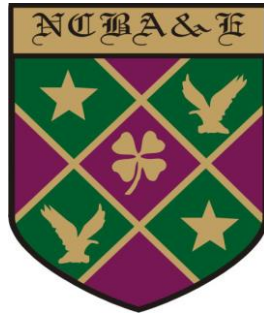


***National College of Business  
Administration & Economics  
Lahore***



**THE IMPACT OF TECHNOLOGICAL  
CHANGE AND GLOBALIZATION ON  
UNEMPLOYMENT IN PAKISTAN**

**BY**

***IBN-E-SAUD***

**MASTER OF PHILOSOPHY  
IN  
ECONOMICS**

**OCTOBER, 2022**

# **NATIONAL COLLEGE OF BUSINESS ADMINISTRATION & ECONOMICS**

## **THE IMPACT OF TECHNOLOGICAL CHANGE AND GLOBALIZATION ON UNEMPLOYMENT IN PAKISTAN**

**BY  
IBN-E-SAUD**

**A dissertation submitted to  
Faculty of Social Sciences**

**In Partial Fulfillment of the  
Requirements for the Degree of**

**MASTER OF PHILOSOPHY  
IN  
ECONOMICS**

**OCTOBER, 2022**



***In the name of ALLAH,  
The Most Beneficial,  
The Most Merciful,***

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**Dissertation Committee:**

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## **DECLARATION**

It is to declare that this research work has not been submitted for obtaining similar degree from any other university/college.

**IBN-E-SAUD  
OCTOBER, 2022**

*DEDICATED*

*TO*

*My Parents*

*&*

*my all Friends*

## ACKNOWLEDGEMENT

All praises to Almighty Allah who has given us the wisdom and knowledge to identify the right path and reach the truth. I express my profound feelings of gratitude and indebtedness to my honorable supervisor, Dr. Mussarrat Khadija Khan, for her ever-inspiring guidance and constructive suggestions throughout my research work being my supervisor.

I am also thankful to Professor Dr. A.R Chaudhary and Dr. Zahid Pervaiz who taught me econometrics, which enabled me to practically apply the econometric techniques in my research work. I am also thankful to my classmates Muhammad Farhan Asif and Ahsan Anwar for their valuable suggestions and relevant discussions. Special thanks to my family for their endless kindness, without them; I would not be able to complete this task.

Genial love, wishes, and thanks are tendered for my all friends; as they always have remained my inner strength and support. They have always shown faith in my dreams.

# RESEARCH COMPLETION CERTIFICATE

Certified that the research work contained in this thesis entitled **“The Impact of Technological Change and Globalization on Unemployment in Pakistan”** has been carried out and completed by **Ibn-e-Saud** under my supervision during his **M.Phil. Economics** Programme.

**(Dr. Zahid Pervaiz)**  
**Supervisor**



## SUMMARY

The study has attempted to examine the potential influence of technological change and globalization on unemployment in Pakistan. Dependent variable was unemployment while independent variables include inflation, GDP per capita, technological change, globalization and gross fixed capital formation. Data for the variables was obtained from World Development Indicators, published by World Bank, (2021) for the time period of 1980-2020. ADF and PP unit root methods were used to check the stationarity among the variables. ARDL method was employed to calculate long-run and short-run estimates. Results of ADF and PP unit root tests showed similar results where globalization was stationary at level with 5 percent level of significance while all remaining variables were only stationary at first difference with 1 percent level of significance. Value F-Statistic in F-Bounds test, was found higher than lower and upper bound with 1 percent level of significance which confirmed the long-term relationship in the model of the study. The study disapproved the presence of Phillips Curve in Pakistan as results showed positive relationship between inflation and unemployment. Role GDP per capita, globalization and gross fixed capital formation was supportive to overcome the issue of unemployment. However, technological change was unemployment increasing factor. ECM results also showed significant relationship of all independent variables with unemployment and value ECT was -0.69 with 1 percent level of significance which confirmed the short-term equilibrium in the model with 69 percent speed of adjustment in one economic period. Value of R-Square showed that 93 percent variation in unemployment was captured by independent variables in the model of the study. Durbin-Watson statistic showed that there was no issue of autocorrelation in the model. Relying on the statistical outcomes, the study suggested to improve GDP per capita, globalization, gross fixed capital formation to reduce unemployment in Pakistan and further recommended that there was need to put sufficient technical and professional skills in the labor force in the presence of rapid technological change.

## KEYWORDS

Unemployment, Globalization, Gross Domestic Product, Technological Change and Inflation.

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# **CHAPTER 1**

## **INTRODUCTION**

During last few decades globalization has become debatable regarding its impact on macroeconomic indicators which include FDI (Liargovas and Skandalis, 2012; Cantah, 2018; Zameer et al., 2020), GDP (Ramzan et al., 2019; Keho, 2017; Hye et al., 2016; Amna Intisar et al., 2020), international trade (Van Cauwenberge et al., 2019) and unemployment rate (Siddiqa et al., 2018; Fatima and khan, 2019; Awad, 2019; Ali and Ali, 2019). Literature showed association of trade openness and globalization with unemployment rate but most of the studies were found unclear to explore the degree of trade openness impact on unemployment (Blanchard 2006; Nickell et al., 2005; Bassanini and Duval 2009). Massive unemployed people might be an alarming sign and hurdle for development of an economy. Humans are considered as a source of production and high unemployment means that economy is producing below its potential level. Productive initiatives are taken by all governments to improve employment opportunities. Enormous and persistent unemployment rate is harmful for a country at domestic level as well as at international level. Low income level due to unemployment leads to poverty, crime, homelessness, frustration, social isolation and loss of self-esteem at domestic level.

Unemployment is defined by Keynes (1936) as “unemployment is an excess supply of labor resulting from a failure in the market economy”. And according to ILO (2001) “unemployment is a situation of being out of work or need a job and continuously searching for it in the last four week or unemployed (age 16 or above) but available to join work in the next two weeks. People who voluntarily do not want to work, full time students, retired people and children are no included in unemployed category”. Does unemployment has significant response to globalization and trade liberalization, remained under investigation in recent literature. Does globalization is employment encouraging factor or boosting unemployment measure is present in literature with different outcomes (Gozgor, 2014).

Literature showed contradictory theoretical framework regarding relationship between trade openness and unemployment. Research studies showed positive influence of trade openness for unemployment which indicated that higher trade openness had discouraged the employment level (Egger and Kreickemeier, 2009; Davis, 1998; Helpman and Itskhoki, 2010). On the other hand, literature was present which indicated negative influence of

trade openness on unemployment and confirmed that increase in trade liberalization had encouraging role for employment level (Melitz, 2003; Revenga, 1997; Mitra and Ranjan, 2010). Some studies also found neutral effect of trade openness for unemployment which concluded that there was no significant linkage between trade liberalization and unemployment (Sener, 2001; Moore and Ranjan, 2005). Global recession during 2008-09 poured adverse effects on international trade and employment among advanced countries (Giannone et al., 2011). Impact of global recession can also be seen discouraging for employment as trade volume decreased severely (Levchenko et al., 2010). Global recession caused reduction in world GDP and global international trade but this impact was found greater in trade volume as compared with world GDP (Gopinath et al., 2012). Focus of researcher has turned significantly to examine the influence of trade liberalization, GDP and globalization on unemployment (Lipsmeyer and Zhu, 2011; Adamu et al., 2017; Awad-Warrad, 2018).

