: Y is Share of manufacturing growth in GDP, OP is Oil prices, HC is Human capital (Education Expenditure + Health Expenditure) and ES is an electricity shortfall (Electricity Generation - Electricity Consumption). * Shows 1% (level of significance), ** Shows 5% (level of significance), *** Shows 10% (level of significance). This is taken from *MacKinnon (1996) one-sided p-values.

Table 5.2: Johansen Maximum Likelihood Test

Hypothesis	Trace Statistics	0.05 Critical values	Hypothesis	Max-Eigen Statistics	0.05 Critical values
None*	53.97978	47.85613	None	22.64595	27.58434
At most 1*	31.33383	29.79707	At most 1	17.66247	21.13162
At most 2	13.67136	15.49471	At most 2	9.462243	14.26460
At most 3*	4.209117	3.841466	At most 3*	4.209117	3.841466

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

*denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Table 5.3: ECM Regression Results

Variables	Coefficients	T-values	
Constant	-1.209990	-1.41935	
Δlog	0.029889	0.99494	
Δlhc	0.021117	3.24561	
Δes	-0.680118	-1.56334	
$\Delta ESM(-1)$	-0.494919	-1.78834	
R-squared	0.395809	Adjusted R-squared	0.109613
Log-likelihood	-36.59107	F-stat	1.383000
S.E of regression	1.055749		

Table 5.4: Granger Causality test

Null Hypothesis:	F-Statistic	Prob.	Conclusion
LOP does not Granger Cause Y	1.40945	0.2630	OP…Y
Y does not Granger Cause LOP	0.82093	0.4515	
ES does not Granger Cause Y	1.61497	0.2190	ES…Y
Y does not Granger Cause ES	3.10486	0.0625	
ES does not Granger Cause LOP	6.62767	0.0049	ES→OP
LOP does not Granger Cause ES	2.22502	0.1290	

Error Correction Modeling: For the short-term dynamics of the model vector error correction model is tested. The ECM coefficient result shows that it is negative and insignificant; hence equilibrium will diverge in case of any shock to independent variables. Oil prices are positively related to share of manufacturing growth in GDP, but it is insignificant. Human capital is positively related with share of manufacturing in GDP, when health expenditure and education expenditure increases, the share of manufacturing in GDP also increases. Electricity shortfall has negative impact on the share of manufacturing in GDP and it is marginally significant.

Granger Causality Test: Granger causality test is used to check the causality between different variables. The share of manufacturing in GDP, Oil prices and electricity shortfall are the variables used for this purpose. According to my result oil prices does not granger cause share of manufacturing in GDP and share of manufacturing in GDP does not granger cause oil prices. Electricity shortfall does not granger cause share of manufacturing in GDP and share of manufacturing in GDP does not Granger cause the electricity shortfall. Results show uni-directional causality between electricity shortfall and oil prices, only electricity shortfall granger causes oil prices.

CONCLUSION

Electricity shortfall badly affects the economic growth of the country. Due to electricity shortfall nations depends on imported oil and gas resources. Industries, household and other parts of the country are badly affected by this situation. The purpose of this study is to check the relationship between the electricity shortfall, oil prices and manufacturing sector growth in Pakistan using time series data from the period 1980-2011. The share of manufacturing sector growth in GDP, Electricity shortfall as a proxy variable of energy crisis, oil prices and health expenditure and education expenditure as a proxy variable of human capital are the variables used in this study. Result show that there is long-run relationship among variables. Electricity shortfall has negative impact on share of manufacturing sector growth in GDP and human capital is positively related with share of manufacturing sector growth in GDP.

The government should solve the problem of electricity as soon as possible, to increase the share of manufacturing in GDP also makes such policies to generate electricity from other natural resources and provide facilities for electricity producing companies also provide incentives to local and multinational companies and make such policies to attract international investors to invest in the energy sector. Improve the quality of education and health sectors and increase expenditures in both sectors, because educated and healthier workers are more productive and beneficial in manufacturing sectors.

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