An Assessment of Association between Natural Resources Agglomeration and Unemployment in Pakistan

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Abstract

Mostly economists believe that due to nonexistence of agglomeration economies, there are less chances of employment spatial distribution in an economy. Following the strands of previous literature about agglomeration special impacts, this study has uplifted the curtain from some interesting realities. This study has examined the association unemployment between natural resources agglomeration in Pakistan from 1980 to 2016. For measuring natural resources agglomeration, an index has been constructed based on coal production, oil production, forest area and agricultural land as percentage of total land area. The study has utilized autoregressive distributed lag (ARDL) method of co-integration. The results show that natural resources agglomeration, secondary school enrollment, foreign direct investment and inflation has negative and significant impact on unemployment in Pakistan. The results reveal that population is putting positive impact on unemployment in Pakistan. The study finds that natural resources agglomeration is an important factor for reducing unemployment in Pakistan. There are some other factors for agglomeration economies, i.e. local economic policies, natural resources availability and amount of manpower for employment spatial distribution in Pakistan. So efforts are needed on mega scale for exploration, proper usage and functioning of natural resources in Pakistan.

Key Words: unemployment, natural resources, inflation, foreign direct investment
JEL Codes: E24, N50, P24,

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Introduction

Agglomeration economies are an important factor in enticing people move towards specific place. Agglomeration of certain types of natural resources increases the importance of this place for households and business. Initially, natural resources fascinate only few households and businesses towards this place but latter on more households and business increase the concentration. After that the size of the place grows, production cost of business decrease and place become potential spot for more households and business. This process leads the congestion of the people and sparking of the agglomeration economies would be happened. Krugman (1991) mentions that agglomeration is the most visible part of geographical economics. So agglomeration creates the cluster of economic activities and logical circular flow has started for household and business. Moreover, agglomeration also starts the process of localization. There is very fundamental and unique type of relationship between natural resource agglomeration and employment. Employment level in a country is a basic indicator of its economic activities and performance. Level of employment decides the level of human wellbeing of the society. Mostly economists support the idea that clustering of natural resources decrease the level of unemployment in a country. High amount of natural resources increase the demand for labor. Therefore, for an appropriate level of employment there must be some specific amount of natural resources are necessary.

In previous literature, the link between spatial concentration of employment and agglomeration economics is ignored but agglomeration economics plays a vital role in employment. Previous studies focus on other factors rather than natural resources agglomeration for employment. Exactly, it is not confirmed that which factors contribute towards rising employment but it is natural resources availability which decide the size of the cities and states. The current research has tried to focus on natural resources agglomeration as a main factor of employment concentration. Generally, development economists considered that natural resources agglomeration is the primary factor for the clustering of people and employment. This means that little amount or non-availability of natural resources agglomeration reduce spatial concentration of people and or make it uneven. So rising agglomeration economies increases worker's spatial concentration and provide opportunities for business to enhance.

Pakistan is an important country in South Asia. Pakistan is having 650 miles long seashore in Indian Ocean. Iran and Afghanistan are situated in the west of Pakistan. China in the far northeast and India is to the east. Pakistan is strategically very important for Middle East, Central Asia, South Asia. With respect to population, Pakistan is 6th big country in the world with 199.71 million populations. The estimated fertility rate and population growth 3.0 and 1.86 respectively. Natural rate of unemployment for a healthy and good working economy as predicted by economists is around 2% but in Pakistan it is more that 5% prevailing throughout our selected era and it is far grimmer for females. This more that 5% means 4.1 million unemployed persons which majorly comprised of age group 20-29 years. Figure-1 gives historical picture on unemployment in Pakistan. Average unemployment of Pakistan remains 5.47% till 2016 from 1985, unemployment was on its peak 7.80% in 2002 but was 3.10% on its lowest level in 1987. Unemployment rate (5.90%) in Pakistan remains unchanged during 2012 and 2016. Pakistan has number of natural resources; cultivated land is one of the main natural resource. Limestone, coal, natural gas, sliver, hydro power potential, salt, gold, cooper and iron are other main natural resources. Pakistan has comparative advantage on many countries in sugarcane, mutton, vegetables, fruits, cotton, wheat,

milk, eggs, beef and rice etc. Pakistan is producing primary products such as paper products, fertilizers, shrimp, construction materials, pharmaceuticals, food process and textiles. These types of natural resources and industries indulged Pakistani power in the process of employment. In such situations, Pakistan becomes an interesting case study. This kind of exercise is hardly available in previous literature in case of Pakistan, so this study will be a healthy contribution towards respective literature.

