The Impact of Unemployment on Economic Growth in China

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ABSTRACT

Economic growth which is considered as one of the best indicator of measuring the robustness of every economy is essential in understanding its relationship with unemployment which is an important macroeconomic indicator that reflects the incompetence of any economy to make full use of its human resources.

Hence, a macro-economic secondary and time series data was extracted from the World Development Indicator (WDI) for the period of 1991-2018 in China. In conducting the econometric analysis of the study, both the Augmented Dickey-Fuller Test and Phillips Perron Test were employed to test and confirm the stationary level of the variables of study; the Autoregressive Distributed Lagged (ARDL) cointegration and the ARDL Bounds test were employed to test for the short-run and the long-run cointegration of the variables of study since both variable were stationary at first difference I (1).

The finding of the study reveals that there are negative short-run and a long-run relationship between unemployment and economic growth. However, Granger causality Test also reveals that both unemployment and economic growth do not impact each other.

Keywords:

Granger causality, Economic growth, Unemployment rate, Stationarity and Cointegration

INTRODUCTION

This scetion will provide some brief information on the subsection titles of the chapter. It details the background of study, the problem statement, and the objectives of study, the research questions, the significance of the study and, the limitation and the scope of the study.

1.1 Background of the Study

Unemployment is one of the crucial variables to consider in understanding the micro and macro dynamics of most economies and developing strategic plans to stabilizing the economies of most nations in order to enhance economic growth and development. Unemployment is considered as one the worst situation any human society can experience since it affects in different dimensions and directions (Al-Habees & Rumman, 2012).

According to Akutson, Messiah, & Dalhatu (2018), unemployment is a serious predicament confronted by most developed and developing nations which leads to economic and social issues. The economic issues of unemployment is denying the nation of tax revenue in the form of income tax, wastage of productive hours and many others while the social issues of unemployment had to do with depression, lack of self-respect, and other vices such as robbery, prostitution and many others (Adarkwa, Donkor, & Kyei, 2017). More so, Al-Habees & Rumman (2012) also stated that unemployment is a multi-dimensional phenomenon compassing economic and social phenomenon which shows the disparity in economic activity and consequence on the social structure of societies as a social activity.

The nature of unemployment is dependent on the structures of the country and the category of which the country fall under whether it is developed, developing or undeveloped (Soylu, Çakmak, & Okur, 2017). Anghel, Anghelache, & Manole (2017) explain that unemployment as a macroeconomic indicator reveals the ineptitude of a country to utilise its abundant labour

resources. This shows that there are many active people who are readily available, searching and capable of adding to productivity output but cannot get a job to do (Yilmaz, 2005). The International Labour Organisation (ILO) defines unemployment based on three (3) important conditions of which must be meet simultaneously and these conditions are; not working, ready to get employed and searching for a job (ILO, 2019).

Hussmanns, Mehran and Verma (1990, p. 97) postulated that unemployment encompass all individuals who meet the recommended age to engage in economic activities and meets the conditions of without work, that, individuals, are not self-employment or who are not engaged in any job that fetches them income; currently available for work, that is, individuals who are readily available to be engaged any income earn job or employment and; seeking work, that is, individuals who are making an effort to get income-earning job or employment.

The classical theory explains that unemployment is a short term demand and supply of which free market force will automatically deal with it and restore maximum occupation in the economy (Banda, Ngirande, & Hogwe, 2016). The Keynesian theory holds the view that unemployment is normally triggered by insufficiencies in total demand over specific periods within the labour market such that adequate jobs are created to accommodate people who want to work (Keynes, 1936). The Marxist theory also explains that unemployment is as a result of the capitalist system where the means of production are owned by the bourgeoisie and the proletariat are exploited thereof through alienation and that unemployment can be reduced by replacing the capitalism with the socialism (Gyang, Anzaku, & Iyakwari, 2018).

Economic growth is generally defined as a variation in a nation's Gross Domestic Product (GDP) which is analysed as various contributions made by the populace in consonance with national income or capital (Piketty, 2014). According to (Jhingan, 2003), economic growth is the procedure by which the real income per person of a nation rises over an extensive period

of duration, which is determined through the rising in productivity output (goods and services manufactured) in a nation. Economic growth is considered as one of the utmost imperative fiscal tools for plummeting poverty as well as improving the eminence of life (DFID, 2008). Hence, production of much goods and improved services within continues time period serves as the basis of increasing prosperity and reducing the disparity of revenue delivery among people in a broader perspective (Ademola & Badiru, 2016).

The Mercantilists stipulates that core objectives of economic activities of traders and the state and a rise in the gross domestic product are embedded in the accumulation of wealth (McDermott, 1999). Adam Smith also described economic growth as not accumulations of gold but rather from the activities of trade, where parties to the exchange of goods are satisfied with his or her benefit and that market generally regulate themselves without any restrictions which lead to natural equilibrium (Smith, 1776).

However, Al-Habees & Rumman (2012) apprised that fiscal or monetary policy objective of the most economic policy of most nations is to increase economic progress and also improve the quality of life of its publics. Gross Domestic Product (GDP) is one of the important component in calculating economic progress is in consonance with other components such as unemployment rates, public spending, inflation, local and foreign investment and balance of trade which in one way or the other have their own peculiar contribution to economic growth of developed, developing and underdeveloped nations (Boldeanu & Constantinescu, 2005).

The influence of unemployment on economic growth (Gross Domestic Product) has long been a pertinent question in most economies (Quy, 2016). Reducing unemployment and increasing economic growth of a country is one the essential macro-economic issues confronting most developed, developing and underdeveloped nations in contemporary times. The robustness of every strong nation is measured by its economic growth with unemployment as one of the

imperative macroeconomic variables which reveal the ability of a republic to make full use of its labour resources (Soylu, Çakmak, & Okur, 2017; Hobijn, 2010).

A lot of studies have shown the presence of contradictory findings on the relationship that exist among unemployment rate and economic progress rate. This makes it difficult to generalise the findings of such studies and also helps in making a prediction on other economies (Seth, John, & Dalhatu, 2018). Okun's law elucidates two essential empirical relationship between unemployment rate and economic progress rate: periodical variations in the rate of unemployment were linked to periodical variation in the rate of economic progress, and nonconformities in the rate of unemployment were also linked to nonconformities in the rate of economic progress from their apex level (Daly & Hobijn, 2010).

In limiting unemployment, economic growth as a key macro-economic indicator has been acknowledging as a significant variable that can help resolve the menace of unemployment (Al-Habees & Rumman, 2012). The contribution of higher economic growth rate to development of the nation and not to talk of unemployment cannot be undermined but however, it plays a vital role in every economic development. It is a means through which the issues of unemployment can be abridged to help reduce poverty in a country. Progress in the economy offers the podium for emerging businesspersons to be born and on the other hand, serves as a means through which unemployment can be absorbed through the creation of jobs.

1.2 Problem Statement

The most pertinent priority of most developed and developing nations is decreasing level of unemployment through policies plans which seeks to increase the desire in entrepreneurs to create more jobs in order for the nation to realize great economic progress (Al-Habees & Rumman, 2012). Enormously, economic growth and unemployment are among the most significant macro-economic variables and indispensable fundamentals in every strategic economic fiscal and monetary policies of every prosperous economy (Soylu, Çakmak, & Okur, 2017).

Haller (2012) assumes that an upsurge in productivity output affect the rate of unemployment to reduce since an upsurge in the number of services and products manufactured within a nation at a particular duration shows an increase in production will require additional human capital to meet the available production. According to Sato (1964), there is an equal influence in increasing output of production and subsequent influence of increase employment based on the nature of available income and that the situations surrounding the availability of income for production are expressed as the economic growth rate. The equilibrium among growth rates would warrant full occupation for unemployed persons and full utilisation of income stock in the long term.

According to Zhang & Wu, China's achievement of an annual gross domestic product growth of about 10% within the last decade is a massive improvement to the economic development of China compared to other previous decades. They also stated that an influential factor to this achievement is an increased population growth of China, which involuntary creates room for larger human capital stock with diverse professional skills and abilities which is keen to an increase in productivity output of every nation (Zhang & Wu, 2018).

Zhu also described China's transformation from one of the poorest nations in the world to an economic giant has no historical precedents. He asserted that within 1978, China was categorised as one the deprived republics in the world with a real per capita GDP of one-fortieth that of the United States of America and one-tenth of that of Brazil. However, with an improved real per capita GDP of about 8% per annum have transformed China's economy to have a real per capita GDP of one-fifth of the United States of America and at par with Brazil real per capita GDP (Zhu, 2012).

A study by Li and Liu (2012) on the relationship between Chinese unemployment rate, economic progress and inflation after employing an annual data from 1978 to 2010 revealed that there was mutually short term and long term stable equilibrium relationship among unemployment, economic progress and inflation, their study also confirms that economic progress is adversely correlated to the unemployment rate in the absence of external factors. But in the short-run economic growth is positively related to the unemployment rate which violates the Okun's law. The Granger causality test reveals that the presence of only a one-way Granger causation between economic progress and being without a job and that being without a job does not impact economic progress but economic progress rather influence a change in unemployment.

However, there are several investigation studies on the relationship of unemployment and economic progress but there is inconsistency in the findings of these studies which some researchers attributes the inconsistency in the findings to other factors. Moreover, there is a little available literature on unemployment situations in China in spite of China's massive improved economy. Therefore, it is imperative for a study of this nature be carried out in other understand the influence of being without a job on economic development of contemporary China economy which will also add to the available literature.

1.3 Study Objective

Generally, the aim of the study is to determine the impact of unemployment on economic growth in China. More so, the study seeks to specifically;

1. Analyse trends in China's unemployment and economic growth rate.
2. Study the long-run co-integration of China's unemployment and economic growth.
3. Study the short-run co-integration of China's unemployment and economic growth.
4. Examine causal linkages that exist among China's unemployment rate and economic growth rate.

1.4 Questions of this Study

1. What are the trends in China's unemployment and economic growth?
2. What are the long-run co-integration of China's unemployment and economic growth?
3. What are the short-run co-integration of China's unemployment and economic growth?
4. What are the causal linkages that exist among China's unemployment rate and economic growth rate?

1.5 Study Hypotheses

The hypotheses below would be assessed in this study.

H0: There is no long-run co-integration of China's unemployment and economic growth.

H1: There is a long-run co-integration of China's unemployment and economic growth.

H0: There is no short-run co-integration of China's unemployment and economic growth

H1: There is a short-run co-integration of China's unemployment and economic growth

1.7 Significance of this Study

Essentially, the study will contribute towards improving policy decision making by the government and other stakeholders on how unemployment and economic progress are connected in the pursuit to development and improving the standard of living of most Chinese. The findings of this study will also help in determining the sort of relationship that exists between unemployment and economic progress in the short-term and the long-term and its peculiar influence on China's economy. Moreover, it will help the people of China to appreciate the reason the economy of China is experiencing higher economic growth in current times but yet there is a lot of unemployment situation available in the country.

1.8 Scope and Limitations of the Study

Various studies have been conducted on the relationship between unemployment and economic growth within different jurisdiction nonetheless; the findings of such studies seem not to be consistent with others. The reasons for inconsistency in findings of these studies are attributed to the methodology used, the type data used, the country of the study and many others.

