THE DETERMINANTS OF LABOR PRODUCTIVITY IN UNITED KINGDOM

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DECLARATION

We hereby declare that:

(1) This undergraduate research project is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this research project has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the research project.

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DEDICATION

Firstly, we would like to dedicate this research project to our supervisor, Dr.Abdelhak Senadjki, for his sincere advice, patient guidance and constructive comments to assist us in completing this research report. We also hope that this research will make him proud and reflect on all teaching towards us thus far.

Besides, we would like to dedicate this dissertation to our family and friends to share with our achievement in this research project as an appreciation to their support and encouragement during the preparation of this research report.

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LIST OF ABBREVIATION

ADF	Augmented Dickey-Fuller
ARCH	Autoregressive Conditional Heteroscedasticity
ARDL	Auto Regressive Distributive Lag
ARMA	Autoregressive–Moving-Average Model
BLUE	Best, Linear, Unbiased and Efficient
BoP	Balance of Payment
CPI	Consumer Price Index
CUSUM	Cumulative Sum Control Chart
CUSUMSQ	Cumulative Sum Control Chart of Square
DF	Dickey-Fuller
ECT	Error Correction Term
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
JB	Jarque-Bera
LM	Lagrange Multiplier
MA	Moving Average
OECD	Organization for Economic Co-operation and Development

OLS	Ordinary Least Square
QALI	Quality Adjusted Labor Input
R&D	Research and Development
RESET	Regression Equation Specification Error Test
UECM	Unrestricted Error Correction Model
UK	United Kingdom
UKTI	UK Trade & Investment
US	United States
USD	U.S. dollar
VECM	Vector Error Correction Model
VIF	Variance Inflation Factor
WDA	Workforce Development Agency

PREFACE

This research project is submitted in order to fulfil the required of the graduate student for the degree of Bachelor of Business Administration (HONS) Banking and Finance in Universiti Tunku Abdul Rahman (UTAR). This research paper is supervised by Dr Abdelhak Senadjki. This study provided a detailed flow and explanation of our topic selected.

The research title is "The determinants of labor productivity in United Kingdom". The variables chosen are FDI, working hours, inflation rate, human capital and wage. Objective for the research is to examine the relationship between all these variables.

Firstly, the study begin with the research background and explaining the relationship between each of the variables. The study further provides the explanation of each of the variables according to the objectives detailed in literature review. Data description, econometric techniques and methodology is presented later. In Chapter 4, the result and interpretation is provided in order to achieve the study's goals. Lastly, the research paper concluded the summary, policy implication, limitations as well as recommendations

ABSTRACT

Labor productivity slowdown has always been United Kingdom's (UK) economic issues. In the face of worsening macroeconomic outlook and the expectation for the coming financial crisis, it is important to understand the determinants of labor productivity in UK in order to tackle the adverse situation which could happened in the future. This study aims to investigate the relationship between the determinants and labor productivity in UK and has a sample size of 30 years. Autoregressive Distributed Lag (ARDL) approach is used to investigate the short run and long run relationship between the labor productivity and macroeconomic variable like wages, working hours, foreign direct investment (FDI), human capital and inflation. The result showed that there is a negative long run relationship between labor productivity and working hours or labor productivity and inflation rates. In addition, a positive long run relationship is found in this study for labor productivity and wages. For human capital, there is no relationship occurs in the long run but a positive short run relationship is identified. However, a long run relationship is found between FDI and labor productivity, yet there is no changes for an additional 1% increase in FDI. Lastly, this study will provide a clearer picture to the policy maker or government in UK on how to manage and enhance the current labor productivity relating to the determinants studied in this research.

CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction

The research will begin with a broad introduction on the background of UK in term of labor productivity. It will focus on the comparison in productivity performance between the developed countries like US, France and Germany with UK. Besides, the relationship between the case of UK which includes FDI, working hours, inflation rate, human capital and wage. Furthermore, the problem statement will be discussed in this research paper and thereafter the research objectives, research question, and the significance of the study will be discussed.

1.1 Research Background

There is no doubt that the quest for the labor and technology evolution has been the main drive for the growth of labor productivity at almost every country. Over the years of progression, the labor productivity has become the key factors to maintain and improve the economic growth, competitiveness, and living standards within a country (Freeman, 2008). Therefore, an increases in labor productivity is generally hailed as a positive outcome for a country (Mojtahedzadeh & Keshideh, 2015).

UK is consider to be the fifth-largest national economy in the world measure by its GDP. The main sector of UK is construction, manufacturing and services (Rhodes, 2016). Among all these sector, the services sector dominates the UK economy as it contributes around 80% of GDP (Rhodes, 2016). The financial services sector is important as London is the world's largest financial center.

The shortfall in productivity has always been UK's economic Achilles heel. After all these years since the Great Recession in 2008, UK is still in the midst of an unprecedented slowdown in productivity growth. As Figure 1.1 shows, in the late 1990s and early 2000s, UK's productivity gap with other developed countries has gradually narrowed but that improvement faltered immediately right after the years preceding the financial crisis and continued to widen since.