Figure-1

PAKISTAN UNEMPLOYMENT RATE

SOURCE: PAKISTAN BUREAU OF STATISTICS

Literature review

A number of theoretical and empirical studies are available on this issue but most relevant and recent are selected here as literature review. Moomaw (1981) pointed out that the spatial concentration of natural resources enhances productivity and growth. Head *et al*. (1995) analyze agglomeration benefits by considering Japanese investments in manufacturing as economic geography suggests that firms of same industry when gathered in same area generate positive externalities also known as agglomeration effects. And this industrial localization finds its evidence statistically. The study has utilized logit estimates to prove that agglomeration benefits play key role in decision of location for project selection. Rosenthal and Strange (2004) explore agglomeration economies in which agglomeration has impacted at least three dimensions at least, that are industrial, geographical and temporal scope. Also natural advantages, consumption opportunities, rent seeking and home market effects contribute to agglomeration. Ottaviano and Thisse (2004) focus on new economic geography approach. By using unified framework survey for analyzing home market effects. Peng *et al*. (2006) examined the middle product economies with help of neoclassical-growth model. The findings show that growth and agglomeration have positive interaction but trade did not increase growth of regions, it also does not increase wage gap in skilled and unskilled workers.

Zambrano (2015) empirically analyzed the influences of natural resources on economic growth and the effect of their presence on social setup. It is argued that resource amassing in countries appreciates real exchange rates but there would be decline in non-resource export sectors, which

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might lead to high inequality, poor growth rates, particularly if institutional management, law maintenance and corruption are not properly managed. Especially capital intensive resources are more prone to conflicts. And this curse is even severe in case of diamond and precious metals. But if institutions are developed, trade is open and there are high investments in exploration resources it might be beneficial. Thus countries should adopt forward looking strategy in resource exploration and resources be privately owned by citizens. Poor countries with mighty natural resources be helped by developed countries in sharing ideas, technology etc. Betz *et al.* (2015) studied the effect of economic growth on coal country by particularly examining the Appalachian region (as of different mining practices) from other regions of U.S. and suggested that mining of coal in modern period does not create enough spatial effects to make Appalachia different from other regions in U.S. They also found negative steady relationship between entrepreneurship and population growth. Farhadi *et al.* (2015) tested free market institutional effect in which property rights are protected and there is freedom of support and voluntary exchange can change the obscenity of natural resources into a blessing. The estimates suggested that the negative growth effects of resource rents can onset benefits in countries with greater economic freedom.

Jovic *et al.* (2016) analyzed natural resources rent and its link to economic development and prosperity. Economic development can be judged from different perspectives and inputs to economy. In this case natural resources rent are the input chosen for exploring economic development. Five different rents of natural resources are compared as which leads to greater effect on economic development indicators. Proxy used for economic development is gross domestic product. Inputs were rent of coal, mineral, forest, oil and natural gas. Sensitivity analysis of dependent variable with each independent variable is performed by using soft computing scheme. Results showed that forest rents have a greater impact on selected dependent variable i.e. gross domestic product. Which can be restated as small changes in forest rents constitute about greater changes in gross domestic product as compared to other rents.

