YANGON UNIVERSITY OF ECONOMICS

DEPARTMENT OF STATISTICS

A STUDY ON THE RELATIONSHIP BETWEEN UNEMPLOYMENT RATE AND SOME ECONOMIC FACTORS IN MYANMAR AND NEIGHBORING COUNTRIES

(1997-2016)

BY

KYAWT KYAWT SAN

M. Econ (Statistics)

Roll No. 3

DECEMBER, 2018

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This is to certify that thesis entitled **"A STUDY ON THE RELATIONSHIP BETWEEN UNEMPLOYMENT RATE AND SOME ECONOMIC FACTORS IN MYANMAR AND NEIGHBORING COUNTRIES(1997-2016)"**, submitted as a partial fulfillment towards the requirements of the Degree of Master of Economics (Statistics) has been accepted by the Board of Examiners.

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ABSTRACT

This study investigates the relation between unemployment rate and some economic factors in Myanmar and Neighboring Countries for the period of 1997-2016 within panel data framework. The data of unemployment rate, GDP growth rate, manufacturing value added and inflation rate has been collected from World Data Bank. In this thesis, the data series have not been existed unit root after taking the first difference. This study examines the long run relationship between unemployment rate and some economic factors by using panel co-integration tests. Panel co-integration tests support that the stability of long-run relationship among some economic factors and unemployment rate. The long-run coefficients are estimated using fully modified ordinary least square (FMOLS) procedure. This result suggest that there exists a long-run elasticity equilibrium co-integration within the variables. In addition, the fixed effects and random effects modelling approach were applied in this panel data. In order to determine the suitable model for estimating panel data, Hausman test and Lagrange Multiplier test were done. According to the results, the random effects model was more appropriate for the data. In the appropriate random effects model, the productivity and inflation rate have statistically significant and positive impact whereas GDP growth rate has a significant and negative effect on unemployment rate.

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LIST OF ABBREVIATIONS

ADF	=	Augmented Dickey-Fuller
ECM	=	Error Component Model
FEM	=	Fixed Effect Model
FMOLS	=	Fully Modified Ordinary Least Square
GDP	=	Gross Domestic Product (GDP) Growth Rate
GM-FMOLS	=	Group-Mean Fully Modified Ordinary Least Square Method
GNP	=	Gross National Product
ILO	=	International Labor Organization
ISIC	=	International Standard Industrial Classification of All EconomicActivities
IR	=	Inflation Rate
LLC	=	Levin, Lin and Chu
LM	=	Lagrange Multiplier
LSDV	=	Least Square Dummy Variable
MVA	=	Manufacturing Value Added
OECD	=	Organization for Economic Co-operation and Development
PP	=	Phillip Perron
REM	=	Random Effect Model
UNIDO	=	United Nations Industrial Development Organization
UR	=	Unemployment Rate

CHAPTER I

INTRODUCTION

1.1 Rationale of the Study

Economic growth and unemployment remain important problems of every country regardless of their economic development level. Countries target that their economy policyis towards establishing economic growth and reducing unemployment. Differences in the economic structures of countries also reflected upon the relationship between economic growth and unemployment to a great extent. The serious problem which every country must deal with increase of their economy is unemployment. Unemployment has an important effect of society as well as economy. During periods of recession, an economy usually experiences a relatively high unemployment rate. According to International Labor Organization report, more than 200 million people globally of the world's workforce were without a job in 2012. With the increase rates of unemployment and other economic factors are significantly affected, such as the income per person, health costs, quality of health-care, standard of living and poverty. High and persistent unemployment, in which economic inequality increases, has a negative effect on subsequent long-run economic growth.

A country's economic conditions are influenced by numerous macroeconomic and microeconomic factors, including monetary and fiscal policy, the state of the global economy, unemployment rate, productivity, exchange rates, inflation and many others. The main objective of every economy is always attempt to cut down a percentage of unemployment rates as low as possible, because it can be a charge of social, an ineffectiveness of human resources or a reduction of national revenue. Full employment of the unemployed workforce, all focused toward the goal of developing more environmentally efficient provide a more significant and lasting cumulative environmental benefit and reduced resource consumption. If so the future economy and workforce would benefit from the resultant structural increases in the sustainable level of GDP growth.

Economic growth is the growth in a nation's productive potential that results from the increased availability and productivity of resources. Economic growth is viewed as a significant instrument for reducing unemployment, poverty and to help improve the living standards of people. An increase in the growth rates of GDP is expected to increase employment levels thus reducing unemployment. This is a widely accepted economic theory, which is well documented through the theoretical proposition relating output and unemployment which is known as Okun's law. There are many indicators to measure a country's economic growth, such as gross domestic product (GDP), gross national product (GNP) and economic growth rate, and so on. GDP can be used to compare the productivity of various countries with a high degree of accuracy. Increased production leads a lower unemployment rate, further increasing demand.

Productivity growth is an indication of optimal resource allocation, effective resource utilization and it has been termed as an ultimate source of economic prosperity. The productivity performance of the manufacturing industry which has been considered as the engine of economic growth in the Asia-Pacific region. Especially in catching up countries productivity improvement in the manufacturing industry help to strengthen the competitiveness of the industry. In addition, a more productive and competitive manufacturing sector creates more jobs and it can accommodate more employees and lessen the unemployment problem. Manufacturing has traditionally played a key role in the economic growth. Manufacturing has positive effect on personal economics as well. Manufacturing employees make 20% more than average wage. Historically, manufacturing tended to be more open to international trade and competition than services. Manufacturing can mobilize higher growth and employment creation. A more rapidly growing manufacturing sector can also play an important role in indirect employment. Manufacturing is part of the very fabric of a country, helping to grow the economy by generating productivity, simulating research and development, and investing in the future. Manufacturing value added (MVA) of an economy is the total estimate of net-output of all resident manufacturing activity units obtained by adding up outputs and subtracting intermediate inputs. Measurement of MVA requires appropriate demarcation of the type of the territory in which the activity takes place. The boundary of manufacturing as an economy is defined by the International Standard Industrial Classification of All Economic Activities (ISIC). The value added of the entire manufacturing sector is, theoretically, the sum of the value added of all manufacturing activities. Thus, MVA measures an exclusive and exhaustive contribution of manufacturing to GDP. This paper analyses MVA as a measure of productivity.

Inflation and unemployment remain serious issues in any economy. Inflation get controlled through monetary policy, strips on Bank rates, it again reduces the private investment into production and leads to decline in production, fall in GDP. Inflation will scare the foreign investors too, and result into the lack of cash inflow from foreign countries, again the GDP will get affected. It is part of the overall macroeconomic policy objectives that an economy maintains low rates of inflation and unemployment. Unarguably, parts of the macroeconomic goals which the government strives to achieve are the maintenance of stable domestic price level, stable economic growth and full employment. Inflation and unemployment both vary from economy to economy. Some economies have found high inflations related to higher unemployment. Therefore, inflation in economy exists everywhere and it would be a proper research objectives for investigation.

Therefore, some economic factors are considered to be explanatory variables of the model and then the relationship between the unemployment rate and some economic factors (GDP growth rate, Manufacturing value added and inflation rate) in Myanmar and Neighboring Countries have been investigated using the panel data analysis in this study.

1.2 Objectives of the Study

The main objective of the study is to investigate the relationship between unemployment rate and some economic factors in Myanmar and Neighboring Countries.

The specific objectives are:

1. To analyze the effect of some economic factors on unemployment rate in Myanmar and Neighboring Countries.
2. To estimate the long-run relationship between some economic factors and unemployment rate.
3. To find out the appropriate model of the relationship between unemployment rate and some economic factors in Myanmar and Neighboring Countries.

1.3 Scope and Limitations of the Study

This study examined the unemployment rate and some economic factors in Myanmar and Neighboring Countries (China, Laos, Thailand, Bangladesh, India) over the period covering from year 1997 to year 2016. The main sources of data are obtained from Data Bank, World Development Indicators, International Labor Organization (ILO).

1.4 Method of Study

This study was investigated common unit root processes using panel unit root test of Levin, Lin and Chu's (2002). The unit root process for each unit (country) using Fisher Type

Dickey-Fuller (1979) unit root test method (ADF). Panel residual-based cointegration test (Padroni test and Kao test) were used to examine the cointegration among unemployment rate and some economic factors. Fully Modified Ordinary Least Square were used for long-run elasticity among variables. Panel data analysis methods (Fixed Effect Least-Square Dummy Variable Model, Random Effects Model) were applied to examine the effect of some economic factors over unemployment rate. Hausman test and Breusch and Pagan Lagrange Multiplier test were used to choose the appropriate model of the relationship between unemployment rate and some economic factors. The Breusch-Pagan-Godfrey test is used to test the heteroskedasticity.

1.5 Organization of the Study

This study composed of five chapters. Chapter I is introduction will concern with rationale of the study, objectives of the study, scope and limitations of the study, method of study and organization of the study. Unemployment rate and some economic factors in Myanmar and Neighboring Countries are presented in Chapter II. Chapter III explains statistical methodology. Panel data analysis for the relationship between some economic factors and unemployment rate are discussed in Chapter IV. The conclusion was presented in Chapter V.

CHAPTER II

UNEMPLOYMENT RATE AND SOME ECONOMIC FACTORS IN MYANMAR AND NEIGHBORING COUNTRIES

2.1 Unemployment Rate

The unemployment rate (UR) is defined as the percentage of unemployed workers in the total labor force. Workers are considered unemployed if they currently do not work, despite the fact that they are able and willing to do so. The total labor force consists of all employed and unemployed people within an economy. The unemployment rate provides insights into the economy's spare capacity and unused resources. Unemployment tends to be cyclical and decreases when the economy expands as companies contract more workers to meet growing demand.

There are also different ways national statistical agencies measure unemployment. This differences may limit the validity of international comparisons of unemployment data. To facilitate international comparisons, some organizations, such as theCountries for the Organization for Economic Co-operation and Development (OECD), Eurostat, and International Labor Comparisons Program adjust data on unemployment for comparability across countries. The unemployment rate is expressed as a percentage. As defined by the International Labor Organization (ILO), "unemployed workers" are those who are currently not working but are willing and able to work for pay, currently available to work, and have actively searched for work. Individuals who are actively seeking job placement must make the effort tobe in contact with an employer, have job interviews, contact job placement agencies, send out resumes, submit applications, respond to advertisements, or some other means of active job searching within the prior four weeks. Simply looking at advertisements and not responding will not count as actively seeking job placement.

Types of unemployment can be defined as voluntary unemployment, involuntary unemployment, frictional unemployment, cyclical unemployment, seasonal unemployment, technological unemployment, structural unemployment and hidden unemployment. These types of unemployment are defined as follows:

– Voluntary unemployment: It is the unemployment of individuals who are looking for higher wages and better jobs that do not want to work at the current wage level.

– Involuntary unemployment: It is the unemployment of people who are ready to work at current wage level and who cannot find work.

– Frictional unemployment: It is the type of unemployment determined during the change of place and occupation. Fractional unemployment can arise even when the economy is in full employment.

– Cyclical unemployment: It is the unemployment created by the shrinkage that occasionally arises in the production volume. In other words, it is the result of the fact that the effective demand of economy is low compared to the production volume. This type of unemployment is caused by the fact that the economic life and activities do not always continue at the same level and fluctuate.

– Seasonal unemployment: It is the unemployment of people who work during certain periods of the year and are unemployed during certain periods. In sectors such as tourism, construction and agriculture, the level of production and hence the unemployment rate fluctuate seasonally. Seasonal unemployment is most apparent in the agricultural sector. In developed and advanced industrial countries, seasonal unemployment is often due to changes in the demand for goods.

– Technological unemployment: It is the result of usingmachines instead of labor force.This type of unemployment occurs with technological progress in countries or innovation in enterprises and technological changes in production.