Disagreement regarding effects of trade liberalization on employment level is researchable particularly in literature of labor market. Presence of technological change and globalization with good association, encourage economic growth, employment level and income distribution while inefficient connection of technology and globalization harms the income distribution and employment level (Raji, 2020). Being a highly populated and developing country, Pakistan is facing a serious issue of unemployment for last many decades. According to economic survey of Pakistan (2019-20) total population of Pakistan is 211.17 million, population growth is 1.89 percent and population density is 265 Km<sup>2</sup>. Unemployment rate was 5.8 percent according to economic survey of Pakistan (2019-20) while this rate was much severe among people of age 20-24 as 11.56 percent which is youth unemployment. Labor force of Pakistan is ranked globally at 9<sup>th</sup> position with 1.9 percent rate of population growth. According to KOF globalization index Pakistan has been ranked as 113<sup>th</sup> country with 53.08 value of globalization index during 2017 and 65.1, 62.3 and 82.5 in the case of China, India and USA. Present study has attempted to examine possible influence of technological change and globalization on unemployment in Pakistan. The study has included major factors of unemployment which have been analyzed worldwide in the literature as technological innovation (Pol and Reveley, 2017; Bessen, 2019) GDP per capita (Feng et al., 2017; Matuzeviciute et al., 2017; Adelowokan et al., 2019), inflation (Bhattarai, 2016; Mohseni and Jouzaryan, 2016; Meo et al., 2018) and gross fixed capital formation (Meyer and Sanusi, 2019; Pasara and Garidzirai, 2020).

## **1.1 OBJECTIVES OF THE STUDY**

Objectives of present study are as follows:

1. To investigate the influence of technological changes on unemployment in Pakistan.
2. To examine the influence of inflation on unemployment in Pakistan.
3. To investigate the impact of globalization on unemployment in Pakistan.
4. To examine the impact of GDP per capita on unemployment in Pakistan.
5. To investigate the influence of gross fixed capital formation on unemployment in Pakistan.
6. To suggest some policy recommendations to overcome the issue of unemployment in Pakistan.

## **1.2 NOVELTY OF THE STUDY**

Issue of unemployment has been examined in the worldwide literature. Widely considered factors of unemployment include inflation, globalization, population, FDI, technological change and gross fixed capital formation (Kurtovic, 2015; Ahmad and Khan, 2018; Adeem et al., 2019; Salama and Oláh, 2019). Recent literature has given much importance to technological change to analyze its potential impact on unemployment in the global perspectives (Li and Zhu, 2019; Caliendo et al., 2020; Zemtsov, 2020). In the case of Pakistan Present literature on determinants of unemployment in Pakistan has included above mentioned factors. Research gap was found regarding influence of technological change on unemployment in the case of Pakistan. Present study can be considered novel in the sense as it include technological change along with other significant factors to examine their impact on unemployment in Pakistan. Empirical data since 1980 to 2020 has been employed to conclude short term and long term relationship regarding the variables of the study.

## **CHAPTER 2**

### **LITERATURE REVIEW AND THEORETICAL FRAMEWORK**

The present chapter has been included to explain the literature review about unemployment and its determinants. This chapter has considered the unemployment issue and its responsible factors historically. Research studies about unemployment at global level in general and for economy of Pakistan specifically have been overviewed. In second part of present chapter, theoretical framework has been established with the help of literature review. Relationship between GDP growth and unemployment has been presented through Okun's law (Okun, 1960) and relationship between inflation and unemployment has been explained through Phillips curve (Phillips, 1958).

#### **2.1 LITERATURE REVIEW**

Potrafke (2010) has investigated the linkage between globalization and deregulation of labor market in the case of 20 OECD countries during 1982-2003. Various aspects which are considered for labor market deregulation includes, unemployment benefit length, unemployment replacement rate and tax wedge. Results show that globalization has no impact on above mentioned various aspects but due to rapid globalization regular employment has diminished. Domestic aspects are found as important factors of labor market regulation instead of globalization.

Kim (2011) has examined the influence of trade on unemployment with consideration of labor market institutions. Data is used for the panel of 20 OECD countries for the time period of 1961 to 2008. Fixed effects Model is employed for five years averages of arranged annual data. Results of the study shows that rise in trade does not reduce unemployment in the existence of rigid labor market institutions while it might be able to overcome unemployment where trade enhancement is supported by flexibility in labor market institution.

Carneiro and Arbache (2003) have examined the influence of trade openness on labor market and macroeconomic variables in the case of Brazil. Computable General Equilibrium model is used to assess the potential relationship among variables of the study. Outcomes of the study show positive impact of trade liberalization on Gross Domestic Product and labor demand. Negative relationship between trade openness and inflation is found.



However, results of the study regarding decrease in unemployment rate are skilled workers and trade oriented sectors.

Aminu and Anono (2012) examine the nexus between inflation and unemployment rate in the case of Nigerian Economy. Annual data is used for the time period 1977-2009. Augmented Dickey fuller test is employed to capture the property of unit root of variables and Johansen cointegration approach is utilized to observe long-run relationship between variables of the study. Results indicate that inflation has negative significant influence on unemployment. Further, Granger causality is employed to analyze causality between variables and its results negate the hypotheses of causality between inflation and unemployment.

Cheema and Atta (2014) have analyzed the unemployment response to productivity, output gap, economic trade openness, uncertainty and gross fixed investment in Pakistan. Annual data for the time period 1973-2010 is used. ARDL econometric technique is used to examine short-run and long-run relationship between variables. Results show positive impact of productivity, output gap and economic uncertainty on unemployment while negative impact of trade openness and gross fixed investment is found. Study suggests reduction in trade restrictions and adoption of depreciation policy and increase in private investment to overcome unemployment in Pakistan.

Gillani et al (2009) analyzed the linkage among unemployment, inflation, poverty and crime in the case of Pakistan. The study utilized the data for time span of 1975-2007. To capture the long run relationship among the variables, Johansen cointegration method was employed and results showed the significant association among the variables. Outcomes of Granger causality method showed that poverty, inflation and unemployment had granger caused the crime in Pakistan.

Rafiq et al (2010) investigated the responsible factors of unemployment in Pakistan. Data during 1998-2008 was used in the study. OLS and Simple single equation linear regression techniques were employed to estimate the coefficients. Results showed that population had positive and significant impact on unemployment while FDI and inflation had negative effects on unemployment. The study confirmed the presence of tradeoff between unemployment and inflation in Pakistan.