Ebeke and Etoundi (2017) examined the impact of natural resources abundance and its implications for standards of living and urbanization in Africa. The basic hypothesis was the that exploitation of natural resources combined with bad governance, creates the situation of fast urban concentration and urbanization and decreases the standard of living in central or primal part of the city. For empirical analysis panel of different African cities were considered, the results suggested that rise in natural resources enhances urbanization drastically. They established a negative relationship between the standard of life in big cities, the resource abundance and other facilities rises urban concentration and urbanization. The findings of the study asserted that results inevitably hold in case of bad governance. Urbanization due to resource agglomeration in developing countries creates the problem of poor governance. Actually poor/bad governance is linked with damaging impacts of urban concentration urbanization for standard of living in African cities. The results suggested that African cities are experiencing a unique type of transformations.

Sikor *et al.* (2017) conceptually analyzed the natural resources and property right regimes, as some twenty years ago a conceptual scheme of arranging property right regimes and differences among various bundles of rights were determined by Schlager and Ostrom (1992). It influenced research on common property rights, natural resource governance, and community resource management. But nowadays governance of natural resources has changed widely which is challenging the application of conceptual scheme. In the process of managing natural resources, local communities

are playing a significant role rather than any other social actors. The management of resources also provides access to different types of advantages which are external in nature such as benefits from environmental services etc. This sort of changes actually causes has increased demand for property rights. It uses conceptual scheme of changes in dealing with natural resources as portraying three basic modifications that are based on control of rights, use of rights and authority of rights leading to a scenario that focuses on eight types of rights of property. This technique was applied to three governing interventions in China and Laos, including direct benefits and indirect benefits that are attained by natives for using natural resources. The results drawn show that coeval governance changes may have not lead to outright dispossessions of natives, as they have the right of direct use of natural resources. But parametrically controlling and authoritative rights on natural resources are exercised by government and international agencies, excluding the local population from its benefits. Empirical testing also suggests a greater trend possibility in compensated exclusion from natural resources.

Ullah *et al.* (2017) analyze management of natural resources in Asia in 21ˢᵗ century. For this purpose, the study views the main natural resource challenges and issues such as; losses in biodiversity, deforestation, ecosystem degradation and natural resources related regional conflicts and their unsustainable use. Institutional Analysis and Development and social-ecological systems methods are used effectively in guiding the formation and governance cooperation in community pool resources (CPRs) that energize citizens in solving their mild problems to increase their working capacity which would result in attaining a major bulk in economic returns from CPRs. Effective benefit sharing mechanism and good governance of CPRs are a tool of attaining a conducive environment for imposing of forest degradation and their after math of emission reduction in region. Community-based natural resource management (CBNRM) is a very emphatic tool of environmental challenges management. As community oriented solution of environmental issues normally depend upon creation of collective effort for responses, environmental benefits on society, risks absorbance and safety nets for poor community members. But several issues are also related to it, which are mostly ignored out of which the most important one is provision of effective governance of CPRs.

Economic Model and data Sources
Simply, economic models are constructed for explaining the complex behavior of economic agents. Normally, an economic model provides us current and actual economic circumstances of various elements in the presence of certain assumptions and abstraction. The main purpose to construct an economic model is to make an investigation and provide future prediction. Current study has examined the association between natural resource agglomeration and unemployment in case of Pakistan. Following the methodologies of Acero (1993), Kalim (2003), Echebiri (2005), Akhtar and Shahnaz (2005), Schoeman *et al.* (2008), Eita and Ashipala (2010), Kingdon and Knight (2001), Garcia (2004), Valadkhani (2003), Monastiriotis (2006) and Kwabena (2011), the functional form of the model can be descried as:

$$UN_t = f(NRI_t, SSER_t, FDI_t, POP_t, INF_t)$$

Where,
NRI = Natural resources index (Principle Component Analysis is used for the construction of natural resource index for Pakistan. Coal production, oil production, forest area and agricultural

land as percentage of total land area are used for the construction of natural resources agglomeration in Pakistan.)

SSER=Secondary school enrollment rate

POP=overall population

FDI=foreign direct investment

INF=Inflation rate

UN=Unemployment rate

t=time period

The data for all the variables is collected from various issues of economic survey of Pakistan and World Development Indicators (WDI) online data bases.

