



British Journal of Economics, Management & Trade
5(2): 164-171, 2015, Article no.BJEMT.2015.014
ISSN: 2278-098X



SCIENCEDOMAIN international
www.sciencedomain.org

The Relationship between Electricity Consumption, Employment Rate, Inflation and Economic Growth in Five Developing Countries

Nagia Abbas^{1*}, Sidra Saeed¹, Sobia Manzoor¹, Muhammad Usman Arshad¹
and Umair Bilal¹

¹Department of Management Sciences, Islamia University, Bahawalpur, Pakistan.

Authors' contributions

This work was carried out in collaboration between all authors. Authors NA, SS and MUA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors NA and SS managed the analyses of the study. Authors SM and UB managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/BJEMT/2015/10569

Editor(s):

(1) Li, Hui, School of Economics and Management, Zhejiang Normal University, China.

Reviewers:

- (1) Anonymous, Mizan-Tepi University, Ethiopia.
- (2) Anonymous, China University of Petroleum, China.
- (3) Anonymous, Tribhuvan University, Kathmandu, Nepal.
- (4) Anonymous, University of La Rioja, Spain.
- (5) Anonymous, Presbyterian University College, Ghana.

Complete Peer review History: <http://www.sciencedomain.org/review-history.php?iid=686&id=20&aid=6254>

Short Research Article

Received 1st April 2014
Accepted 26th July 2014
Published 28th September 2014

ABSTRACT

This paper explores the relationship between electricity consumption, employment rate, Inflation and economic growth in the developing countries. This study incorporates the data of 5 developing countries namely Pakistan, China, India, South Africa and Malaysia over the period 1990 to 2012 and analysis has been made by employing the method of random Generalized Least Square (GLS) model. Hausman specification test and random effect model is used in this paper. The result reveals that Electricity consumption is highly significant in developing countries. The insignificant relationship find between inflation and electricity consumption during this time span (1990-2012) means inflation has no direct impact on economic growth of developing countries. So this study proves that employment rate and electricity consumption are the main variables that shows the positive impact and inflation has no direct impact on economic growth of developing countries. Developing Governments should adopt different policies namely sustainable electricity

*Corresponding author: Email: Naginaabbas123@yahoo.com;

development and utilization of land and resources, for electricity production to meet its consumption appropriately which leads to boost employment rate in economy that ultimately improves the economic growth in developing countries. Developing Governments also take some measures namely monetary measures, fiscal measures, increase in production measures, proper commercial policies and encouragement to savings are important in order to control the inflation at its minimum level for the betterment of developing economies as a whole.

JEL Codes: F43, J21, L94, P24

Keywords: Economic growth; electricity Consumption; employment rate; developing countries; inflation.

1. INTRODUCTION

The importance of energy has been realized by humans in the beginning of creation. For economic growth and development it is necessary to extract the energy resources from the environment. Energy consumption in different countries is different depends on development level, because development level of each country is not the same. Energy resources include oil, coal, gas etc. Each country spent a significant portion on the energy consumption. Energy is the elementary instrument for the socioeconomic development of every country especially in undeveloped countries. Among all energy resources electricity takes crucial part [1].

Electricity is the basic energy resource. It plays important role in the development of each country. It is used to manufacture goods, to create capital and to provide services. Due to dynamic environment, rapid development and innovation the consumption of electricity has also mounted [2].

The electricity generating process is so sophisticated in the developing countries as compared to the developed countries. Many countries use different methods to produce the electricity. The emerging countries still tried to produce electricity efficiently but are not successful [3].

Demand and supply of electricity consumption in each country is different. In some countries there is access of electricity and some countries face shortage due to excess demand. It results the shortfall and badly affect many industries and businesses specifically to which their work is completely depend on electricity. The shortage of demand is tried to meet through load-shedding [4].

So to see the impact of electricity consumption on Gross Domestic Product either electricity is

crucial for development or not. Researchers checked that the change in electricity consumption how much affects economic growth and development. Many studies have been already conducted and reveal that it is positively related with the GDP of the country because it is the central part of many businesses and availability could stop productive activities and heighten the unemployment rate [5].

Another thing that is important for the economic growth is low inflation level in the country. We can say that low level of inflation is necessary to sustain the economic growth stable. Many researchers have been already studied the topic of inflation and economic growth in order to see the relationship between them. Without the increase in inflation high economic growth in the country is possible if the expected output of the country produce at what level that meet the demand [6].