Eita and Ashipala (2010) have examined the Philip curve in Namibia during 1971-2007. Data is taken from National Planning Commission and Bank of Namibia. Relationship between inflation and unemployment is captured through Engle-Granger method. Results of the study support the

Philip curve phenomenon that there is inverse relationship between inflation and unemployment. Study also shows negative and significant influence of investment on unemployment in Namibia. Author suggests that increase in aggregate demand can decrease unemployment.

Maqbool, et al. (2013) have investigated the empirical nexus among unemployment, foreign direct investment, inflation, gross domestic product, external debt and population in the case of Pakistan. Annual data for the time period of 1976-2010 is used. ARDL method is employed to examine the impact of all variables on unemployment. Results indicates that population, inflation, foreign direct investment and gross domestic product are important determinants of unemployment in Pakistan. Results are found statistically significant in short run and long run.

Katria *et al.* (2011) have measured the validity of Phillips curve in six expected SAARC economies and eight SAARC conomies which include (Russia, Republic of China, Myanmar, Iran, Indonesia and South Africa). Annual panel data is used for the time period of 1980-2010. Unbalanced panel data is taken from World Bank estimations are obtained through unbalanced regression model. Results show presence of indirect linkage between inflation and unemployment in all SAARC economies. Phillips curve is found true in present 8 SAARC countries.

Trimurti and Komalasari (2014) have assessed the determinants of unemployment in 7 provinces of Indonesia. Estimations are made for quarterly data during 2004-2010. Outcomes of the study show inverse linkage between inflation and unemployment while economic growth and minimum wage level are found insignificant for unemployment. Researchers conclude that control on inflation might cause reduction in unemployment in the case of Indonesia.

Gozgor (2014) has axplained the impact of trade openness on unemployment in the case of G7 economies: United States (US), United Kingdom (UK), Germany, France, Japan, Italy and Canada. Unemployment rate is used for 16-64 year old population. Trade liberalization is considered through four different measures which include real trade openness, nominal trade openness, KOF globalization index and economic globalization index. Inflation, GDP growth and real interest rates are other explanatory variables in the study and data is taken from WDI. Results of the study have shown significant negative influence of four measures of trade openness on unemployment rate for G7 countries.

Nwaka et al (2015) have analyzed the influence of gross domestic product, trade openness and public spending on education and foreign price

shocks on unemployment rates in the case of Nigeria. Results of the study have showed negative impact of gross domestic product and per capita income on unemployment while trade openness has direct influence on unemployment rate. Commodity prices are considered as proxy variable for foreign policy shocks and shows positive association with unemployment rate in Nigeria.

Alrayes and Abu Wadi (2018) investigated the factors of unemployment in the case of Bahrain for the time period of 1980-2015. The study estimated the effects of GDP, government expenditure, inflation and gross fixed capital formation on unemployment in Bahrain. Outcomes displayed GDP and inflation as insignificant factors for unemployment while government expenditure and gross fixed capital formation were found as significant factors of unemployment in Bahrain. The study suggested promoting gross fixed capital formation to reduce unemployment in Bahrain.

Riaz and Zafar (2018) examined the influence of GDP, enrollment in college and universities, population and technical & vocational education on unemployment in Pakistan. The study used data for the time period of 1990-2015. ARDL method was used to estimate long term relationship among the variables. Inverse and significant linkage was found between GDP and unemployment. Impact of population was positive and significant while technical and vocational education was found as insignificant factor for unemployment in Pakistan.

Maijama'a et al (2019) examined the influence of population on unemployment in the Nigerian economy. Annual data was used during 1991-2017. ADF and PP unit root tests were used which confirmed the stationarity of variables which include GDP per capita, population, FDI, CPI and unemployment. Results of DOLS showed positive and significant effect of exchange rate and population on unemployment while CPI, FDI and GDP per capita had negative influence on unemployment. The study recommended improving GDP per capita to handle the issue of unemployment in Nigeria.

Raji (2020) utilized non-linear ARDL method to assess the influence of technological change and globalization on unemployment for Nigerian economy. Quarterly data for the time span of 2000-2018 was used. Coefficient sign of explanatory variables were found significant but varying magnitude and sign for short term and long term. Financial globalization, trade globalization and technological change were found as uplifting factors of unemployment in Nigeria. The study advocated that government of Nigeria should launch appropriate social techniques having efficient connectivity between technology and globalization through research and development.

Arango and Flórez (2020) assessed the factors of structural unemployment in the case of Colombia for the time span of 1984 to 2015. Structural auto regressive model and Phillips Curve were developed in the study. To measure the cointegration relationship, study used fully modified OLS cointegration method. The study concluded significant determinants of structural unemployment in the case of Colombia which include real minimum wage, an indicator of hiring cost, non-wage labor cost, the real rate of interest, sectoral shifts and few demographic factors which were proportion of workers who had no education. The study also utilized the aforementioned variables or determinants to estimate true rate of structural unemployment in Colombia.

Dvouletý et al. (2020) examined the determinants of ‘young adults’ unemployment and such factors included family background and individual level. The study covered extensive range of young age unemployment which ranges from 18 to 35 years. The study was done in eleven European countries during 2016. Survey based data was used to estimate the factors of unemployment among young adults. Sample size was consisted of 14,602 economically active individuals. The study measured logistic regressions where dependent variable was unemployment. The study found that other than gender, age, caring responsibilities, ethnic background, migration and experiences of unemployment, there were some other significant factors of unemployment which include unemployment experiences of parents and religious affiliations. The study suggested that policy makers should consider the unemployed young adults specifically women, young adults, ethnic minorities, risk averse young people.

Nepram et al. (2021) examined the influence of government expenditures on unemployment in the case Indian states by employing panel dataset comprised on selective 6 economic years from time span of 1993-94 to 2017-18. The study included government expenditures, ideology, per capita income, state based domestic economic growth and educational level as independent variables in the model to estimate their impact on unemployment in Indian states. Government expenditures were further subdivided into aggregate expenditures, development expenditures and non-development expenditures. The study found that decrease in public expenditure can lead to reduce unemployment in Indian states. The study also found that unemployment level was comparatively high in states where education level was high as compared with those where education level was lower. To revisit the educational policy was among significant suggestions of the study to overcome the issue of unemployment in states of India. Impact of per capita income and output growth was also found supportive to reduce unemployment.

Daly et al. (2017) investigated the influence of globalization on unemployment in Pakistan. Data was used for the time span of 1980 to 2013. Instead of using globalization in general, study used its three dimensions separately to evaluate their individual impact on unemployment in Pakistan. Dimensions of globalization were political globalization, social globalization and economic globalization. ARDL econometric method was employed to estimate regression analysis in short term and long term. Results showed that political and social globalization has positive relationship with unemployment in the long term while negative relationship in the short term. Economic globalization was found significant and supportive factor to overcome the issue of unemployment in the short term and long term.

Ahmad (2020) analyzed the relationship between unemployment and inflation in Pakistan. The study had utilized the data for the time span of 1991-2015. Data was evaluated to confirm the presence of Phillips curve by dividing the data into three parts. First time span was 1991 to 2000 and results concluded that inflation showed increasing trends while declining trends were present in unemployment. Second time span was 2001 to 2005 where again presence of Phillips curve was confirmed with increasing inflation and decreasing unemployment trends and same was also confirmed for 2005 to 2010. The study showed that Phillips was present in the case of Pakistan.