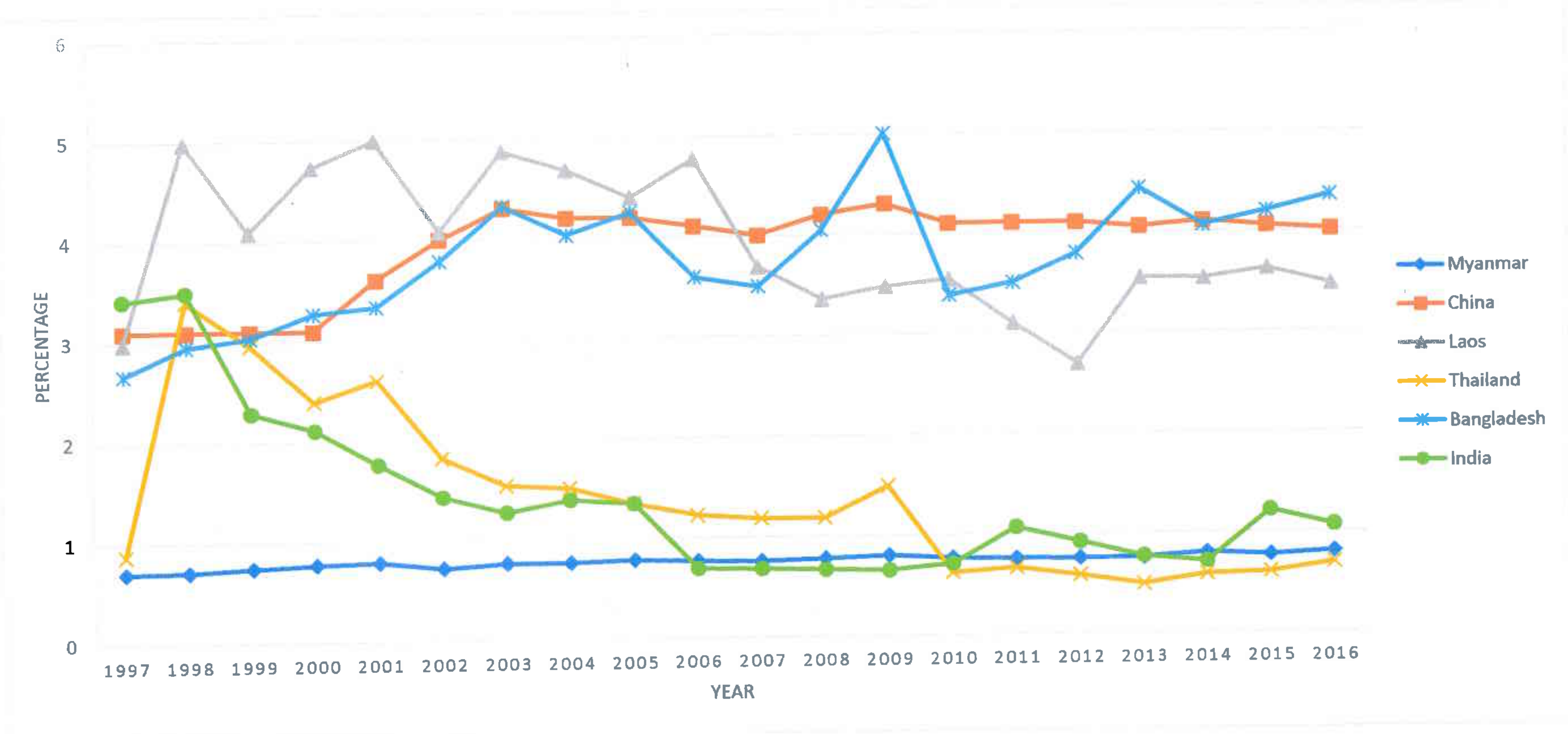
– Structural unemployment: It is the type of unemployment that arises during periods when the economy is at a collective and constantly stagnant level with all sectors. Structural unemployment can also be defined as the mismatch between the general structure of labor demand, acting on factors such as labor force structure, geographical differences, occupation, skill and industry.

– Hidden unemployment: It is the unemployment that people who participate in the production process do not have any contribution to production, that is, those whose marginal productivity is zero.

Many economies industrialize and experience increasing numbers of non-agricultural workers. The shift away from self-employment increases the percentage of the population who are included in unemployment rate. Unemployment rate differs from country to country and across different time periods. When comparing unemployment rates between countries or time periods, it is best to consider differences in their levels of industrialization and self-employment. Unemployment rate in Myanmar and Neighboring Countries from year 1997 to

2016 are described in Appendix-A. Figure (2.1) describes the unemployment rate in Myanmar and Neighboring Countries from 1997 to 2016.

Figure (2.1) Unemployment Rate in Myanmar and Neighboring Countries (1997-2016)



Source: World Data Bank

In this Figure (2.1), it can be seen that Bangladesh has the highest unemployment rate among this study countries after 2013. The young population in Bangladesh has been about 52 million which is more than 33 percent of the total population, therefore youth unemployment issue is crucial for sustainable development of Bangladesh. Bangladesh's government is failed to meet the job demand among the large population, only a tiny fraction of total jobless is managed by different government offices and private organization by a majority still remain unemployed. Among this study countries, Laos has the highest unemployment rate before 2006, then its unemployment rate declined after 2006 but still higher than Thailand, Myanmar and India. Laos' unemployment rate fluctuated among this study year. The Lao is a least developed country and unemployment rate are higher for younger people, especially among new graduates and in rural area. Unemployment rate of Thailand and India increased between 1997 and 2001, but its obviously declined in the later years. Since 1996 Thailand's financial institution had problem and financial crisis became in 1997, therefore the unemployment rate had quickly increased in 1998. India unemployment rate fluctuated substantially in this study years, it tended to decrease through 1997-2016 period. It had been found that China's unemployment rate has the highest percentage by averagely among this studying countries. In China, the number of new job seekers entering the labor market will be around 15 million people every year since 2003. However, only eight million jobs can be created annually, so China's unemployment rate still remains at higher percent in the studying periods. The unemployment rate of Myanmar is stable among this study year, Myanmar's unemployment rate is averagely stable at 0.7 percent and 0.8 percent by ILO. According to ILO database, the unemployment rate in Myanmar and Neighboring Countries has the different situation by having different policies, population and other economic factors of each country.

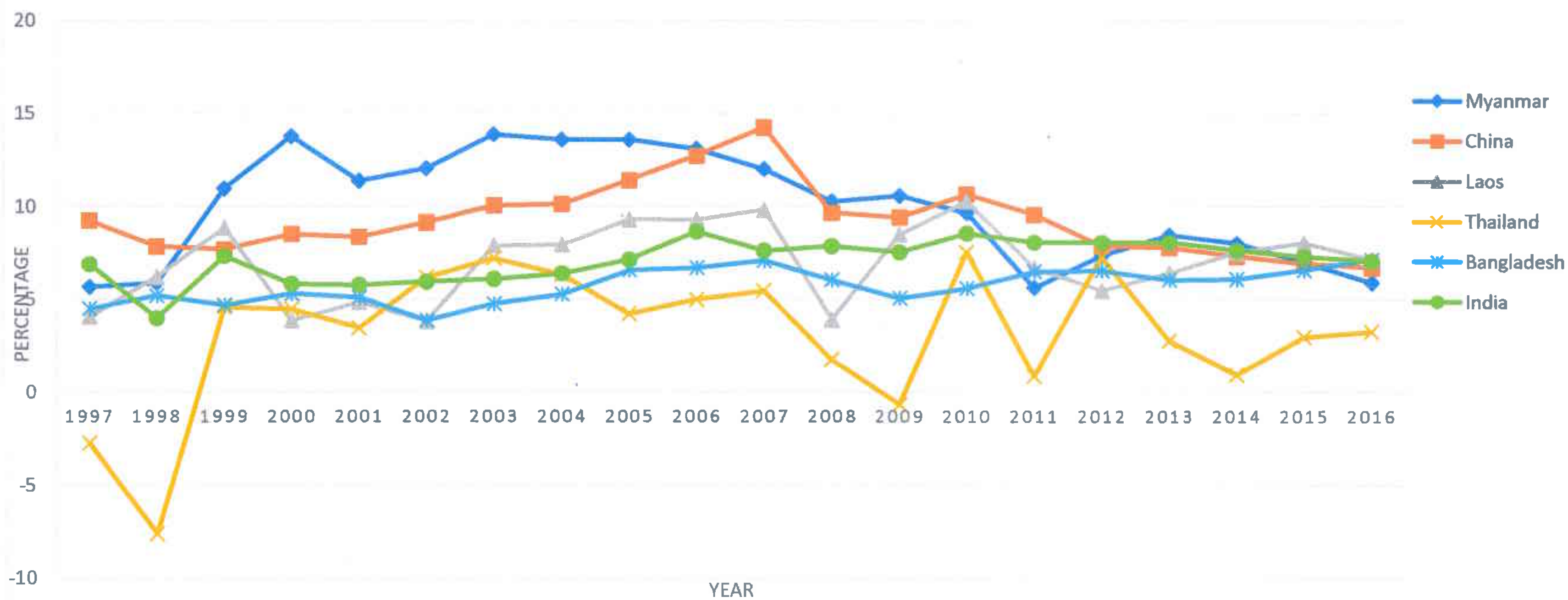
2.2 GDP Growth Rate

Economic growth is an increase in the capacity of an economy to produce goods and services, compared from one period of time to another. It can be measured in nominal or real terms, the latter of which is adjusted for inflation. Traditionally, aggregate economic growth is measured in terms of gross national product (GNP) or gross domestic product (GDP), although alternative metrics are sometimes used. Economic growth rate is a measure of economic growth form one period to another in percentage terms. This measure does not adjust for inflation; it is expressed in nominal terms. It demonstrates the change in a nation's or larger economy's, income over a specified period of time. The economic growth rate is calculated from data on GDP collected by countries' statistical agencies.

The gross domestic product (GDP) is one of the primary indicators used to gauge the health of a country's economy. The OECD defines GDP as "an aggregate measure of production equal to the sum of the gross values added of all resident and institutional units engaged in production (plus any taxes, and minus any subsidies, on products not included in the value of their outputs). The major advantage of GDP per capita as an indicator of standard of living is that it is measured frequently, widely, and consistently.

Economic growth, an indicator of welfare of a country, is measured by GNP or its per capita value. The concept of economic growth is defined as the increase in the amount of goods and services produced in a country during by the time of progress. If we consider that there are many countries with different economic sizes all over the world, we can see that some of these countries are very rich, some are very poor, and a great majority is among these two extremes. Some of these countries are growing very fast, but some countries are either too slow or not growing at all. For this reason, researching the reasons for these differences in growth between countries and examining the concept of economic growth has become the focus of attention. Another macroeconomic variable that is an important as economic growth and which is of particular concern to countries is unemployment. Unemployment represents the level of employment in which people have the desire and ability to work and want to pay but who cannot find jobs. Unemployment arises from the economic structure of a country, and it arises from different reasons depending on whether it is a developed or underdeveloped country. The reason for unemployment in underdeveloped countries is capital inadequacy, while in developed countries technological progress is the reason (Yilmaz, 2005). GDP growth rate in Myanmar and Neighboring Countries from 1997 to 2016 are described in Appendix-A. Figure (2.2) describes GDP growth rate in Myanmar and Neighboring Countries from 1997 to 2016.

Figure (2.2) GDP growth rate in Myanmar and Neighboring Countries (1997 – 2016)



Source: World Data Bank

In this Figure (2.2), it can be seen that GDP growth rate of Myanmar has the highest growth rate from 1997 to 2006 and dramatically decline in the later years 2007-2016.GDP growth rate in Myanmar averaged 8.73 percent from 1997 until 2017. The growth rate declined to 5.9 percent in the fiscal year 2016 due to a decrease in exports affected by bad weather and floods. GDP growth rate in China averaged 9.58 percent from 1989 until 2016. GDP growth rate of Laos having the point between 0.4 percent and 10 percent because of a result of decentralized government control and encouragement of private enterprise. Currently, Laos ranks amongst the fastest growing economies in the world, averaging 8 percent a year in GDP growth. GDP growth rate of Thailand is the lowest among Myanmar and Neighboring Countries. Since 1996, the government of Thailand were closed 18 trust companies, three commercial banks and 56 financial institutions. In 1997, Thailand's foreign debt had risen to US$109,276 billion, while Thailand had US$38,700 billion in international reserves. Many loans were backed by real estate in Thailand. So, Thailand's GDP growth rate has the many fluctuation among analyzing countries. GDP growth rate in Bangladesh averaged 5.69 percent from 1997 until 2016, reaching an all time high of 7.11 percent in 2016. GDP growth rate in India averaged 6.16 percent from 1997 until 2016.

2.3 Manufacturing Value Added

Manufacturing Value Added (MVA) of an economy is the total estimate of net-output of all resident manufacturing activity units obtained by adding up outputs and subtracting intermediate inputs. Measurement of MVA requires appropriate demarcation of the type of economic activity and of the territory in which the activity takes place. The boundary of manufacturing as an economic activity is defined by the International Standard Industrial Classification of All Economic Activities (ISIC).