Therefore, in this study, a secondary macro-economic secondary data will be extracted from World Development Indicator (WDI) and the data (time series) captured data set form the

duration of 1991 to 2018 which represents twenty-seven (27) period sets. Hence, the scope is limited to these twenty-seven-period sets (1991-2018) which are as a result of insufficient availability of data. This study focused on only unemployment and economic growth and not all other types of macroeconomic indicators. The findings and recommendations of the study may not apply to other economies since the data used is restricted to China only.

1.6 Organization of this study

Chapter one of the studies will present the necessary background of this study, problem statement, the objective of this study, research question, and significance of this study and organization of this study. Chapter two will presents theoretical and empirical works other researchers on the causal linkages between unemployment and growth of various economies. Chapter three will look at the methods that will be used prior to the achievement of the research objectives of this study. Chapter four will at the presentation of data or facts. Chapter five will focus on analysing empirical data or facts. Chapter six will present the discussion and interpretation of findings and finally, chapter seven will look at conclusion implications and recommendation of the study.

LITERATURE REVIEW

2.0 Introduction

This section is keen on reviewing detailed literature which is pertinent to this study and as such, intended to bring out detailed account on the various perspectives and intuition on; trends in China's unemployment and economic growth, the concept of unemployment, various concepts on economic growth, and theoretical of Okun's theory and empirical reviews of other researchers.

2.1 Trends in China's Unemployment

The annual unemployment rate of China is within the range of 3.76% and 4.89% in 2007 and 1991 respectively. This shows that out of 100 people who are actively searching and willing to work to receive some income only 4 to 5 people are unable to secure employment. This really shows that unemployment rate in China which falls in the range of 3.76% to 4.89% is not high but moderate and it really shows how the economy of China is able to contain most of the available human capital or labour force.

Although, there is some linear additional upsurge in the rate of unemployment from 2010 where the unemployment rate was 4.12% to the current year 2018 where the unemployment rate is 4.71%. However, it can be perceived that the linear increase in the unemployment rate in each year from 2010 to date is reasonable.

2.3 Trends in China's Economic growth

China within the last four decade, that is, 1979 to 2017 has transformed its economy from the state is a poor developing nation to a state of being one of the most power developed markets

in the world. The average annual real productivity output of China has grown to an approximate of 10% which according to the World Bank makes them one the faster grown, expanded and sustained economy in the world. This change in transition has cause China to eradicate about 800 million persons out of poverty (Morrison, 2018).

According to the annual time series data available at World Development Indicator, the annual economic growth (GPD) rate of China is within the range of 14.23% and 6.7%which represents the highest rate economic growth (GPD) and the lowest economic growth (GPD) rate respectively form 1991-2018. This shows that from 1991 to 2018, a variation in economic progress (GPD) rate is within the highest 14.23% and lowest at 6.7%.

Though the rate of economic growth (GPD) is changing, in 1992 China had experienced its highest increase in economic growth (GPD) rate with a change of 4.93%. This shows that there was a lot of labour output which led to an increase in production. Nonetheless, between 2003 and 2004 China experience its lowest change of economic growth (GPD) rate with a rate of 0.07%. Which indicate there was little output which led to constant or little addition to 2003 economic growth (GPD).

2.1 The concept of Unemployment

The phenomenon of unemployment has been expounded from diverse viewpoints in the economic literature. The International Labour Organisation (ILO) defines unemployment based on three (3) important conditions of which must be meet simultaneously and these conditions are; not working, ready to get employed and searching for a job (ILO, 2019). Therefore, Hussmanns, Mehran and Verma (1990, p. 97) postulated that unemployment encompass all individuals who meet the recommended age to engage in economic activities and meets the conditions of without work, that, individuals, are not self-employment or who are not engaged in any job that fetches them income; currently available for work, that is,

individuals who are readily available to be engaged any income earn job or employment and; seeking work, that is, individuals who are making an effort to get income-earning job or employment. However, there are exceptions for individuals who are currently not working but will start work within the reference time frame and for individuals who are on an impermanent suspension.

The classical theory apprises that unemployment is a short term condition which free market force will automatically deal with it and restore maximum occupation in the economy but the theory of the Keynesian postulate that unemployment exists because of deficient aggregate demand for labour and that governments should use expansionary fiscal policy to help reduce unemployment in the economy (Banda, Ngirande, & Hogwe, 2016).

In the words of (Brunner & Meltzer, 1978, p. 1), "*Unemployment can be defined as the difference between the amount of employment demanded and supplied at each real wage or as the difference between actual and equilibrium employment. Both definitions are in use currently*". The Marxist theory explains that unemployment is as a result of the capitalist system where the means of production are owned by the bourgeoisie and the proletariat are exploited thereof through alienation and that unemployment can be reduced by replacing the capitalism with the socialism (Gyang, Anzaku, & Iyakwari, 2018). Moreover, the Keynesian hold the view that unemployment is normally triggered by insufficiencies in total demand over specific periods within the labour market such that adequate jobs are created to accommodate people who want to work (Keynes, 1936).

The rate of unemployment within every country is measured by the occurrence of unemployment and it is considered as a percentage by division of the whole of jobless persons by employed persons (Ademola & Badiru, 2016) nevertheless, (Hussmanns, Mehran, &

Verma, 1990) apprise that unemployment rate is determined in relation to the total number of employed personnel and unemployed personnel.

Unemployment has been classified into different types and these are voluntary and involuntary redundancy, frictional and cyclical redundancy, seasonal and technological redundancy, structural and hidden redundancy (Soylu, Çakmak, & Okur, 2017).

2.2 The concept of economic growth

Economic progress is considered as part of the utmost imperative fiscal tools for plummeting poverty as well as improving the eminence of life (DFID, 2008). Economic progress is well-defined as the rise in gross domestic product or real gross per capital and it is, however, influenced directly by labour (employment), natural resources and capital and influenced indirectly by the collective demand, institutions, economic and fiscal policies, efficiency of the government (Boldeanu & Constantinescu, 2005).

According to (Jhingan, 2003), economic growth is the procedure by which the real per capita revenue of a nation rises over a long duration of the interval, and it is determined through the rise in the number of services and products manufactured within a nation. Hence, there is the much goods and improved services within a successive time period which serves as the basis of increasing prosperity through the good level of comfort of the people and reduction in the disparity of revenue delivery in a broader perspective (Ademola & Badiru, 2016).

Gross domestic product which often abstracted as economic development is appreciated as a balanced practice of raising the industrious ability of the individuals and henceforth, of rising general revenue, being categorized by greater rates of rise of per capita productivity and whole factor output, particularly labour output (Seth, John, & Dalhatu, 2018). Economic growth is significant once the degree of development is considerably greater than inhabitants growth

since it has to cause a development in individual wellbeing through creating of job opportunities and hence strong demand for labour, the central and often the only strength of the poor (DFID, 2008).

2.3 Theoretical reviews of Okun's Law

In Arthur Okun's studies on the Potential GNP: Its Measurement and Significance, he apprised that maximum employment is an act of policy goal and that it should be linked to a correspondence target of aggregate demand and production (Okun, 1962).

Okun's Law explains the relationship that exists between the variations in unemployment and the variations in economic (Gross Domestic Product) in order to determine the possible output. The potential output is the highest level of real GDP output at maximum employment and Okun's Law is the measurement of this output in relation to human capital input. He postulated that a GDP raise higher than 3% on middling is required to lower unemployment (Okun, 1962) however, the rate is not constant but rather hinge on the country growth of the employment power and employment output. More so, it states that once unemployment drops by 1%, Gross National Product increases by 3%. Also, Okun apprised that quarterly alterations in the rate of unemployment were connected to quarterly real gross domestic product growth and aberrations of unemployment rate from its non-accelerating inflationary level which is connected to aberrations of gross domestic product from its highest are the two the significant empirical relationship between economic growth and unemployment (Daly & Hobijn, 2010).

According to Noor, Nor and Ghani (2007) there are two (2) approaches that can be employed to develop the Okun's elasticity constant and these are the output- gap technique, which is shown below:

$X_t - X_t^* = b(Z_t - Z_t^*)$ ……………………………… (1)

Zt= actual production, Zt*= possible production, Xt= normal unemployment, Zt*= possible unemployment, b=Okun's constant.

Okun's first difference is the next approach to estimate the Okun's coefficient, which is shown below:

$\Delta X=\alpha-b\ (\Delta Z/Z)$……..….. (2)

An additional alternative is to exam the comparative output to unemployment variations

$(\Delta Z/Z)t=\alpha-b\Delta Xt+\varepsilon t$…….…. (3)

$\log Zt=\alpha-b\log Xt+\varepsilon t$……(4)

Approximation of b will give the Okun's coefficient. This coefficient shows that the relationship between the rate of unemployment and economic progress (GDP) rate is negative.

2.4 Empirical literature

Various empirical studies will be explored to help bring out the relevant information needed in these studies. Numerous scholars have conducted research works to examine the relationship that exists between the rate of unemployment and economic development rate of many jurisdictions. Nonetheless, contradicting findings have been established due to factors such as the jurisdiction of study, the available and source of data for the study, the econometrics technique applied and many others.

In the mid- 20th century, Harrod and Domar made the first research studies on the relationship between unemployment and economic progress (GDP) rate (Quy, 2016). Their studies emphasized on possible dysfunctional aspects of economic growth such as ways in which economic progress could go hand-in-hand with increasing unemployment. Harrod and Domar

studies were grounded on critical issues of equilibrium which boils down to an assessment between the normal growth rate which was dependent on the rise in the human resource and the warranted economic growth rate which is also reliant on the saving and investing behaviours of households and firms (Solow, 1956).

Sato (1964) stated that there is an equal influence in increasing output of production and subsequent influence of increase employment based on the nature of available income and that the situations surrounding the availability of income for production are expressed as the economic growth rate. The equilibrium among growth rates would warrant full occupation for unemployed persons and full utilisation of income stock in the long term. Moreover, Sato (1964, p. 1), apprised that "when the economy deviates slightly from the natural growth rate the consequence would be either growing unemployment or prolonged inflation since the system has no built-in equilibrating force".

However, Solow model introduced new conceptions into the debate of economic growth by discarding the relationship between economic progress and unemployment as peripheral (Quy, 2016). Solow (1956) indicated that production does not occur under the assumption of stationary proportions which at the long run causes dysfunction aspect of economic growth. Nonetheless, Solow accepted all the other assumption stipulated by the Harrod and Domar Model of economic growth except stationary proportions which will lead to dysfunction of economic development in the long-term (Schiliro, 2017). Solow's model, therefore, assumes that gross domestic product (GDP) is produced according to a total production function technology.

Neto and Silva (2013) also explained that there are four (4) main ways of explaining the relationship between unemployment and economic growth. These four (4) ways are; capitalizations effect which demonstrations an adverse correlation between unemployment and

economic growth; creative obliteration outcome which classifies an optimistic relation between development and unemployment; series of saving outcomes which leads an adverse connexion between unemployment and growth; and as a final point, organisation failure outcome which leads to an adverse connexion between unemployment and growth.

