Can Power Supply Play Any Role for Unemployment in Pakistan? An Empirical Investigation

Safdar Husain Tahir
Iqra Anwar
Muhammad Rizwan Ullah
Government College University, Faisalabad, Pakistan

Abstract
The unemployment is threatening issue all over the world particularly in developing countries. The study aims to quantify the effect of power supply on unemployment in Pakistan. In addition, it examines the linkage among manufacturing capacity utilization, interest rate, exchange rate and unemployment. The study uses time-series data ranging from the period 1980-15 for analysis. The Augmented Dickey Fuller (ADF) test, Trend analysis, Ordinary Least Square Regression Models and Co-integration test are applied. The study reveals that power supply (electricity wastage rate and electricity power consumption) have significant negative impact, whereas manufacturing capacity utilization, interest rate and exchange rate have insignificant impact on unemployment. One-kilo watt increase in electric power consumption would decrease the level of unemployment about 3 percent. The co-integration model shows presence of a long-term association among different variable used in the study. The study focuses the detrimental issue for the manufacturing industry of Pakistan i.e. power supply and unemployment. In addition, it recommends that government should boost energy supply up and devise the need of developing more efficient plans and reliability in strengthening the power sector.
Keywords: Power Supply, Manufacturing Capacity Utilization, Interest Rate, Exchange Rate, Unemployment.

Growth in employment is vital important in any country around the globe. Through the employment, working people engage in their jobs and get money for themselves and for their family members as well (Ayinde, Ayinde, Memudu and Ojehomon, 2007, p.365). It makes working people to live happy life with their families. Unemployment may make people hopeless and involve them in deceptive activities like robberies, domestic violence, kidnapping, smuggling, murders etc. and sometimes these people even commit suicide due to social and financial pressure (Akram, Khan, Khan and Tufail, 2012, p.1). Therefore, it is necessary to debate on the reasons of unemployment which cause disturbance in the society at large. Sometimes, it creates a startling situation especially in developing countries like Pakistan.

The study explains the theory of social relations of unemployment and its consequences on society. Unemployment remains the most critical and troublesome factors in capitalist economy (Schervish, 1977). This paper intends to analyze the relation among unemployment, manufacturing capacity utilization, interest rate and exchange rate. Unemployment is one of the main causes of disturbance in the society around the globe. Power supply creates unemployment in

the economy (Emeka, Ogonna, Chinyere and Idenyi, 2016, p.1). Power supply is very important for any economy. Power supply shortfall is one of the main reasons of closedown of multinational and domestic companies, which ultimately creates unemployment (Subair and Oke, 2008, p.18). Akram, Khan, Khan and Tufail (2012, p.1) considered unemployment as one of the notable challenges that threatening the Pakistani economy. The unemployment rate in Pakistan stands at 5.9 percent (Pakistan Bureau of Statistics, 2017), 4.04 percent in China (Ministry of Human Resources, 2016) 4.9 percent in USA (United State Bureau of Labor, 2016), 24.5 percent in South Africa (Statistics South Africa, 2016) 5.6 percent in Saudi Arabia and 10 percent in France (Bureau of Labor, 2016).

Pakistan is blessed with plenty of natural resources but unfortunately these resources are not to be planned to utilize them properly (Awan, and Rashid, 2012). Indisputably, power supply considers as one of the major reasons of unemployment in Pakistan as various business sectors like textiles, power generation and distribution, food and personal care products, fertilizer, pharmaceuticals, sugar, chemical, and cement sector etc. depend upon electricity power. Power supply is generating through different sources such as power storage mechanisms like batteries and fuel cells, automatic electric arrangements, generators and alternates like solar energy systems, and various other electric sources. But only a few groups of people (rich) can afford high cost sources of electricity in Pakistan (Javaid, Hussain, Maqsood, Arshad, Arshad, and Idrees, 2011, p.38).

Capacity utilization of manufacturing firms is a measure of potential economic output of any industry. The production output of goods gives an idea to determine the inner situation of an organization. Total capacity utilization of power supply considers as helpful measure to identify the internal strength of an economy. There is a close relationship between unemployment and total capacity utilization rate (Alves and Correa, 2014).