Price stability in country is essential for the growth. In latest years the central bank emphasizes on price strength because it has a great effect on monetary policy. Monetary policy focused on interest rates and monetary aggregates to keep the price stable. Various spectators are concentrating on price stability, their purpose is to find out that inflation is either costly or not and how much costly it is? It determines by the price whether it is stable or not [7].

It has been reorganizing that developing countries are facing high level of poverty, mostly people are unemployed and it is a great macroeconomic problem. To reduce it, it is necessary that mostly people got employed [8].

Whether they are farmers, jobholders or self-employed, the main purpose is that they earn their income by doing work. The more the people employed there will be great opportunity for the development of the economy. People will more

skilled they will insert more effort to meet their basic needs and also to raise their standard of life. This is the sign of economic development [9].

By analyzing the global economy we can say that electricity consumption is one of the most important factors of economic growth. Moreover the increased demand of electricity consumption will create swear problems in the whole world. All of the above discussion aimed to explore the impact of electricity consumption, inflation and employment rate on economic growth in developing nations. That will provide the strong insight for policy makers in order to form the best policies for electricity generation in order to enhance the employment rate that will ultimately boost the economic growth. Policy makers can also get help how to maintain inflation that leads to enhance economic productivity in the developing nations and dramatically boost their economies.

The study is arranged as follows: The next section gives insight about literature review. Third section demonstrates the methodology. Fourth section explains the result and interpretations. Whereas the fifth section presents the conclusion.

2. REVIEW OF LITERATURE

From last few decades the electricity demand is going to increase which motivates us to study the relationship between electricity consumption and economic growth. So it is a great decision that how can we utilize particular policies to preserve or restore the electricity without affecting the productivity in economic growth [10].

Some analyst argued that there is a direct relationship between the use of electricity consumption and the growth of gross domestic product (GDP).The relationship between electricity consumption and economic growth is one of the basic issues from several years. The causality is the basic subject that is under discussion from several years by economists, econometricians and policy makers.

Every country's production and consumption activities are dependent on electricity consumption, because the industrial growth and economic productivity need electricity that leads to economic development. So electricity is considered as a basic input for industrial growth and economic development. Modern economies

can attain more than half of the industrial growth with the help of electricity whereas cost of production can be reduced more than ten percent [11].

[12] States that according to the economic literature the production is generally categorized into three factors: land, labor and capital as the production factor. In contrast many theorists and economists considered electricity as another factor of production. Some economists such as Cleveland suggested that electricity is one of the main and prior factor than other's. Some neoclassical theorists do not believe that electricity is important factor for production. According to the David Stern's some neoclassical theorists and economists believe that electricity consumption (consumption of electricity, oil fuel, coal etc.) strongly affects the economic growth. His research mainly focused on to find the correlation between electricity consumption and economic growth. Finally he has considered that electricity is the important factor in Gross domestic product.

Electricity consumption is considered as a main factor for economic and social development. Higher the use of energy indicates the more economic growth. According to IEA [13] global electricity demand has been increasing and is expecting to increase two third of the global demand and half of the share in 2030 in developing countries especially Asian countries like India and China.

The reason behind the industrial development is the people who gave their skills and expertise to the organizations. This will not only benefit to the organization but also crucial for the economic growth of any country. The higher the employment rate not just benefits to the firm but also will take place an important role to reduce social as well as economic problems of the country [14].

Another major problem is the growing rate of inflation in the country. The increasing price within the country creates several severe social and economic problems that have a negative effect on the growth of the economy. Inflation is the foremost complex macroeconomic factor that is more concentrated by the economic policy makers and central bank. It has a huge effect on the most economic decisions. So for the economic growth and development of any country it is very essential to keep prices stable [15].

These three factors and variables: Inflation rate, electricity consumption and economic growth not only affect the country but also show effects on the global level. Because today in the competitive environment everyone wants to develop, for this it is important for any country that almost all people should be employed and took play their role as they can. Their demand about the electricity and goods should meet according to the available resources. If they meet their needs and demands according to the available resources they can control the prices up to some extent as to control inflation in the country.

Moreover the electricity in the country is a gift of God. In every field of life it is important to run their function properly. Electricity consumption varies in all the industries. By extra demand we can face the shortage, the shortfall in the electricity can create huge problems and will not only becomes a cause of go down the industrial performance but also will stop working. So it should be properly and efficiently used.

Econometricians have explained many methods to check the relationship between electricity and economic growth and the linkage between inflation and economic growth and the connection between employment rate and economic growth.