Seth, John and Dalhatu (2018) stated that there are no relationships between the rate of unemployment rate economic growth rate in Nigeria in the long-term after employing the ARDL Bound Testing and the Parsimonious Error Correction Model (ECM) of the ARDL Model to test the Data for the period 1986 to 2015. More so, outcomes of the Parsimonious Error Correction Model show that in the short-run, a 1% rise in unemployment leads to a 20.6% rise in economic growth (real gross domestic product).

Gyang, Anzaku and Iyakwari (2018) used Augmented Dickey-Fuller Test (ADF) to examine the stationary properties of unemployment, inflation and economic growth (real gross domestic product) in Nigeria of the periods 1986 to 2015 and also used Johansen Co-integration Test as well as Granger Causality Tests to check for cointegration in the long-term and short-term and also test for the causality between the rate of unemployment, inflation rate and economic progress respectively. However, the findings showed that there is a short-term and long-term relationship between the rate of unemployment, inflation rate and economic progress rate and also the findings of the Graner Causality Test also show that unemployment and Inflation were not statistically substantial in explaining progress rate in the nation for the periods under review.

Kreishan (2011) also conducted a study on the connexion between unemployment and economic growth in Jordan by the application of Okun's law Approach by analysing the yearly time series data for the duration of 1970 to 2008. The answers of the studies show that economic progress does not influence unemployment and that there is no connexion between economic

growth and unemployment in Jordan and more so, the Okun's law which stipulates that there is an adverse connexion between economic progress and unemployment does not hold in Jordan.

Levine (2013) apprised that the relationship that exists between economic development rate and the rate of unemployment might be a loose in the short-term because it is not rare for the rate of unemployment to demonstrate a sustainable deterioration which sometimes after other bold measures of economic policy plans have yielded a positive results and this is usually mentioned to be a lagging economic pointer. However, the finding of the studies shows that there is an adverse link between unemployment and economic progress in the long-term because so long as development in the real gross domestic product (GDP) surpasses development in employee productivity, service will upsurge. This will cause a vacancy within the production sector and this will eventually reduce unemployment in the long-run.

Özel, Sezgin, & Topkaya (2013) conducted a study to investigate the fiscal growth, productivity and unemployment data for seven industrial nations (G7) from the year 2000 to 2011. The findings of the studies revealed that there is a strong significant negative relationship between economic development and unemployment within the period 2000-2007 which is marked the pre-crisis period. More so, the finding of the studies also revealed that there is an insignificant and loosed adverse relationship between unemployment rate and economic development rate within the period of 2008-2011 which marked the post-crisis period.

Soylu, Cakmak and Okur (2017) applied Panel Unit Root, Pooled Panel OLS and Panel Johansen Co-integration test to examine the relationship between economic progress and unemployment in Eastern European Countries for the period of 1992-2014 within panel data framework. The findings of the studies revealed that unemployment and economic growths were stationary at first level. However, the findings of studies also revealed the presence of an

adverse long-term cointegration between unemployment and economic progress. More so, economic progress positively causes a change in unemployment which means an upsurge in economic progress will eventually lead to a drop in unemployment.

Studies by Birchenall (2002) on development and unemployment (without market resistances) also indicated that an increase in economic development by the substitution of opportunity cost of capital which will eventually affect unemployment positively because labour or human resource will still be part of the substituted opportunity cost of means of production and this will lead to greater unemployment of the unskilled workers.

Accordingly, Parrello (2010) also apprised that there is a progressive relationship between unemployment and economic development and that the efficacy of any policy on labour market designed at enhancing the performance of the labour market, significantly hinges on how individuals mark-down future income. Likewise, Adomola and Badiru (2016) explained that there is a progressive relationship between unemployment, inflation and economic progress rate after using OLS and Diagnostic to analyse the connexion between unemployment, inflation and economic progress.

Banda, Ngirande and Hogwe (2016) also analysed the effect of economic development on unemployment of South Africa by employing a periodical time series data for the year 1994-2012. Their studies showed the existence of a positive long-run relationship between unemployment and economic development after using Johnsons' Cointegration and Vector Error Correction Model. This means an increase in unemployment in the long-term will also reflect growth in economic progress. More so, Enejoh and Tsauni (2017) also asserted that there is a positive relationship among unemployment and growth rate in both the short-term and long-term. The finding also reveals that unemployment causes a change in economic growth but economic growth do not cause a change in unemployment.

Contrariwise, a study by Li and Liu (2012) on the link between Chinese the rate of unemployment, economic development and inflation after employing an annual data from 1978 to 2010 revealed that there was both short-term and long-term stable equilibrium relationship among unemployment, economic progress and inflation, their study also confirms that economic progress is adversely related to unemployment rate in the absence of external factors. But in the short-term economic growth is positively related to unemployment rate which violates the Okun's law. The Granger causality test reveals that the presence of only one-way Granger causality between economic growth and unemployment rate and that unemployment does not impact economic progress but economic progress rather influence a change in unemployment.

Furthermore, Karabulut and Gokhan (2010) examined the relationship between gross domestic product and unemployment: evidence from MENA Countries. They admitted the presence of long-term connexion among gross domestic product growth and unemployment but further apprised that the relationship between gross domestic product growth (economic growth) and the rate of unemployment is an adverse relationship which means a rise in gross domestic product growth (economic growth) means a decrease in unemployment rate in chosen MENA countries (Turkey, Egypt, Isra3el, and Jordan).

Abdul-Khaliq, Soufan, & Shihab (2014) studied the relationship between the rate of unemployment and GDP growth in Arab countries for the duration of 1994 to 2010. They used a unit root test approach and Pooled EGLS (Cross-section SUR) to test for the stationary level of the variables of the study. The findings of their studies showed that economic development has an adverse and significant relationship with the rate of unemployment which affirms Okun's Law which states that an upsurge in economic growth leads to a reduction in the rate

of unemployment in the long-run and a reduction in economic development rate will lead to a rise in the rate of unemployment.

Hua-chu (2008) conducted an empirical study on analysis of the relationship between economic progress and the rate of unemployment in Guangdong from 1978 to 2016. The findings of his studies revealed that there is a long-run stable relationship between the rate of unemployment and economic progress and that a 1% upsurge in economic progress leads to 0.22% upsurge in the rate of unemployment. More so, economic progress granger causes the rate of unemployment whiles the rate of unemployment also granger cause economic progress which means the rate of unemployment can cause a change in economic progress and economic growth can also cause a change in the rate of unemployment.

Mosikari (2013) made a study on the effect of the rate of unemployment on the gross domestic product in South African by using a yearly time series of the duration of 1980 to 2011. He applied Augmented Dickey-Fuller (ADF) stationarity test and Phillip-Perron tests to check and confirm the stationarity of the variables of the study. He then used Johansen Co-integration to test the long-term relationship between the rate of unemployment and economic progress (gross domestic product) since all the variable of the study were stationary at levels and also applied Granger Causality test to the causal connexion between the rate of unemployment and economic progress. The results of his studies showed that there is long-term relationship between the rate of unemployment and economic progress and also the results of the studies also showed that economic progress and the rate of unemployment does not cause a change each other after applying Granger causality test.

Göçer & Erdal (2015) used a panel data analysis method to study the connexion between the rate of youth unemployment and economic progress of eighteen (18) Europen countries for the period of 1996-2012 in the perspective of Okun law. They employed Panel Unit Root Test to

check whether the data for the variables of the study were stationary and Panel Co-integration Test to check the long-term connexion between the rate of youth unemployment and economic progress. The findings of the study showed the variables of the study were not stationary at level but became stationary at first difference and also the results of the study also showed that there is a negative long-term connexion between the rate of youth unemployment and economic progress. This means that an upsurge in economic progress will show a reduction in youth unemployment.

Misini and Badivuku-Pantina (2017) used a simple linear regression to analyse the relationship between nominal gross domestic product (economic growth) and the rate of unemployment. The findings of their studies revealed a negative relationship exists between nominal gross domestic product (economic growth) and unemployment.

Noor, Nor and Ghani (2007) conducted a study on relationship among output and unemployment in the Malaysian economy; does Okun's Law exist? They used Augmented Dickey-Fuller (ADF) stationarity test and Phillip-Perron tests to test and confirm the stationarity of unemployment and gross domestic product. The findings of the studies showed that both output and unemployment of study were not stationary at level but became stationary at first difference. More so, the regression results also showed that there is a negative long-term connexion between the rate of unemployment and gross domestic product (economic growth) and also the rate of unemployment and the gross domestic product had a two-way causality link after applying Granger Causality Test. This means the rate of unemployment causes a variation in gross domestic product and also gross domestic product also causes a change in the rate of unemployment.

Also, Imran, Mughal, Salman and Makarevic (2015) investigated the relationship between unemployment and fiscal growth of 12 selected Asian nations for the duration of 1982 to 2011.

The findings of their studies show that there is a significant adverse relationship between unemployment and fiscal growth after applying the fixed effect and Pooled OLS techniques. Which means an upsurge in unemployment leads a reduction fiscal growth rate.

Makaringe & Khobai (2018) investigated the trends and effect of unemployment on fiscal growth in South Africa using periodical data over the period 1994 first quarter to 2016 fourth quarter. They used Augmented Dickey-Fuller (ADF) stationarity test and Phillip-Perron tests to test and confirm the stationarity of the variables of the study. The outcomes of the test revealed that the variables of the study were not stationary at level but became stationary at first difference. They also used ARDL model to test the presence of short-term and long-term association between unemployment on fiscal growth of which the result of the test showed that there is an adverse short-term and long-term association among the variables of the study. The findings of the study confirm Okun's Law which states that there is an inverse relationship among unemployment and fiscal growth.

Dritsakis & Stamatiou (2016) conduct research on investigating the relationship among unemployment rate, fiscal growth and inflation rate in Greece, using annual data covering the duration of 1995 to 2015. They employed Augmented Dickey-Fuller (ADF) Test, Phillip-Perron Tests and Dickey-Fuller Test to check the stationarity of the variables of the studies and the findings of tests revealed that unemployment rate, fiscal growth and inflation rate were stationary. They further employed Auto-Regressive Distributed Lag Test to test for long-term and short-term co-integration among unemployment rate, fiscal growth and inflation rate and Vector Error Correction Model to check the direction of the causation among unemployment rate, fiscal progress and inflation rate. The results of the test revealed that there is a negative relationship between unemployment and fiscal growth in both short-term and long-term. Moreover, in the short-term unemployment cause a change in fiscal growth whiles fiscal

growth does not cause a variation in the rate of unemployment but within the long-term unemployment and fiscal growth causes a change in each other.

Lam (2014) conducted a study on the applicability of Okun's connexion concerning unemployment and GDP Growth in the Philippines: A Time Series Approach. He used Dickey-Fuller Test and Phillips Perron Test to check the stationarity of the time series data and the results of the test showed that fiscal growth was stationary at level but unemployment was not stationary at level but became stationary at first difference. He then used the Engle-Granger Test and Johansen Co-integration Test to test for a long-term relationship among the variables of the study and the outcomes of both test disclosed that unemployment and fiscal growth are co-integrated. They also used Granger Causality Test to check the direction of causation between the rate of unemployment and GDP Growth and the outcomes of the test indicated that unemployment causes a change in fiscal growth whiles fiscal growth does not cause any change in unemployment. Therefore, the findings of the studies were consistent with Okun's Law.