Many other developed economies have disappointing productivity growth after the financial crisis, but the UK's record is particularly poorer. The productivity in the UK has barely grown from 2012-2014 and in terms of performance, UK productivity is comparatively lower than other developed country like France, Germany and United States. If this trend continues, UK living standard will remain stagnate and the level of government deficit will be worsen.

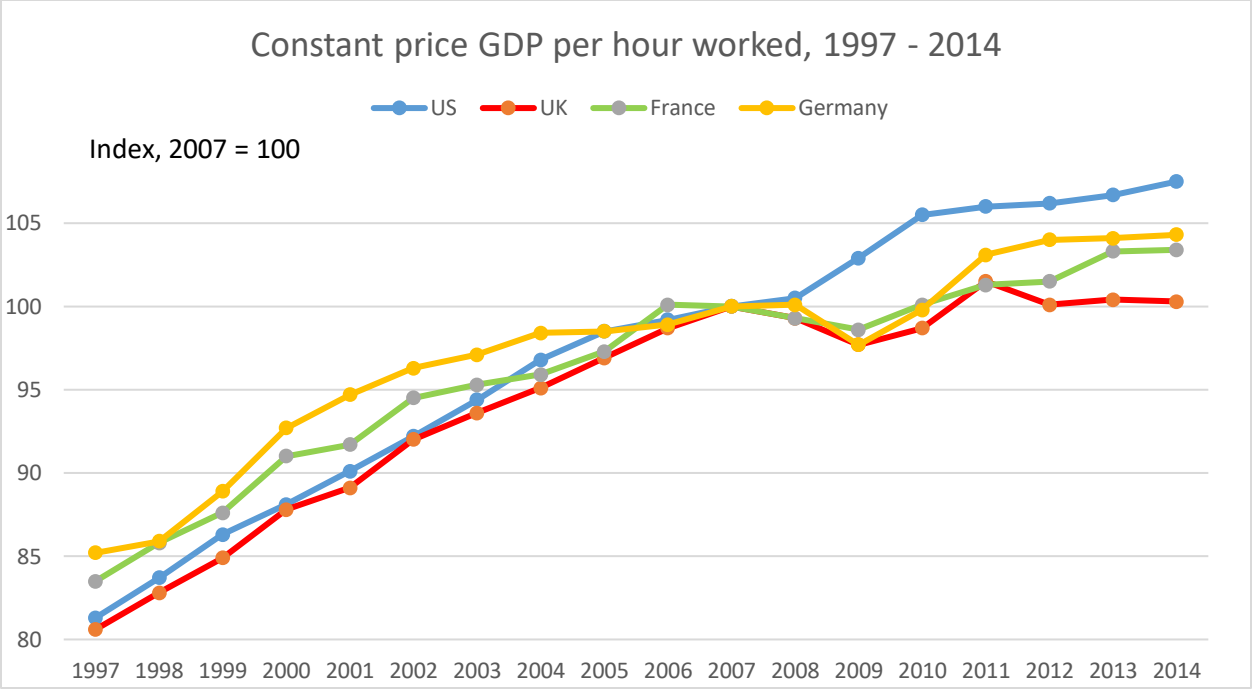


Figure 1.1. Labor Productivity of UK, US, France and Germany (Labor Productivity = Gross Domestic Product (GDP) per hour worked)

Source: Office for National Statistics, 2016

There have been a number of factors for the deterioration in productivity such as the availability of unskilled labor, misallocation of capital, overworking effect and etc. (Elliot, 2016; Wolf, 2017). Therefore, an understanding for the relationship between these factors with the labor productivity is crucial.

1.1.1 Foreign Direct Investment and Labor Productivity in UK

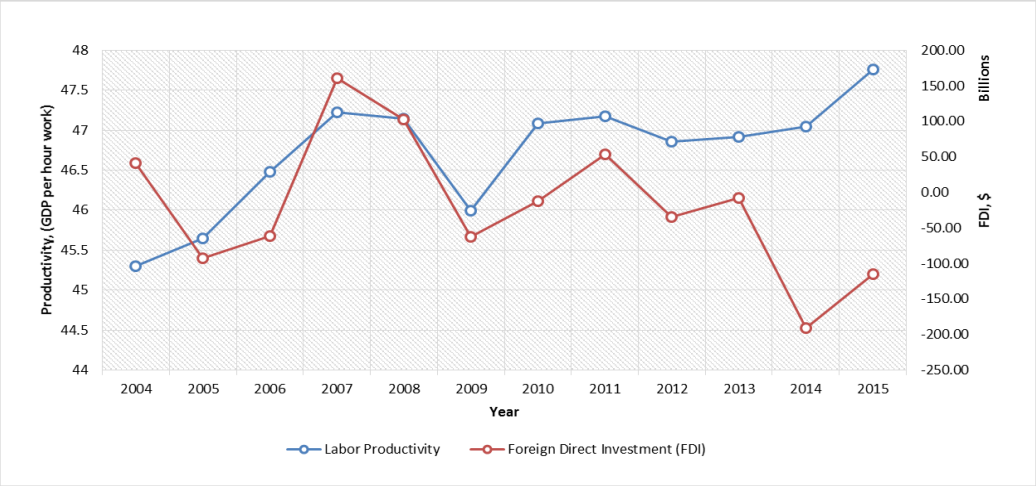


Figure 1.2. Net Foreign Direct Investment, (BoP, current US$) and Labor Productivity (GDP per hour worked) in UK.