Imtiaz et al. (2020) examined factors of unemployment in economy of Pakistan. Dependent variable in the study was unemployment while independent variables included investment, agriculture output, political stability and population size. Unemployment was taken as young people of age 15 to 25 years. According to author, unemployment issue was mainly harmful for the young people who suffered during recession times. The study concluded that poor agriculture output, overpopulation, low investment and political instability were significant responsible factors of unemployment in Pakistan. Suggestion for policy makers were to improve agriculture sector, increase investment and to ensure political stability in the case of Pakistan.

## **2.2 THEORETICAL FRAMEWORK**

Theoretical background of the study has been presented in the present chapter that how independent variables are associated with dependent variable. Unemployment is dependent variable while GDP per capita, inflation, technological change, globalization and gross fixed capital formation are explanatory variables in the model. For this instance comprehensive description of globalization has been included. Okun's Law (Okun, 1960) has been added in theoretical framework which stated that there is significant

favorable impact of GDP growth to decrease level of unemployment. Furthermore, Philips Curve (Phillips, 1958) also has been included to show the relationship of unemployment with Inflation which explained the existence of inverse linkage between inflation and unemployment.

Economic growth and employment nexus was evolved as Okun's law which postulated that economic growth have significant impact to reduce unemployment where statistical association was that 4 percent rise in economic growth brings 1 percent reduction in unemployment. Okun's law was presented to show statistical associations of national product. Initially Okun developed model where unemployment dependent variable and real GDP was the only independent variable (Okun, 1960). Furthermore, Okun also explained carefully the relationship between output and unemployment and stated that such nexus include combined effect of labor force, labor productivity and average worked hours where coefficient values of Okun's law was comprised by taking aggregate of aforementioned factors. Regarding monetary policy, Okun's law has great importance but only in the presence of properly measured natural rate of unemployment. Okun's law has been supported by many economists as it provides guidance for monetary policy measures to uplift aggregate output and employment level.

The study also has considered the influence of inflation on unemployment. Trade-off between inflation and unemployment is better clarified through Philips Curve. Persistent rise in overall prices of goods and services for a particular time span is considered as inflation. In the presence of inflation, value of currency in monetary terms decrease. Low inflation rate is that when general average price level of goods and services is not increasing. When people are looking for job opportunities and have capabilities to work but they are unable to find any employment opportunities at a specific wage level then this is named as unemployment. Phillips curve had been originally developed by A. W. Phillips who explained the indirect relationship between inflation and unemployment where he consider the role of economic growth to uplift inflation which further cause multiple job opportunities and lower unemployment level. The concept of Phillips Curve was disapproved during 1970s when stagflation took place. In stagflation, both the inflation and unemployment started to increase in same direction instead of inverse movements and very high level of unemployment and inflation was recorded. Prior to 1970s, United States never faced such alarming situation of unemployment and inflation as during 1973 and 1975 there was decrease in position of economic growth while inflation was tripled.

Impact of globalization remained positive to boost economic activities and employment level (Spence, 2011; Kiren and Awan, 2018). Present study

has included KOF globalization index to examine its empirical impact on unemployment in Pakistan. KOF globalization have been calculated by considering its 3 dimensions which are economic, social and political globalization (Gygli et al., 2019). Economic, social and political areas of globalization have been widened since 1970s particularly when cold war ended, huge boost occurred. All three dimensions of globalization have been further divided into various sub dimensions. KOF globalization index was first time calculated and published in 2002 for the time period starting from 1970. Currently published report in 2021 has covered the time period of 1970 to 2019. Weights have been assigned to all three dimensions which are as 36 percent for economic globalization, 37 percent for social globalization and 27 percent for political globalization. Economic globalization is further sub divided into two major sections as actual flows with 50 percent weights and restrictions also with 50 percent weights. Flows of exports and imports, FDI, trade restrictions and rate of taxes were considered important to measure actual flows and restrictions for final calculation of economic globalization. Social globalization was further categorized into 3 major heads which included data on personal contact data, information flows and cultural proximity data which were given weights 33 percent, 36 percent and 32 percent respectively. Political globalization was calculated by including and embassies in country, global treaties, participation in UN Security Council Missions and membership in global organizations with weights of 25 percent, 26 percent, 22 percent and 27 percent respectively.

According to annual KOF globalization report 2021, Singapore was on top among all countries in the world with score of 94.28 percent for overall globalization for the year 2019 while in the same time score of Netherlands was 90.12 and report showed upward trends of globalization for entire global level. KOF globalization score of Pakistan during 2019, was 54 percent while 65 percent in China, 62 percent in India, 59 percent in Sri Lanka, 49 percent in Bangladesh and 82 percent in USA. Among the Asian countries Pakistan was found less globalized as compared with India and Sri Lanka. Score of Pakistan for KOF globalization in 2018 was 53.92 which improved to 54 percent in 2019. Countries with high globalization score were mainly those who were following less barriers global trade of goods and services. Capital market were also less restricted which uplifted the globalization score in all three dimensions of KOF globalization index. All those economies who have followed free trade agreements, less tariffs and favorable foreign investment arrangements.

## CHAPTER 3

### DATA AND METHODOLOGY

#### 3.1 DATA AND VARIABLES DESCRIPTION

Present study has utilized time series data for the time span of 1980-2020. Data has been obtained from secondary data sources which include economic survey of Pakistan (various issues) and World Development Indicators (WDI) published by World Bank. Data for KOF globalization index is taken from Gygli (2019). Composition of KOF globalization index has been given in the appendix 1. Dependent variable in the study is unemployment while explanatory variables are inflation, GDP, technological change, KOF globalization and gross fixed capital formation. Econometric form of the time series model is given below.

$$UNEMP_t = \alpha + \beta_1 INF_t + \beta_2 GDPPC_t + \beta_3 TC_t + \beta_4 GLOB_t + \beta_5 GFCE_t + \varepsilon_t \quad (1)$$

Variables of the model have been described below.

##### 3.1.1 Unemployment

Unemployment (UNEMP) is dependent variable in the model. Unemployment (total) is estimated as percentage of total labor force. Data is in percentage form, as percentage of total labor force from WDI and economic survey of Pakistan (various issues).

##### 3.1.2 Inflation

Inflation (INF) is increase in general price level which is calculated through consumer price index (CPI). CPI estimates the inflation rate as percentage increase in general price level (for specific basket of goods) with base year (2010) annually. Percentage change in CPI is considered for inflation rate.



### **3.1.3 GDP Per Capita**

Total domestic output divided by total population of the country shows the value of GDP per capita (GDPPC). In the present study data for GDP per capita is obtained from WDI.

### **3.1.4 Technological Change**

Applications for patents have been used as proxy to measure technological change (TC). Data was obtained in form of number of patent application from WDI.