2.5 Conclusion

The above-reviewed works show contradicting findings on the relationship between the rate of unemployment on fiscal growth rate. Theoretical studies by Okun assert that he is an inverse relationship between unemployment and fiscal growth whiles other empirical studies affirms Okun's law only in the short-term or only in the long-term or even in both the short-term and the long-term.

Nevertheless, some other empirical findings also discard Okun's law because the outcomes of their studies showed a positive relationship between unemployment and fiscal growth in either the short-term or in the long-term or even in both the short-term and the long-term. More so,

other studies endorse the presence no relationship between unemployment and fiscal growth in either the short-term or long-term or even in both the short-term and the long-term.

METHODOLOGY

3.1 Introduction

This section outline the detailed steps of the various research approaches to be used in helping to achieve the research objectives of this study. This includes five sections which are the Data Source, Measurement of Variables, Model specification, and the Estimation strategy.

3.2 Data Source

The study employed secondary macro-economic data that was downloaded from the World Development Indicator for the period 1991-2018. The data of the study was a time series data where its observations were based on multiple variables over some period of time and were arranged in sequential order. The main variables under study are two variable which is economic growth proxy by GDP growth (annual %) and Unemployment proxy by Unemployment, total (% of the total labour force). Nevertheless, the sample of the study was based on the availability of the data set and the importance of the chosen variables and how they affect each other.

3.3 Measurement of the variables of this study

The variables used in this study were measured as; economic growth was proxy by annual Gross Domestic Product which is the quantity of economic output that accounts for the effects

of inflation or deflation. The rate of Real GDP is how much real GDP grows from one period to the next. Thus, the rate of Real GDP is calculated as follows;

$$\text{Real GDP} = \frac{\text{Current Real GDP - Previous Real GDP}}{\text{Previous Real GDP}} \text{ X 100} \ldots\ldots\ldots\ldots\ldots \text{ (1)}$$

Whilst, the Unemployment rate proxy by Unemployment, total (% of the total labour force) is the percentage of unemployed persons in the total labour force. The rate of unemployment is the number of persons searching for a job divided by the total labour force. Thus, the unemployment rate is calculated as follows;

$$\text{Real GDP} = \frac{\text{Number of Unemployed Persons}}{\text{Labour Force}} \text{ X 100} \ldots\ldots\ldots\ldots\ldots\ldots\text{(2)}$$

3.4 Model Specification

Okun law, which explains the link between unemployment and economic growth, was used as a theoretical basis. The classical theory explains that unemployment is a short term condition which free market force will automatically deal with it and restore maximum occupation in the economy (Banda, Ngirande, & Hogwe, 2016) whiles the Keynesian hold the view that unemployment is normally triggered by insufficiencies in total demand over specific periods within the labour market such that adequate jobs are created to accommodate people who want to work (Keynes, 1936). The Marxist theory also explains that unemployment is as a result of the capitalist system where the means of production are owned by the bourgeoisie and the proletariat are exploited thereof through alienation and that unemployment can be reduced by replacing the capitalism with the socialism (Gyang, Anzaku, & Iyakwari, 2018).

The study, therefore, adopted Okun's (1962) model presented by Ademola and Badiru (2016) which integrated economic growth proxy by Annual Gross Domestic Product as the independent variable and Unemployment rate proxy by Unemployment, total (% of the total labour force) as the dependent variable. The model is specified as:

$Y=\beta 0+\beta 1Ut+\varepsilon t$ …… *(3)*

Hence; *Y* denotes the unemployment rate, *U* denotes the economic growth.

Modification to model (3) is as follows:

$Unempl=\beta 1+\beta 2\ Rgdp+\varepsilon t$ …… (4)

Hence; *Rgdp* denotes the rate of GDP growth (independent variable),

Unempl denotes unemployment rate (dependent variable),

$\beta 1$ – Parameters and

εt - Error term (white noise)

Therefore equation (2) will be log-linearized in order to critically transform it to estimable form:

$lnUnempl=\beta 1+\beta 2lnRgdp+\varepsilon t$ …… (5)

The apriori expectations are as follows: $\beta 1<0$ *(i.e. $\beta 1$ is non-negative value)*

3.5 Estimation strategy

This section talks about the estimation strategies employed in analysing the data (time series) that were extracted for the study. The examination of the data was based on three important steps which were; stationarity test; short-run and long-run Test; and Granger causality test. Firstly, the stationarity test was conducted to make sure all the variables were stationary I(0)

or at first difference I(1). Secondary, cointegration test was conducted to test the long-run co-integration among the variables of the study and further proceed to test for short-run relationship between the variables and finally, the Granger causality test was conducted to explain the causal relationship between the variables of the study or causal direction among the variables of the study.

3.5.1 Unit Root Test

The unit root test is the principal stage in the estimation procedure. It was carried out on the variables (Unemployment and Economic growth) employed in the study to test if the study variables are stationary at levels I(0) or stationary at first difference I(1) since there will be spurious regression results if a non-stationary series data is regressed on another non-stationary data (Gujaraty, 2004).

The major principle underlying the time series is the stationary levels of the data in question. Since the data (time series) was adopted to evaluate the relationship between variables for future prediction and analysis, it was, therefore, expedient to check whether the velocity (fluctuation) was constant over a long-run, check whether the variance and co-variance were invariant (stay constant) over time.

Hence, the study used both Augmented Dickey-Fuller (ADF) unit root test by Dickey and Fuller (1979) and the Phillips-Perron (PP) unit root test by Phillips-Perron (1988) to test and confirm the stationarity of the variables (Unemployment and Economic growth) at levels and at first levels. Both the Augmented Dickey-Fuller (ADF) unit root test and the Phillips-Perron (PP) unit root test would test the alternative hypothesis against the null hypothesis to check whether the data (time series) employed were non-stationary. Accepting or rejecting the null

hypothesis depends on the t-test of the lags and the t-statistics. If the t-test of the lags is a lesser amount of than the critical point the null hypothesis of a presence of unit root is accepted.

3.5.2 The Autoregressive Distributed Lagged (ARDL) cointegration framework

Cointegration is the second stage of the estimation procedure. It was executed out to explain the long-term relationship between variables of this study (the rate of Unemployment and Economic growth rate). Series of literature in the field of economics has employed the Johansen cointegration approach in estimating the long-run relationship of variables. Most researchers have argued that this is the best when it comes to dealing with I(1) variables. On the other hand, researches by earlier scholars introduced Autoregressive Distributed Lags (ARDL) which has become an alternative in attempting cointegration issue. These scholars believe that the ARDL approach has so many benefits that outweigh the benefit of the Johansen co-integration.

However, this study employed a cointegration method acknowledged as the "Autoregressive Distributed Lag (ARDL) bound test. The reasons for employing the ARDL bound test are; The ARDL cointegration procedure is comparatively more efficient when the size of the data of the study is small. This study data of study covers the period of 1991to 2018 inclusive. Thus, the whole data set for the study is 27 which are quite good considering the scope and nature of the study; and also, the ARDL model will enable the ordinary least square (OLS) technique to estimate the cointegration once the lag of the model is identified. This makes the ARDL approach very the best model in this case and;

Finally, the ARDL method does not need the pretesting of the variables of the study involved in the method for unit roots as compared to other methods such as the Johansen approach. It is expedient to apply the Johansen technique when the variables of the study are stationary at levels I(0) but when all variables are stationary at first difference I(1) or the variables are at a

combination of stationary at the level I(0) and stationary at first difference I(1), the ARDL model is the best.

ARDL model uses just two steps in its estimation. Firstly, the F-test is employed to decide the incidence of long-term relationship between variables under study. Secondary, we approximate the short run error correction model.

3.5.3 ARDL Bounds test

This test was done following two main procedures. The first procedure was to estimate the ARDL equation by using the ordinary least squares estimator in other to check if there exists a long-term relationship among the variables of the study. The F-test is then conducted for the combined significance with respect to the elasticity constants of variables at their lagged state.

We check the null hypothesis in contradiction of the alternative hypothesis as follows:

$$H_{0=}\ \delta o$$

$$H_1 \neq \delta_0$$

The critical values give rise to the test for cointegration when the variables of the studies are stationary at levels I(0) or stationary at first difference I(1). There is an assumption on the lower bound value in that the order of combination of the explanatory variable is zero, or I(0) with the order of integration of the upper bound being one, I(1). The following interpretation is given;

1) When the F calculated is more than the higher bound, we conclude that there is co-integration between the two variables of the study. Then, we discard the null hypothesis of no relationship between the variables of the studies.

2) When the F calculated drops lower than the lesser bound figure, then we cannot discard the null hypothesis of no relationship among the variables of the studies.
3) When the F calculated falls between the two bounds that are lower and upper bound, there is no conclusive decision whether the variables of the studies are cointegrated or not.

Imperatively, we have to proceed with the bound test, we impose a restriction on the ARDL to approximate the long-term relationship between the dependent and independent variables of the studies.

3.5.4 Test for Causality

Test for causality is the final stage of the estimation procedure. It was carried out to inspect the causal relationship between the two variables (the rate of unemployment and economic growth rate). The studies employed Engle & Granger (1989), Granger causality test to know causal relationship among the two variables of the study, whether one variable directly causes the other variable or none of the variables has an influence on the other.

PRESENTATION OF DATA

4.1 Introduction

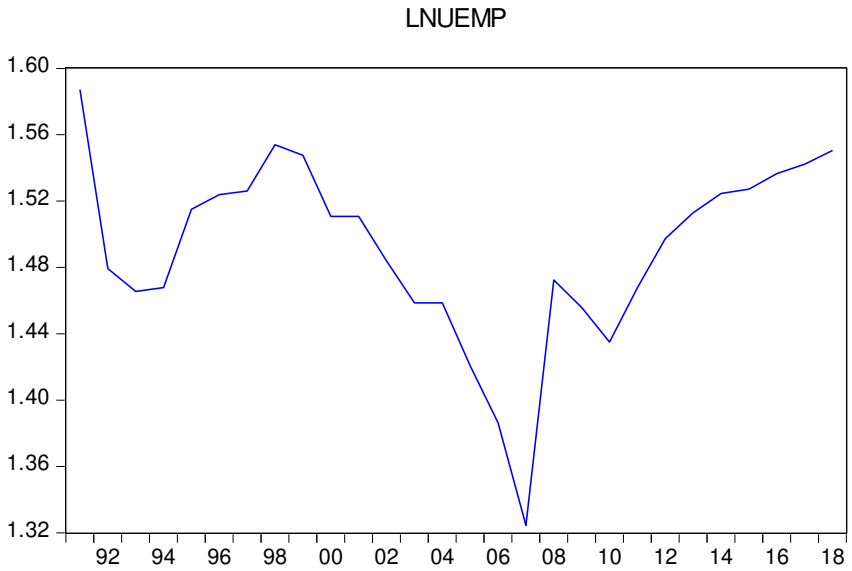
The data results of the studies are presented in this chapter. It is classified into two (2) section and these are graphs and tables. Moreover, all the graphs and tables were generated form EViews 9.