Econometric Methodology

This study investigates the relationship between natural resources and level of unemployment in Pakistan from 1980 to 2016. Moreover, the data for time series have the non-stationarity or unit root problem. Nelson and Plosser (1982) discuss that frequently the data for time-series macro-economic indicators have unit-root issue. This also violates OLS assumptions. So in case of time series data unit root problem must be checked. Nemours unit root tests are available in applied econometric literature. This paper uses Augmented Dickey-fuller (ADF) unit root tests for removing non-stationarity of the data. In econometric many co-integration tests are used for examining cointegration among variables, such as Engle-Granger (1987) test, Maximum Likelihood based on Johansen (1991/1992) and Johansen-Juselius (1990) tests. But this study uses Pesaran et al., (2001) most advanced Autoregressive Distributed Lag (ARDL) of co-integration. This method has nemours benefits on old-fashioned methods of co-integration. This method can be used when we have mixed order of integration. It can be useful for small set of data. It can give exact evidence about the structural break in data. It has strong power of prediction in the existence of structural breaks in data.

Empirical Results and Discussion

This paper attempts to analysis association between natural resource agglomeration and unemployment in Pakistan from 1980 to 2016. In this section empirical estimates are given. First, correlation matrix of included variables is shown in table-1. The results explain that unemployment has inverse and significant correlation with natural resources, secondary school enrollment, foreign direct investment and inflation but inverse and insignificant correlation with population. Natural resources have positive and significant correlation with secondary school enrollment, foreign direct investment, population and inflation. Secondary school enrollment has positive and significant correlation with foreign direct investment, population and inflation. Foreign direct investment has positive and significant correlation with population and inflation. The estimated results of correlation matrix reveal that most of the independent variables of the selected model has not very strong correlation, so there is less chances of high multicollinearity.

Table-1

UN	1.0000					
NRI	-0.8003 0.000	1.00000				
SSER	-0.6527 -0.014	0.81481 0.0000	1.00000			

	UN	NRI	SSER	LFDI	LPOP	INF
LFDI	-0.5442	0.78728	0.73221	1.00000		
	0.056	0.0011	0.0037			
LPOP	-0.1457	0.55733	0.73391	0.65437	1.00000	
	0.852	0.0022	0.0000	0.01380		
INF	-0.7969	0.76323	0.58632	0.77053	0.39235	1.00000
	0.000	0.0000	0.0083	0.0060	0.22450	
	UN	NRI	SSER	LFDI	LPOP	INF

This study is going to examine the co-integration among variables. Stationarity of the variables is primarily requirement for all co-integrational methods. This paper select ADF test for examining the stationarity of the variables. The results of ADF unit root test are presented in table-2. The results in table 2 reveal that all variables are non-stationary at level but at first difference natural resources, secondary school enrollment, population, foreign direct investment, inflation and unemployment become stationary. On the basis of ADF unit root test, this study uses ARDL bound testing method for examining the co-integration among the variables.

Table-2

Variables	At level		At 1st difference	
	t-statistics	p-value	t-statistics	p-value
NRI	-0.767188	0.8043	-4.147918	0.0060
SSER	-0.181138	0.9241	-2.000143	0.0463
LPOP	0.773	0.9901	-3.283119	0.0348
LFDI	-1.228754	0.6379	-3.216124	0.0368
INF	-2.059229	0.2615	-5.136529	0.0009
UN	-2.180314	0.2197	-3.074054	0.0480

This study uses unemployment as dependent variable whereas foreign direct investment, natural resources, secondary school enrollment, population and inflation as explanatory variables. The estimates of ARDL test are shown in table 2. The estimates reveal that calculated F-statistics value (14.10011) is greater than upper-bound at 5%. This reveals that there is co-integration among the variables. So, model can be used for long run association.