Source: Organization for Economic Co-operation and Development (OECD), 2016 and World Bank, 2016

FDI is the major source of private capital flows in developing countries as compared to the other sources (Naanwaab & Diarrassouba, 2016). A positive relationship exists between foreign direct investment and labor productivity, which in turn affects the economic growth. As Figure 1.2 shows, the trend of both FDI and labor productivity fluctuates over a period of 12 years in UK. The FDI in UK increases sharply in 2006 which result in a relatively increases in labor productivity and thereafter FDI starts to decline from year 2007 to 2009 due to the global financial crisis (Hughes & Saleheen, 2012). According to the Allen (2010), the occurrence of global financial crisis result in the reduction on FDI due to the merger and acquisition activity drying up in credit crunch. Allen (2010) states the reduction on FDI lead to the labor productivity decrease simultaneously as the financial services sector contributed the most in GDP in UK economy.

On the contrary, there is also an inverse relationship occurs between foreign direct investment and labor productivity (Alam, Arshad, & Rajput, 2013). By referring to Figure 1.2, FDI of UK decreases sharply in 2013, until the end of 2014 is due to the large disinvestments in some traditional partner countries like United States (EUR -69.8 billion) and Switzerland (EUR -20 billion) (Eurostat Statistics Explained, n.d.). However, labor productivity still increases slightly throughout the years. This is because the freedom of movement was extended for new EU member, Romania and Bulgaria and the amount of immigrants working was doubled between the year 2012 and 2014 (Migration Watch UK, n.d.). While in the year 2014, the FDI increase as 1,610 of the 1,988 projects that landed in the UK are assisted by UK Trade and Investment (UKTI) by funding essential infrastructure and regeneration projects across UK (UK Trade & Investment, 2015). The assistance of UKTI on the project has created almost 85,000 new jobs which eventually increase the labor productivity in UK.

1.1.2 Inflation and Labor Productivity in UK

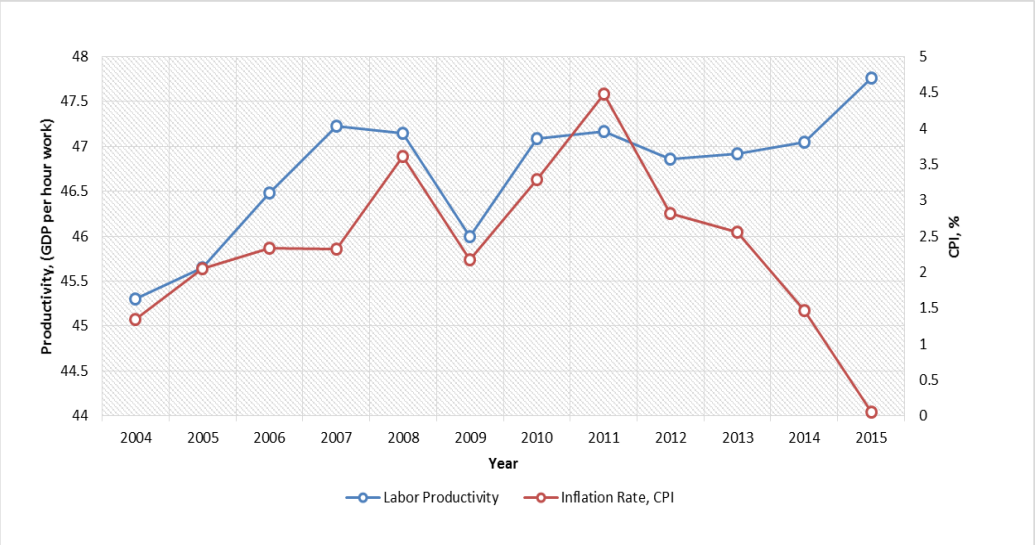


Figure 1.3. Inflation, consumer prices (annual %) and Labor Productivity of United Kingdom, 2004 – 2015

Source: OECD, 2016 and World Bank, 2016

Inflation is an economic phenomenon that enable the increasing of goods and services price. When inflation happen, people tend to save more and the demand to buy goods and services decrease which reduce the purchasing power. Inflation leads to the drop of purchasing power of workers which demotivate them and reduce the effort that they put in. Figure 1.3 shown the relationship between inflation and labor productivity in UK from year 2004 to 2015.