4.2 Graphs for the data of Study

The data of the study was presented in a diagram (graph) displaying the behaviour of the two variables (economic growth and unemployment) of the study.

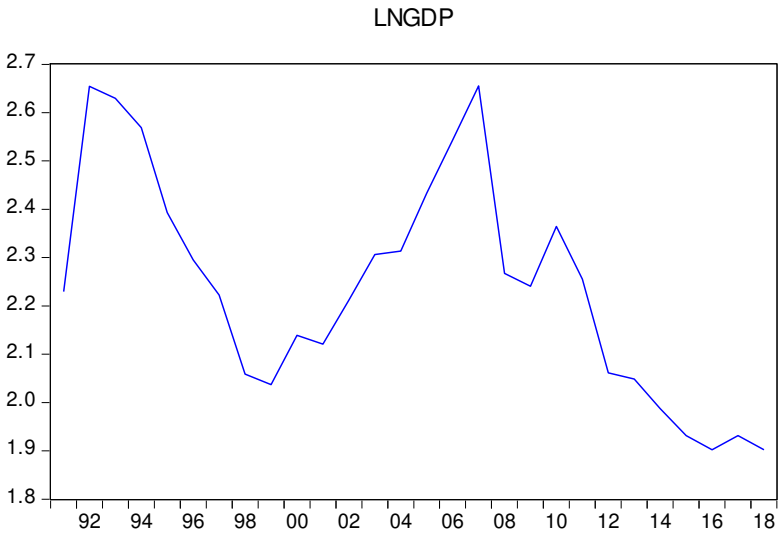
4.2.1 Unemployment rate Graph

The graph below shows the various changes in unemployment in China from 1991 to 2018.



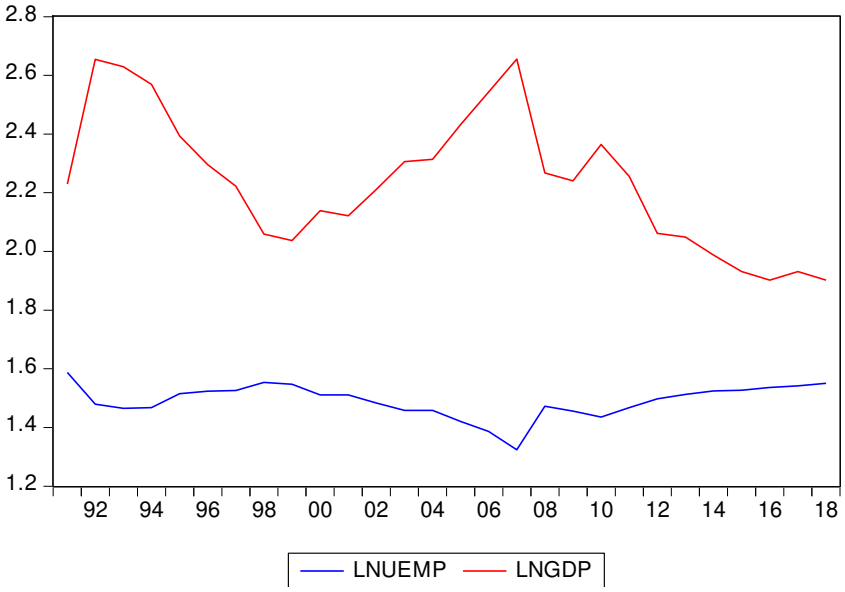
4.2.2 Economic Growth Rate (GDP) Graph

The graph below shows the various changes in economic growth (GDP) of China from 1991 to 2018.



4.2.3 Combined trend of the Unemployment rate and Economic Growth Rate (GDP)

The graph below shows the relationship between unemployment rate and economic growth rate of China from 1991 to 2018.



4.3 Tables for the findings of the Study

The tables below presented the results of the Unit Roots Test, the Bound Test, the Long Run test, the Short Run test and the Granger Causality test of the data for the two variables (economic growth and unemployment) of study.

4.3.1 Unit Roots Test results

The table below displays the Unit roots Test of unemployment rate and economic growth rate data of the study by using both Augmented Dickey-Fuller (ADF) test and Phillips-Perron Test to check and confirm the stationary levels of the variables of the studies at the level I(0) or at the first difference I(1).

Table 4.1 below shows the outcomes obtained for the Stationary levels of variables.

Variables	**Level**		**First Difference**	
	ADF	**PP**	**ADF**	**PP**
	Constant	**constant**	**constant**	**constant**
Inuemp	0.512		0.512	0.003***
0.003***				
Ingdp	0.354	0.354	0.028***	0.028***

*We test the null hypothesis of the series being non-stationary or have a unit root against the alternative hypothesis of the existence of stationarity. Mackinnon (1996) critical values was used in rejecting the null hypothesis by both ADF and PP test, ***, **,* signifies the rejection of the null hypothesis of the existence of a unit root at 1%, 5%, and 10% significance levels respectively.*

4.3.2 Bound Test Results

The table below presents the outcomes of the bound test and indicated where the calculated F-statistic fall at 95% and 90% significance.

Table 4.2 results of bounds test

Checking for the presence of a long run co-integration between the variables in the ARDL

K	95% lower bound	95% upper bound	90% lower bound	90% upper bound
1	4.49	5.73	4.04	4.78

Model	Calculated F-statistics	Inference
Ingd(Inuemp)	6.499611**	Cointegration

4.3.3 Long Run Test Results

The table below displays the estimated long-run relationship between economic growth (GDP) and unemployment data of the study by using the Autoregressive Distributed Lagged (ARDL) Cointegration.

Table 4.3 Estimated long run unemp model

Dependent variable: Inuemp		
Regressors	**Autoregressive Distributed Lag Model**	
	Long run Elasticity	**t-statistics**
Ingdp	-0.320	(-3.878) **
C	2.173	(12.045)

****, **, * denotes significance level at 1%, 5% and 10% respectively. Values in parenthesis are t-statistics. ARDL (1,4) was based on the Schwarz Bayesian criterion*

4.3.4 The Short Run Test

The table below displays the estimated short-run relationship between economic growth (GDP) and unemployment data of the study by using the Autoregressive Distributed Lagged (ARDL) Cointegration.

Table 4.4 Estimated short run error correction model using the ARDL Approach

Dependent variable: Inuemp		
Regressors	**Autoregressive Distributed Lag Model**	
	Long run Elasticity	**t-statistics**
Ingdp	-0.333	(-16.640) ***
C	0.484	(3.167)

****, **, * denotes significance level at 1%, 5% and 10% respectively. Values in parenthesis are t-statistics. ARDL (1,4) was based on the Swchwarz Bayesian criterion*

4.3.5 The Granger Causality Test

The table below displays the results of the causal relationship between the two variables (economic growth and unemployment) from the data of the study by using Granger Causality Test.

Table 4.5: Results of the Granger causality test

Null hypothesis	**F-statistics**	**Prob.**
lnuemp does not Granger cause lngdp	1.17741	0.3460
lngdp does not Granger cause lnuemp	1.81217	0.1811

ANALYSIS OF DATA

5.1 Introduction

The analysis of data of the studies is presented in this section. It is divided into subsection section which outlined the statistical trends of the variables of the studies, the unit root test, the cointegration bound test, the long run and the short run ARDL error correction models and the Granger causality.

5.2 Unemployment trend in China

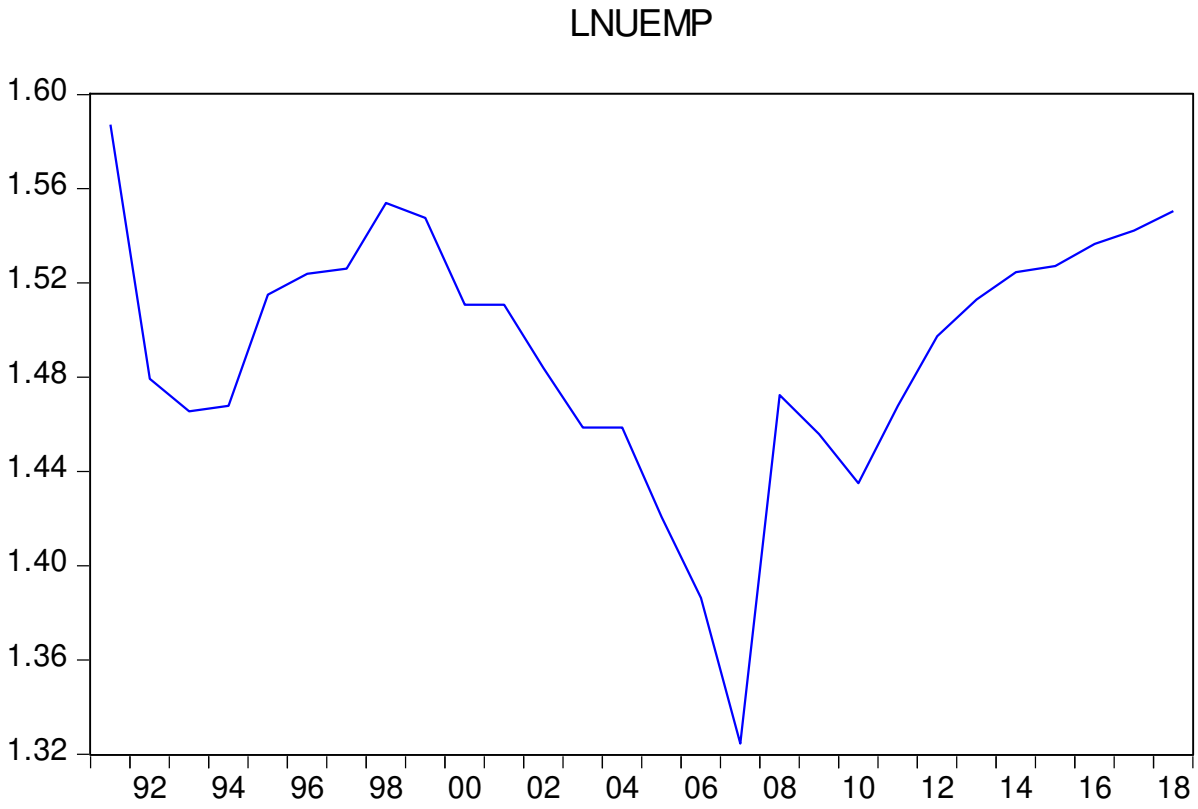
The annual unemployment rate of China is within the range of 3.76% and 4.89% in 2007 and 1991 respectively. This shows that out of 100 people who are actively searching and willing to work to receive some income only 4 to 5 people are unable to secure employment. This really shows that unemployment rate in China which falls in the range of 3.76% to 4.89% is not high but moderate and it really shows how the economy of China is able to contain most of the available human capital or labour force.

Although, there is some linear additional upsurge in the rate of unemployment from 2010 where the unemployment rate was 4.12% to the current year 2018 where the unemployment

rate is 4.71%. However, it can be perceived that the linear increase in the unemployment rate in each year from 2010 to date is reasonable.

The trend of the unemployment rate in China from 1991-2018 is interesting because of its instability shown in the graph below. There were many different rates of changes in the unemployment rate for a period of 27 years. From the graph below, China experienced its highest unemployment rate in 1991 with an unemployment rate of 4.89% thus among 100 active people who were willing and searching for a place to work in 199, it was only 5 of them who couldn't get employment or job to do.