3. METHODOLOGY

This study use electricity consumption, inflation, employment rate, as an independent variables while economic growth (GDP) as dependent variable. 5 developing countries namely Pakistan, China, India, South Africa and Malaysia are included in order to see the impact of independent variables on economic growth of these countries. Data source for this study is "World Bank" and the annual data takes over the period 1990 to 2012.

3.1 Inflation

The level at which prices of goods and services increases and relatively purchasing power of

people decreases is called inflation. Different researches shows that inflation has a positive correlation with electricity consumption because when inflation increase then cost of electricity consumption will increase which leads to decrease the economic growth because the prices of goods and services will increase and less subsidies will be provided so that various historical researches explores the negative relationship between inflation and economic growth.

3.2 Gross Domestic Product (GDP) Per Capita

Economic growth measures in term of per capita GDP. Per capita GDP is used to measure the overall country's output to that takes gross domestic product and it is divided by total number of people in the country is called Gross Domestic Product. Per capita GDP is the proxy of economic growth, so it considers that when the economic growth of the country will increase leads to stimulate the economic activity due to which the chances of employment are also increase. When employment of the country increase then peoples have more money to spend due to which demands of the luxuries increase which leads to increase the inflation.

3.3 Electricity Consumption

Amount of energy (e.g. electricity) consumed in a process or a system by organization or a society in the country is called electricity consumption. Electricity consumption has positive strong correlation with economic growth.

3.4 Employment Rate

The proportion of country's population that is employed under age 15 and above is called employment rate. It is also called working age population. When companies start their production and install new units then employment rate will increase which leads to increase in economic growth. So employment rate has positive impact on economic growth.

Table 1. Economic growth measures

Variables	Symbol	Expected sign	Theories/Model	Data source
Electricity consumption	EC	+	Subject Under Empirical Study	World Bank
Inflation	INF	+/-	Interest rate parity	World Bank
Employment rate	EMP	+	Keynesian theory of Employment	World Bank
Gross DP	GDP	Dependent variable		World Bank

This table shows Economic growth measures, their theories/ Models, symbols and data sources

3.5 Hypothesis

- H1: There is a relationship between inflation and economic growth.
- H2: Electricity consumption affects economic growth.
- H3: There is a link between employment rate and economic growth.

3.6 Regression Equation

$$EG = \alpha + \beta_1 EC + \beta_2 INF + \beta_3 EMP + \epsilon_i$$

In the above equation:

- EG : Economic growth
- C : Coefficient
- EC : Electricity consumption
- INF : Inflation
- EMP : Employment rate
- ϵ_i : Error term
- β_1 to β_3 : Coefficients of independent variables

3.7 Panel Unit Root Test

To check the stationarity of three variables that are included in this paper the study use Panel data unit root test.

3.8 Levine, Lee and Chu (LLC)

The specifications for the Levine, Lee and Chu (LLC) unit root test are given below:

$$\Delta \mu_{it} = \alpha_i + \mu_i \mu_{it-1} + \sum_{k=1}^{pi} p_i \Delta \mu_{it-k} + \epsilon_{it} \dots \dots (1)$$

Here Δ is the first difference, μ_{it} represents the dependent variable showing observation for the country i at time t ; ϵ_{it} embodies the error term

which is distributed independently for all i, t . The null hypothesis for the test is $\mu_x = \mu = 0$ for all i ; against alternative hypothesis $\mu_x = \mu < 0$ for all i .

3.9 Im, Pesaran and Shin (IPS)

The specifications for the Im, Pesaran and Shin (IPS) unit root test are given below:

$$\Delta x_{i,t} = \alpha_i + \beta_i x_{i,t-1} + \sum_{j=1}^{pi} \rho_{ij} \Delta x_{i,t-j} + \epsilon_{it} \quad (2)$$

$i = 1 \dots \dots N,$
 $t = 1 \dots \dots T$

Here Δ is the first difference, x_{it} represents the dependent variable showing observation for the country i at time t ; ϵ_{it} embodies the error term which is distributed independently for all i, t . The null hypothesis for the test is $H_0: \beta_i = 0$, for all i ; against alternative hypothesis $H_1: \beta_i < 0$ for all i .

3.10 Augmented Dickey Fuller (ADF)

The specifications for the Augmented Dickey Fuller (ADF) unit root test are given below:

$$\Delta x_t = \alpha_o + \gamma x_{t-1} + \sum_{i=2}^p \beta_i \Delta x_{t-1+i} + \epsilon_t \quad (3)$$

Where $\gamma = -(1 - \sum_{i=1}^p \alpha_i)$ & $\beta_i = -\sum_{j=i}^p \alpha_j$, $i = 1, 2 \dots p-1$.