In terms of territory, United Nations Industrial Development Organization (UNIDO) Statistics uses the national account concept of resident units. Data are compiled for an economy rather than a country within its political boundary. Many territories function as a separate economy, occasionally with a different currency from that of the country they belong to in terms of political and administrative sovereignty. UNIDO produces value added estimates of manufacturing activities at two levels – the sector level (often termed industry value added) and the aggregated level, referred to in this paper as manufacturing value added:

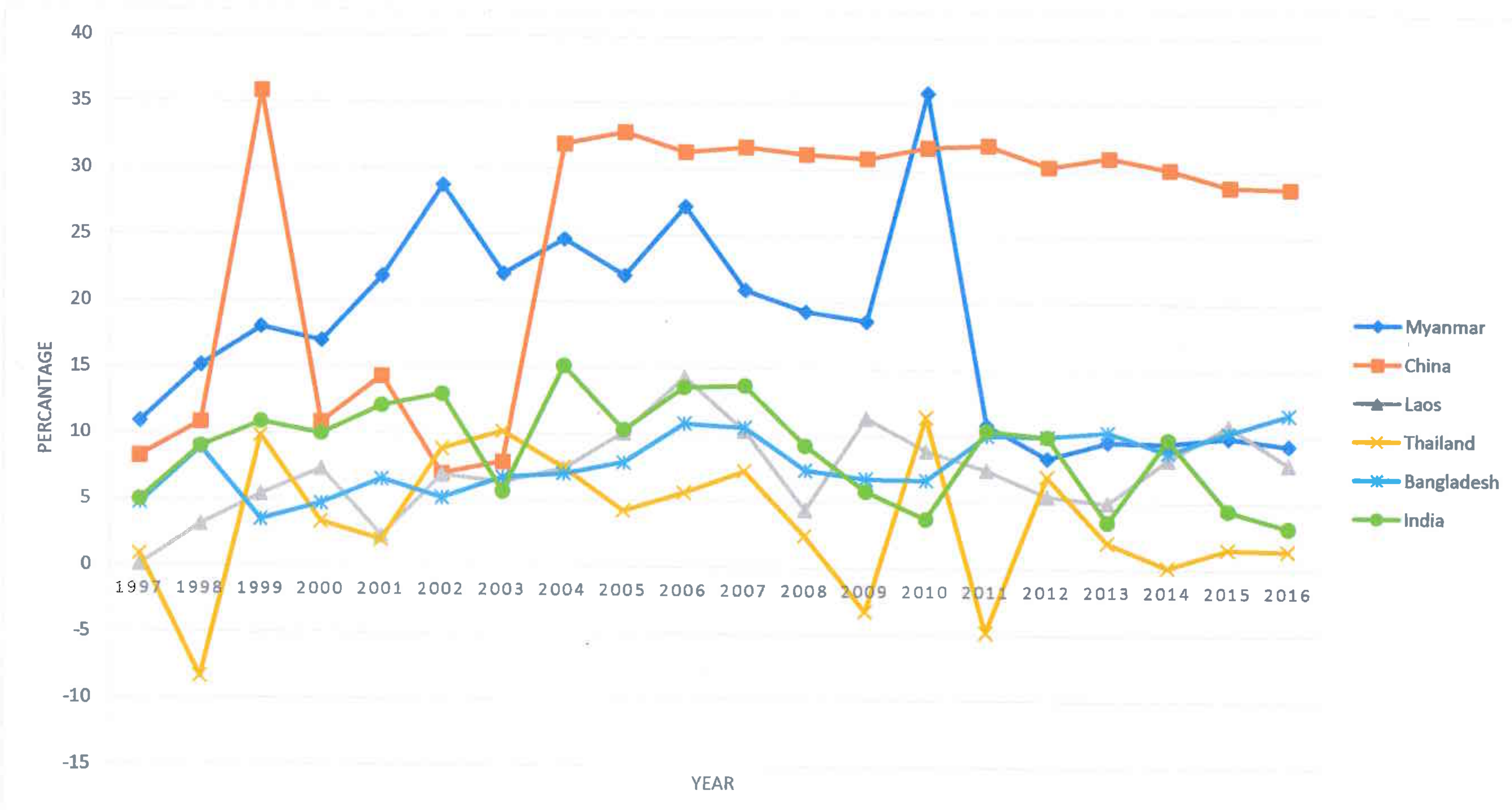
1. The value added of a manufacturing industry (industry value added) is a survey concept that refers to the given industry's net output derived from the difference of

gross output and intermediate consumption. Value added is calculated without deducing consumption of fixed assets represented by depreciation in economic accounting concepts. The social cost of producing value added is higher than that considered in the existing statistical practice, as it takes the depletion and degradation of natural resources into account. Depending on the survey method selected, industry value added may often refer to census value added which disregards the margin between the receipt from and payment for non-industrial services. Survey data on industry value added may also disregard the contribution of small and household-based manufacturing units which are often excluded from the regular industrial survey programme. Estimates for such units are made separately for the compilation of national accounts. For these reasons, industry value added is used to measure the growth and structure, but not the level.

2. The value added of the entire manufacturing sector is, theoretically, the sum of the value added of all manufacturing activities. However, in practice, MVA cannot simply be derived by adding up all industry value added figures because of the complexity associated with survey methods. Industry value added may not cover all activity units engaged in manufacturing due to the incomplete frame used in the survey. On the other hand, activity units are often classified as manufacturing based on their primary activity. This implies that secondary activity can often be of a non-manufacturing nature. Such discrepancies are resolved in the process of compiling national accounts using supply use or input-output tables. Thus, MVA measures an exclusive and exhaustive contribution of manufacturing to GDP.

While GDP provides an important point of reference for analysis of a country's overall economic development, it does not reveal any specific information about sectoralcomposition and, in particular, the different degrees of industrial development. Countries show profound structural differences which tend to relate to their stage of overall economic development and the difference contribution of the various sectors (agriculture, industry – and manufacturing as part of it – and services) their economic system is composed of. To capture the different levels of countries' industrial development, UNIDO generally uses MVA per capita as the main indicator. Manufacturing value added (%) in Myanmar and Neighboring Countries from the year 1997 to 2016 are described in Appendix-A. Figure (2.3) describes manufacturing value added in Myanmar and Neighboring Countries from 1997 to 2016.

Figure (2.3) Manufacturing Value Added in Myanmar and Neighboring Countries (1997 – 2016)



Source: World Data Bank

In this Figure (2.3), total value added of Myanmar between 1997 and 2016 grew substantially from 9,843 million to 62,181 million US dollars rising at an increasing annual rate that reached a maximum of 13.84 percent in 2003 and then decreased to 5.87 percent in 2016. China is the world's largest manufacturing economy and considered to be one of the most competitive nations in the world. In 2009, around 8 percent of the total manufacturing output in the world came from China, therefore China's manufacturing value added still remain high in the later year. Therefore, China is the highest growth rate among Myanmar and Neighboring Countries. Laos is in the process of implementing a value-added tax system, its value added in manufacturing growth tended to increase through 1997 to 2016. The effect of the lowest Thailand's GDP growth rate reflects in manufacturing value added. So that, Thailand is the lowest manufacturing value added among Myanmar and Neighboring Countries inthe analyzing period of time. Bangladesh value added in manufacturing growth fluctuated substantially in this study years, it tended to increase through 1997-2016. India value added in manufacturing growth fluctuated substantially in this study year, its industrial sector underwent significant change due to the 1991 economic reforms.

2.4 Inflation Rate

In economics, inflation is a sustained increase in price level of goods and services in an economy over a period of time. When the price level rises, each unit of currency buys fewer goods and services; consequently, inflation reflects a reduction in the purchasing power per unit of money- a loss of real value in the medium of exchange and unit of account within the economy. A chief measure of price inflation is the inflation rate, the annualized percentage change in a genera price index, usually the consumer price index, over time. The opposite of inflation is deflation.

Inflation affects economies in various positive and negative ways. The negative effects of inflation include an increase in the opportunity cost of holding money, uncertainty over future inflation which may discourage investment and savings, and if inflation were rapid enough, shortages of goods as consumer begin hoarding out of concern that prices will increase in the future. Positive effects include reducing unemployment due to nominal wage rigidity.

Economists generally believe that the high rates of inflation and hyper inflation are caused by an excessive growth of the money supply. Low or moderate inflation may be attributed to fluctuations in real demand for goods and services, or changes in available supplies such as during scarcities. However, the consensus view is that a long sustained period of inflation is caused by money supply growing faster than the rate of economic growth. Inflation may also lead to an invisible tax in which the value of currency is lowered in contrast with its actual reserve, ultimately leading individuals to hold devalued legal tender. The inflation rate is most widely calculated by calculating the movement or change in a price index, typically the consumer price index. The inflation rate is the percentage change of a price index over time.

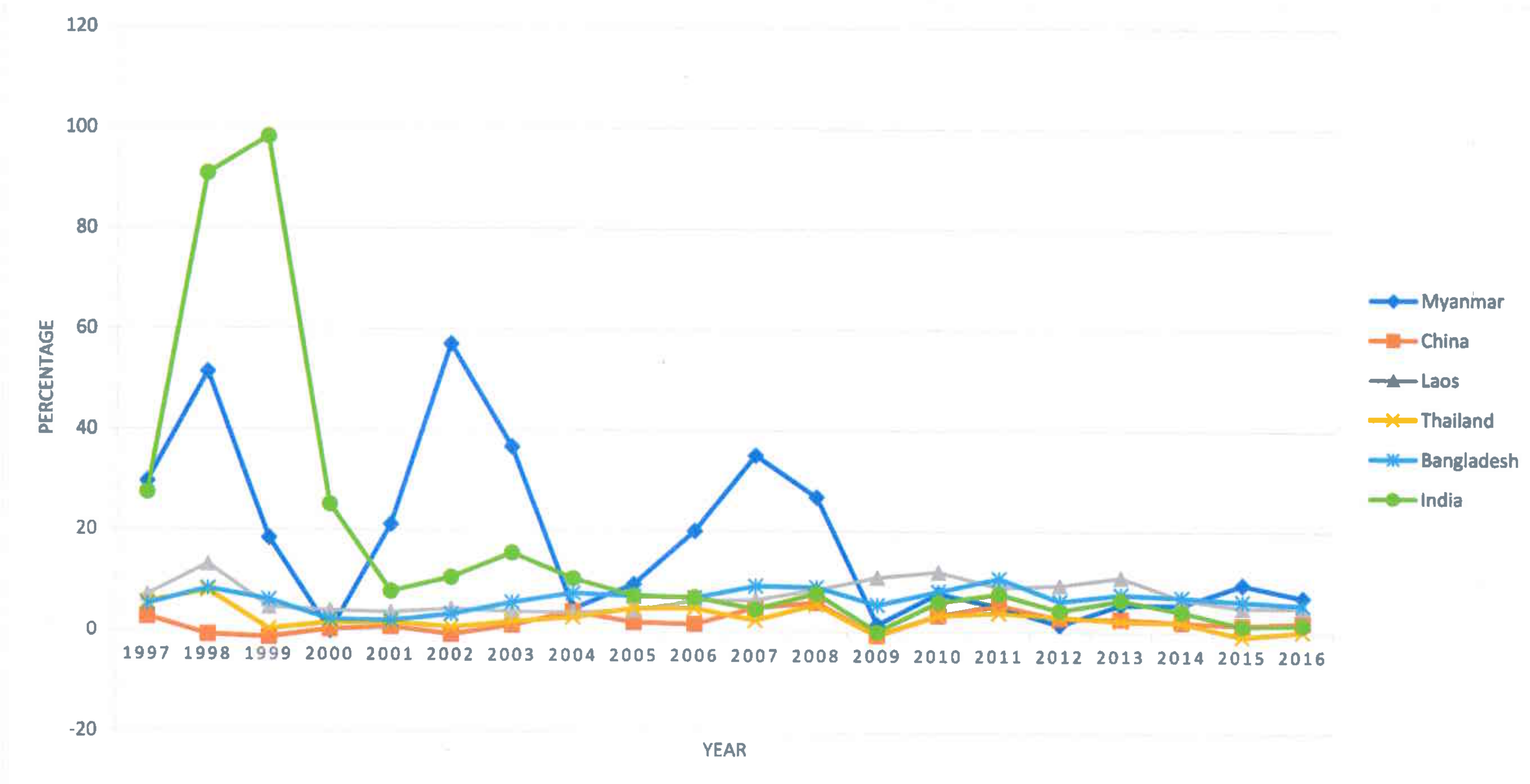
Historically, a great deal of economic literature was concerned with the question of what causes inflation and what effect it has. There were different schools of thought as to the causes of inflation. This can be divided into two broad areas: quality theories of inflation and quantity theories of inflation. The quality theory of inflation rests on the expectation of a seller accepting currency to be able to exchange that currency at a later time for goods that are desirable as a buyer. The quantity theory of inflation rests on the quantity equation of money that relates the money supply, its velocity, and the nominal value of exchange. Adam Smith and David hume proposed a quantity theory of inflation for money, and a quality theory of inflation for production.

Currently, the quantity theory ofmoney is widely accepted as an accurate model of inflation in the long run. Consequently, there is now broad agreement among economists that in the long run, the inflation rate is essentially dependent on the growth rate of money supply relative to the growth of the economy. However, in the short and medium term inflation may be affected by supply and demand pressures in the economy, and influenced by the relative elasticity of wages, prices and interest rates.

Today, most economists favor a low and steady rate of inflation. Low (as opposed to zero or negative) inflation reduces the severity of economic recessions by enabling the labor market to adjust more quickly in a down turnand reduces the risk that a liquidity trap prevents monetary policy from stabilizing the economy. The task of keeping the rate of inflation low and stable is usually given to monetary authorities. Generally, these monetary authorities are the central banks that control monetary policy through the setting of interest rates, through open market operations, and through the setting of banking reserve requirementsCentral bankers target a low inflation rate because they believe that high inflation is economically costly, whereas deflation endangers the economy during recessions. Inflation rate in Myanmar and Neighboring Countries from the year 1997 to 2016 are described in

Appendix-A. Figure (2.4) describes inflation rate in Myanmar and Neighboring Countries from 1997 to 2016.