The rate of unemployment begun to decrease from 1992 with a rate of 4.39% to 1994 with 4.34% where it then begun to rises again from 1995 with 4.55% to 1999 with 4.7%. In 2000, the rate began to decrease with rate of 4.53% which 0.17% decrease from 1999 rate of 4.7% until the unemployment fall to Chinas' lowest unemployment rate of 3.76% thus only 4 out 100 people who are active and willing to work didn't get employed. From 2010 the unemployment rate of China has continued to rise from a rate of 4.2% to 4.7% which is its current unemployment rate. Thus currently, 5 out of 100 people who are active and willing to work didn't get employed.



5.3 Economic growth trend in China

China within the last four decade, that is, 1979 to 2017 has transformed its economy from the state is a poor developing nation to a state of being one of the most power developed markets in the world. The average annual real productivity output of China has grown to an approximate of 10% which according to the World Bank makes them one the faster grown, expanded and sustained economy in the world. This change in transition has cause China to eradicate about 800 million persons out of poverty (Morrison, 2018).

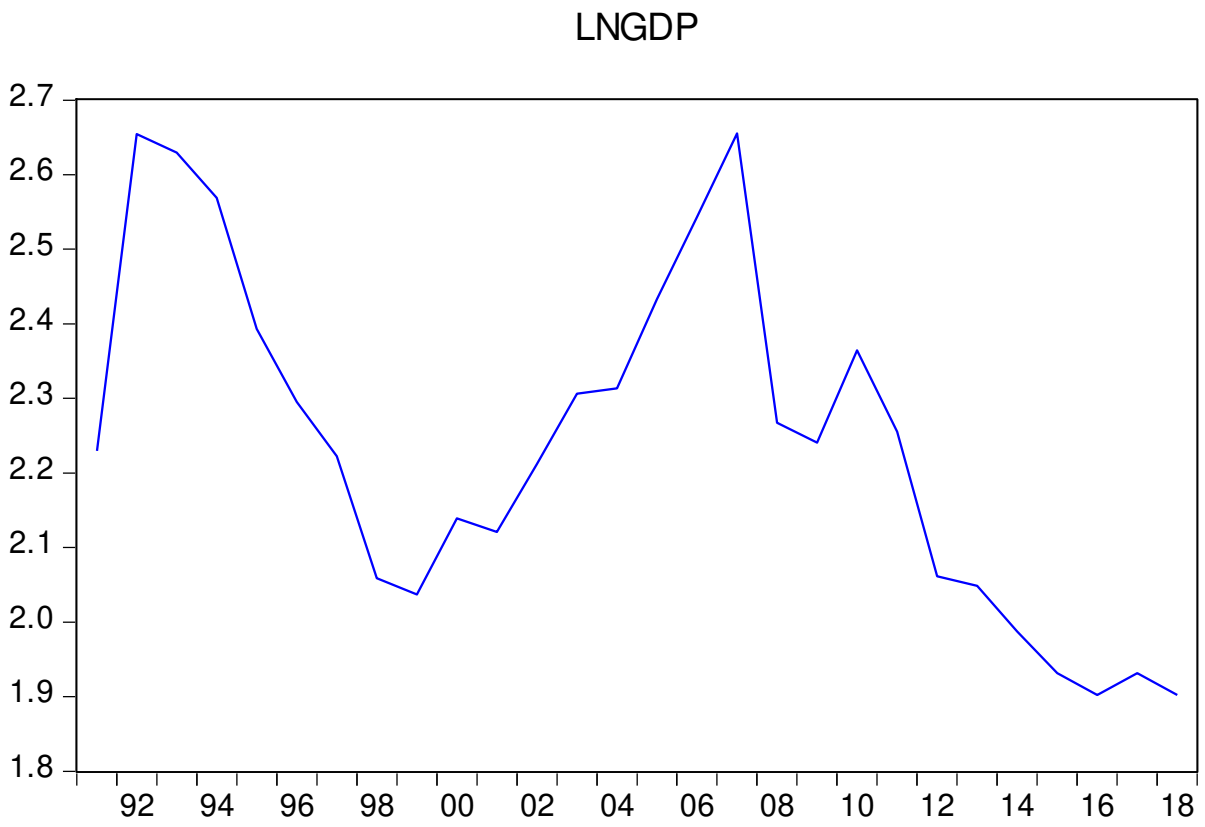
According to the annual time series data available at World Development Indicator, the annual economic growth (GPD) rate of China is within the range of 14.23% and 6.7%which represents

the highest rate economic growth (GPD) and the lowest economic growth (GPD) rate respectively form 1991-2018. This shows that from 1991 to 2018, a variation in economic progress (GPD) rate is within the highest 14.23% and lowest at 6.7%.

Though the rate of economic growth (GPD) is changing, in 1992 China had experienced its highest increase in economic growth (GPD) rate with a change of 4.93%. This shows that there was a lot of labour output which led to an increase in production. Nonetheless, between 2003 and 2004 China experience its lowest change of economic growth (GPD) rate with a rate of 0.07%. Which indicate there was little output which led to constant or little addition to 2003 economic growth (GPD).

The trend of economic growth (GDP) rate in China from 1991-2018 is fascinating because of its unpredictability shown in the graph below. There were many dissimilar rates of changes in the economic growth rate (GDP) the period of 27 years. From the graph below, in 1991 China experienced 9.3% economic growth (GDP) rate and then the economic growth (GDP) increase to 14.22% in 1992 which represent 4.92% which indicate China highest increase of economic growth (GDP) rate up to date but represent the second highest economic growth (GDP) rate.

Economic growth (GDP) begun to continuously decrease from 1993 with the rate of 13.86% to 2001with rate of 8.34% and then begun to gain some strength from 2002 with the rate of 9.13% to 2007 with the rate of 14.23 which is the highest economic growth (GDP) rate up to date. Since 2007, economic growth (GDP) has diminished from 2008 with a rate of 9.65% which represent the highest decline in economic growth (GDP) rate up to date.



5.4 Analysis of the Unit Root Test

In other to estimate non-spurious regression results, I first estimated the stationarity of the variables by employing the Augmented Dickey-Fuller (ADF) and the Phillips and Perron (PP) unit root test and the following results were obtained.

Table 4.1 below shows the results obtained for the Stationarity of variables.

variables	**Level**	**First Difference**

	ADF	PP	ADF	PP
	Constant	Constant	Constant	Constant
Inuemp	0.512	0.512	0.003***	0.003***
Ingdp	0.354	0.354	0.028***	0.028***

*We test the null hypothesis of the series being non-stationary or has a unit root against the alternative hypothesis of the existence of stationarity. Mackinnon (1996) critical values was used in rejecting the null hypothesis by both ADF and PP test, ***,**,* signifies the rejection of the null hypothesis of the existence of a unit root at 1%,5%, and 10% significance levels respectively.*

It can be ascended from table 4.1 that, tests by ADF and PP clearly shows that the variables (economic growth (GDP) and unemployment) of study were not stationary at level I(0) since ADF t-statistics of -1.304 for economic growth (GDP) and -2.447 for unemployment were less than the critical values of 1%, 5%, and 10% respectively and PP t-statistics of -1.304 for economic growth (GDP) and -2.519 for unemployment were also fewer than the critical values of 1%, 5%, and 10% respectively.

Nonetheless, the variables (economic growth (GDP) and unemployment) of the study was stationary at first level I(1) since ADF t-statistics of -5.707 for economic growth (GDP) and -6.076 for unemployment were greater than the critical values of 1%, 5%, and 10% respectively and PP t-statistics of -5.706 for economic growth (GDP) and -6.284 for unemployment were also more than the critical values of 1%, 5%, and 10% respectively.

Therefore we can conclude that the variables (economic growth (GDP) and unemployment) of the study were not stationary at level but they were all stationary at first difference which means that the data of variables of the study are good to use in this study.

5.5 Bounds test

Bound test expedites to check the long run relationship between the variables (economic growth (GDP) and unemployment) of study. More so, it was expedient to the position of the F-statistics within the critical value bound of significance.

Table 4.2 results of bounds test

Testing for the existence of a long run relationship among the variables in the ARDL				
K	95% lower bound	95% upper bound	90% lower bound	90% upper bound
1	4.49	5.73	4.04	4.78
Model		Calculated F-statistics		Inference
Ingdp(Inuemp)		6.499611**		Cointegration

From table 4.2 above, the calculated F-Statistics (6.499611) is bigger than both the 95% and 90% upper bound confidence level of 5.73 and 4.78 respectively form the equation. Therefore, from this finding, it is postulated that there is cointegration among the dependent variable (unemployment) and the independent variables (economic growth (GDP)). This is in confirmation with the studies of Soylu, Cakmak and Okur (2017), Banda, Ngirande and Hogwe (2016) and Mosikari (2013).

5.6 Results of the Long Run Unemployment

The long-run relationship between the dependent variable (unemployment) and independent variable (economic growth (GDP)) was estimated by the ADRL. The long-run elasticity is represented by the coefficients of the dependent variable (economic growth (GDP)).

Table 4.3 Estimated long run inflation model

Dependent variable: Inuemp		
Regressors	**Autoregressive Distributed Lag Model**	
	Long run Elasticity	**t-statistics**
Ingdp	-0.320	(-3.878) **
C	2.173	(12.045)

***, **, * denotes significance level at 1%, 5% and 10% respectively. Values in parenthesis are t-statistics. ARDL (1,4) was based on the Swchwarz Bayesian criterion

From table 4.3 above, the long run elasticity coefficient of the dependent variable (economic growth (GDP)) is adverse and statistically significant at the 10% error level. With respect to the coefficient, a one per cent upsurge in economic growth will cause a 0.32% decrease in the unemployment rate. This confirms the assertions by Hua-chu (2008), Li and Liu (2012) and Karabulut and Gokhan (2010) that, a long run relationship exit between economic growth (GDP) and unemployment. Accordingly, the null hypothesis that there is no long-run relationship between unemployment and economic growth in China is rejected.

5.7 Results of Short Run Error Correction Model

The error correction model tries to provide a remedy by the reconciliation of short-run behaviour of a variable with the long run behaviour. It becomes mandatory to estimate the

short-run error correction when there is a long run relationship among the variables (economic growth (GDP) and unemployment). Thus it measures the dynamics of the short run model captured by the ECM and the coefficient help with the speed with which the model adjust to an equilibrium whenever there is a shock. This model is represented by the first difference as seen in table 4.4

Table 4.4 Estimated short run error correction model using the ARDL Approach

Dependent variable: Inuemp		
Regressors	**Autoregressive Distributed Lag Model**	
	Short Run Elasticity	**t-statistics**
Ingdp	-0.333	(-16.640) ***
C	0.484	(3.167)

****, **, * denotes significance level at 1%, 5% and 10% respectively. Values in parenthesis are t-statistics. ARDL (1,4) was based on the Swchwarz Bayesian criterion*

From table 4.4 above, the short run elasticity coefficients of economic growth (GDP) are negative and statistically significant at 1% error term. From the table above, economic growth (GDP) has a negative short-run relationship with unemployment and a one per cent increase in economic growth will cause a 0.33% decrease in the unemployment rate. This confirms the assertions by Makaringe & Khobai (2018), Dritsakis & Stamatiou (2016) and Lam (2014) that, a short run relationship exit between economic growth (GDP) and unemployment. Accordingly, the null hypothesis that there is no short-run relationship between unemployment and economic growth in China is rejected.