### **3.1.5 Globalization**

KOF globalization index (GLOB) has been used to cover the global connection of the country. KOF globalization consist of three dimensions which include political, social and economic globalization. Score of KOF globalization index ranges from 0-100, where zero means no globalization and 100 means complete globalization. Construction of KOF globalization index is given in the appendix 1.

### **3.1.6 Gross Fixed Capital Formation**

Acquisition of assets produced are considered as gross fixed capital formation (GFCF) which is called investment. Data for gross fixed capital formation has been obtained from WDI as percentage of GDP.

## **3.2 HYPOTHESIS OF THE STUDY**

The present study includes following hypothesis.

### **3.2.1 Hypothesis No. 1**

**H<sub>0</sub>:** Inflation has no significant linkage with unemployment.

**H<sub>1</sub>:** Inflation has significant linkage with unemployment.

### **3.2.2 Hypothesis No. 2**

**H<sub>0</sub>:** GDPPC has no significant linkage with unemployment.

**H<sub>1</sub>:** GDPPC has significant linkage with unemployment.

### **3.2.3 Hypothesis No. 3**

**H<sub>0</sub>:** Technological change has no significant linkage with unemployment.

**H<sub>1</sub>:** Technological change has significant linkage with unemployment.

### **3.2.4 Hypothesis No. 4**

**H<sub>0</sub>:** Globalization has no significant relationship with unemployment.

**H<sub>1</sub>:** Globalization has significant relationship with unemployment.

### **3.2.6 Hypothesis No. 5**

**H<sub>0</sub>:** Gross fixed capital formation has no significant linkage with unemployment.

**H<sub>1</sub>:** Gross fixed capital formation has significant relationship with unemployment.

## **3.3 ECONOMETRIC TECHNIQUES**

The present study has used ADF and Phillips Perron tests for stationarity check of the variables. F-bounds test was utilized to confirm the presence of cointegration in the mode. To estimate long-run coefficients of the model, ARDL method was used while short-run estimations were performed through error correction method. Granger causality test was exercised to estimate pairwise causality links among the variables of the model in present study. All aforementioned econometric techniques have been explained below.

### **3.3.1 Unit Root Tests**

ADF and PP test are common utilized unit root tests in the most of time series studies and these unit root tests are to evaluate the changes in variance and mean for a specific time span.

An autoregressive model is utilized in unit root tests to assess whether a variable is stationary or non-stationary.

A test for assessing if a time series' mean, variance, and covariance are time-independent.

#### **3.3.1.1 Augmented Dickey-Fuller Test**

The ADF method is used to assess the presence of unit root in an autoregressive model. The formula works well with time series that are trending, such as asset prices. The ADF method is the simplest way to look for a unit root, but most economic and financial data for a long period have a higher intricate and dynamic structure compared with a simple autoregressive model can describe, which is where ADF test comes in.

ADF method of unit root is considered as more reliable and appropriate test where a hypothesis is evaluated through producing a t-statistic along with p-value which confirms the probability value for significance level. ADF method is more advanced form of dickey fuller method which is highly useful for large time span samples.

#### **3.3.1.2 Time Series Estimations and Utilization of ADF unit Root Method**

To evaluate the series if variables regarding stationarity is a very critical aspect particularly in the case when data is for long time span. For such instance, ADF method is widely accepted and utilized to decide about the presence or absence of unit root among the variables. When data proves as non-stationary then forecasting through reliance on such data becomes challenging. For such purpose confirmation of stationarity is done through utilization of ADF and PP tests.

### **3.3.1.3 Uses of Augmented Dickey-Fuller (ADF) Test**

There are two techniques to check if something is stationary. One method is to examine the mean and variance of a time series manually, while another is to use the ADF test function. Stationary time series, as we all know, do not alter in mean or variation over time. As a result, we can divide data into equal lengths and compare the mean and variance of the split data.

The ADF test is a trustworthy solution for unit root testing, with excellent results, particularly for time series with a large number of data. For relatively short time series, the PP test is a good replacement. Despite this, the ADF test is and will continue to be one of the most widely used unit root tests. Its main advantage is its ease of practicality.

### **3.3.1.4 The Philips-Perron Unit Root Test**

The Philips-Perron method is non-parametric, which indicates that in PP method selecting the level of serial correlation is not required as needed in ADF method. Estimation method is same in PP method as in ADF it has adjustment for the issues of heteroscedasticity and autocorrelations

The PP test's fundamental drawback is that it is based on asymptotic theory. Finally, this only performs effectively in huge samples, which is a luxury whenever it is utilized in financial time series data. It also has the same drawbacks as ADF methods, such as sensitivity to structural breaks and low sample power, which frequently leads to unit root conclusions.

### **3.3.1.5 Limitations of Unit Root Tests**

The unit root tests are straightforward. In practice, however, there are following limitations:

1. Asymptotic distributions for unit root tests are typically nonstandard and non-normal.
2. These distributions are functions of standard movements, and there are no closed form formulas for them. As a result, simulation approaches must be used to calculate critical values.
3. The addition of deterministic components, such as constants, temporal trends, and dummy variables, affects the distributions, therefore separate sets of critical values must be used.

4. The power of PP and ADF methods against  $I(0)$  alternatives which are close to being  $I(1)$  is relatively low.
5. As deterministic terms are further addition to the test regressions, the power of unit root tests declines.
6. The so-called efficient unit root tests should be utilized for maximal power against very persistent alternatives.

### **3.3.2 F-Bound Test**

The F-bounds test was used to ensure that all variables in the model had a long-run relationship. Furthermore, unlike other cointegration strategies that require the same order of integration to produce cointegration, the ARDL model can be utilized either all the variables are stationary at level or all the variables are stationary at first difference or even at mix of level and first difference. The model approaches in two steps. In the first phase, the F-test employs to see if there is any long-run association between the variables (cointegration). In the second phase, the long-run connection coefficient is found, whereas short term coefficients of series are estimated, and speed of adjustment is estimated there with value ECM whose negative sign shows convergence and positive sign shows divergence in short term.

### **3.3.3 Autoregressive Distributed Lag (ARDL)**

If the variables of interest have a mixed order of integration or are not all non-stationary, the Johansen cointegration test cannot be used directly because it requires all variables to be  $I(1)$ . An autoregressive distributed lag (ARDL) model may be used to represent both non-stationary and mixed order of integration time series. In a general-to-specific modelling framework, this model uses a suitable number of lags to reflect the data generation process.

According to economic analysis, there is a long run relationship between the variables under investigation. This indicates that the long-run relationship qualities are not harmed. In other words, variances and means are consistent for a long time span. However, most empirical studies have demonstrated that when estimating time series factors, the constancy of the means and variances is not satisfied. Most cointegration strategies are incorrectly implemented, estimated, and considered to control the issue.