Table-3

F-statistics= 14.10011		
Level of significance	Lower bound value	Upper bound value
5%	5.46	6.61
10%	6.12	7.23

The estimated long run results are given in table 4. Long run analysis shows that natural resources have inverse and significant association with unemployment. The estimated results explain that 1% rise in natural resources brings (-0.2042%) fall in unemployment. The results reveal that enrollment in secondary school has inverse and significant association with unemployment in case

of Pakistan. The results reveal that 1% rise in secondary education decreases unemployment by (-0.2762%). Kingdon and Knight (2001), Garcia (2004), Valadkhani (2003), Monastiriotis (2006) and Kwabena (2011) support the findings of the present study. The results explain that population has positive and significant association with unemployment in case of Pakistan. The results show that 1% rise in overall population brings (1.5002%) rise in unemployment, these results are in line with Acero (1993), Kalim (2003), Echebiri (2005), Akhtar and Shahnaz (2005), Schoeman *et al.* (2008), Eita and Ashipala (2010), Kingdon and Knight (2001), Garcia (2004), Valadkhani (2003), Monastiriotis (2006) and Kwabena (2011). The results explain foreign direct investment has inverse and significant influence over unemployment in case of Pakistan. The estimates reveal that 1% rise in foreign direct investment reduces unemployment by (-0.8715%). Valadkhani (2003) and Monastiriotis (2006) also find same type relation between unemployment and foreign direct investment. The estimates show that inflation has negative and significant association with unemployment in Pakistan. It shows that 1% rise in inflation brings (-0.29572%) fall in unemployment in Pakistan, these findings are consistent with the findings of Acero (1993), Kalim (2003), Echebiri (2005), Akhtar and Shahnaz (2005), Schoeman *et al.* (2008), Eita and Ashipala (2010), Kingdon and Knight (2001), Garcia (2004), Valadkhani (2003), Monastiriotis (2006), Kwabena (2011) and Qazi *et al.* (2010).

Table-4

Long Run: Dependent variable: UN

Variable	Coefficient	p-value
NRI	-0.2042	0.0008
SSER	-0.2762	0.0001
LPOP	1.5002	0.0022
LFDI	-0.8715	0.0077
INF	-0.29572	0.0040

After examining the long run association of variables, now short run association can be analyzed. With the help of VECM short run relation among the variables can be analyzed. The short run outcomes are given in table 5. The outcomes explain that in short run natural resources has positive and significant association with level of unemployment in Pakistan. The estimated outcomes reveal that secondary school enrollment and inflation has inverse short run association with unemployment in case of Pakistan. The results reveal that population and foreign direct investment has insignificant relationship with level of unemployment in Pakistan. The outcomes of the study show that the value of ECM is significant and negative which is theoretical correct. This shows the convergence towards long run from short run. The outcomes point out that ECM has (-0.225220), this reveals the adjustment speed of model towards equilibrium in the long run. The results show that 22% variations in short run is reversed in coming year. It is estimated that model needs 5 months and 4 years for complete convergence. The most of estimated short run findings are consistent with the short run findings of Echebiri (2005), Akhtar and Shahnaz (2005), Schoeman *et al.* (2008) and Eita and Ashipala (2010).

Table-5

Short Run: Dependent variable: UN		
Variable	Coefficient	p-value
NRI	0.16830	0.0000

SSER	-0.38000	0.0020
LPOP	1.73950	0.2009
LFDI	-0.830311	0.3002
INF	-0.1675221	0.0400
Ecm(-1)	-0.225220	0.0015

R-Squared .72736 R-Bar-Squared .64784 S.E. of Regression .011289 F-Stat. F(6,25) 10.6712[.000] Mean of Dependent Variable .046908 S.D. of Dependent Variable .019022 Residual Sum of Squares .0030583 Equation Log likelihood 102.6838 Akaike Info. Criterion 94.6838 Schwarz Bayesian Criterion 88.8209 DW-statistic 2.1932

For examining heteroscedasticity, normality of the data, serial correlation and function form of the model, the diagnostic analysis has been conducted. The estimated outcomes of the diagnostic methods given in table 6. The estimated outcomes from Lagrange multiplier test of residual serial correlation reveal that absence of serial correlation in data. Ramsey's RESET method with the help of square of the fitted values explain that estimated model is in exact functional-form. Kurtosis and Skewness base normality tests reveal that data set is normally distributed. The estimated outcomes reveal the absence of heteroscedasticity. This show that estimated model fulfills all the basic assumptions of OLS.