5.8 Results of Granger Causality

This section considers the results of the Granger Causality test in an attempt to investigate the causal linkages between economic growth and unemployment in China. It should be emphasized that the literal meaning of the Granger causality does not imply that occurrences of one variable are as a result of the other. It is much more a predictive test.

The unit root by ADF and PP clearly shows that economic growth rate (GDP) and unemployment rate are stationary at first difference I(1). Therefore, I employed the first log difference between the variables in conducting the Granger Causality test.

Table 4.5: Results of the Granger causality test

Null hypothesis	**F-statistics**	**Prob.**
lnuemp does not Granger cause lngdp	1.17741	0.3460
lngdp does not Granger cause lnuemp	1.81217	0.1811

From the table 4.5 above, unemployment does not Granger cause economic growth (GDP) in the long run and short run because the F-statistics of 1.177 is insignificant and also economic growth (GDP) does not Granger cause unemployment in the long run and short run because the F-statistics of 1.812 is insignificant. This confirms the assertions by Mosikari (2013) that, there is no causal relationship between economic growth (GDP) and unemployment.

Though there is a negative relationship between economic growth (GDP) and unemployment in the long run and the short run, they do not have a causal relationship and that other factors might cause their relationship in both long run and short run and not necessary the variables themselves.

DISCUSSIONS AND INTERPRETATION OF FINDINGS

6.1 Introduction

This chapter shows the discussions and interpretation of findings the data of the study in consonance with the objectives of the study. Hence, the discussion and interpretations of findings are classified into five (5) section and these are the trend of unemployment in China, the trend of economic growth in China, the short run relationship between the variables, the long-run relationship between the variable and the causal linkage between the variables.

6.2 The trends in the unemployment rate in China

The annual unemployment rate of China is within the range of 3.76% and 4.89% in 2007 and 1991 respectively. This shows that out of 100 people who are actively searching and willing to work to receive some income only 4 to 5 people are unable to secure employment. This really shows that unemployment rate in China which falls in the range of 3.76% to 4.89% is not high but moderate and it really shows how the economy of China is able to contain most of the available human capital or labour force.

Although, there is some linear additional upsurge in the rate of unemployment from 2010 where the unemployment rate was 4.12% to the current year 2018 where the unemployment rate is 4.71%. However, it can be perceived that the linear increase in the unemployment rate in each year from 2010 to date is reasonable.

The trend of the unemployment rate in China from 1991-2018 is interesting because of its instability shown in the graph below. There were many different rates of changes in the unemployment rate for a period of 27 years. From the graph below, China experienced its highest unemployment rate in 1991 with an unemployment rate of 4.89% thus among 100 active people who were willing and searching for a place to work in 199, it was only 5 of them who couldn't get employment or job to do.

The rate of unemployment begun to decrease from 1992 with a rate of 4.39% to 1994 with 4.34% where it then begun to rises again from 1995 with 4.55% to 1999 with 4.7%. In 2000, the rate began to decrease with rate of 4.53% which 0.17% decrease from 1999 rate of 4.7% until the unemployment fall to Chinas' lowest unemployment rate of 3.76% thus only 4 out 100 people who are active and willing to work didn't get employed. From 2010 the unemployment rate of China has continued to rise from a rate of 4.2% to 4.7% which is its

current unemployment rate. Thus currently, 5 out of 100 people who are active and willing to work didn't get employed.

6.3 The trends of economic growth in China

China within the last four decade, that is, 1979 to 2017 has transformed its economy from the state is a poor developing nation to a state of being one of the most power developed markets in the world. The average annual real productivity output of China has grown to an approximate of 10% which according to the World Bank makes them one the faster grown, expanded and sustained economy in the world. This change in transition has cause China to eradicate about 800 million persons out of poverty (Morrison, 2018).

According to the annual time series data available at World Development Indicator, the annual economic growth (GPD) rate of China is within the range of 14.23% and 6.7%which represents the highest rate economic growth (GPD) and the lowest economic growth (GPD) rate respectively form 1991-2018. This shows that from 1991 to 2018, a variation in economic progress (GPD) rate is within the highest 14.23% and lowest at 6.7%.

Though the rate of economic growth (GPD) is changing, in 1992 China had experienced its highest increase in economic growth (GPD) rate with a change of 4.93%. This shows that there was a lot of labour output which led to an increase in production. Nonetheless, between 2003 and 2004 China experience its lowest change of economic growth (GPD) rate with a rate of 0.07%. Which indicate there was little output which led to constant or little addition to 2003 economic growth (GPD).

The trend of economic growth (GDP) rate in China from 1991-2018 is fascinating because of its unpredictability shown in the graph below. There were many dissimilar rates of changes in the economic growth rate (GDP) the period of 27 years. From the graph below, in 1991 China experienced 9.3% economic growth (GDP) rate and then the economic growth (GDP) increase

to 14.22% in 1992 which represent 4.92% which indicate China highest increase of economic growth (GDP) rate up to date but represent the second highest economic growth (GDP) rate.

Economic growth (GDP) begun to continuously decrease from 1993 with the rate of 13.86% to 2001with rate of 8.34% and then begun to gain some strength from 2002 with the rate of 9.13% to 2007 with the rate of 14.23 which is the highest economic growth (GDP) rate up to date. Since 2007, economic growth (GDP) has diminished from 2008 with a rate of 9.65% which represent the highest decline in economic growth (GDP) rate up to date.

6.4 The short-run relationship between unemployment and economic growth

The short-run relationship between the unemployment rate as the dependent variable and economic growth (GPD) rate as the independent variable was tested using ARDL Bound Test. From the finding of the test of short-run by the ARDL Bound Test shows that there is a negative and significant at 1% error term of the short-run relationship between unemployment and economic growth (GPD) rate since the coefficient of short-run elasticity of the independent variable (economic growth (GPD) rate) was -0.333 and the probability of the independent variable (economic growth (GPD) rate) was 0.0000.

This answers the third objective of the study which sought to study the short-run co-integration of China's unemployment and economic growth and also rejects the null hypothesis of there is no short-run co-integration of China's unemployment and economic growth.

6.5 The long-run relationship between unemployment and economic growth

The long-run relationship between the unemployment rate as the dependent variable and economic growth (GPD) rate as the independent variable was tested using ARDL Cointegration Test. From the finding of the test of long-run by the ARDL Cointegration Test shows that there is a negative and significant at 10% error level of the long-run relationship between unemployment and economic growth (GPD) rate since the coefficient of the long run elasticity

of the independent variable (economic growth (GPD) rate) was -0.320 and the probability of the independent variable (economic growth (GPD) rate) was 0.0012

This answers the second objective of the study which sought to study the long-run co-integration of China's unemployment and economic growth and also rejects the null hypothesis of there is no long-run co-integration of China's unemployment and economic growth.

6.6 The causal linkage between unemployment and economic growth

The finding of Granger Causality indicates that there is no causal relationship between the two variables of study (economic growth (GDP) rate and unemployment) since the F-statistics of 1.177 of unemployment Granger cause economic growth is not significant at all level because the probability is 0.346 and the F- Statistics of economic growth Granger causes unemployment is also not significant at all level because the probability is 0.181.

This shows that even though unemployment and economic growth have both short-run and long-run relationship, they do not cause each other or influence each other in any way. Therefore other factors might cause both unemployment and economic growth to have short-run and long-run relationship and this confirms the assertions by Mosikari (2013) that, unemployment does not influence economic growth whiles economic growth also does not influence unemployment. More so, this answers the fourth objective of the study which sought to examine causal linkages that exist among China's unemployment rate and economic growth rate.

CONCLUSION, IMPLICATIONS, AND RECOMMENDATIONS

7.1 Introduction

The final chapter concentrate on the conclusion of the findings, implications of the finding and the recommendation on the finding of the study.

7.2 Conclusion

This study concentrated on the impact of unemployment on economic growth in China. The study employed a time series data for the period of 1991 to 2018 from World Development Indicator (WDI) which represent a 27-period set. The econometric model that was used for the analysis was an ARDL model. Here both the short run and long-run relationship between the

independent variable (economic growth rate) and dependent variable (unemployment rate) were estimated. It was found that the unemployment rate has a short run and long-run relationship with the economic growth rate in the economy of China. This simply implies that to maintain a sustainable unemployment rate, much attention should be paid to the economic growth rate in even though there is no causality them, other external factors might have caused them (unemployment rate and economic growth rate) to have a negative relationship.

7.3 Implications

The findings of these studies reveal that the unemployment rate and economic growth rate have a negative relationship. Therefore, when there is an increasing economic growth rate in China, unemployment in China will also decrease because more labour resource will be required to maintain an increase in production.

However, when there is a reduction in the economic growth rate in China, unemployment in China will also increase because less labour will be required to produce decrease production.

Therefore, China can resolve the issue of high unemployment by incorporate the idea of industrialization into their short term and long term policies since more of human capital will be needed by these industries. Also, the government in China can invest more in the development of human capital for them have request skills to be more productive since higher productivity relates to low unemployment.

7.4 Recommendations

According to the results shown above, the unemployment rate and economic growth rate have a short-run and long-run negative relation. So in other to reduce unemployment in China, there should increase economic growth by making arousing the desires of youth to engage in economic activities which will boost the gross domestic product.

Moreover, I will recommend further studies to be carried on the other macro-economic factors such as inflation, interest rate, money supply growth, and the exchange rate which might cause unemployment rate and economic growth rate to have negative relations in both short-run and long-run in China.