UK experiences a sharp increase of inflation and decrease of labor productivity in year 2007 until 2008. This occurred is because financial crisis happened between the years. The reason of the UK suffer from financial crisis

are inattentive monetary policy before crisis, slack of financial management, and lose of global balance (Martin & Milas, 2009). The inattentive monetary policy stimulate the sharp rise in housing prices with reduce the default of mortgage and so cause the mortgage-backed securities over-pricing. Next, huge investments in financial products which indistinctly understand and growth rapid in risk of off-balance sheet created the regression in financial market result the slack of financial management. Moreover, the highly surplus of current account, result the rises the liquidity of finance that decline the interest rate in the developed markets with the lower saving rate arouse the loses of global balance. According to Flanders (2011), the growth of inflation effect the cost of fuel and light rises result the demand in UK falls during the recession. This in turn result in a drop on labor productivity. The lesser amount of new people joining the workforce and labor working hours are not enough to cover the inflation.

As figure 1.3 show, during year 2012 to 2015, it shows hyper deflation. This phenomenon is significantly affect by drop of oil and goods price. Forbes (2015) stated deflation is attributable to the difficult in repaying debt and the expectation of consumers and businesses. They expect the future price fall, and therefore, they delay their purchases and investment. Furthermore, exchange rate is also one of the motive which decline inflation. The trend of exchange rate can change the price of goods and lead to drag down the core inflation. Meanwhile, the upturn of labor productivity since 2012 is mainly influence by longer period spent by worker in working and stock of capital is a little higher. The improvement of education of British workers is also one of the reason that improve the labor productivity. In short, the price drop will encourage people spend more, hence, increase the demand in market and supply of goods increase at the same time. Since the supply of goods rises, it will lead to growth of labor productivity.

1.1.3 Working Hours and Labor Productivity in UK

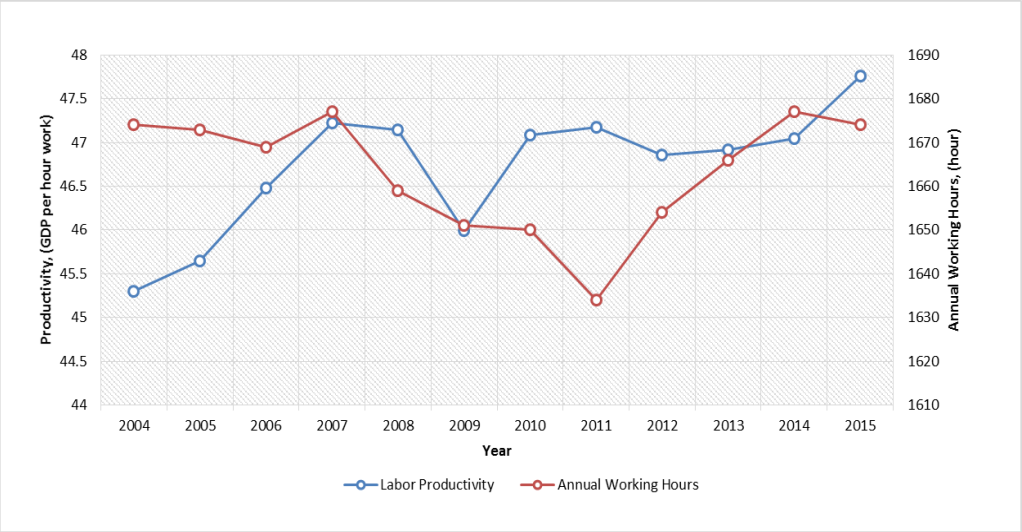


Figure 1.4. Working Hours and Labor Productivity (GDP per hour worked) in UK

Source: OECD, 2016

The regulation of working hours contributes to the variation on labor productivity. Adverse relationship is found between these two variables (Bryson & Forth, 2007). The working hours in UK is high as compared to other developed countries as in Australia, Switzerland, Germany and more. Employer requires their employees to work overtime every week. Employers believe that by working extra hours will result in higher productivity since their workers perform longer than those who did not. As Figure 1.4 shows, the labor productivity is observes to be increased at most of the period when the working hours increases.

As shown in the figure 1.4, the fall on working hours result in growing of labor productivity. It is due to the Working Time Directive (2003/88/EC) announced by EU where EU's countries have to assure that working hours shall not exceed 48 hours on average. According to European Commission (n.d.), Working Time Directive aims to ensure health and safety in workplace for employees. Whilst being the best workplace in EU's countries, UK has successfully reduce long working hours after introduction to this regulations (Devlin, 2014). According to Pencavel (2014), employees tend to perform better at shorter hours. Positive relationship is found between the two variables in year 2007. The reduction on these two continued at a growing rate until the late 2009s. Like any other countries, the occurrence of this event appears to be the consequences of the economic recession (Harari, 2016). The output level tend to fall during the presence of recession. The growing of working hours and inability to overcome recession results in low labor productivity. UK has shifts from being one of the high performer to stagnant condition. On the other hand, the dramatic fall on working hours in year 2011 results in exceptionally high labor productivity. This is due to the implementation of Equality Act 2010. This act is reinforced in the 2010 with the merging of the Employment Equality (Age) Regulations 2003, the Disability Discrimination Act 1995 and many more (Equality & Human Rights Commission, n.d.). This act has given right to employees to develop flexible working where it's different from the employee's normal working pattern. Employees have the right to request reasonable changes on working hours in association of protected characteristics. As mentioned earlier by Pencavel (2014), employees tend to work at better efficacy at shorter hours. Since the employee can adjust their working pattern that benefits both employee and his employer, it results in higher productivity.