Figure (2.4) Inflation Rate in Myanmar and Neighboring Countries (1997 – 2016)



Source: World Data Bank

In this Figure (2.4), it had been found that India's inflation rate has been risen over the last decade. However, it has been decreasing slightly since 2010. The inflation rate of India rose98.27 percent in 1999 because of an armed conflict between India and Pakistan in that year. The cost of war has been huge and all the resources of the nation was directed towards war effort. The production of consumption and capital goods was a heavy beating. The low availability of goods had a result into higher prices and thereby lead into hyper inflation conditions. The inflation rates of Myanmar from 1997 to 2008 were not steady and were happening increasing and decreasing rapidly. In 2003-2004, the inflation rate has fallen down nearly 30 percent. The reason for 2003-2004 are that major banking crisis that the 20 private banks were shuttered and was disrupted the economy. Therefore, Myanmar's Inflation rate has fallen to 6.96 percent in 2004. Myanmar inflation rate fluctuated substantially between 1997 and 2009. And then, it tends to decrease from 2009 to 2016. Bangladesh's inflation rate has stable situation by averagely, inflation rate is the highest in Bangladesh reaching10.7 percent in 2011. China, Laos, Thailand and Bangladesh have the stable situation by averagely. China's economy is in rapid growth, therefore it suffered several times high inflation happened. Inflation rate in Laos averaged 18.52 percent from 1997 until 2016. Thailand's inflation rate fluctuated substantially in this year, it tended to decrease through 1997-2016 period ending 0.18 percent in 2016.

CHAPTER III

STATISTICAL METHODOLOGY

3.1 Panel Analysis

Panel (data) analysis is a statistical method, widely used in social science, epidemiology and econometrics to analyze two-dimensional (typically cross sectional and longitudinal) panel data. In panel data, the same cross-sectional unit is surveyed over time. In short, panel data have space as well as time dimension. There are other names for panel data, such as pooled data (pooling of time series and cross-sectional observations), combination of time series and cross-section data, micro-panel data, longitudinal data (a study over time of a variable or groups of subjects), event history analysis (studying the movement over time of subjects through successive states or conditions) and cohort analysis. The regression model based on panel data is called panel data regression model.

The panel data is called a balanced panel; a panel is said to be balanced if each subject has the same number of observations. If each entity has a different number of observations, is called an unbalanced panel. In panel data divided into short panel and long panel. In a short panel the number of cross-sectional subjects, N, is greater than the number of time periods, T. In a long panel, it is T that is greater than N.

3.2 Panel Unit Root Tests

Panel unit root testing emerged from time series unit root testing. The major difference to time series testing of unit roots is that it had to consider asymptotic behavior of the time-series dimension T and the cross-sectional dimension N. The way in which N and T converge to infinity is critical if one wants to determine the asymptotic behavior of estimators and tests used for nonstationary panels. There are several possibilities to handle the asymptotic:

1. sequential limit theory (one dimension is fixed, say N, and the other dimension T is allowed to go to infinity and provides an intermediate limit; starting from this intermediate point, N is allowed to grow large)

2. diagonal path limits (N and T go to infinity along a diagonal path—e.g., there is a monotonic increasingly connection between N and T)

3. joint limits (N and T are allowed to go to infinity at the same time)

The unit root test was conducted to avoid of spurious regression problem. All variables need to be stationary at any point estimated, a non-stationary time series will become stationary after differencing several times. There are six methods for panel data unit root test, which are: Levin-Lin-Chu (2002), Breitung (2000), Im-Pesara-Shin (2003), Fisher-type test using ADF (Maddala and Wu,1999), Fisher-type test using PP test (Choi,2004) and Hadri (2000) to check for the presence of stationary around a deterministic trend or mean with a shift against a unit root. The properties of panel-based unit root tests under the assumption that the data is independent and identically distributed (i.i.d) across indviduals. When the persistence parameters are common across crossection then this type of process is called a common unit root process. Levin, Lin and Chu (LLC) employ this assumption. When the persistent parameters freely move across crosssection then this type of unit root process is called an individual unit root process. The Im, Pesaran and Shin (IPS), Fisher-ADF and Fisher-PP test are based on this form.

3.2.1 Levin-Lin-Chu Test

Levin, Lin and Chu (LLC) test was undertaken (Levin et al., 2002). The LLC test employs a null hypothesis of a unit root using the basic Augmented Dickey Fuller specification:

Null Hypothesis	:	Each individual time series contains a unit root.
H_0	:	$\rho = 0$.
Alternative Hypothesis	:	Each time series is stationary.
H_1	:	$\rho < 0$.

$$\Delta y_{i,t} = \rho_i y_{i,t-1} + \sum_{l=1}^{P} \alpha_{i,1} \Delta y_{i,t-1} + \beta_i d_{i,t} + \varepsilon_{i,t} \qquad (3.1)$$

where, y_{it} refers to the stochastic process for a panel individual i=1 2, ...N and each individual (country) containing t=1, 2, ... T time-series observations d_{it}, represents exogenous variables in the model, such as country fixed effects and individual time trends, while ε_{it} refers to the error terms, which are assumed to be mutually independent disturbances. This test determines whether y_{it} is integrated for each individual of the panel. The alternative hypothesis ρ_i is identical and negative. Because ρ_i is fixed across i, this is one of the most complicated of the tests because the data from the different individuals need to be combined into a single final regression. The residual from regressions of $\Delta y_{i,t}$and $y_{i,t-1}$is obtained using individual regression. Null hypothesis is unit root, whereas the alternative is common stationary root. The major weakness of this test is that it assumes the individual processes to be cross-sectionally independent, which is unrealistic. The necessary condition for the Levin-Lin-Chu test is $\sqrt{NT}/T \to 0$, while sufficient conditions would be $NT/T \to 0$ and $NT/T \to \kappa$. (NT means that the cross-sectional dimension N is a monotonic function of time dimension T.) If T is very small, the test is undersized and has low power. One disadvantage of the test statistic is that it relies critically on the assumption of cross-sectional independence. If T is very large, then Levin et al. (2002) suggest individual unit root time-series tests. If N is very large (or T very small) usual panel data procedures can be applied.

3.2.2 Fisher-Type Dickey-Fuller Test

The Fisher-type test uses p-values from unit root tests for each cross-section i. The formula of the test looks as follows:

Null Hypothesis : Each series in the panel contains a unit root.

H_0 : $\rho_i = 0$.

Alternative Hypothesis : Some of the individual series have unit roots.

H_1 : $\begin{cases} \rho i < 0 & \text{for} \quad i = 1,2,\dots,N \\ \rho i = 0 & \text{for} \quad i = N_1 + 1,\dots,N \end{cases}$

$$P = -2\sum_{i=1}^{N} \ln P_i \qquad (3.2)$$

The test is asymptotically chi-square distributed with 2N degrees of freedom ($T_i \to \infty$ for finite N). The lag lengths of the individual augmented Dickey-Fuller tests are allowed to differ. A drawback of the test is that the p-values have to be obtained by Monte Carlo simulations. A big benefit is that the test can handle unbalanced panels.

3.3 Panel Cointegration Tests

If the presence of a unit root is detected in the variables, then it is necessary to check for the presence of a cointegrating relationship among the variables. Panel cointegration methods are very popular among the researchers these days. With the growing availability of time series data for many countries, use of panel co-integration methods, to discover the long run relationship, are adopted by a number of researchers in the field of economics. Padroni's and Kao's co-integration methodology has been applied in this study. There are two types of panel cointegration tests in the literature. The first is similar to the Engle and Granger (1987) framework which includes testing the stationarity of the residuals from a level regression. The second panel cointegration test is based on multivariate cointegration technique proposed by Johansen (1988). Panel techniques may be better in detecting cointegration relationships since a pooled levels regression combines cross-sectional and time series information in data when estimating cointegration coefficients.

3.3.1 Padroni Residual-Based Panel Cointegration Test

Padroni (1997), are conducted to examine whether a co-integrating relationship between the variables does exist. The reason for employing the Padroni co-integration test is that it controls for country size and heterogeneity allowing for multiple regressors (as in this case). Padroni (2000) provides seven panel co-integration statistics for seven tests for testing the null hypothesis of no cointegration. Four (i.e., panel-υ, panel-ρ, panel-pp, panel-ADF) of those are based on the within-dimension tests while the other three (i.e., group- ρ, group-pp, group ADF) are based on the between-dimension or group statistics approach. For the within-dimension statistics the null hypothesis of no cointegration for the panel cointegration test is

$$H_0 : \gamma_i = 1 \quad \text{for all i = 1,..., N} \tag{3.3}$$

$$H_0 : \gamma_i = \gamma < 1 \text{ for all i = 1,..., N}$$

For the between-dimension statistics the null hypothesis of no cointegration for the panel cointegration test is

$$H_0 : \gamma_i = 1 \text{ for all i = 1,..., N}$$

$$H_0 : \gamma_i < 1 \text{ for all i = 1,..., N}$$

The relevant panel co-integration statistics provided by Padroni (1999) use the following expressions.

Panel υ-statistic:

$$Z_\nu = (\sum_{i=1}^{N} \quad \sum_{i=1}^{T} \quad \hat{L}_{11}^{-2}\hat{e}_{it-1}^{2})^{-1}$$

Panel ρ-statistic:

$$Z_P = (\sum_{i=1}^{N} \quad \sum_{i=1}^{T} \quad \hat{L}_{11}^{-2}\hat{e}_{it-1}^{2})^{-1}\sum_{i=1}^{N} \quad \sum_{i=1}^{T} \quad \hat{L}_{11}^{-2}\hat{e}_{it-1}^{2} (\hat{e}_{it-1} \, \Delta\hat{e}_{it} - \hat{\lambda}_i)$$

Panel ρρ-statistic:

$$Z_t = (\hat{\sigma}^2 \sum_{i=1}^{N} \sum_{i=1}^{T} \quad \hat{L}_{11}^{-2}\hat{e}_{it-1}^{2})^{-1/2} \sum_{i=1}^{N} \quad \sum_{i=1}^{T} \quad \hat{L}_{11}^{-2}\hat{e}_{it-1}^{2}(\hat{e}_{it-1} \, \Delta\hat{e}_{it} - \hat{\lambda}_i)$$

Panel ADF statistic:

$$Z_p^* = (\hat{s}^{*2} \sum_{i=1}^{N} \sum_{i=1}^{T} \hat{L}_{11}^{-2} \hat{e}_{it-1}^2)^{-1/2} \sum_{i=1}^{N} \sum_{i=1}^{T} \hat{L}_{11}^{-2} \hat{e}_{it-1}^{*2} (\hat{e}_{it-1}^* \Delta\hat{e}_{it})$$

Group ρ-statistic:

$$\tilde{Z}_P^* = \sum_{i=1}^{N} (\sum_{i=1}^{T} \hat{e}_{it-1}^2)^{-1} \sum_{i=1}^{T} (\hat{e}_{it-1}^2 (\hat{e}_{it-1} \Delta\hat{e}_{it} - \hat{\lambda}_i)$$

Group ρρ-statistic:

$$\tilde{Z}_t = \sum_{i=1}^{N} (\hat{\sigma}^2 \sum_{i=1}^{T} \hat{e}_{it-1}^2)^{-1/2} \sum_{i=1}^{T} (\hat{e}_{it-1}^2 (\hat{e}_{it-1} \Delta\hat{e}_{it} - \hat{\lambda}_i)$$

Group ADF statistic:

$$\tilde{Z}_t^* = \sum_{i=1}^{N} (\sum_{i=1}^{T} \hat{s}^2 \hat{e}_{it-1}^{*2})^{-1/2} (\sum_{i=1}^{T} (\hat{e}_{it-1}^* \Delta\hat{e}_{it})$$

The first four statistics are within-dimension based statistics and the rest are between-dimension based statistics. Padroni (1999) describe the seven test statistics. The firsts of the simple panel cointegration statistics is a type of non-parametric variance ratio statistics. The second is a panel version of a non-parametric statistic that is analogous to the familiar Phillips Perron rho-statistics. The third statistics is also non-parametric and is analogous to the Phillips and Perront-statistics. The fourth statistics is the simple panel cointegration statistics which is corresponding to augmented Dickey-Fuller t-statistics. (Padroni. 1999, p 658). The rest of the statistics are based on a group mean approach. The first of these is analogous to the Phillips and Perron rho-statistics, and the last two analogous to the Phillips and Perron t-statistics and the augmented Dickey-Fuller t-statistics respectively.

3.3.2 Kao Cointegration Test

Kao (1999) describes two tests under the null hypothesis of no cointegration for panel data. One is a Dickey-Fuller type test and another is an Augmented Dickey-Fuller type test. In this study, the Augmented Dickey-Fuller type test Kao are presented. In the bivariate case, Kao consider the following model:

$$y_{it} = \alpha_i + \beta x_{it} + e_{it} \quad ;i=1,\cdots,N \text{ and } t=1,\cdots,T \qquad (3.4)$$

where,

$$y_{it} = y_{it-1} + u_{it}$$

$$x_{it} = x_{it-1} + \varepsilon_{it}$$

α_i are the fixed effect varying across the cross-section observations, β is the slope parameter, y_{it} and x_{it} are independent random walks for all i . The residual series e_{it} should be I(1) series.