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APPENDIX

Clean and extracted Time series data from World Development Indicators

Year	GDP growth	Unemployment
1991	9.294075913	2.400000095
1992	14.21616358	2.400000095
1993	13.86757602	2.700000048
1994	13.05215872	2.900000095
1995	10.94922737	3
1996	9.928372463	3.099999905
1997	9.230769231	3.200000048
1998	7.837613919	3.200000048
1999	7.667486171	3.299999952
2000	8.491508492	3.299999952
2001	8.33991055	3.799999952
2002	9.130645945	4.199999809
2003	10.03560303	4.599999905
2004	10.11122346	4.5
2005	11.39577594	4.5
2006	12.71947902	4.400000095
2007	14.23138804	4.300000191
2008	9.654289373	4.599999905
2009	9.399813171	4.699999809
2010	10.63614046	4.5
2011	9.55091409	4.5
2012	7.859627493	4.599999905
2013	7.768615284	4.599999905
2014	7.299518921	4.599999905
2015	6.90531667	4.599999905
2016	6.736675253	4.5
2017	6.757007611	4.400000095
2018	6.6	4.416999817

APPENDIX 1: TEST OF STATIONARY LEVELS OF VARIABLES

Augmented Dickey-Fuller Test for Economic Growth (LNGDP) at Level I(0)

Null Hypothesis: LNGDP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.304455	0.6126
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNGDP)
Method: Least Squares
Date: 04/20/19 Time: 16:50
Sample (adjusted): 1992 2018
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGDP(-1)	-0.162517	0.124586	-1.304455	0.2040
C	0.353861	0.281911	1.255222	0.2210

R-squared	0.063727	Mean dependent var	-0.012121
Adjusted R-squared	0.026276	S.D. dependent var	0.144986
S.E. of regression	0.143069	Akaike info criterion	-0.979794
Sum squared resid	0.511717	Schwarz criterion	-0.883806
Log likelihood	15.22722	Hannan-Quinn criter.	-0.951252
F-statistic	1.701602	Durbin-Watson stat	1.315533
Prob(F-statistic)	0.203960		

Augmented Dickey-Fuller Test for Economic Growth (LNGDP) at First Difference I(1)

Null Hypothesis: D(LNGDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.706640	0.0001
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNGDP,2)
Method: Least Squares
Date: 04/20/19 Time: 16:50
Sample (adjusted): 1993 2018
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGDP(-1))	-0.925916	0.162252	-5.706640	0.0000
C	-0.028085	0.023591	-1.190488	0.2455

R-squared	0.575715	Mean dependent var	-0.017478
Adjusted R-squared	0.558036	S.D. dependent var	0.180380
S.E. of regression	0.119917	Akaike info criterion	-1.330228
Sum squared resid	0.345123	Schwarz criterion	-1.233451
Log likelihood	19.29296	Hannan-Quinn criter.	-1.302360
F-statistic	32.56574	Durbin-Watson stat	1.889134
Prob(F-statistic)	0.000007		

Phillips-Perron Test for Economic Growth (LNGDP) at Level I(0)

Null Hypothesis: LNGDP has a unit root
Exogenous: Constant
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.304455	0.6126
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.018952
HAC corrected variance (Bartlett kernel)	0.018952

Phillips-Perron Test Equation
Dependent Variable: D(LNGDP)
Method: Least Squares
Date: 04/20/19 Time: 16:51
Sample (adjusted): 1992 2018
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGDP(-1)	-0.162517	0.124586	-1.304455	0.2040
C	0.353861	0.281911	1.255222	0.2210

R-squared	0.063727	Mean dependent var	-0.012121
Adjusted R-squared	0.026276	S.D. dependent var	0.144986
S.E. of regression	0.143069	Akaike info criterion	-0.979794
Sum squared resid	0.511717	Schwarz criterion	-0.883806
Log likelihood	15.22722	Hannan-Quinn criter.	-0.951252
F-statistic	1.701602	Durbin-Watson stat	1.315533
Prob(F-statistic)	0.203960		

Phillips-Perron Test for Economic Growth (LNGDP) at First Difference I(1)

Null Hypothesis: D(LNGDP) has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-5.706338	0.0001
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.013274
HAC corrected variance (Bartlett kernel)	0.013279

Phillips-Perron Test Equation
Dependent Variable: D(LNGDP,2)
Method: Least Squares
Date: 04/20/19 Time: 16:51
Sample (adjusted): 1993 2018
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGDP(-1))	-0.925916	0.162252	-5.706640	0.0000
C	-0.028085	0.023591	-1.190488	0.2455

R-squared	0.575715	Mean dependent var	-0.017478
Adjusted R-squared	0.558036	S.D. dependent var	0.180380
S.E. of regression	0.119917	Akaike info criterion	-1.330228
Sum squared resid	0.345123	Schwarz criterion	-1.233451
Log likelihood	19.29296	Hannan-Quinn criter.	-1.302360
F-statistic	32.56574	Durbin-Watson stat	1.889134
Prob(F-statistic)	0.000007		

Augmented Dickey-Fuller Test for Unemployment (LNUEMP) at Level I(0)

Null Hypothesis: LNUEMP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.447170	0.1391
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNUEMP)
Method: Least Squares
Date: 04/20/19 Time: 16:51
Sample (adjusted): 1992 2018
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNUEMP(-1)	-0.344931	0.140951	-2.447170	0.0218
C	0.512111	0.209962	2.439071	0.0222

R-squared	0.193253	Mean dependent var	-0.001358
Adjusted R-squared	0.160983	S.D. dependent var	0.043511
S.E. of regression	0.039855	Akaike info criterion	-3.535942
Sum squared resid	0.039711	Schwarz criterion	-3.439954
Log likelihood	49.73522	Hannan-Quinn criter.	-3.507400
F-statistic	5.988643	Durbin-Watson stat	1.610709
Prob(F-statistic)	0.021768		

Augmented Dickey-Fuller Test for Unemployment (LNUEMP) at Frist Difference I(1)

Null Hypothesis: D(LNUEMP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.076138	0.0000
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LNUEMP,2)
Method: Least Squares
Date: 04/20/19 Time: 16:52
Sample (adjusted): 1993 2018
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNUEMP(-1))	-1.078435	0.177487	-6.076138	0.0000
C	0.002603	0.007721	0.337142	0.7389

R-squared	0.606037	Mean dependent var	0.004468
Adjusted R-squared	0.589622	S.D. dependent var	0.061409
S.E. of regression	0.039339	Akaike info criterion	-3.559394
Sum squared resid	0.037141	Schwarz criterion	-3.462617
Log likelihood	48.27212	Hannan-Quinn criter.	-3.531526
F-statistic	36.91946	Durbin-Watson stat	2.149734
Prob(F-statistic)	0.000003		

Phillips-Perron Test for Unemployment (LNUEMP) at Level I(0)

Null Hypothesis: LNUEMP has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.519052	0.1223
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.001471
HAC corrected variance (Bartlett kernel)	0.001645

Phillips-Perron Test Equation
Dependent Variable: D(LNUEMP)
Method: Least Squares
Date: 04/20/19 Time: 16:52
Sample (adjusted): 1992 2018
Included observations: 27 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNUEMP(-1)	-0.344931	0.140951	-2.447170	0.0218
C	0.512111	0.209962	2.439071	0.0222

R-squared	0.193253	Mean dependent var	-0.001358
Adjusted R-squared	0.160983	S.D. dependent var	0.043511
S.E. of regression	0.039855	Akaike info criterion	-3.535942
Sum squared resid	0.039711	Schwarz criterion	-3.439954
Log likelihood	49.73522	Hannan-Quinn criter.	-3.507400
F-statistic	5.988643	Durbin-Watson stat	1.610709
Prob(F-statistic)	0.021768		

Phillips-Perron Test for Unemployment (LNUEMP) at Frist Difference I(1)

Null Hypothesis: D(LNUEMP) has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.284254	0.0000
Test critical values:	1% level	-3.711457	
	5% level	-2.981038	
	10% level	-2.629906	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.001429
HAC corrected variance (Bartlett kernel)	0.001156

Phillips-Perron Test Equation
Dependent Variable: D(LNUEMP,2)
Method: Least Squares
Date: 04/20/19 Time: 16:52
Sample (adjusted): 1993 2018
Included observations: 26 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNUEMP(-1))	-1.078435	0.177487	-6.076138	0.0000
C	0.002603	0.007721	0.337142	0.7389

R-squared	0.606037	Mean dependent var	0.004468
Adjusted R-squared	0.589622	S.D. dependent var	0.061409
S.E. of regression	0.039339	Akaike info criterion	-3.559394
Sum squared resid	0.037141	Schwarz criterion	-3.462617
Log likelihood	48.27212	Hannan-Quinn criter.	-3.531526
F-statistic	36.91946	Durbin-Watson stat	2.149734
Prob(F-statistic)	0.000003		

APPENDIX 2: ARDL TEST RESULT

Short Run Test

Dependent Variable: LNUEMP
Method: ARDL
Date: 04/20/19 Time: 16:53
Sample (adjusted): 1995 2018
Included observations: 24 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): LNGDP
Fixed regressors: C
Number of models evalulated: 20
Selected Model: ARDL(1, 4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNUEMP(-1)	0.777193	0.080127	9.699466	0.0000
LNGDP	-0.333424	0.020038	-16.63974	0.0000
LNGDP(-1)	0.315959	0.037366	8.455744	0.0000
LNGDP(-2)	-0.094641	0.028532	-3.316948	0.0041
LNGDP(-3)	0.087153	0.025374	3.434794	0.0032
LNGDP(-4)	-0.046240	0.017120	-2.700953	0.0151
C	0.484170	0.152860	3.167403	0.0056

R-squared	0.974455	Mean dependent var	1.489299
Adjusted R-squared	0.965439	S.D. dependent var	0.056342
S.E. of regression	0.010474	Akaike info criterion	-6.041307
Sum squared resid	0.001865	Schwarz criterion	-5.697708
Log likelihood	79.49568	Hannan-Quinn criter.	-5.950150
F-statistic	108.0823	Durbin-Watson stat	2.665160
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Long Run Test

ARDL Cointegration And Long Run Form
Dependent Variable: LNUEMP
Selected Model: ARDL(1, 4)
Date: 04/20/19 Time: 16:55
Sample: 1991 2018
Included observations: 24

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGDP)	-0.333424	0.020038	-16.639737	0.0000
D(LNGDP(-1))	0.094641	0.028532	3.316948	0.0041
D(LNGDP(-2))	-0.087153	0.025374	-3.434794	0.0032
D(LNGDP(-3))	0.046240	0.017120	2.700953	0.0151
CointEq(-1)	-0.222807	0.080127	-2.780666	0.0128

Cointeq = LNUEMP - (-0.3195*LNGDP + 2.1730)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGDP	-0.319527	0.082386	-3.878405	0.0012
C	2.173044	0.180409	12.045090	0.0000

ARDL Bounds Test

ARDL Bounds Test
Date: 04/20/19 Time: 16:53
Sample: 1995 2018
Included observations: 24
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	6.499611	1

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	4.04	4.78
5%	4.94	5.73
2.5%	5.77	6.68
1%	6.84	7.84

Test Equation:
Dependent Variable: D(LNUEMP)
Method: Least Squares
Date: 04/20/19 Time: 16:53
Sample: 1995 2018
Included observations: 24

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNGDP)	-0.333424	0.020038	-16.63974	0.0000
D(LNGDP(-1))	0.053728	0.022293	2.410089	0.0276
D(LNGDP(-2))	-0.040913	0.019817	-2.064504	0.0546
D(LNGDP(-3))	0.046240	0.017120	2.700953	0.0151
C	0.484170	0.152860	3.167403	0.0056
LNGDP(-1)	-0.071193	0.019853	-3.586002	0.0023
LNUEMP(-1)	-0.222807	0.080127	-2.780666	0.0128

R-squared	0.949809	Mean dependent var	0.003444
Adjusted R-squared	0.932095	S.D. dependent var	0.040195
S.E. of regression	0.010474	Akaike info criterion	-6.041307
Sum squared resid	0.001865	Schwarz criterion	-5.697708
Log likelihood	79.49568	Hannan-Quinn criter.	-5.950150
F-statistic	53.61790	Durbin-Watson stat	2.665160
Prob(F-statistic)	0.000000		

APPENDIX 3: GANGER CAUSALITY

Pairwise Granger Causality Tests
Date: 04/20/19 Time: 16:58
Sample: 1991 2018
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LNGDP does not Granger Cause LNUEMP	26	1.23719	0.3105
LNUEMP does not Granger Cause LNGDP		0.31201	0.7353