Moreover, the slight growth on productivity since 2013 is mainly influences by the increase of full time workers since 2013, in contrast of the previous trend in earlier 2011 where the amount of self-employed and part time workers are more than full time workers. In the estimation of Quality Adjusted Labor Input (QALI), the increase of hours worked result in growth in quality adjusted labor input for year 2013 to 2015 (Wales, 2016). This in turn leads to growth of labor productivity. The growth of labor productivity since 2012 signifying the possibility of recovery.

1.1.4 Human Capital in terms of Enrollment Rate and Labor Productivity in UK

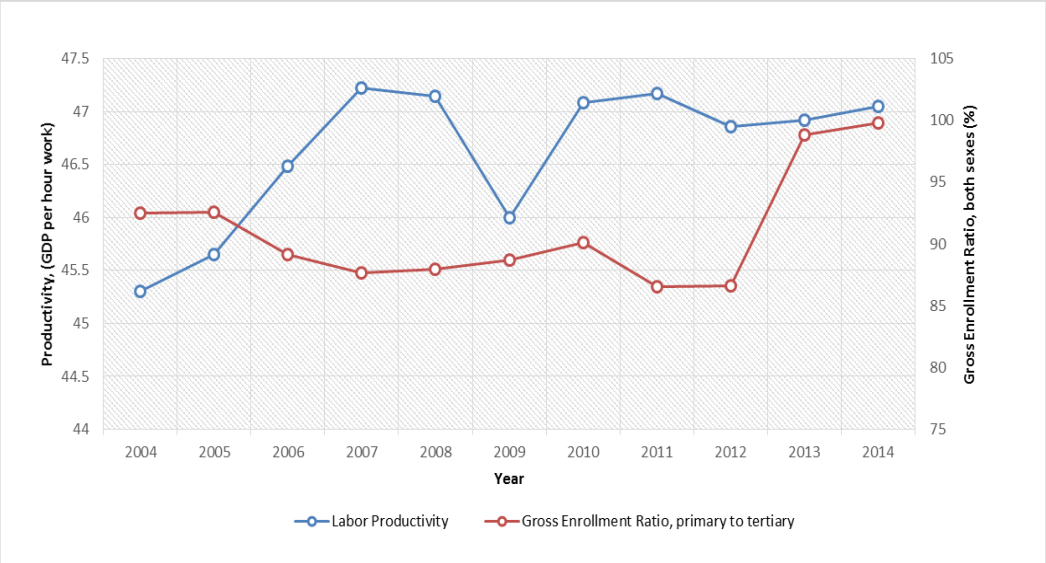


Figure 1.5. Enrollment Rate and Labor Productivity (GDP per hour worked) in UK

Source: OECD, 2016 and World Bank, 2016

Gross enrolment ratio can be defined as the numbers of students with different grade levels such as elementary, middle and high schools that enrolled in school (Kumuda, 2014). This can be showed by using the ratio of the number of students in a specific country to those who qualify for the particular grade level (OMICS, 2014).

Based on the figure 1.5, the labor productivity increases rapidly from year 2004 and achieves the highest in 2007 while gross enrollment ratio decrease from year 2005 to 2007. Based on the Education Secretary Charles Clarke (2003), states that the reason behind this was because of the “top-up” of the tuition fees up to £3,000 and the imposed of this fees system make student confused. Thus, we can assume that labor that cannot afford the tuition fees will seek for the job instead of study. According to Oulton, Nicholas, and María Sebastiá-Barriel (2013) states that Bank of England claimed the labor productivity showed a serious drop is mainly causes by World Financial Crisis in year 2008. Besides, the existence of a 'productivity puzzle' happened in 2009 also causes the productivity decrease while gross enrollment ratio increase. However, government of UK states that there is no necessary reduction on education in terms of primary, secondary and post-secondary non-tertiary education because education plays a significant role in today world. Besides that, they also need to boost the economy despite falling enrolments as a sustainable recovery started from year 2007 (OECD, 2010). Bank of England further claims that the labor productivity dropped continuously since 2007 to 2009 is because of a long shadow from financial crisis

Despite the financial crisis in earlier years, UK's enrolment rates continue to grow sturdily. According to Chung (2012), the demand for tertiary graduates increase although there is recession indicating that the average employment rates among these individuals are still in a well condition. As tertiary graduates have more field related knowledge, thus graduates may replace less-educated retirees. It is known that higher skilled individual is responsible for the widest growth in labor productivity, for both before and after financial crisis (Aznar, Forth, Mason, O'Mahony, & Bernini, 2015). As we can see from figure 1.5, the enrolment ratio faced a sharp increase during the year 2012 achieving its most significant rise throughout the year while labor productivity experienced a stable increase in their data. The significant rise in enrolment is due to the emerged of application rates from disadvantaged group in the UK. The disadvantaged can be classified as area-based measures of higher education entry or by individual-level measures of low income (UCAS Analysis & Research, 2013). This is due to the rise of government expenditure of education funding as well as financial support by public loans (OECD, 2014). According to Bank of England (2015), the reason behind productivity increased was the migrants of foreign workers and the increases of wages.