Interest rate is also a primeval factor of capacity utilization. It is the cost of borrowing money from other resources. When interest rate goes down, liability of borrowed money increases and therefore, aggregate demand also increases and heavy investments in projects create suppliers' demand for production. Consequently, more people are hired and unemployment decreased. Similarly, exchange rate considers as an important indicator in economic development of a country. Exchange rate may also be a cause of unemployment, any decrease in exchange rate causes to decrease the exports, and ultimately demand of labor decreases and the production of exporting goods stops or slows down which creates unemployment.

Population growth is also a reason of high unemployment rate. Higher population and unskilled graduators may be a big reason of unemployment. Pakistan stands in sixth number according to population

size. The population growth rate from 2016 to 2017 is calculated about two percent (Economic Survey of Pakistan 2016-17). This is very dangerous situation can cause a disaster if not controlled. As the population of any country increase, more power supply requires to meet the needs of people. Proper supply of energy is a major part of any established economy in industrial and technological sector. It is difficult to survive without power supply. Henceforth, the core aim of this study is to analyze the linkage among power supply, manufacturing capacity utilization and unemployment.

Significance of Study

Developing countries like Pakistan are facing threatening issues (unemployment and power supply) of industries in last decade. The problem of load shedding and unemployment are increasing gradually day by day. The federal government endeavors to tackle this issue immediately to reduce the panic situation that makes public and industries worried. The previous studies like Mahmood, Bokhari and Aslam (2013) has investigated linkage between interest, inflation and unemployment in Pakistan. The current study contributes in the existing literature by examining the relation among power supply, electric power consumption, manufacturing capacity utilization, interest rate, exchange rate and unemployment in the current scenario through well-established Johansen co-integration test (Nieh, C. C., & Lee, C. F. 2001). The expected indirect relation between electric power consumption and unemployment, if empirically established, would be laid foundation for policy makers to design policy for reducing unemployment rate in the country. The study focuses the detrimental issue for the manufacturing industry of Pakistan i.e. power supply and unemployment. In addition, it recommends that government should boost energy supply up and devise the need of developing more efficient plans and reliability in strengthening the power sector. The recommendations of the study can be used to eradicate the threatening issue (load shedding) in Pakistan.

Literature Review

Through gainful employment, the working class attracts money to themselves, their dependents and to their nation. The issue of unemployment has become a worldwide phenomenon demanding for intensive increased attention, though the impact is more astounding in developing economies. Working on the relationship among power supply and unemployment rate, this study focuses one of the hottest issues in the mainstream of Pakistan.

Literature Review in International Context

Many research studies found negative long term relation between power supply and unemployment rate around the globe (Malley and Molana. 2007, p.561; George and Oseni. 2012, p.10; Alves and Correa, 2014; Ogbeide et al., 2015, p.49; Emeka, et al., 2016, p.1). Most of the

studies such like George and Oseni (2012, p.10) considered that load shedding of electricity was a major reason of unemployment. In addition, they suggested that government and policy makers should spend a big part of the budget in power sector. Some of the studies were conducted on the three to four decades data of developed countries like France, Italy, Japan, Canada, Germany, UK and US (Malley and Molana, 2007, p.561). Modern techniques like local linear trend model (LLTM), Error correction model (ECM) and ordinary least squares (OLS) method, semi-structural empirical model (SSEM) and the disaggregate Philips Curve (DPC) were used to establish the relation of variables.

Alves and Correa (2014) determined the relationship among unemployment, inflation and industrial capacity utilization by applying a semi-structural empirical model and the disaggregate Philips Curve. They also revealed a positive association between capacity utilization and unemployment rate. Meļihovs and Zasova1 (2009, p.25) contributed their knowledge to assess the natural rate of unemployment and capacity utilization in Latvia. They identified that there was a noteworthy effect of capacity utilization on rate of unemployment. Mojekwu and Iwuji (2012, p.157) found a significant and positive relationship between unemployment and capacity utilization. They also found a negative impact of inflation on capacity utilization.