Here Δ is the first difference, x_t represents the dependent variable showing observation for the country i at time t ; ϵ_{it} embodies the error term which is distributed independently for all i, t . The null hypothesis for the test is $H_0: \gamma = 0$ against alternative hypothesis $H_1: \gamma < 0$.

Table 2. Results panel unit root test

Variables	I(0)			I(1)		
	Levin, Lin & Chu	Im, Pesaran and Shin W-stat	ADF - Fisher Chi-square	Levin, Lin & Chu	Im, Pesaran and Shin W-stat	ADF- Fisher Chi-square
EC	5.02257	3.70730	6.24408	2.25932**	1.98922**	24.3467**
EG	4.78520**	4.29620**	36.0456**	7.36419**	8.01806**	69.9743**
EMP	0.87142	1.53356	1.53356	5.28682**	4.87336**	41.3513**
INF	3.45850**	3.20620**	27.3757**	8.48470**	7.23592**	65.5917**

*This table reports panel unit root test. ** Probabilities for Fisher tests are computed using an asymptotic Chi, -square distribution. All other tests assume asymptotic normality, I (0): Level, I (1): First Difference*

3.11 Hausman Specification Test

This test is used in order to choose the alternative tests. Validity of test is checks with the help of Hausman specification test it shows that which one test is describe the variables movements in the series in the better way so these tests are fixed and random effects models. If the result of chi square is less than 0.05 then we use the fixed effect model in Hausman specification test. When a sample variable reveals the whole population then we use fixed effect model [16].Equation can be written as econometrically:

$$A_{it} = \alpha + \beta B_{it} + \mu_{it} \quad (4)$$

Where A_{it} is the economic growth of the country which is our dependent variable, α is the intercept, β is the coefficient variable of all illustrative variables whereas μ_{it} is the disruption term. In fixed effects models the disruption term μ_{it} is disintegrated into specific effect, μ_i , and the residue disruption, \hat{u}_{it} .

$$A_{it} = \alpha + \beta B_{it} + \mu_i + \hat{u}_{it} \quad (5)$$

- H_0 = Fixed effects model is appropriate
- H_1 =Random effects model is appropriate

Probability >chi2 = 0.7003

Chi square value indicates that our data is rejecting the null hypothesis and accepting the alternative hypothesis. So we will use random effects model of panel regression.

4. RESULTS AND INTERPRETATION

Random Generalized Least Square (GLS) model result demonstrates that Employment rate, and Electricity consumption are affecting significantly to economic growth of developing countries. Result demonstrates that Electricity consumption is significantly and positively correlates with

economic growth. This confirms that increase of Electricity consumption leads to enhance the economic growth in developing countries. Because when peoples use more electricity in factories, industries for the production of different products then employment rate will be increases and lot of opportunities will be generated in country that ultimately leads to boost the economy with export of produced products.

Moreover the result of this study is proving the same relationship of independent variables with GDP that are prescribed in the previous studies. Electricity consumption enhances the economic growth which ultimately leads to increase the employment. Because when electricity Consumption will be increase then economy will grow and generate employment opportunities in the economy of the country [17].

A result of Table 3 indicates that inflation has insignificant relationship with economic growth. It demonstrates that during this period the sample shows no relationship of inflation on economic growth in developing economies. Insignificant result of inflation shows that during this time span it has no impact on economic growth. Some studies find significant relationship between inflation and economic growth whereas other studies find the insignificant relationship. One of study shows that inflation has significantly negative impact on economic growth. Level of Inflation increase will reduce the economic growth at the same arrangement e.g. 10 percent increase in inflation leads to 3 to 4 percent decrease in economic growth [18]. But this study finds out the insignificant relationship between inflation and economic growth.

An empirical result demonstrates that employment rate and electricity consumption are the main variables that shows the positive impact on economic growth of developing countries. Whereas inflation has no direct impact on economic growth.

Table 3. Results random GLS model

GDP	Coef	t-value	p-value	Std. Err
Inflation	-0.0301126	-0.49	0.628	0.0620569
Employment rate	0.658968	1.98	0.04541**	0.331294
Electricity consumption	0.2242696	4.27	0.000 **	0.0524779
Cons	-8.163787	-2.69	0.007	3.037304
R square	0.355			

*This table shows the result of random GLS model. ** indicates that values are significant at 5% level*

5. CONCLUSION

The foremost objective of this study is to exhibit the impact of Inflation, Employment rate and Electricity consumption on economic growth in five developing countries namely Pakistan, China, India, South Africa and Malaysia. Study employed annual data over the period 1990 to 2012. The variables like inflation, employment rate, Electricity consumption and economic growth are taken for in depth analysis by the use of different tests.