1.1.5 Wages and Labor Productivity in UK

Figure 1.6. Average annual wages ($) and Labor Productivity of United Kingdom, 2004 – 2015

Source: OECD, 2016

In economic theory, the higher the wages the higher the productivity. Higher wages will generate greater labor cost which will result in an increased on marginal labor productivity when firms substitute capital for labor (Wakeford, 2004; Gordon, 1997). According to Kumar, Webber, and Perry (2009), there is a relationship between the labor productivity and wages as higher wages would be able to increase the opportunity cost of job loss and motivates the worker to improve productivity. The graph above shown the relationship between wages and labor productivity in UK from year 2004 to 2015.

In year 2005 to 2007, the labor productivity and wages shows a positive relationship. Both of the variables increases linearly in these few years. According to Valero, Corry, and Reenen (2011), the labor productivity has increases due to the advancement in skills, technology and innovation, which lead to increase in the wages of worker. Therefore, workers will require high pay rate of wages which compatible with their skill level. With all of these advancement, upsurge production of a UK's firm. Likewise, both increase in the business services and distribution sectors also improve the productivity as well (Valero, Corry, & Reenen, 2011).

UK experienced a sharp decrease of labor productivity and stagnation of annual wages in year 2007 until 2009 due to the financial crisis happened between the years. The reasons lead to financial crisis are banking crisis, oil productivity declines, and lose in global balance which result in inflation and dropped on labor productivity (Valero, Corry, & Reenen, 2011). Overall, UK's economic growth are affected. Due to this reason, unemployment increase lead to the demand of workers decrease as well, which in turn make the workers only want to retain their jobs even the paid wages is much lower (Bell & Blanchflower, 2010).

In UK, the wages of workers decreases gradually start from the year 2010 until 2014, however labor productivity still experiences a slightly growing stage. Wages of workers declines even UK experienced a favorable economic condition. This situation occurred is due to the economy in UK had almost reaches a full employment stage (Romei, 2017). Labor supply increases, and causes a raising on unemployment risk (Romei, 2017). Due to this reason, Romei (2017) indicated that workers who had confront with the unemployment risk will lose their labor bargaining power on wages which is restricted by the firms. Therefore, labor productivity in UK still increase at the lower rate of wages (Romei, 2017).

1.2 Problem Statement

Labor productivity is an important factor in determining the productive potential of a country economy. Countries with strong labor productivity growth tend to benefit from high rates of economic growth and strong export demand. Since the start of the great recession in early 2008, UK labor productivity growth has remained very low – well below the historical average.

According to Gov.UK (2015), government has launches several plan to enhance the foundation of British economy by encouraging long term investment and promote a dynamic economy. These plan includes corporation tax deduction to 18% by 2020, introduction of new Digital Transformation Plan to support the adoption of new technologies within UK as well as a new National Living Wage which aims to provide a higher wages and lower tax for individual worker in UK. However, despite all the efforts being done by the government, UK still lagging behind the other developed countries like US, Germany, and France when it comes to output per hours worked, despite strong employment levels. UK is not the only country that taking a hit in productivity from the financial crisis.

One of the popular discussed factors among the researcher in UK are working hours. According to Office of National Statistics (2016), UK working hours is longer as compared to Germany which 22% higher in UK. At the same time, the inflation rate of UK has hit a new five-year high of 105.2 in term of BDO's inflation index (Gough, 2017).

In spite of that, the low pay sector, including retail, administration and food contributes for about 23 per cent of UK's gross value added (Fearn, 2016). Meanwhile, the real wages of other sector is also dropping (Fearn, 2016). As the pay is falling behind the raise of inflation, the consumer spending will be strained even more.

In addition, UK is consider to be the country that received highest inward FDI in the past decades (Naanwaab & Diarrassouba, 2016). The overseas investors had splurged around $772bn which equivalent to one third of UK's GDP to acquire about 2000 British firms ("Take Away Finance", 2017). In 2015, the value of employed human capital hit an increase of 4.8% as compared with 2014 (Office for National Statistics, 2016). This increment is the highest record since 2004 and surpassed the record in 2008 by 0.2% for the first time (Office for National Statistics, 2016).

How does UK going to boost or sustain the present economic growth with the changes in macroeconomic variable? Addressing a long-standing productivity is crucial and challenging in UK. Therefore, it is very critical to identify and study the linkage between macroeconomic variable and the labor productivity in order to discover the root of poor productivity performance in UK.