Dogural and Soytas (2010, p.1523) analyzed the relations of oil prices with interest rate and unemployment by adopting efficiency wage model (EWM). They concluded that interest rate and unemployment had a strong relation with each other. Also, Basu, Ghosh, & Kallianiotis (2001, p.223) examined the effect of interest rate on unemployment. Error Correction, Philips-Peron and Co-integration Models were used to check the long-run interconnection among oil prices, interest rate, industrial production and unemployment rate. They found significant and positive long-term effect of oil price and interest rate on unemployment.

Broll and Hansen-Averlant (2010, p.423) identified the impact of exchange rate on unemployment by using simple microeconomic and equilibrium model. They concluded a negative relationship between exchange rate and unemployment. Demir (2010, p.1127) also found a significant negative association between exchange rate and unemployment. Chimnani et al. (2012) examined the association between exchange rate and unemployment in Asia. By using ordinary least square model, they found a negative relationship between exchange rate and unemployment.

Literature Review in Context of Pakistan

Similarly, different studies indicated significant negative relation between price of energy in the Pakistan and economic growth (Arshad et al., 2016, p.25). They concluded a negative effect of charges applied to energy on economic growth of the country. They also found a negative relationship among energy prices, interest (real) as well as exchange rates and concluded that high rate of energy charges put a kind of huge

pressure on the expenditures government and up surged rate of unemployment in the country. They further revealed that energy charges directly influenced economic growth through its impact on interest (real) and consumption of government, while it indirectly influenced growth of output through exchange rate, investment in stock exchange and unemployment rate.

Khan and Abbas (2016, p.1159) examined the long run association among electricity consumption, prices of energy related product and domestic product and real income. They found that changes in the prices of electricity exerted slight impact on the consumption of electricity in Pakistan. They also found that price of non-energy related domestic products showed positive effect on electricity demand in industrial sector vice versa to agricultural sector of Pakistan. Rashid and Haq (2016, p.102) studied the macroeconomic determinants of unemployment with the inclusion of electricity generation process. They revealed a negative linkage between rate of electricity consumption and unemployment rate in Pakistan.

Bakhshi and Ebrahimi (2016, p.4) analyzed the association between exchange rate and unemployment by using annual data from the period of 1981 to 2012. They adopted autoregressive econometric model with distributed lag and five important variables; gross domestic product exchange rate, unemployment rate, exports as well as imports.
They found that exchange rate had negative impact on unemployment while growth domestic product had significant positive impact on unemployment.

Mahmood, Bokhari and Aslam (2013, p.482) discussed the major hurdles in the development of economy of Pakistan in which interest, inflation and unemployment rates were on the top. They used secondary data ranged from 1992 to 2011. They applied VECM and Co-integration analyze the time series data. They found a significant positive relationship between interest rate and unemployment rate.

Zeshan and Ahmad (2013, p.18) analyzed the impact of energy consumption on gross domestic product and unemployment in Pakistan by using structural vector auto-regression framework. They found that energy consumption was positively related to employment in Pakistan.

Aqeel and Butt (2001, p.101) investigated the casual relationship among economic growth, energy consumption and unemployment in Pakistan. They applied Hsiao's of granger causality and co-integration test to analyze the results. They inferred that economic growth influenced total energy consumption in Pakistan. They concluded that increase in electricity consumption caused to increase economic growth which ultimately increased the employment opportunities in developing nations like Pakistan.

Kalim (1998, p.171) worked out the main determinants of capacity utilization in manufacturing sector of Pakistan. She conducted a survey comprising of 80 firms to investigate the factors responsible for

manufacturing capacity utilization. Load-shedding was identified as a major factor determining capacity utilization rate. She also confirmed that power supply influenced manufacturing capacity utilization rate in Pakistan. The current study addresses the recent issue (load shedding) in the economy of Pakistan and its consequences on the society.

From both part of literature reviews, it can be concluded that power supply (electricity wastage rate and electricity power consumption), manufacturing capacity utilization, interest rate, exchange rate and unemployment have strong linkage in them need to be studied empirically.

Methodology of the Study

The study used quantitative method to analyze the impact of power supply, average manufacturing capacity utilization, interest rate and exchange rate on unemployment in Pakistan by using the data ranging from 1980 to 2015. Data were collected from reliable sources i.e., annual statistical bulletin of State Bank of Pakistan (SBP) and official website of World Bank. Descriptive statistics, Augmented Dickey Fuller (ADF) Test, trend analysis, co-integration test and ordinary least square (OLS) regression models were applied to analyze the results.