This study employed the regression analysis in methodology to check the impact of independent variables on dependent variables, data stationarity is checked out by the use of "Panel Unit Root Test" that includes three techniques i.e. Augmented Dickey Fuller technique, Levin, Lee and Chu and Im, Pesaran and Shin test that explore economic growth and inflation are stationary at level whereas employment and electricity consumption are stationary at first difference.

Random Generalized Least Square (GLS) model result demonstrates that employment and Electricity consumption have direct impact on the economic growth. Whereas there is insignificant relationship between inflation and electricity consumption during this time span (1990-2012) means inflation has no direct impact on economic growth of developing countries.

Electricity consumption mainly effects the economic growth in developing countries because shortage of electricity may cause a deleterious impact on developing economies. Because developing economies productivity is electricity based. Economic productivity also involves people so electricity shortage may adversely affect the employment rate and economic growth as a whole.

Developing Governments should use their land and resources for electricity generation. For example hydroelectricity can be generated by constructing dams and solar energy projects may also help out in electricity production. So that electricity consumption can be meet appropriately that leads to boost employment rate in economy and ultimately improves the economic growth in developing countries.

Moreover Developing Governments must take some measures namely monetary measures, fiscal measures, increase in production

measures, proper commercial policies and encouragement to savings are important, policy makers also ensure the better maintenance of rules and regulations and ensures reduction in the nonproductive activities by the governments in order to control the inflation at its minimum level for the betterment of economies as a whole.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Zamani M. Evaluating the Relationship between the Energy Consumption and the Macroeconomic Indicators. *Research Journal of Environmental and Earth Sciences*. 2012;12:(4)1025-1032.
2. Hey Q, Riaz S. Causality between Energy Consumption and Economic Growth: The Case of Pakistan. *The Labor Journal of Economics*. 2008;2(13):45-58.
3. Atif S, Siddiqui W. The Electricity Consumption and Economic Growth Nexus in Pakistan: A New Evidence; 2008.
4. Shahbaz M, Feridun M. Electricity consumption and economic growth empirical Evidence from Pakistan. *Springer Science Business Media*; 2011.
5. Gbadebo, Odularu. Does Energy Consumption Contribute to Economic Performance? *Empirical evidence from Nigeria. Journal of economics and business*. 2009;12:2.
6. Ayyoub M, Chaudhry IS, Farooq F. Does Inflation Affect Economic Growth? The case of Pakistan. *Pakistan Journal of Social Sciences (PJSS)*. 2011;31(1):51-64.
7. Barro RJ. Inflation and Economic Growth. *Annals of economics and finance*. 2013;14(1);85-109.
8. Wajid A, Dr. Kalim R. The Impact of Inflation and Economic Growth on Unemployment: Time Series Evidence from Pakistan. *International Conference on Business Management*; 2013.
9. Hull K. Understanding the Relationship between Economic Growth, Employment and Poverty Reduction (OECD); 2009.
10. Zahid A. Energy-GDP Relationship: A Causal Analysis for the Five Countries of South Asia, *Applied Econometrics and International Development*. 2008;8-1.

11. Barney F, Franzi P. The future of energy From Future Dilemmas: Options to 2050 for Australia's population, technology, resources and environment. CSIRO Sustainable Ecosystems. 2002;157-189.
12. Zamani M. Evaluating the Relationship between the Energy Consumption and the Macroeconomic Indicators. Research Journal of Environmental and Earth Sciences. 2012;12-4:1025-1032.
13. IEA. World Energy Outlook 2009. International Energy Agency (IEA), Paris, France; 2009.
14. Rafiq M, et al. Determinants of unemployment: A case study of Pakistan economy. Abasyn journal of social sciences. 2008;3:1.
15. Hussain S. Inflation and Economic Growth: Evidence from Pakistan. International Journal of Economics and Finance. 2011;3;5.
16. Abrevaya J. Rank estimation of generalized fixed-effects regression model. Journal of Econometrics. 2000;95:1-23.
17. Aqeel A, Sabihuddin M. The Relationship between Energy Consumption and Economic Growth in Pakistan. Asia-Pacific Development Journal. 2011;8:2.
18. Barro RJ. Inflation and Economic Growth. Annals of economics and finance. 2013;14(1):85-109.

© 2015 Abbas et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<http://www.sciencedomain.org/review-history.php?iid=686&id=20&aid=6254>