1.3 Research Questions

1. How FDI affects labor productivity in UK?

2. How inflation affects labor productivity in UK?

3. How working hours affects labor productivity in UK?

4. How human capital affects labor productivity in UK?

5. How wages affects labor productivity in UK?

1.4 Research Objectives

To examine the impact of each factor towards the labor productivity and the granger causality relationship between the factors and labor productivity. The factors are FDI, inflation, working hours, human capital and wages.

1.5 Specific Objectives

1. To investigate the impact of FDI on labor productivity in short and long run.

2. To investigate the impact of inflation on labor productivity in short and long run.

3. To investigate the impact of working hours on labor productivity in short and long run.

4. To investigate the impact of human capital on labor productivity in short and long run.

5. To investigate the impact of wages on labor productivity in short long run.

1.6 Significance of the study

This study investigates the impact of macroeconomic variable like FDI, inflation, working hours, human capital and wages on labor productivity in short run and long run respectively. This research study would be very useful to the policy makers or government in UK as it provide a clearer picture on how to sustain or improve the current labor productivity relating to the macroeconomic variable.

CHAPTER 2: LITERATURE REVIEW

2.0 Main Theory

2.0.1 Efficiency Wages

Efficiency wages theory reject the previous statement that wages are given according to the marginal productivity of workers under perfect competition (Meager & Speckesser, 2011). The main idea of this theory is that a firm would benefit from paying workers a wage higher than their marginal revenue product (Georgiadis, 2007; Meager & Speckesser, 2011; Shapiro & Stiglitz, 1984; Goh & Wong, 2010). Georgiadis (2007) emphasized that it is optimal for the employers to pay wages setting above the market clearing level in order to recruit, retain or motivate employees. However, this theory applies particularly when there is an alternative income for unemployment such as unemployment benefit. In addition, efficiency wage theory imply that rather than wage set according to productivity, they have to be set at a particular in order to achieve a specific productivity in an economy with unemployment benefits (Meager & Speckesser, 2011).

According to Shapiro and Stiglitz (1984), assumption is made that if a workers is caught shirking and they are being fired immediately but the workers can easily get an alternative work in the situation of no stigma attached to being fired. In this case, raising wages above the market clearing level than other firms would create discouragement for employee to shirking

as it make being fired costly to them. This statement also supported by Burki (1995). Nonetheless, the firm also can retain a more experienced worker than hired new worker who may not being as productive as the experienced worker (Goh & Wong, 2010). This is efficient if the productivity gain is more than the wage costs. In brief, as mentioned in efficiency wage theory, Wakeford (2004) indicated that higher real wages can eventually lead to an increase in labor productivity by rising the opportunity cost of job loss. Therefore, the unit cost of labor will raise as the real wages increase and hence cause substitution from labor to capital. This substitution will increase the marginal and thus the labor productivity.

On the contrary, some researchers figured out that increases wages more than market clearing level is unable to achieve the desirable labor productivity level (Powell, Montgomery, & Cosgrove, 1994; Krueger & Summers, 1987). Powell, Montgomery, and Cosgrove (1994) states that there is a very little effect to explain the wage discrepancies for the turnover version of the efficiency wage model. They investigated the relationship between wages and quit and fire rates for the skill classification in respect of teachers and their assistants. The magnitude of the effect of higher wages on quits and fires is too little to be consistent with the efficiency wage argument. Krueger and Summers (1987) also conducted a research on the relationship between efficiency wages and quit rates and obtained a similar result as Powell, Montgomery, and Cosgrove (1994).

2.0.2 Endogenous Growth Theory

The endogenous growth theory is a theory that argues that economic growth is generated within a system and not external forces. The theory holds that investment in human capital, research and development, knowledge will lead to the economic and productivity growth (Romer, 1986; Arrow, 1962; Pack, 1994). Pack (1994) emphasized that in the endogenous growth theory, it is hard to test for the presences of externalities even though it is important. Romer (1986) stated that potentially high rates of return of investment often eroded by the poor investment in human capital, infrastructure and research and development in the developing countries.

In the endogenous growth theory, the important parts of the production are the knowledge and the processes of creating knowledge. This is proven by Westphal, Rhee, and Pursell (1981) who conducted the research on firm-level. When the firms and workers are more experienced in the production, they can be more productive and this is known as learning-by-doing by Arrow (1962). In the Arrow model, if we assume that productivity increases as human capital is accumulated, an implication of the resulting model would be subsided to human capital that could increases growth. However, Nelson and Phelps (1966) argues that a countries can benefited from the rapid transfers of technology and a highly skilled labor who is able to adapt the new technologies to the local needs.

In order to acquire the ability to achieve higher productivity, expenditures on equipment and knowledge is necessary and it is expensive. Diffusion of technological know-how can be achieved through the foreign direct investment (Pack, 1994; Barro, 1990; Barrel & Pain, 1997). FDI is facilitates

by international trade (Pack, 1994). For instance, the rapid growth of exports would allow a countries to overcome the imperfections in their technology markets such as monopolistic licensing fees which limit the diffusion of proprietary knowledge. Romer (1990) also supported that FDI can accelerates productivity through strengthening human capital which is the most crucial factor in Research and Development (R&D) effort.