Variables Description

Two types of variables were used in the study, as discussed in Table 1:

Table 1: Description of Variables

Variables	Definitions
Dependent Variable	
Unemployment Rate (UER)	It is a marvel that arises when an individual keenly searching for job is powerless to catch a job. UER is mostly used to measure the health of an economy. UER is computed by dividing number of employed persons with all persons available in work force.
Independent Variables	
Electricity Power Consumption (EPC)	Electronic and electric devices consume electricity in order to generate desired output (like motion, light, heat etc.) Electric power consumption is the demand of actual energy made on prevailing power supply. Electricity consumption is measured in watt-times, or more precisely in Kilowatt hours (Kwh).
Electricity Wasted Output (EWO)	During the electric operations, some of the electric energy (depending on the efficiency of electric energy) is consumed in unintentional output i.e. waste of heat. About 40% of the total energy is wasted in the form of sound and heat. It means only 60% of the electric consumption is useful.
Average Manufacturing Capacity Utilization (AMKR)	It is defined as the extent to which a nation or an organization consumes its installed capacity of production. It is a relationship between the possible outputs that could be manufactured by the installed equipment and the outputs that is manufactured by the installed equipment.
	Interest rate is described as the percentage of principal

Interest Rate (INR)	charged to the borrower by the lender for the utilization of its asset or money. It is the annual cost of debt-capital or credit calculated as the ratio of interest to principal. It is expressed as the annualized percentage of the outstanding loan.
Exchange Rate (EXR)	It is the price of currency of the nation with respect to another currency. It is calculated as the difference between two currencies divided by current exchange rate.

Model Specification

The ordinary least square (OLS) regression models arranged as following:

$UER_t = \beta_0 + \beta_1 LUER_{t-1} + \beta_2 EPC_{t-1} + \beta_3 EWO_{t-1} + E_t$ ----------*(Model 1)*

$UER_t = \beta_0 + \beta_1 LUER_{t-1} + \beta_2 AMKR_{t-1} + \beta_3 EPC_{t-1} + \beta_4 EWO_{t-1} + E_t$ ----------*(Model 2)*

$UER_t = \beta_0 + \beta_1 LUER_{t-1} + \beta_2 INR_{t-1} + \beta_3 AMKR_{t-1} + \beta_4 EPC_{t-1} + \beta_5 EWO_{t-1} + E_t$------ *(Model 3)*

$UER_t = \beta_0 + \beta_1 LUER_{t-1} + \beta_2 EXR_{t-1} + \beta_3 INR_{t-1} + \beta_4 AMKR_{t-1} + \beta_5 EPC_{t-1} + \beta_6 EWO_{t-1} + E_t$--*(Model 4)*

To identify the long run relationship between power supply, average manufacturing growth rate, interest rate exchange rate and unemployment in Pakistan, the following model was developed:

$UER_t = \beta_0 + \beta_1 EPC_t + \beta_2 EWO_t + \beta_3 AMKR_t + \beta_4 INR_t + \beta_5 EXR_t + E_t$ ----------*(Model 5)*

Where; UER = Unemployment Rate, LUER = Lag Unemployment Rate, EPC = Electricity Power Consumption, EWO = Electricity Wasted Output, AMKR= Average Manufacturing Capacity Utilization, INR = Interest Rate, EXR= Exchange Rate, β_0 = Constant Terms, ϵ_t = Error Terms, and t = time period

Results and Discussions

This section showed the results of trend analysis, descriptive statistics, unit root, ordinary least square regression analysis and co-integration test.

Descriptive Statistics

Table A2 denotes the first Table in appendix A. Table A2 showed the descriptive statistics of all the variables under current study. Minimum and maximum values gave an idea about uppermost and lowermost values of the variables. Mean values demonstrated the average values of all the variables. Amounts of Standard Deviation showed the variability in variables. Table A2 showed that average rate of unemployment in Pakistan was 5.1914, while the lower and highest rate of unemployment was 2.60 and 7.80 respectively. The standard deviation of unemployment rate was 1.5039 that showed a close linkage of data with the mean values.