Table-6

Diagnostic Tests		
Test Statistics	LM-Version	F-Version
A-Serial Correlation CHSQ(1)	1.3867[.239]*F(1,15)*	.70240[.415]*
B-Functional Form CHSQ(1)	1.5212[.217]*F(1,15)*	.77406[.393]*
C-Normality CHSQ(2)	1.3313[.514]*	Not- applicable
D-Heteroscedasticity CHSQ(1)	.79430[.373]*F(1,29)*	.76260[.390]*
A: Lagrange multiplier test of residual serial correlation		
B: Ramsey's RESET test using the square of the fitted values		
C: Based on a test of Skewness and kurtosis of residuals		
D: Based on the regression of squared residuals on squared fitted values		

Stability tests for analysis provides information related to the estimated model is shifted or not over time. The estimated outcomes of the Cumulative Sum of the Squares (CUSUMSQ) and Cumulative Sum (CUSUM) tests are explained in Figures 2 and 3. Estimated figures reveal that CUSUM and CUSUMSQ rest between the two critical lines shown in red indicating that the estimated model remains stable.
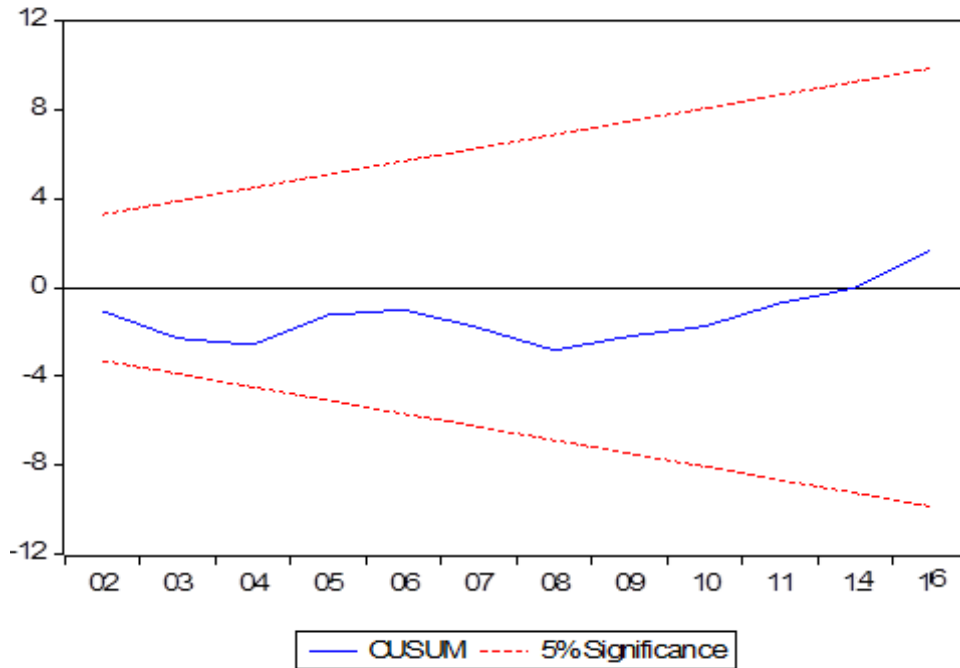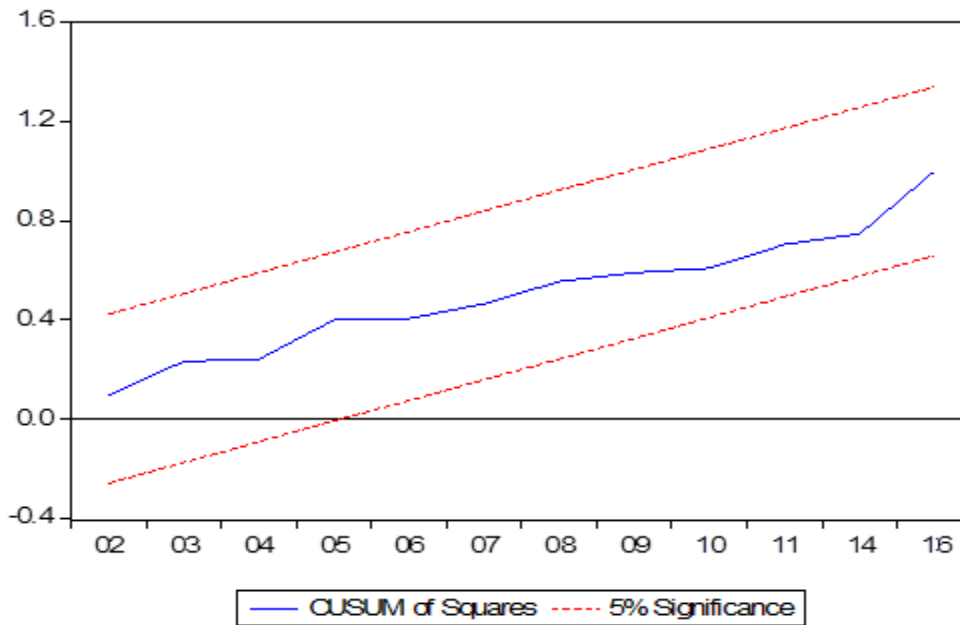
Figure 2 CUSUM