Long run coefficients of the present study have been estimated by following ARDL equation 2, given below.

$$\begin{aligned}
 UNEMP_t = & \alpha_0 + \sum_{i=1}^r \beta_1 UNEMP_{t-i} \\
 & + \sum_{i=1}^s \beta_2 INF_{t-i} + \sum_{i=1}^u \beta_3 GDPPC_{t-i} + \sum_{i=1}^p \beta_4 TC_{t-i} \\
 & + \sum_{i=1}^q \beta_5 GLOB_{t-i} + \sum_{i=1}^v \beta_6 GFCF_{t-i} + \varepsilon_t
 \end{aligned} \quad (2)$$

### 3.3.4 Requirements for the Application of ARDL

Following are fundamental requirements to apply ARDL method for regression analysis in time series estimation to capture long run relationship among variables of the model.

1. The ARDL method can be utilized in the case if variables are stationary at level or all are stationary at first difference or the case where mix of level and first difference. To avoid the issues of pre-testing in cointegration estimations through which level and first difference can be categorized.
2. The ARDL error correction representation becomes significantly more efficient if the F-statistics (Wald test) demonstrates that the sample data size is modest or finite and there is a single long run relationship.
3. In the case when Wald test shows presence of long run multiple linkages and in such condition Johansen and Juselius (1990) can be used. In the condition of multiple long run cointegration, multivariate method should be applied.
4. If the trace, maximum eigenvalue, or F-statistics reveal a single long-run relationship, the ARDL approach can be used instead of the Johansen and Juselius approach.

### **3.3.5 Granger causality Test**

Granger causality method which is also known as “G-causality” was originally presented in 1960s and utilized in economics. In few recent years, this method also has been employed in Neuroscience.

G-causality is method to predict statistically the causation among the variables. In pairwise causality method, if one variable cause the second variable only but second does not granger cause the first variable then this is named as unidirectional variable. When both variables in pairwise causality test granger cause each other, then this is named as bidirectional causality. No causality is the case when any one variable in the pair of variables does not granger cause to the other variable.

### **3.3.6 Limitations and Extensions of Granger Causality Test**

#### **3.3.6.1 Linearity**

G-causality can only provide information on linear properties of signals in its original formulation. Nonlinear extensions are now available, although they are more difficult to apply in practice and their statistical features are less well known.

#### **3.3.6.2 Stationarity**

The use of G-causality presupposes that the signals under consideration are covariance steady.

### **3.3.7 Error Correction Model (ECM)**

ECM is a time series regression method based on the behavioral premise that two or more time series have an equilibrium linkages that governs both short and long-run behavior. James Davidson and David F. Davidson were the first to popularize the ECM in economics.

A short-run method with a mechanism that recovers a variable's long-run relationship from a state of disequilibrium is called Error Correction model. The distance between the value of the variable in the previous period and its value in the long-term equilibrium is connected to the change of the variable in the present time period in a dynamic model. This model is widely

used to evaluate the rate of adjustment to the long-term equilibrium linkage between cointegrated variables in the short run.

ECM defines the linkage among the dependent variable and explanatory variables of the model in short-term while maintaining a long term cointegrating linkages. To explain, regressing the values of y and x captures the long-term linkage between the co-integrated variables. The error terms of this regression are then used, together with other short-run drivers, to adjust for short-run trends, bringing the long-term equilibrium into alignment.

Error correction version of ARDL is given below in equation 3.

$$\begin{aligned}
\Delta UNEMP_t = & \alpha_0 + \sum_{i=1}^r b_i \Delta UNEMP_{t-i} \\
& + \sum_{i=1}^s c_i \Delta INF_{t-i} + \sum_{i=1}^u d_i \Delta GDPPC_{t-i} \\
& + \sum_{i=1}^p e_i \Delta TC_{t-i} + \sum_{i=1}^q f_i \Delta GLOB_{t-i} \\
& + \sum_{i=1}^v g_i \Delta GFCF_{t-i} + \delta_1 UNEMP_{t-1} + \delta_2 INF_{t-1} \\
& + \delta_3 GDPPC_{t-1} + \delta_4 TC_{t-1} + \delta_5 GLOB_{t-1} \\
& + \delta_6 GFCF_{t-1} + \varepsilon_t
\end{aligned} \tag{3}$$

Short-run coefficients have been obtained through ECM method, as shown in equation 4.



## **CHAPTER 4**

### **RESULTS AND DISCUSSION**

Present chapter has been included to show and interpret the results of all techniques which have been applied in the present study. Initially unit root tests were utilized to check the stationary among the all variables of the model. F-bounds test was used to confirm the presence of cointegration in the model. To capture short-term and long-term coefficients of the model, error correction method and ARDL technique were used.

#### **4.1 UNIT ROOT RESULTS**

To assess the stationarity of the series, ADF and Phillips Perron test have been used. Both tests showed similar results. Table 1 presents results of unit root methods. Dependent variable unemployment was found stationary at first difference with 1 percent level of significance. Globalization was the only variable which was stationary at level with 5 percent level of significance while all other independent variables (GDP per capita, Technological change, inflation and gross fixed capital formation) were found stationary at first difference with 1 percent level of significance. Entirely, variables were stationary with mix of level and first difference which provided base to use ARDL method for short run and long run estimates.

**Table 1**  
**ADF and PP Unit Root Tests**

| <b>Variables</b> | <b>ADF Test at Level</b> |                    | <b>ADF Test at 1<sup>st</sup> difference</b> |                    |
|------------------|--------------------------|--------------------|----------------------------------------------|--------------------|
|                  | <b>T-Statistic</b>       | <b>Probability</b> | <b>T-Statistic</b>                           | <b>Probability</b> |
| <b>UNEMP</b>     | 0.094                    | 0.960              | -9.306                                       | 0.000***           |
| <b>INF</b>       | -2.652                   | 0.261              | -6.494                                       | 0.000***           |
| <b>GDPPC</b>     | -1.733                   | 0.717              | -5.732                                       | 0.000***           |
| <b>TC</b>        | -2.785                   | 0.211              | -7.083                                       | 0.000***           |
| <b>GLOB</b>      | -5.249                   | 0.021**            | -6.626                                       | 0.000***           |
| <b>GFCF</b>      | -2.410                   | 0.369              | -5.757                                       | 0.000***           |
| <b>Variables</b> | <b>PP Test at Level</b>  |                    | <b>PP Test at 1<sup>st</sup> difference</b>  |                    |
|                  | <b>T-Statistic</b>       | <b>Probability</b> | <b>T-Statistic</b>                           | <b>Probability</b> |
| <b>UNEMP</b>     | -0.263                   | 0.989              | -9.008                                       | 0.000***           |
| <b>INF</b>       | -2.856                   | 0.186              | -6.494                                       | 0.000***           |
| <b>GDPPC</b>     | -1.841                   | 0.665              | -5.732                                       | 0.000***           |
| <b>TC</b>        | -2.638                   | 0.266              | -8.399                                       | 0.000***           |
| <b>GLOB</b>      | -2.446                   | 0.035**            | -6.614                                       | 0.000***           |
| <b>GFCF</b>      | -2.410                   | 0.369              | -5.738                                       | 0.000***           |

\*, \*\*, \*\*\* significant at 10%, 5% and 1% level respectively

## 4.2 F-BOUNDS TEST

F-Bounds test have been used to check the presence of cointegration in the model. Results conformed the conintegration as F-statistic (4.56) was significance with 2.5 level of significance and outcomes are shown in Table 2.