Interest rate had the mean value of 12.478 that showed the central value of data, the minimum value of interest rate was 7.0, and maximum value was 19.50. Average value of AMKR was 6.2096 and the minimum and maximum value was -4.170 and 15.510 respectively. The mean value of electricity power consumption was 340.859 kilowatt per hour. An average rate of electricity-wasted output was 41.0914 showing that kilowatt per hour of electricity power generation was lost in carrying of electricity wastage output, the minimum value of lost transmission was 32.72, and maximum lost was 56.65 kilowatt per hour of electricity generation.

Trend Analysis

The study tried to find-out the ways to analyze the links among power supply, average manufacturing capacity utilization, interest rate and unemployment from the period of 1980-2015. The study applied trend analysis to check the upward and downward fluctuations of variables. The graphical presentation of trend analysis was shown in the Figure B1 to Figure B5 (appendix B).

In appendix B, Figure B1 represented the variation in unemployment rate in Pakistan. Unemployment rate showed the rise and fall movements in decreasing manner from 1980 to 1990. It represented a little bit decrease in UER. Then UER moved in upward trend form 1991 to 2003. The graph of unemployment showed the general increase in UER from 2007 to 2015.

Figure B2 denotes the second figure in appendix B. Figure B2 showed the trends in the consumption of electricity power. The graph of power consumption gave a picture of significant increase in kilowatt in the period of 1980 to 2006 and 2009 to 2015, as the line of graph was moving upward. A slight decrease found in the period of 2007 and 2008.

Figure B3 denotes the third figure in appendix B. Figure B3 represented the fluctuations in manufacturing growth rate. The economy of Pakistan disclosed a continuous fluctuation in manufacturing capacity utilization with decreasing appearance from 1980 to 1997. Sharp fluctuations appeared in 1998 to 2006. From 2007 to 2009, AMKR speedily fallen even in negative trend that showed the negligence in manufacturing growth but with the expectations AMKR again moved upward from 2010 to 2015.

Figure B4 denotes the fourth figure in appendix B. Figure B4 displayed that interest rate fluctuated from down to upward continuously from 1980 to 1998. Then the trend gradually fell from 1999 to 2003. Moreover, it showed the downward trend from 2009 to 2015. Figure B5 showed an upward trend in the exchange rate throughout the period of 1991 to 2015.

Unit Root Test (URT)

The URT test is vital important for time series data. URT is widely applied to check the stationarity of data that is most important for

further analysis. The data said to be non-stationary it its mean and variance not constant. The data must be stationary as its mean and variance constant over time and covariance between two periods of time.

The null hypothesis (H_0) accepted when the ACV (absolute critical value) of test statistics is lower than the CAV (critical absolute value) of the Augmented Dickey Fuller (ADF) test or vice versa. If the H_0 is rejected, then the series showed no unit root and stationarity. The outcomes ADF test revealed that all the variables showed stationary at level i.e. H_0 rejected. As all the under consideration variables of the study were stationary at level, so, ordinary least square regression (OLS) models can apply to analyze the association among the variables.

Breusch-Pagan-Godfrey (BPG) -Heteroscedasticity Test

The current study applied BPG test to check heteroscedasticity in the residual term of the used model. The study rejected the alternative assumption (i.e. residuals are heteroscedastic) and accepted the H_0 (i.e. residuals are homoscedastic) which showed that the variances of residuals were homogenous or there was no heteroscedasticity ($p>0.05$) in the model. Therefore, the Breusch-Pagan-Godfrey test found there was no heteroscedasticity problem in the model.

Regressions Analysis

Ordinary least square regression analysis was used to determine the association among dependent and independent variables. This model used to check the association among variables of study. This model was used on the basis of various previous studies such as (George and Oseni, 2012).