For the Augmented Dickey-Fuller test, estimated residual is

$$\hat{e}_{it} = \rho\hat{e}_{it-1} + \sum_{j=1}^{P} \varphi_j \Delta\hat{e}_{it-j} + v_{itp}$$

Under the null of no cointegration, the ADF test take the from

$$t_{ADF} = \frac{(\hat{\rho}-1)\left[\sum_{i=1}^{N}(e_i' Q_i e_i)\right]^{1/2}}{S_v}$$

Further calculation Kao shows the following statistics

$$\text{ADF} = \frac{t_{ADF}+\sqrt{\sigma N}\hat{\sigma}_v/(2\hat{\sigma}_{0v})}{\sqrt{\hat{\sigma}_{0v}^2/(2\hat{\sigma}_v^2)+3\hat{\sigma}_v^2/(10\hat{\sigma}_{0v}^2)}} \sim N(0,1)\ .$$

3.4 Fully Modified Ordinary Least Squares (FMOLS) Method

The group-mean fully modified ordinary least squares (GM–FMOLS) method is applied to estimate the long-run coefficients between the variables. One co-integration is established in the model, then rationale of Fully Modified Least Squares (FMOLS) panel estimates is valid. The GM–FMOLS panel technique (Padroni, 2001) takes into account the intercept and the endogeneity issue. The estimates are robust to endogenous regressors. It also removes omission variable bias and homogeneity restrictions on long-run parameters. The group-mean panel FMOLS estimator can be written as:

$$\hat{\beta}_{GFM}^{*} = \frac{1}{N}\Sigma_i \left[\frac{\sum_{t=1}^{T}(X_{i,t}-\bar{X}_i)Y_{i,t}^{*}-\hat{T}\gamma_i}{\sum_{t=1}^{T}\left(\sum_{t=1}^{T}(X_{i,t}-\bar{X}_i)^2\right)}\right]$$

Where, $Y_{i,t}^{*}= \left(Y_{i,t} - \bar{Y}_i\right) - \frac{\hat{\Omega}_{21,i}}{\hat{\Omega}_{22,1}} \cdot \Delta X_{i,t}$ and $\hat{\gamma}_i = \hat{T}_{21,i} + \hat{\Omega}_{21,i}^{0} - \frac{\hat{\Omega}_{21,i}}{\hat{\Omega}_{22,i}}\left(\hat{T}_{22,i} + \hat{\Omega}_{22,i}^{0}\right)$.

Here, $\hat{\Omega}_i = \hat{\Omega}_{21,i}^{0} + \hat{T}_i + \hat{T}_i$ is the estimated long-run covariance matrix of the stationary vector, consisting of the estimated residuals from the co-integration regression.

$\hat{\Omega}^0_{21,i}$ is the long-run covariance between the stationary error terms. $\hat{T}_i$ is a weighted sum of the auto-covariances and a bar over these letters denotes the mean for i[th] members. The associated t-statistic for the between-group FMOLS estimator takes the following form:

$$t_{\hat{\beta}^*_{GFM}} = \frac{1}{\sqrt{N}} \sum_{i=1}^{N} (\hat{\beta}^*_{FM,i} - \beta) \left(\hat{\Omega}^{-1}_{11,i} \Sigma_t (X_{i,t} - \bar{X}_i)^2 \right)^{1/2}$$

Where, β is a value under the null hypothesis. The above t-statistic is standard normal as T and N approach infinity.

3.5 The Fixed Effect Least-Squares Dummy Variable (LSDV) Model

The least-square dummy variable (LSDV) model allows for heterogeneity among subjects by allowing each entity to have its own intercept value.

$$Y_{it} = \beta_{1i} + \beta_2 X_{1it} + \beta_3 X_{2it} + \beta_4 X_{3it} + u_{it} \qquad (3.5)$$

where, i = 1,2,…,n

t = 1,2,…T

i is the i[th] subject and

t is the time period.

Equation (3.5) is known as the fixed effects (regression) model (FEM). The term "fixed effects" is due to the fact that, although the intercept may differ across subjects, each entity's intercept does not vary over time, that is, it is time-invariant. The FEM given in equation (3.5) assumes that the (slope) coefficients of the regressors do not vary across individuals or over time.

$$Y_{it} = \alpha_1 + \alpha_2 D_{2i} + \alpha_3 D_{3i} + \alpha_4 D_{4i} + \alpha_5 D_{5i} + \alpha_6 D_{6i} + \beta_2 X_{1it} + \beta_3 X_{2it} + \beta_4 X_{3it} + u_{it} \qquad (3.6)$$

where D_{2i} =1 for subject 2, 0 otherwise; D_{3i} =1 for subject 3, 0 otherwise; and so on, the equation (3.6) is also known as the least-squares dummy variable (LSDV) model. Notice that it introduced only i[th] subject minus one dummy variable to avoid falling into the dummy-variable trap (i.e., the situation of perfect collinearity). Here, we are treating subject 1 as the base, or reference, category. The intercept α_1 is the intercept value of subject 1 and the other α coefficients represent by how much the intercept values of the other subject differ from the intercept value of the first subject. So, the terms fixed effects and LSDV can be used interchangeably. The LSDV model (3.6) is also known as the covariance model and X_2 and X_3 are known as covariates.

From equation (3.6), the null hypothesis is that all the differential intercepts are equal to zero.

$$H_o : \alpha_1 = \ldots = \alpha_{N-1} = 0$$

$$H_1 : \alpha_i \neq 0 \text{ for some } i \neq j$$

The test statistic is obtained by:

$$F = \frac{\left(RSS_{Restricted} - RSS_{Urestricted}\right)/(N-1)}{\left(RSS_{Urestricted}\right)/(NT-N-K)} \sim F_{N-1,NT-N-K}$$

Where, $RSS_{Restricted}$ is the residual sum of squares for the restricted model (Pooled OLS), $RSS_{Urestricted}$ is the residual sum of squared for the unrestricted model (LSDV) model. $F_{N-1,NT-N-K}$ is the usual F-distribution with N-1 and NT-N-K degrees of freedom for the numerator and denominator respectively (K is the number of predictor variables). Equation (3.6) is known as a one-way fixed effects model because it had allowed the intercepts to differ between subjects. But it can also allow for time effect, and extend model (3.6) by adding time dummy variables. The model that emerges is called a two-way fixed effects model because it had allowed for both individual and time effects.

3.6 The Random Effects Model (REM)

Although fixed effects or LSDV model can be expensive in terms of degrees of freedom if it have several cross-sectional units. If the dummy variables do in fact represent a lack of knowledge about the (true) model, why not express this ignorance through the disturbance term u_{it}? This is precisely the approach suggested by the proponents of the so called Error Components Model (ECM) or Random Effects Model (REM).

The basic idea is to start with equation (3.5),

$$Y_{it} = \beta_{1i} + \beta_2 X_{1it} + \beta_3 X_{2it} + \beta_4 X_{3it} + u_{it} \tag{3.7}$$

Instead of treating β_{1i} as fixed, it assumes that it is a random variable with a mean value of β_1. And the intercept value for an individual i can be expressed as

$$\beta_{1i} = \beta_1 + \varepsilon_i \quad ,i = 1, \cdots, n \tag{3.8}$$

where, ε_i is a random error term with a mean value of zero and variance σ_ε^2.

Substituting equation (3.8) into (3.7), the equation becomes that

$$Y_{it} = \beta_1 + \beta_2 X_{1it} + \beta_3 X_{2it} + \beta_4 X_{3it} + \varepsilon_i + u_{it}$$

$$Y_{it} = \beta_1 + \beta_2 X_{1it} + \beta_3 X_{2it} + \beta_4 X_{3it} + \omega_{it} \quad (3.9)$$

Where, $\omega_{it} = \varepsilon_i + u_{it}$

The composite error term consists of two components, the cross-section, or individual-specific, error component and the combined time series and cross-section error component. The usual assumptions made by ECM are that

$$\varepsilon_i \sim N(0, \sigma_\varepsilon^2)$$

$$u_{it} \sim N(0, \sigma_u^2) \quad (3.10)$$

$$E(\varepsilon_i u_{it}) = 0$$

$$E(\varepsilon_i \varepsilon_j) = 0 \text{ for } (i \neq j)$$

$$E(u_{it} u_{is}) = E(u_{ij} u_{ij}) = E(u_{it} u_{js}) = 0 \text{ for } (i \neq j ; t \neq s)$$

That is, the individual error components are not correlated with each other and are not autocorrelated across both cross-section and time series units.

$$E(\omega_{it}) = 0 \quad (3.11)$$

$$\text{var}(\omega_{it}) = \sigma_\varepsilon^2 + \sigma_u^2 \quad (3.12)$$

As equation (3.12) shows, the error term ω_{it} is homoscedastic. However, it can be shown thatω_{it} and ω_{is}($t \neq s$) are correlated.; that is, the error terms of a given cross-sectional unit at two different in time are correlated. The correlation coefficient is as follows:

$$\rho = \text{corr}(\omega_{it}, \omega_{is}) = \frac{\sigma_\varepsilon^2}{\sigma_\varepsilon^2 + \sigma_u^2}; \qquad t \neq s$$

3.7 Fixed Effects (LSDV) Versus Random Effects Model

Panel data models examine group (individual-specific) effects, time effects, or both. These effects are either fixed effect or random effect. A fixed effect model examines if intercepts vary across groups or time periods, whereas a random effect model explores differences in error variances. A one-way model includes only one set of dummy variables (e.g., country), while a two way model considers two sets of dummy variables (e.g., country and year). If it is assumed that the error component and the X's are uncorrelated, ECM may be appropriate, whereas if they are correlated, FEM may be appropriate. Keeping this fundamental difference in the two approaches in mind, the choice between FEM and ECM may be done by:

1. If T (the number of time series data) is large and N (the number of cross-sectional units) is small, there is likely to be little difference in the values of the parameters estimated by FEM and ECM. Hence the choice here is based on computational convenience. On this score, FEM may be preferable.
2. When N is large and T is small, the estimates obtained by the two methods can differ significantly. In ECM $\beta_{1i} = \beta_1 + \varepsilon_i$, where ε_i is the cross-sectional random component, whereas in FEM, we treat β_{1i} as fixed and not random. If the individual, or cross-sectional units in units in the sample are not random drawings from a larger sample, FEM is appropriated. Otherwise, ECM is appropriated.
3. If the individual error component ε_i and one or more regressors are correlated, then the ECM estimators are biased, whereas those obtained from FEM are unbiased.
4. If N is large and T is small, and if the assumptions underlying ECM hold, ECM estimators are more efficient than FEM estimators.
5. Unlike FEM, ECM can estimate coefficients of time-invariant variables. The FEM does control for such time-invariant variables, but it cannot estimate them directly, as is clear from the LSDV or within-group estimator models.

3.8 Hausman Test

The Hausman specification test compares the fixed versus random effects under the null hypothesis that the individual effects are uncorrelated with the other regressors in the model (Hausman 1978). If correlated (H_0 is rejected), a random effect model produces biased estimators, violating one of the Gauss-Markov assumptions; so a fixed effect model is preferred. Hausman's essential result is that the covariance of an efficient estimator with its difference from an inefficient estimator is zero (Greene 2003). When the random effects assumption holds, both the fixed and random effects estimators are consistent. However, when the assumption does not hold, only the fixed effects estimator is consistent, and the random effects estimator is biased. If the null hypothesis that the individual effects are uncorrelated with the other regressors in the model is not rejected, a random effect model is better than its fixed counterpart. Hausman test may be useful to the applied researcher to guide the choice between the FE and RE models, assuming unobserved covariates. The test statistic developed by Hausman test has an asymptotic Chi-square distribution.

Test hypothesis is:

Null Hypothesis : The random effect model is appropriate.

Alternative Hypothesis : The fixed effect model is appropriate.

3.9 Breusch and Pagan Lagrange Multiplier Test

The Breusch and Pagan Lagrange Multiplier (LM) Test carried out on the estimates of the random model showed that the random effect model was appropriate for the data. The null hypothesis of the random effect model is that individual-specific or time-series error variances are zero ($\sigma_u^2 = 0$).

Test hypothesis is:

Null Hypothesis : The random effect model is not appropriate.

Alternative Hypothesis : The random effect model is appropriate.

3.10 Breusch-Pagan-Godfrey Test

The Breusch-Pagan-Godfrey Test (sometimes shorted to the Breusch-Pagan test) is a test for heteroscedasticity of errors in regression. Homoscedasticity in regression is an important assumption; if the assumption is violated, we won't be able to use regression analysis. It tests whether the variance of the errors from a regression is dependent on the values of the independent variables. In that case, heteroskedasticity is present. The test statistic approximately follows a chi-square distribution; with *k* degrees of freedom. If the test statistic has a p-value below an appropriate threshold (e.g. $p<0.05$) then the null hypothesis of homoskedasticity is rejected and heteroskedasticity assumed.