Figure 3 CUSUM Squares

Conclusions and Recommendations

This paper has analyzed the association between natural resources agglomeration and unemployment in Pakistan from 1980 to 2016. This paper takes level of unemployment as explained variable whereas natural resources agglomeration, population, foreign direct investment, inflation and secondary education enrollment are selected explanatory variables. ADF unit root test is used for testing the stationarity of the variables. ARDL bound testing method is used for

examining the cointegration among the variables of the model. The results show that natural resources has negative and significant relationship with unemployment. The study finds that natural resources agglomeration is an important factor for reducing unemployment in Pakistan. There are some other factors for agglomeration economies, i.e. local economic policies, natural resources availability and amount of manpower for employment spatial distribution in Pakistan. Government of Pakistan should make arrangements for the discovery of more natural resources, so that natural resources agglomeration can be enhanced which further reduces unemployment in Pakistan. The result reveal that secondary school enrollment has inverse and significant association with unemployment in case of Pakistan. Rising level of education has provided the surety of rising human capital (Becker, 1994). So if we have educated labor force then half of our unemployment will be automatically vanished (Acero, 1993). So government of Pakistan should create opportunities for better education. Prime Minister's Youth Program is a remarkable initiative of the government for enhancing human capital but still many programs are needed for huge number of unemployed youth. The results reveal that population has positive and significant relationship with unemployment in case of Pakistan. Rising population means more youth for work, Pakistan is the sixth most populous country to the world (Economic Survey of Pakistan, 2016-17). For controlling its rising unemployment there must be some checks on population growth in Pakistan (Kalim, 2003). Pakistan has well established family planning programs but the results of these programs are very poor. So government should use such tactics which motive masses about the risks of rising population. The results reveal that foreign direct investment has negative and significant impact on unemployment in case of Pakistan. For increasing foreign direct investment in Pakistan, the government should provide investors a suitable environment for investment. For this purpose, different benefits are provided to the foreign investors (Monastiriotis, 2006), so that unemployment can be minimized. The results reveal that inflation rate has negative and significant relationship with unemployment in Pakistan. Phelps (1967) points out that inflation has positive relationship with employment. Same is true from the results of this study, but the government of Pakistan should take necessary steps that rising inflation cannot disturb the purchasing power of the masses.

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