**Table 2**  
**F-Bounds Test**

| <b>Null Hypothesis: No Levels Relationship</b> |                   |                   |
|------------------------------------------------|-------------------|-------------------|
| <b>Test Statistics</b>                         | <b>Value</b>      | <b>K</b>          |
| <b>F-statistic</b>                             | 4.5633**          | 5                 |
| <b>Critical Value Bounds</b>                   |                   |                   |
| <b>Significance</b>                            | <b>I(0) Bound</b> | <b>I(1) Bound</b> |
| <b>10%</b>                                     | 2.26              | 3.35              |
| <b>5%</b>                                      | 2.62              | 3.79              |
| <b>2.5%</b>                                    | 2.96              | 3.18              |
| <b>1%</b>                                      | 3.41              | 4.68              |

\*, \*\*, \*\*\* significant at 10%, 5% and 1% level respectively

### **4.3 ARDL LONG-RUN COEFFICIENTS**

Long-run ARDL estimates showed that inflation had positive and significance impact on unemployment which negates the presence of Phillips curve in the case of Pakistan. Table 3 shows results of ARDL long run coefficients. Technological change also had positive relationship with unemployment which alerts about utilization of technological advancement and absorption of labor force.

Rest of the independent variables (GDP per capita, globalization and gross fixed capital formation) had negative and significant impact on unemployment.

**Table 3**  
**ARDL Method Results**

| <b>Dependent Variable = UNEMPLOMENT</b> |                     |                       |                     |                    |
|-----------------------------------------|---------------------|-----------------------|---------------------|--------------------|
| <b>Variables</b>                        | <b>Coefficients</b> | <b>Standard Error</b> | <b>t-Statistics</b> | <b>Probability</b> |
| <b>INF</b>                              | 0.4629              | 0.1266                | 3.6563              | 0.0029***          |
| <b>GDPPC</b>                            | -1.1053             | 0.5070                | -2.1801             | 0.0482**           |
| <b>TC</b>                               | 0.8912              | 0.1738                | 5.1271              | 0.0001***          |
| <b>GLOB</b>                             | -0.4215             | 0.1575                | -2.6767             | 0.0165**           |
| <b>GFCF</b>                             | -1.6030             | 0.5183                | -3.0926             | 0.0070***          |
| <b>C</b>                                | 1.7971              | 0.5262                | 3.4147              | 0.0026***          |

\*,\*\*,\*\*\* significant at 10%, 5% and 1% level respectively

#### **4.4 ERROR CORRECTION METHOD**

Short run estimates confirmed the presence of short run equilibrium in the model as value of ECM was -0.69 with 1 percent level of significance which showed 69 percent convergence towards the equilibrium in the short run period as shown in Table 4. R-square value showed that 93 percent variation in the unemployment (dependent variable) was captured by explanatory variables in the model. Durbin-Watson value was 2.02 which confirmed that there was no auto correlation in the model.

**Table 4**  
**ECM Results**

| Variable                  | Coefficient | Std. Error         | t-Statistic | Prob.     |
|---------------------------|-------------|--------------------|-------------|-----------|
| D(UNEMP(-1))              | -0.761828   | 0.296112           | -2.572769   | 0.0278**  |
| D(UNEMP(-2))              | -1.278244   | 0.362723           | -3.524026   | 0.0055*** |
| D(UNEMP(-3))              | -0.571161   | 0.234491           | -2.435746   | 0.0351    |
| D(INF)                    | -0.348427   | 0.257422           | -1.353521   | 0.2057    |
| D(INF)                    | 0.417115    | 0.345216           | 1.208272    | 0.2547    |
| D(INF)                    | 0.810377    | 0.294040           | 2.756011    | 0.0203**  |
| D(INF)                    | -0.606066   | 0.224064           | -2.704879   | 0.0221**  |
| D(GDPPC01)                | 0.005148    | 0.001526           | 3.373908    | 0.0071*** |
| D(GDPPC01(-1))            | -0.010049   | 0.001462           | -6.873216   | 0.0000*** |
| D(GDPPC01(-2))            | 0.001964    | 0.002841           | 0.691160    | 0.5052    |
| D(GDPPC01(-3))            | -0.004332   | 0.002602           | -1.665001   | 0.1269    |
| D(TC)                     | 0.230426    | 0.389387           | 0.591767    | 0.5671    |
| D(TC(-1))                 | 0.122412    | 0.400350           | 0.305763    | 0.7661    |
| D(TC(-2))                 | 1.596350    | 0.413462           | 3.860937    | 0.0032*** |
| D(GLOB)                   | -0.740522   | 2.486342           | -0.297836   | 0.7719    |
| D(GLOB(-1))               | -2.721861   | 3.025412           | -0.899666   | 0.3894    |
| D(GFCF)                   | -1.317931   | 1.324807           | -0.994810   | 0.3433    |
| D(GFCF(-1))               | 6.169382    | 1.481459           | 4.164397    | 0.0019*** |
| D(GFCF(-2))               | 0.124449    | 2.299301           | 0.054125    | 0.9579    |
| D(GFCF(-3))               | 3.863291    | 1.920456           | 2.011653    | 0.0720*   |
| CointEq(-1)               | -0.698941   | 0.144567           | -4.834712   | 0.0007*** |
| R-Squared                 | 0.9330      | Adjusted R-Squared | 0.9253      |           |
| Durbin-Watson Stat 2.0262 |             |                    |             |           |

\*,\*\*,\*\*\* significant at 10%, 5% and 1% level respectively

#### 4.5 GRANGER CAUSALITY TEST

To examine the granger causality relationship among the variables of the model of present study, pairwise granger causality test has been used and results have been presented in the Table 5. Null hypothesis of in the test is that there is no causality relationship between the two variables given in the form

of pair. Probability value presented in the Table 5 confirms the presence or absence of causality linkage between variables. When probability value is equal or less than 5 percent then null hypothesis of “no causality relationship between variables” is rejected and alternative hypothesis of “presence of causality relationship” has been accepted. Sample includes time period from 1980 to 2020 with 2 lag value. Results showed mix of causality relationship (e.g. unidirectional causality, bidirectional causality and no causality). Results showed unidirectional causality between inflation and unemployment, running from inflation to unemployment with 5 percent significance level. Second pair of GDP per capita and unemployment showed unidirectional causality linkage running from GDP per capita to unemployment with 10 percent significance level. Bidirectional causality relationship between technological change and unemployment was found. Causality running from technological change to unemployment with 1 percent significance level and causality running from unemployment to technological change with 5 percent significance level was found. Causality relationship between unemployment and globalization was unidirectional running from globalization to unemployment with 1 percent level of significance. Unidirectional causality between unemployment and gross fixed capital formation, running from gross fixed capital formation to unemployment with 5 percent level of significance was found. Bidirectional causality was present between inflation and GDP per capita with 5 percent level of significance.