Test hypothesis is:

Null Hypothesis : The error variances are homoskedasticity.

Alternative Hypothesis : The error variances are heteroskedasticity.

CHAPTER IV

PANEL DATA ANALYSIS FOR THE RELATIONSHIP BETWEEN SOME ECONOMIC FACTORS AND UNEMPLOYMENT RATE

The effects of some economic factors on unemployment rate are studied in this chapter. The dependent variable is unemployment rate (UR) and the explanatory variables are some economic factors; GDP growth rate, manufacturing value added (MVA) and inflation rate (IR). The panel data which consists of six countries for the period from 1997 to 2016 has been used in this study. The data are shown in Appendix-A. The panel unit root tests were used to check for stationary in the data for unemployment rate, GDP growth rate, manufacturing value added and inflation rate. Then, Padroni co-integration test and Kao test were also used to check whether the panel data are co-integrated. By using Fully Modified Ordinary Least Square Method (FMOLS), the long-run elasticity among variables were estimated. The panel data regression models (fixed effect least square dummy variables model, random effect model) have been used to examine the relationship between unemployment rate and some economic factors. Hausman test and Breusch and Pagan Lagrange Multiplier test has been also used in this study to find out the appropriate model between the fixed effect model and random effect model. The Breusch-Pagan-Godfrey test has been used to test the heteroscedasticity.

4.1 Test for Stationary

The following table has been used to check for the stationary in the data for the unemployment rate, GDP growth rate, manufacturing value added and inflation rate after taking the first difference. The results of the stationary test by adopting LLC and Fisher type ADF with the individual intercept are shown in the following Table (4.1). This study applied the form of log transformation to minimize the problem of multi-collinearity among the variables and to reduce the variability of the data. Under the necessary assumptions, this model was transformed into a linear-log model.Panel unit root test of LLC were used to investigate common unit root processes. The unit root process for each unit (country) was examined by using Fisher-Type ADF test. All variables, except unemployment rate, are used in natural log form.

Table (4.1) Panel Unit Root Tests Results

Variables	**UR**		**Log GDP**		**Log MVA**		**Log IR**		**Lag**
Method	**Statistic**	**P-value**	**Statistic**	**P-value**	**Statistic**	**P-value**	**Statistic**	**P-value**	
LLC	-3.71811	0.0001*	-5.19796	0.0000*	-7.19395	0.0000*	-7.54822	0.0000*	1
ADF – Fisher Chi-square	53.52225	0.0000*	66.8847	0.0000*	81.4162	0.0000*	68.5061	0.0000*	1

* statistically significant at 1% level.

Source: World Data Bank

From Table (4.1), all the variables are non-stationary at level. But after taking the first difference, they become stationary. It indicated that the presence of unit root in the data.

4.2 Panel Co-integration Test

In co-integration analyses, long-term economic relations are tested and estimated. Panel unit root tests' results presented in Table 4.1 shows that all the variables are non-stationary and have the problem of unit root at level form. All of them become stationary at their first differences and have I (1) order of integration, so there are probably having long-run relationship among economic growth (Log GDP), manufacturing value added (Log MVA), inflation rate (Log IR) and unemployment rate (UR). Therefore, panel cointegration test is used to confirm the presence of the cointegration among this variables.

The regression model for unemployment rate and some economic factors (Log GDP, Log MVA, Log IR) are as follows:

$$UR_{it} = \alpha_{it} + \beta[\text{Log (GDP)}_{it} + \text{Log (MVA)}_{it} + \text{Log (IR)}_{it}] + \mu_{it} ;i=1,2,\ldots,6 \quad (4.1)$$

$$t=1,2,\ldots,20$$

Where,

Where,	UR	=	Unemployment rate
	GDP	=	GDP growth rate
	MVA	=	Manufacturing value added
	IR	=	Inflation rate
	μ_{it}	=	Error term

The following Table (4.2) presents the panel co-integration results for some economic factors on unemployment rate.

4.3 The Estimated Fully Modified Ordinary Least Squares (FMOLS) Method for Unemployment Rate and Some Economic Factors

After cointegration test, the impact of some economic factors over unemployment rate would examine the long-run elasticity. The following Table (4.3) summarized the coefficients of unemployment rate (UR), GDP growth rate (Log GDP), manufacturing value added (Log MVA), and inflation rate (Log IR) by estimating fully modified ordinary least square methods (FMOLS).

Table (4.3) Results of Panel FMOLS Method

Variable	Coefficient	Std.Error	t	P-value
Log GDP	-1.0885	0.4427	-2.4588	0.0156*
Log MVA	0.6850	0.2755	2.4862	0.0145*
Log IR	0.2630	0.1365	1.9260	0.0568**
R-squared	0.8659			
Adjusted R-squared	0.8557			
S.E. of regression	0.5786			
Long-run variance	0.3097			
Mean dependent var	2.5321			
S.D. dependent var	1.5233			
Sum squared residual	35.1559			

y: dependent variable ; unemployment rate.

, * statistically significant at 5% level and 10% level.

Source: World Data Bank

From Table (4.3), all the variablesin the FMOLS model are individually, statistically significant at 5% and 10% level. This results implied long run elasticity of Log GDP, Log MVA and Log IR on unemployment rate are -1.0885,0.6850 and 0.2630, respectively. From this estimate, if GDP growth rate rises by 1%, unemployment rate will decrease by 1.0885%.

If manufacturing value added rises by 1%, unemployment rate will increase by 0.6850%. Similarly, if inflation rate rises by 1%, unemployment rate will increase by 0.2630%. Thus, the long-run coefficients obtained from FMOLS estimates are partially robust as the coefficient have no identical signs.

4.4 The Fixed Effect Least-Squares Dummy Variable Model for Unemployment Rate and Some Economic Factors

The Least Square Dummy Variables (LSDV) model allows for heterogeneity among countries by allowing each entity to have its own intercept value. The explained variable unemployment rate and the three explanatory variables (GDP growth rate, manufacturing value added and inflation rate) are analyzed by using the fixed effect least square dummy variables. Fixed effect model with dummy variables, where intercepts are different for different countries α_i, but each individual intercept does not vary over time. This study used some economic factors on unemployment rate using data for the period 1997 to 2016 in Myanmar and Neighboring Countries.

The LSDV model for unemployment rate, GDP growth rate, manufacturing value added and inflation rate are as follows:

$$UR_{it} = \alpha_1 + \alpha_2 D_{2i} + \alpha_3 D_{3i} + \alpha_4 D_{4i} + \alpha_5 D_{5i} + \alpha_6 D_{6i} + \beta_2 LogGDP_{it} + \beta_3 LogMVA_{it} + \beta_4 LogIR_{it} + u_{it} \quad (4.2)$$

where,

α_i	=	Intercept values
UR	=	Unemployment Rate
β_2	=	Slope of GDP growth rate
GDP	=	GDP growth rate
β_3	=	Slope of Manufacturing Value Added
MVA	=	Manufacturing, value added (%)
β_4	=	Slope of Inflation Rate
IR	=	Inflation Rate

D_{2i}	=	1 ; for country 2
		0 ; otherwise
D_{3i}	=	1 ; for country 3
		0 ; otherwise
D_{4i}	=	1 ; for country 4
		0 ; otherwise
D_{5i}	=	1 ; for country 5
		0 ; otherwise
D_{6i}	=	1 ; for country 6
		0 ; otherwise
u_{it}	=	Error term

The following Table (4.4) presents the estimated results for the LSDV model of some economic factors over unemployment rate in Myanmar and Neighboring Countries.

Table (4.4) Estimated Results for LSDV Model

Variables	Coefficient	Std.Error	t	P-value
Constant	0.8405	0.3336	2.52	0.013**
Log GDP	-1.0786	0.3462	-3.12	0.002*
Log MVA	0.5538	0.1936	2.86	0.005*
Log IR	0.2817	0.1345	2.10	0.038**
DUM 2	3.2659	0.2234	14.62	0.000*
DUM 3	3.3422	0.2071	16.14	0.000*
DUM 4	0.8241	0.2594	3.18	0.002*
DUM 5	3.0376	0.2055	14.78	0.000*
DUM 6	0.7113	0.1995	3.57	0.001*
R-squared	0.8485			
Adj R-squared	0.8376			
Root MSE	0.6066			
$F_{(8,111)}$	77.72			
P-value	0.0000			
No: of groups	6			
No: of time (year)	20			
No: of observations	120			

**, * statistically significant at 5% level and 1% level.

Source: World Data Bank

From Table (4.4), in the LSDV model all the variables are individually, statistically significant at 1 percent and 5 percent level.

The estimated LSDV model for unemployment rate and some economic factors in Myanmar and Neighboring Countries can be expressed as follow:

$$UR_{it} = 0.8405 + 3.2658 D_{2i} + 3.3422 D_{3i} + 0.8241D_{4i} + 3.0378D_{5i} + 0.7113 D_{6i}$$

$$-1.0786LogGDP_{it}+0.5538LogMVA_{it} + 0.2827LogIR_{it} \quad (4.3)$$

From the above equation, it is found that the value of R^2 (0.8485) was considerably high enough. This model reports an adjusted R^2 (0.8376 percent). The GDP growth rate has negative effect on unemployment rate. Manufacturing value added and inflation rate have positive effects on unemployment rate. In this model, all the differential intercept coefficients are individually highly statistically significant, suggesting that the six countries are heterogeneous. If GDP growth rate rises by 1%, unemployment rate will decrease by 1.0786%. Therefore, it can be concluded that GDP growth rate increases, unemployment will be decreased. If manufacturing value added rises by 1%, unemployment rate will increase by 0.5538 %. If inflation rate rises by 1%, unemployment rate will increase by 0.2827 %. Therefore, it can be concluded that if the inflation rate increases, unemployment rate will be increased.

Equation (4.3) is called a one-way fixed effects model because it had allowed the intercepts to differ between countries. As a consequence, LSDV produces six regression equations for six countries that are following:

Myanmar: $UR_{it} = 0.8405 - 1.0786LogGDP_{it} +.0.5538LogMVA_{it} + 0.2827LogIR_{it}$

China: $UR_{it} = 4.1063 - 1.0786LogGDP_{it} +.0.5538LogMVA_{it} + 0.2827LogIR_{it}$

Laos: $UR_{it} = 4.1027 - 1.0786LogGDP_{it} +.0.5538LogMVA_{it} + 0.2827LogIR_{it}$

Thailand: $UR_{it} = 1.6646 - 1.0786LogGDP_{it} +.0.5538LogMVA_{it} + 0.2827LogIR_{it}$

Bangladesh: $UR_{it} = 3.8783 - 1.0786LogGDP_{it} +.0.5538LogMVA_{it} + 0.2827LogIR_{it}$

India: $UR_{it} = 1.5518 - 1.0786LogGDP_{it} +.0.5538LogMVA_{it} + 0.2827LogIR_{it}$

4.4.1 Testing Fixed Group Effects (F-Test)

According to the LSDV model, there is a question that is whether there is a significant fixed group effect. Therefore, this study used the restricted F test in model.

Null Hypothesis :All the differential intercepts are equal to zero.

Alternative Hypothesis :All the differential intercepts are not equal to zero.

Test Statistic : Restricted F Test = $\frac{(R^2_{LSDV}-R^2_{Pool})/(N-1)}{(1-R^2_{LSDv})/(NT-N-K)}$

$F = \frac{(0.8485-0.0417)/(6-1)}{(1-0.8685)/(120-6-3)} = 136.1688$

$R^2_{pooled} = 0.0417$, $R^2_{LSDV} = 0.8485$

Critical value : At α=5% level of significant,

$F_{(0.05,N-1,NT-N-K)} = F_{(0.05,5,111)} = 2.37$

Decision Rule : If F> 2.37, reject H_o.

Otherwise, accept H_o.

Decision : Since F = 136.1688> 2.37, reject H_o.

Conclusion :All the differential intercepts are not equal to zero.

Therefore, there is a fixed group effect in this panel data.

4.5 The Random Effects Model for Unemployment Rate and Some Economic Factors

The random effects model estimates variances components for groups (or times) and error, assuming the same intercept and slope, u_{it} is a part of errors and thus should not be correlated to any regressors. The explained variable (unemployment rate) and the three explanatory variables (GDP growth rate, manufacturing value added and inflation rate) for the period 1997 to 2016 in Myanmar and Neighboring Countries are analyzed by using the random effects model.

The random effects model for unemployment rate and some economic factors (GDP growth rate, manufacturing value added and inflation rate) is as follows:

$UR_{it} = \beta_1 + \beta_2 LogGDP_{it} + \beta_3 LogMVA_{it} + \beta_4 LogIR_{it} + \varepsilon_i + u_{it}$

$UR_{it} = \beta_1 + \beta_2 LogGDP_{it} + \beta_3 LogMVA_{it} + \beta_4 LogIR_{it} + w_{it}$ (4.4)

Where, β_1 =Intercept

UR = Unemployment Rate

β_2 = Slope of GDP growth rate

GDP = GDP growth rate

β_3 = Slope of Manufacturing value added

MVA = Manufacturing, value added (%)

β_4 = Slope of Inflation Rate

IR = Inflation Rate

ε_i = Random error term

u_{it} = Error term

w_{it} = Composite error term

The following Table (4.5) represents the random effects model for some economic factors over unemployment rate in Myanmar and Neighboring Countries.