Table A3 denotes the second Table in appendix A. Table A3 showed the results of Ordinary Least Square Regression Model. In the Table A3, Model 1 declared that electricity power supply (EPC) (electricity wastage rate, electricity power consumption) had significant negative impact on unemployment rate. It means an increase in the usage of electricity caused to boost up investments which help in economic stabilization that leads to reduce level of unemployment. The results showed that one kilo-watt increase in electric power consumption would decrease the level of unemployment about 3 percent. Similarly, one percent increase in electric wastage output rate would decrease the level of unemployment about 2.4 percent. Model 2 showed an insignificant negative impact of average manufacturing growth rate on unemployment. In the third model, a significant and negative relationship was found between electricity power consumption and unemployment; all the other variables had not significant impact on unemployment.. Further, in fourth model, insignificant negative impact of exchange rate on unemployment rate found. The study was in line with Emeka, Ogonna, Chinyere, & Idenyi (2016)

Johnson Co-integration Model (JCM)

JCM was used to access the current long-run association among the independent and dependent variables employed in the study by

assembling a co-integration equation. E-view software adopted to test these results. The result of Johnson co-integration test can be seen in the Table A4.

The results of Johnson co-integration test identified that there were two co-integration equations. Trace statistics examined whether co-integration exist in Johnson's Method or not. Study identified in the first trace statistics, its value was higher than 5% critical values that were (120.167 > 95.753) and (76.93084 > 69.1.81889) while the other trace statistics were less than 5% critical values (1.474885 < 3.841466). The eigenvalues (0.7196, 0.5927) of the first and second trace statistics were significantly bigger than zero. Shortly, the H_0 (non- integration among the variables) rejected as at least two equations were statistically significant at level 5 percent. It showed the existence of long run equilibrium association among variables.

Conclusions and Discussions

The paper identified the impact of power supply, average manufacturing capacity utilization, interest rate and exchange rate on unemployment in Pakistan. The results of JCM (Co-integration model) indicated a long run significant linkage among unemployment rate, power supply, average manufacturing capacity utilization, exchange rate and interest rate in Pakistan.

Model 1 confirmed that power supply (electricity wastage rate, electricity power consumption) had significant negative impact on unemployment rate. It means an increase in the usage of electricity caused to boost up investments and helped in economic stabilization which reduces level of unemployment. Model 2 showed an insignificant negative impact of average manufacturing capacity utilization on unemployment. In third model, a significant and positive relationship found between electricity power consumption and unemployment; all the other variables had not significant impact on unemployment. Further, in the fourth model, insignificant negative impact of exchange rate found on unemployment rate.

From the determination of trend analysis, electricity power supply was increasing during the period of 1980 to 1990 while unemployment rate decreased within the same period. The trend analysis also indicated that interest rate was fluctuating in upward manners while unemployment rate decreased from 1980 to 1988, which showed an indirect influence of lending on rate of unemployment. When the lending charges increased, it created troubles in investment of manufacturing sector and the people discouraged to find jobs and ultimately it caused to increase in unemployment. A negative impact of exchange rate on unemployment found as an increase in exchange rate of dollar caused to increase unemployment, this trend found in the period of 1980 to 1990.

It was recommended that government should boost energy supply up and develop more efficient and sound plans in strengthening the power sector and they should take necessary actions about the

constant supply of energy to compete the increasing demand of electric supply in Pakistan. Government should enhance the manufacturing sector for creating employment in the economy. For strengthening the production of manufacturing sector, the constant power supply is also necessary. Interest rate should control up to appropriate level because high interest rate affects both the consumers and business entities in Pakistan, as it caused to decrease in investment that results economy to suffer losses. This ultimately caused to increase in unemployment. The exchange rates should be maintained. Higher exchange rates caused to increase exports, in turn, the demand of labor will increase for more production of exporting goods and unemployment will be controlled.

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Appendix A: Tables

Table 2: Descriptive Statistics

Particular	UER %	LUER %	EPC (kwh)	EWO %	AMKR %	INR %	EXR %
Mean	5.191	5.128	340.859	41.091	6.209	12.478	44.360
Maximum	7.800	7.800	488.560	56.650	15.510	19.500	101.630
Minimum	2.600	2.600	136.011	32.720	-4.17	7.000	2.710
Std. Dev.	1.504	1.519	108.508	6.799	4.059	3.112	28.853
Observation	35	35	35	35	35	35	35

Note: UER (Unemployment rate), LUER (Lag Unemployment rate), EPC (Electricity power consumption), EWO (Electricity wasted output rate), AMKR (Manufacturing growth rate), INR (Interest rate), EXR (Exchange rate).