Technological change and inflation were also found with bidirectional causality running from technological change to inflation with 1 percent level of significance and running from inflation to technological change with 5 percent level of significance. Unidirectional causality was present between inflation and globalization which was running from globalization to inflation with 1 percent level of significance. Causality running from inflation to gross fixed capital formation with 5 percent level of significance was also present as unidirectional causality. Unidirectional causality was found running from GDP per capita to technological change with 5 percent level of significance. Bidirectional causality between globalization and GDP per capita was found running from globalization to GDP per capita with 1 percent level of significance and running from GDP per capita to globalization with 5 percent significance level. With 5 percent level of significance, bidirectional causality between gross fixed capital formation and GDP per capita formation was found. Unidirectional causality was present running from technological change to globalization with 10 percent significance level and same was present from gross fixed capital formation to technological change. Unidirectional causality was also present running from globalization to gross fixed capital formation with 5 percent significance level.

**Table 5**  
**Pairwise Granger Causality Test**

|                                                       |              |             |             |
|-------------------------------------------------------|--------------|-------------|-------------|
| Sample: 1980 2020                                     |              |             |             |
| Lags: 2                                               |              |             |             |
| Null Hypothesis:<br>No Granger Causality Running From | Observations | F-Statistic | Probability |
| INF to UNEMP                                          | 39           | 4.98250     | 0.0317**    |
| UNEMP to INF                                          |              | 1.09896     | 0.3448      |
| GDPPC to UNEMP                                        | 39           | 3.03793     | 0.0611*     |
| UNEMP to GDPPC                                        |              | 2.24399     | 0.1215      |
| TC to UNEMP                                           | 39           | 10.0712     | 0.0030***   |
| UNEMP to TC                                           |              | 5.64712     | 0.0228**    |
| GLOB to UNEMP                                         | 39           | 11.4234     | 0.0017***   |
| UNEMP to GLOB                                         |              | 0.62947     | 0.5390      |
| GFCF to UNEMP                                         | 39           | 4.19472     | 0.0477**    |
| UNEMP to GFCF                                         |              | 0.49024     | 0.6167      |
| GDPPC to INF                                          | 39           | 4.98250     | 0.0317**    |
| INF to GDPPC                                          |              | 2.84293     | 0.0427**    |
| TC to INF                                             | 39           | 3.45276     | 0.0148***   |
| INF to TC                                             |              | 2.64542     | 0.0437**    |
| GLOB to INF                                           | 39           | 4.34572     | 0.0361**    |
| INF to GLOB                                           |              | 2.70245     | 0.0527***   |
| GFCF to INF                                           | 39           | 0.29415     | 0.7470      |
| INF to GFCF                                           |              | 3.89209     | 0.0215**    |
| TC to GDPPC                                           | 39           | 0.81900     | 0.4494      |
| GDPPC to TC                                           |              | 4.17136     | 0.0240**    |
| GLOB to GDPPC                                         | 39           | 5.43196     | 0.0090***   |
| GDPPC to GLOB                                         |              | 3.62363     | 0.0272**    |
| GFCF to GDPPC                                         | 39           | 5.39231     | 0.0213**    |
| GDPPC to GFCF                                         |              | 4.82694     | 0.0218**    |
| GLOB to TC                                            | 39           | 2.33420     | 0.1122      |
| TC to GLOB                                            |              | 2.63451     | 0.0864*     |
| GFCF to TC                                            | 39           | 3.76487     | 0.0333**    |
| TC to GFCF                                            |              | 0.85929     | 0.4325      |
| GFCF to GLOB                                          | 39           | 0.29863     | 0.7438      |
| GLOB to GFCF                                          |              | 3.51168     | 0.0411**    |

## **CHAPTER 5**

### **CONCLUSION AND POLICY RECOMMENDATIONS**

The present study has investigated the determinants of unemployment in the case of Pakistan. Role of technical change and globalization was considered among key factors of unemployment. Time series data was used obtained from WDI for the time period of 1980-2020. Dependent variable of the study was unemployment rate whereas GDP per capita, Inflation, technological change, inflation, globalization and gross fixed capital formation were explanatory variables. ADF and PP unit root methods have been utilized to assess the stationarity of variables and findings showed that except globalization all other variables were found stationary at first difference while only globalization was found stationary at level. Outcomes of both unit root tests were same and concluded that variables were stationary with mix of level of first difference. F-Bounds test was applied to evaluate the null hypothesis of no level relationship among the variables which showed that calculated F-statistic was higher than lower and upper bound tabulated values with 2.5 percent significance level and therefore null hypothesis was rejected and presence of long term relationship among the variables was confirmed. Calculated value of F-statistic was 4.56 and calculated value of upper bound was 3.18 at 2.5 percent level of significance. ARDL econometric technique was utilized to examine long-run relationship among the variable in the model. Results of the ARDL showed that all independent variables were found as significant factors of unemployment. Impact of inflation was found positive with 1 percent level of significance which postulated the absence of Phillips Curve in Pakistan. Coefficient value of GDP per capita was -1.10 which showed that 1 percent increase in GDP per capita will bring 1.1 percent reduction in unemployment level. This inverse relationship between GDP per capita and unemployment showed favorable contribution of GDP per capita to overcome the issue of unemployment. Technological change showed positive impact on unemployment with 0.89 coefficient value which alerts about need of technical and professional capabilities of people to make them able for efficient contribution in the presence of rapid technological change. Globalization was found significant factor of unemployment with -0.42 coefficient value with 5 percent level of significance. This outcome supported boost in globalization for Pakistan to reduce unemployment. Gross fixed capital formation also exhibited inverse impact on unemployment with 1 percent level of significance which showed that improvement in gross fixed capital formation reduced unemployment in Pakistan. Results of error correction method showed that there was significant association of all



independent variables with unemployment. Value of error correction term was -0.698 with probability value 0.000 which means that speed of adjustment towards the equilibrium in one economic period was 69 percent with 1 percent level of significance. Negative sign of ECT value confirmed the convergence towards the equilibrium. Value of adjusted R-square was 0.92 and absence of autocorrelation was ensured through Durbin-Watson value which was 2.02.

Relying on the outcomes of the study, following policy measures have been recommended. Government should take steps to reduce inflation to reduce unemployment. Furthermore, improvement in professional abilities of labor force are crucial for better employment level in the presence of technological changes. GDP per capita, globalization and gross fixed capital formation should be enhanced to overcome the issue of unemployment in Pakistan.

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# APPENDIX

## KOF Globalization Index

- a)    **Economic Globalization** **36%**  
Factors of Economic Globalization include Real flows, overall trade, FDI, investment, trade barriers and tariffs and taxes on trade.
  
- b)    **Social Globalization** **37%**  
Factors include personal contact data, transfers, foreigners in country, tourism by foreigners, information flows, usage of internet, data on trade of newspaper and books.
  
- c)    **Political Globalization** **27%**  
Number of embassies, membership in international organizations, participation in U.N Security Council and international treaties.