Table (4.5) Estimated Results for Random Effects Model

Variables	Coefficient	Std. Error	t	P-value
Constant	2.7048	0.8926	3.03	0.002*
Log GDP	-1.0796	0.3423	-3.15	0.002*
Log MVA	0.5561	0.1914	2.91	0.004*
Log IR	0.2795	0.1329	2.10	0.035**
Sigma u	2.1261			
Sigma e	0.6066			
Rho	0.9247			
Wald χ^2	18.37			
P-value	0.0004			
No: of groups	6			
No: of time (year)	20			
No: of observations	120			

**, * statistically significant at 5% level and 1% level.

Source: World Data Bank

From Table (4.5), all the variables in the random effects model are individually, statistically significant at 1% and 5 % level.

The estimated random effects model for unemployment rate and some economic factors in Myanmar and Neighboring Countries can be expressed as follow:

$$UR_{it} = 2.7048-1.0796LogGDP_{it}+ 0.5561LogMVA_{it} + 0.2795LogIR_{it} \qquad (4.5)$$

For the estimated random effects model, the value of Rho (0.9247) was considerably high enough. The GDP growth rate has negative effect on unemployment rate. Manufacturing value added and inflation rate have positive effects on unemployment rate. If GDP growth rate rises by 1%, unemployment rate will decrease by 1.0796 %. Therefore, it can be concluded that GDP growth rate increases, unemployment will be decreased. If manufacturing value added rises by 1%, unemployment rate will increase by 0.5561 %. If inflation rate rises by 1%, unemployment rate will increase by 0.2895 %. Therefore, it can beconcluded that if the inflation rate increases, unemployment rate will be increased. The overall model for the estimated random effects model is also statistically significant at 1% level.

4.6 Hausman Test

Hausman test is used to find out the appropriate model. The null hypothesis is underlying Hausman test is that the Fixed Effect Model (FEM) and Error Component Model (ECM) estimation do not differ substantially.

Test hypothesis is:

Null Hypothesis : The random effect model is appropriate.

Alternative Hypothesis : The fixed effect model is appropriate.

Test Statistic:

Table (4.6) Estimated Results of Hausman Test

Variables	Coefficients		Difference	Standard Error
	Fixed effect model	Random effect model		
LogGDP	-1.0786	-1.0796	0.00096	0.0516
Log MVA	0.5538	0.5561	-0.0023	0.0293
Log IR	0.2827	0.2795	0.0032	0.0206
χ^2	0.03			
p-value	0.9986			

Source: World Data Bank

From Table (4.6), the Hausman test clearly accept the null hypothesis, for the estimated χ^2 value is insignificant. Therefore, it can be concluded that the random effects model is appropriate for this study.

4.7 Breusch and Pagan Lagrange Multiplier Test

The Lagrange Multiplier test (Breusch-Pagan) is used to test the hypothesis that there are no random effects.

Null Hypothesis : The random effect model is not appropriate.

Alternative Hypothesis : The random effect model is appropriate.

Test Statistic:

Table (4.7) Estimated Results of LM Test

Variable	Variance	Square Root (Variance)
UR	2.2660	1.5053
e	0.3679	0.6066
u	4.5204	2.1261
χ^2	736.85	
P-value	0.0000	

Source: World Data Bank

From the Table (4.7), the model showed that with a Chi-square of 736.85 and a P-value 0.0000 is less than 1% level. It means that the null hypothesis is rejected. Therefore, it can be concluded that the random effect model is more appropriate for this study.

4.8 Test for Heteroskedasticity

The Breusch-Pagan-Godfrey (BP) test is used for the reliability of the result. This test result is presented in Table (4.8).

Test hypothesis is:

Null Hypothesis : The error variances are homoskedasticity.

Alternative Hypothesis : The error variances are heteroskedasticity.

Table (4.8) Estimated Results of Breusch-Pagan-Godfrey Test

Dependent Variable	Chi-square (χ^2)	P-value
Unemployment Rate	1.05	0.3056

Source: World Data Bank

From Table (4.8), the results with a Chi-square of 1.05 and a P-value 0.30856. It means that the null hypothesis is accepted. Therefore, it can be concluded that the error variances are homoscedasticity for this panel data.

CHAPTER V

CONCLUSION

The main objective of the study was to investigate the impact of some economic factors on unemployment rate, using data for the period 1997 to 2016, in Myanmar and Neighboring Countries (China, Laos, Thailand, Bangladesh and India). The variables for the study are unemployment rate, GDP growth rate, manufacturing value added and inflation rate. The study discussed the Okun's law theories and it considered the Okun's difference type model as the relevant theory in explaining the long run impact of unemployment rate on some economic factors. In this study, panel unit root test was applied and it is found that series are not stationary at level. For this reason, the first differences of the series have been taken. All of this tests confirm that the data are first-difference stationary. In doing so, the study applied the panel co-integration testing approach to determine the linkage between unemployment and economic growth factors. Co-integration result explored that long run relationship exist among the variables for all models. Then, panel group mean fully modified ordinary least square (FMOLS) methods are examined for the coefficients are long-run elasticity. The results of FMOLS showed significant impact of all the variables for all this studying countries.

Furthermore, the two panel data regression models (fixed effect least-square dummy variable (LSDV) and random effects model) are used to analyze the panel data. The Hausman test and Lagrange Multiplier test are used to choose the appropriate model (LSDV or random effects model). According to the results, the random effects model is more appropriate than fixed effect model. In the appropriated random effects model, it has been found that GDP growth rate is negatively effects on unemployment rate. Furthermore, the results demonstrated that in the long run, unemployment rate 1% increases economic growth rate will decrease by 1.08% which satisfy the negative inverse relationship as assumed by Okun (1962). As empirically evidenced, from previous studies that economic growth is influenced by unemployment, it can be deduced that Okun's law holds. The manufacturing value added (productivity) is significant and positively related on unemployment rate. From the result of productivity impact on economic growth, it can be concluded that productivity gains due to electrification, mass production and agricultural mechanization. So, there was no need for a large number of previously employed workers. Therefore, manufacturing value added (productivity) does not hinder on unemployment rate. Inflation rate is also significant and positively related on unemployment rate which means inflation rate does not hinder on unemployment rate.

The empirical results of this study provide the policy makers with a better understanding of unemployment and economic growth linkage to formulate investment policies in Myanmar and Neighboring Countries. The government should come up with effective macro-economic policies and ensure improvements in the structure and functioning systems of governance for stabilizing economic growth along with job creation. The government thus needs to create a conducive environment and flexible labor market policies or legislations that entice many private sector and small businesses which will in turn consolidate the existing entrepreneurship activity with new entrepreneurial entrants so as to create more employment and absorb a large pool of unemployed population.

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APPENDIX

APPENDIX- A

Table (1)- Unemployment Rate, GDP growth rate, Manufacturing Value Added (%) and Inflation Rate for Myanmar (1997-2016)

Year	Country Code	Unemployment Rate (%ILO)	GDP growth Rate (%annual)	Manufacturing Value Added (%annual growth)	Inflation Rate (% consumer price)
1997	1	0.69563332	5.651582963	10.8753334	29.69723258
1998	1	0.70776523	5.866213153	15.09522355	51.48754975
1999	1	0.73886558	10.94512998	17.9963888	18.40104337
2000	1	0.768835476	13.74593056	16.965443	-0.109165515
2001	1	0.786544666	11.34399707	21.83588979	21.10130538
2002	1	0.722775677	12.02551343	28.70651971	57.07451126
2003	1	0.765432224	13.84399689	22.04287634	36.58971753
2004	1	0.765245698	13.56466162	24.68650434	4.534213741
2005	1	0.78633555	13.56895002	21.93939125	9.368618142
2006	1	0.765323445	13.07610138	27.16889942	19.99648734
2007	1	0.756433456	11.99143524	20.88908671	35.02459707
2008	1	0.776543	10.25530539	19.27603009	26.79953719
2009	1	0.797324567	10.5500091	18.57545097	1.472343114
2010	1	0.76313455	9.634439452	35.80458269	7.718381959
2011	1	0.75269889	5.591482378	10.81099992	5.021460146
2012	1	0.751334456	7.332670447	8.32437387	1.467583227
2013	1	0.753345568	8.426001025	9.537695165	5.524279207
2014	1	0.795434567	7.991243344	9.459750573	5.474464713
2015	1	0.769999981	6.992515574	9.899999447	9.485472555
2016	1	0.79999654	5.871982226	9.32110395	6.964739177

Source: World Development Indicators, World Data Bank.

Table (2)- Unemployment Rate, GDP growth rate, Manufacturing Value Added (%) and Inflation Rate for China (1997-2016)

Year	Country Code	Unemployment Rate (%ILO)	GDP growth Rate (%annual)	Manufacturing Value Added (%annual growth)	Inflation Rate (% consumer price)
1997	2	3.099999905	9.230769231	8.252321264	2.787113448
1998	2	3.099999905	7.837613919	10.80855848	-0.849543449
1999	2	3.099999905	7.667486171	35.80458269	-1.358514164
2000	2	3.099999905	8.491508492	10.81099992	0.256518286
2001	2	3.599999905	8.33991055	14.31565869	0.719808092
2002	2	4.00265644	9.130645945	6.976676361	-0.766719454
2003	2	4.300000191	10.03560303	7.85436555	1.164517601
2004	2	4.199999809	10.11122346	31.87437669	3.888815681
2005	2	4.199999809	11.39577594	32.7556673	1.813995156
2006	2	4.099999905	12.71947902	31.29909785	1.46607832
2007	2	4.00123	14.23138804	31.70227302	4.767210585
2008	2	4.199999809	9.654289373	31.16535478	5.843024243
2009	2	4.300000191	9.399813171	30.86676361	-0.700630985
2010	2	4.099999905	10.63614046	31.70651971	3.325774987
2011	2	4.099999905	9.536443008	31.90428763	5.410918114
2012	2	4.099999905	7.85626211	30.31565869	2.643051771
2013	2	4.050000191	7.757635146	30.99553667	2.62808601
2014	2	4.099999905	7.297665959	30.11929352	2.000344887
2015	2	4.050009	6.900204817	28.83588979	1.437024514
2016	2	4.009994767	6.689349894	28.70651971	2

Source: World Development Indicators, World Data Bank.

Table (3)- Unemployment Rate, GDP growth rate, Manufacturing Value Added (%) and Inflation Rate for Laos (1997-2016)

Year	Country Code	Unemployment Rate (%ILO)	GDP growth Rate (%annual)	Manufacturing Value Added (%annual growth)	Inflation Rate (% consumer price)
1997	3	2.98543366	4.049820849	0.051186908	7.16425362
1998	3	4.976546	6.18441582	3.131843594	13.2308409
1999	3	4.08766	8.845755561	5.393774516	4.669821024
2000	3	4.730000019	3.840991157	7.299097849	4.009433962
2001	3	4.98764564	4.823966264	2.270325195	3.684807256
2002	3	4.0764647	3.803975321	6.866763608	4.392199745
2003	3	4.8664774	7.860381476	6.336610322	3.805865922
2004	3	4.6754474	7.922943418	7.383441995	3.76723848
2005	3	4.400000095	9.284824616	10.10425285	4.246353323
2006	3	4.7654772	9.263964759	14.31565869	6.145522388
2007	3	3.686545674	9.801360337	10.27507722	6.369996746
2008	3	3.355647748	3.890957062	4.328432471	8.351816444
2009	3	3.477545262	8.479783897	11.2955621	10.87739112
2010	3	3.539999962	10.25996306	8.86006284	11.99229692
2011	3	3.09766612	6.6383638	7.413173833	8.857845297
2012	3	2.690000057	5.456387552	5.453083306	9.312445605
2013	3	3.539999962	6.386106401	4.96584744	10.90764331
2014	3	3.529000044	7.505220233	8.252321264	6.649500151
2015	3	3.621000051	8.01005265	10.80855848	4.906973441
2016	3	3.463999987	7.107034368	7.895487158	4.941447235

Source: World Development Indicators, World Data Bank.