Table 3: Regression Analysis

Variables	M-1		M-2		M-3		M- 4	
	Co	P Value	Co	P Value	Co	P Value	Co	P Value
Constant	36.933	0.000***	36.103	0.000***	36.123	0.000***	34.953	0.001***
LUER	0.316	0.090*	0.281	0.131	0.288	0.152	0.279	0.170
EPC	-0.031	0.001***	-0.030	0.001***	-0.031	0.001***	-0.270	0.005***
EWO	-0.246	0.016**	-0.201	0.057*	-0.205	0.800	-0.174	0.174
AMKR			0.039	0.205	-0.040	0.226	-0.046	0.191
INR					-0.004	0.928	-0.001	0.979
EXR							-0.005	0.548
R-Square	0.855		0.863		0.852		0.865	

Note: UER (Unemployment rate), LUER (Lag Unemployment rate), EPC (Electricity power consumption), EWO (Electricity wasted output rate), AMKR (Manufacturing growth rate), INR (Interest rate), EXR (Exchange rate).
*, ** and *** shows levels of significance at 10%, 5% and 1% respectively.

Table 4: Unrestricted CRT (Co-Integration Rank Test) Trace M-5

Hypothesized No. of CE(s)	EV	Trace Statistic	5% CV	Prob.**

0 *	0.719632	120.1670	95.9986	0.0004
AM 1 *	0.592700	76.93084	71.71665	0.0121
AM 2	0.462244	46.39184	48.55612	0.0682
AM 3	0.333841	25.29993	29.90706	0.1510
AM 4	0.255103	11.48821	16.09471	0.1832
AM 5	0.042452	1.474885	3.941869	0.2246

Note: Trace test shows 2 Co-integrating equation(s) at the 5% level. AM means at most.

Appendix B: Figures

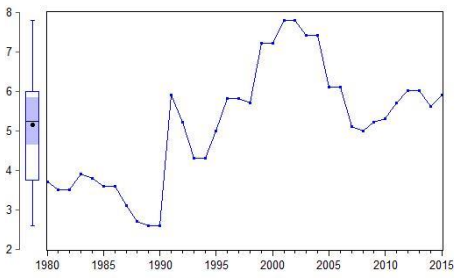

Figure 1: Unemployment

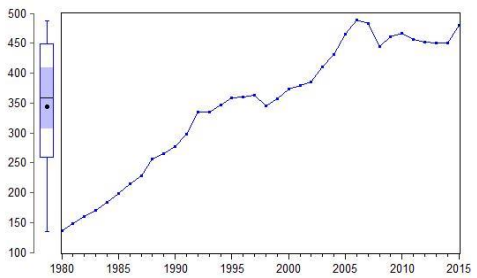

Figure 2: Electric Power Consumption

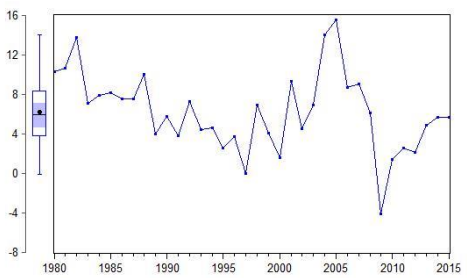

Figure 3: Average Manufacturing Capacity Utilization

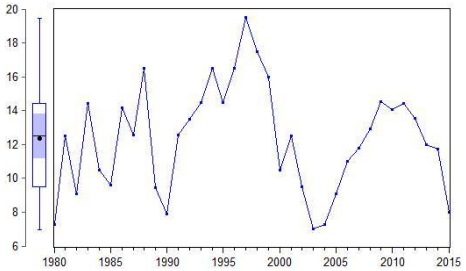

Figure 4: Interest Rate

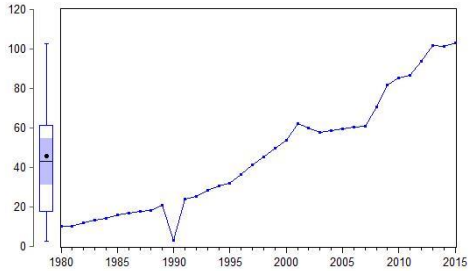

Figure 5: Exchange Rate