Table (4)- Unemployment Rate, GDP growth rate, Manufacturing Value Added (%) and Inflation Rate for Thailand (1997-2016)

Year	Country	Unemployment Rate (%ILO)	GDP (%annual)	Manufacturing (%annual growth)	Inflation Rate (% consumer price)
1997	4	0.870000005	-2.75359	0.871380307	5.625797471
1998	4	3.400000095	-7.633733631	-8.381968994	7.99472875
1999	4	2.960000038	4.572298369	9.805899813	0.284726459
2000	4	2.390000105	4.455676031	3.31303378	1.591969175
2001	4	2.599999905	3.444243766	1.958764751	1.626908873
2002	4	1.820000052	6.148879817	8.82379214	0.697308977
2003	4	1.539999962	7.189329965	10.15640136	1.804349946
2004	4	1.50999999	6.289288549	7.457121551	2.759149262
2005	4	1.350000024	4.187834924	4.211552003	4.540369196
2006	4	1.220000029	4.967916824	5.610388111	4.63747436
2007	4	1.179999948	5.43509257	7.231580991	2.241540953
2008	4	1.179999948	1.725667908	2.388019463	5.468489496
2009	4	1.49000001	-0.690733346	-3.309525678	-0.845716092
2010	4	0.620000005	7.513590658	11.37018656	3.247588424
2011	4	0.660000026	0.839959472	-4.832142863	3.809820409
2012	4	0.579999983	7.242967294	6.899806021	3.02
2013	4	0.49000001	2.732473309	1.963300823	2.18496066
2014	4	0.579999983	0.914519144	0.100938364	1.895890134
2015	4	0.600000024	2.941235423	1.508171084	-0.900164342
2016	4	0.689999998	3.237980767	1.412300412	0.188334903

Source: World Development Indicators, World Data Bank.

Table (5)- Unemployment Rate, GDP growth rate, Manufacturing Value Added (%) and Inflation Rate for Bangladesh (1997-2016)

Year	Country Code	Unemployment Rate (%ILO)	GDP growth Rate (% annual)	Manufacturing Value Added (% annual growth)	Inflation Rate (% consumer price)
1997	5	2.67122	4.717909399	4.489896497	5.305601057
1998	5	2.9510458	8.869635252	5.177026873	8.402237956
1999	5	3.03481232	3.483703486	4.670156368	6.106695898
2000	5	3.269999981	4.699566957	5.293294718	2.208256209
2001	5	3.334887666	6.532232869	5.077287776	2.007173742
2002	5	3.78422219	5.138653128	3.83312394	3.332564933
2003	5	4.320000172	6.670853807	4.739567399	5.668707734
2004	5	4.02866544	6.982225362	5.23953291	7.587536385
2005	5	4.25	7.856794832	6.535944941	7.046618162
2006	5	3.589999914	10.81066262	6.671868265	6.765261171
2007	5	3.491222268	10.5351157	7.058636206	9.106984969
2008	5	4.045556122	7.331292479	6.013789759	8.901944895
2009	5	5.01	6.693401414	5.045124794	5.423472362
2010	5	3.380000114	6.646765729	5.571802274	8.126676392
2011	5	3.50113326	10.01338542	6.46438388	10.7048046
2012	5	3.78890222	9.955216248	6.521435078	6.21818237
2013	5	4.429999828	10.3068902	6.013596067	7.529972823
2014	5	4.05577811	8.766757021	6.061093054	6.991165327
2015	5	4.19462876	10.31057687	6.552633316	6.19428023
2016	5	4.349999905	11.6908152	7.113489474	5.513525727

Source: World Development Indicators, World Data Bank

Table (6)- Unemployment Rate, GDP growth rate, Manufacturing Value Added (%) and Inflation Rate for India (1997-2016)

Year	Country Code	Unemployment Rate (%ILO)	GDP growth Rate (%annual)	Manufacturing Value Added (%annual growth)	Inflation Rate (% consumer price)
1997	6	3.414000034	6.872091273	4.975436244	27.50886245
1998	6	3.49000001	3.967608091	8.967553222	90.98073456
1999	6	2.282999992	7.306376073	10.8654338	98.27213702
2000	6	2.109999895	5.798782326	9.965776623	25.08464143
2001	6	1.762000012	5.751412882	12.09603147	7.811807948
2002	6	1.432000017	5.918743682	12.97451171	10.63134463
2003	6	1.271000004	6.067002304	5.627673777	15.48935292
2004	6	1.39199996	6.35769548	15.11929352	10.46226673
2005	6	1.350000024	7.107568369	10.32508808	7.165417599
2006	6	0.68900001	8.619266209	13.5462776	6.80218938
2007	6	0.67900002	7.596828801	13.70227302	4.522297607
2008	6	0.663999975	7.824902763	9.165354778	7.629305029
2009	6	0.649999976	7.501774913	5.778277662	0.035294368
2010	6	0.709999979	8.526905517	3.706640242	5.982348385
2011	6	1.059999943	8.038652681	10.39307839	7.576924053
2012	6	0.912999988	8.026098434	9.936805923	4.256942205
2013	6	0.763999999	8.026300226	3.515902623	6.364939277
2014	6	0.709999979	7.611963441	9.753065104	4.13522637
2015	6	1.210999966	7.269591775	4.417516719	1.276227705
2016	6	1.059999943	7.023091874	3.141326612	1.509359614

Source: World Development Indicators, World Data Bank.

Country		**Code**
Myanmar	=	1
China	=	2
Laos	=	3
Thailand	=	4
Bangladesh	=	5
India	=	6

APPENDIX-B

1. EViews Output of Panel Unit Root Tests

1.1 Panel Unit Root Tests for Unemployment Rate

Null Hypothesis: Unit root (common unit root process)
Series: D(UR)
Date: 10/11/18 Time: 22:30
Sample: 1997 2016
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 102
Cross-sections included: 6

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-3.71811	0.0001

** Probabilities are computed assuming asympotic normality

Null Hypothesis: Unit root (individual unit root process)
Series: D(UR)
Date: 10/11/18 Time: 22:34
Sample: 1997 2016
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 102
Cross-sections included: 6

Method	Statistic	Prob.**
ADF - Fisher Chi-square	53.5225	0.0000
ADF - Choi Z-stat	-5.37878	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

1.2 Panel Unit Root Tests for Log GDP

Null Hypothesis: Unit root (common unit root process)
Series: D(LOGGDP)
Date: 10/11/18 Time: 22:36
Sample: 1997 2016
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 102
Cross-sections included: 6

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-5.19796	0.0000

** Probabilities are computed assuming asympotic normality

Null Hypothesis: Unit root (individual unit root process)
Series: D(LOGGDP)
Date: 10/11/18 Time: 22:37
Sample: 1997 2016
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 102
Cross-sections included: 6

Method	Statistic	Prob.**
ADF - Fisher Chi-square	66.8847	0.0000
ADF - Choi Z-stat	-6.39640	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

1.3 Panel Unit Root Tests for Log MVA

Null Hypothesis: Unit root (common unit root process)
Series: D(LOGMVA)
Date: 10/11/18 Time: 22:39
Sample: 1997 2016
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 102
Cross-sections included: 6

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-7.19395	0.0000

** Probabilities are computed assuming asympotic normality

Null Hypothesis: Unit root (individual unit root process)
Series: D(LOGMVA)
Date: 10/11/18 Time: 22:39
Sample: 1997 2016
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 102
Cross-sections included: 6

Method	Statistic	Prob.**
ADF - Fisher Chi-square	81.4162	0.0000
ADF - Choi Z-stat	-7.40891	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

1.4 Panel Unit Root Tests for Log IR

Null Hypothesis: Unit root (common unit root process)
Series: D(LOGIR)
Date: 10/11/18 Time: 22:41
Sample: 1997 2016
Exogenous variables: Individual effects
User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Total (balanced) observations: 102
Cross-sections included: 6

Method	Statistic	Prob.**
Levin, Lin & Chu t*	-7.54822	0.0000

** Probabilities are computed assuming asympotic normality

Null Hypothesis: Unit root (individual unit root process)
Series: D(LOGIR)
Date: 10/11/18 Time: 22:41
Sample: 1997 2016
Exogenous variables: Individual effects
User-specified lags: 1
Total (balanced) observations: 102
Cross-sections included: 6

Method	Statistic	Prob.**
ADF - Fisher Chi-square	68.5061	0.0000
ADF - Choi Z-stat	-6.59669	0.0000

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

2. EViews Output of Panel Cointegration Test

2.1 Pedroni Residual Cointegration Test

Pedroni Residual Cointegration Test
Series: UNEMPLOYMENT__ILO_ LOGGDP LOGMANU LOGINFLA
Date: 09/05/18 Time: 12:52
Sample: 1997 2016
Included observations: 120
Cross-sections included: 6
Null Hypothesis: No cointegration
Trend assumption: Deterministic intercept and trend
Automatic lag length selection based on SIC with a max lag of 3
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-0.288222	0.6134	0.124516	0.4505
Panel rho-Statistic	-0.187725	0.4255	0.120826	0.5481
Panel PP-Statistic	-4.971175	0.0000	-4.156322	0.0000
Panel ADF-Statistic	-4.691045	0.0000	-3.813095	0.0001

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	0.773516	0.7804
Group PP-Statistic	-7.156375	0.0000
Group ADF-Statistic	-4.638199	0.0000

2.2 Kao Co-integration Test

Kao Residual Cointegration Test
Series: UNEMPLOYMENT__ILO_ LOGGDP LOGMANU LOGINFLA
Date: 09/05/18 Time: 12:53
Sample: 1997 2016
Included observations: 120
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
Automatic lag length selection based on SIC with a max lag of 4
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.
ADF	-2.621273	0.0044

Residual variance	0.182061
HAC variance	0.125482

3. EViews output of Fully Modified OLS Method

Dependent Variable: UNEMPLOYMENT__ILO_
Method: Panel Fully Modified Least Squares (FMOLS)
Date: 09/13/18 Time: 12:42
Sample (adjusted): 1998 2016
Periods included: 19
Cross-sections included: 6
Total panel (balanced) observations: 114
Panel method: Pooled estimation
Cointegrating equation deterministics: C
Additional regressor deterministics: @TREND
First-stage residuals use heterogeneous long-run coefficients
Coefficient covariance computed using default method
Long-run covariance estimates (Bartlett kernel, Newey-West fixed bandwidth)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGGDP	-1.088526	0.442714	-2.458758	0.0156
LOGMVA	0.685043	0.275540	2.486188	0.0145
LOGIR	0.263026	0.136544	1.926304	0.0568

R-squared	0.865926	Mean dependent var	2.532128
Adjusted R-squared	0.855710	S.D. dependent var	1.523306
S.E. of regression	0.578635	Sum squared resid	35.15595
Long-run variance	0.309696		

4. Stata Output of Fixed Effect Least-Squares Dummy Variable (LSDV) Model

Source	SS	df	MS			
				Number of obs	=	120
				F(8, 111)	=	77.72
Model	228.808655	8	28.6010819	Prob > F	=	0.0000
Residual	40.8463152	111	.367984821	R-squared	=	0.8485
				Adj R-squared	=	0.8376
Total	269.65497	119	2.26600815	Root MSE	=	.60662

UR	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
LogGDP	-1.078605	.3461969	-3.12	0.002	-1.764617	-.3925923
LogMVA	.5537602	.1935848	2.86	0.005	.1701591	.9373613
LogIR	.2826956	.1344554	2.10	0.038	.0162633	.549128
country						
2	3.26583	.2234407	14.62	0.000	2.823067	3.708593
3	3.342182	.2071074	16.14	0.000	2.931785	3.752579
4	.8241253	.2594266	3.18	0.002	.3100542	1.338196
5	3.037752	.2055123	14.78	0.000	2.630515	3.444988
6	.7112588	.1994536	3.57	0.001	.3160283	1.106489
_cons	.8404627	.3336059	2.52	0.013	.1794003	1.501525

5. Stata Output of Random Effects Model (REM)

```
. xtreg UR LogGDP LogMVA LogIR, re

Random-effects GLS regression               Number of obs      =       120
Group variable: country                     Number of groups   =         6

R-sq:                                       Obs per group:
     within  = 0.1398                                      min =        20
     between = 0.0496                                      avg =      20.0
     overall = 0.0081                                      max =        20

                                            Wald chi2(3)       =     18.37
corr(u_i, X)   = 0 (assumed)                Prob > chi2        =    0.0004
```

UR	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
LogGDP	-1.079567	.3423262	-3.15	0.002	-1.750514	-.4086204
LogMVA	.5560567	.1913526	2.91	0.004	.1810125	.9311009
LogIR	.2794658	.132864	2.10	0.035	.019057	.5398745
_cons	2.704879	.8925835	3.03	0.002	.955447	4.45431
sigma_u	2.1261444					
sigma_e	.60661752					
rho	.924724	(fraction of variance due to u_i)				

.

6. Stata Output of Hausman test

```
. hausman fixed .

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed        random       Difference          S.E.
-------------+----------------------------------------------------------------
      LogGDP |   -1.078605    -1.079567        .0009627        .0516246
      LogMVA |    .5537602     .5560567       -.0022965        .0293129
       LogIR |    .2826956     .2794658        .0032299        .0206251
------------------------------------------------------------------------------
                          b = consistent under Ho and Ha; obtained from regress
           B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =        0.03
                Prob>chi2 =      0.9986
```

7. Stata Output of Breusch and Pagan Lagrange multiplier test for random effects

```
Breusch and Pagan Lagrangian multiplier test for random effects

        UR[country,t] = Xb + u[country] + e[country,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                      UR |   2.266008       1.505327
                       e |   .3679848       .6066175
                       u |    4.52049       2.126144

        Test:   Var(u) = 0
                             chibar2(01) =   736.85
                          Prob > chibar2 =   0.0000
```