In contrary, De Long and Summers (1991) argued that investment in equipment is critical in identifying the differences across countries. They found that the share of investments has a disproportionate effect on productivity growth. Many countries does not have the capacity to produce their own machinery and must thus import it. If misguided of exchange rate and macroeconomic management occurs, these countries will be unable to pay for the equipment abroad and lead to decrease in productivity. Therefore, equipment investment itself is greatly depends on the policy environment rather than being standalone variable.

2.0.3 Maslow's Need Hierarchy Theory

According to several researchers Kaur (2013), Osabiya (2015), and Saarvala (2006), motivation plays a very important role in increasing the employee job satisfaction and productivity. A high productivity is a long term benefits for the company results from motivated employee. Maslow's Need Hierarchy Theory is proposed by Abraham Harold Maslow which outlined five hierarchical needs which could be applied to an organization and its employees' performance (Gordon, 1965). The theory emphasized that if

people grew in an environment where their needs are not met, these people will not be functions as a healthy individuals (Kaur, 2013; Saarvala, 2006).

There are 5 types of needs for people and it is activates in a hierarchical manner from physiological needs, safety needs, social needs, esteem needs to self-actualization (Jerome, 2013; Saarvala, 2006; Osabiya, 2015). Physiological needs is the basic needs for human survival such as air, food, water, shelter, clothes and sleep. This theory mentions that, a manager should provide comfortable working conditions, reasonable working hours and necessary breaks or holiday for the employee to rest and reenergizes (Jerome, 2013). Saarvala (2006) and Osabiya (2015) further supports that the fulfillment of one's needs bring the productive out from the employees. The overworked caused by company's restructure has requires employees to work long hours in workplace. Thus, it is critical to satisfy different needs of employees to demonstrate better performance to the company. The decline in working hours which lower employees' fatigue level has causes the rising of motivation which in turn increase the productivity.

Absenteeism arise from fatigue reduce employee's motivation to work. Saarvala (2006) has mentions that absenteeism brings effects on productivity. The loss of productivity when employees weren't physical and mentally well rested, they would not be able to perform effectively since they have worked for long hours that causes fatigue. However, Srivastava and Barmola (2011) argued that those who spent more hours on work are due to the increase motivation arise from their job role as they have greater satisfaction towards their job. It is believed that those who is less motivated spent more time on personal tasks as it contribute higher satisfaction.

However, Maslow theory has been criticized by several researchers. According to Graham and Messner (1998), they criticize in 3 major part that is directed to the need theory and other content theories of motivation. First, there is no adequate empirical data to support their conclusions (Forson, 2012; Parkin, Tutesigensi, & Büyükalp, 2009). As this theory is difficult to test empirically, there are doubts regarding the basic human needs. Forson (2012) claimed that higher-level needs do not necessarily met by favorable work situation such as flexible working hours as it could be arise from the other areas of their life. Second, they assume all employees are the same. Parkin, Tutesigensi, and Büyükalp (2009) states that the theory over focused on individual to the point that they overlook environmental factors. In addition, the individuals' needs varied across situation, thus it is irrelevant that all employees have the same mindset (Whittington & Evans, 2005; Dugguh, 2014). Third, it is not theories of motivation but rather a theories of job satisfaction (Forson, 2012). Job satisfaction does not automatically dedicate to work performance.

2.0.4 Human Capital Theory

Human capital theory is first presented in the writing of Theodore Schultz. It is a framework that examines the relationship between education, economic growth and social well-being (Schultz, 1960). In particular, the theory emphasizes that more skilled or better educated workers can increase their training provided their technical efficiency is increases. These workers contribute effectively to the acquisition and combination of productive resources that are more open-minded to new approaches in production and management (Becker, 1964; Mincer, 1974). Human capital theory also stress on the how education increase labor productivity as well as the efficiency of

workers with the application of productive human capability. In spite of that, the theory is important as it helps the policymakers in understanding the amounts and characteristics of education and training that is required in order to achieve the desired economic growth (Netcoh, 2016). With proper policy interventions, cost associates with educational investments can be reduced. Furthermore, human capital theory also uses to understand what type of investments in more productive in education and when is the best timing to make the investments.

Human capital is an extension of the capital concept and posits that education and training are capital investment that leads to a greater productivity, which is translated into economic returns like increases in wages and GDP (Becker, 1964; Sakamota & Powers, 1995; Psacharopoulus & Woodhall, 1997; Robert, 1991). Olaniyan and Okemakinden (2008) argues that productive population comes from the education population. Van-Deng-Berg (2001) further supports that the strong investment on education by government would generate a more educated labor force and populate. For instance, investment in human capital acts as an important input for the innovations, information, research and development, which directly accelerates the technological progress. The labor productivity increases with the application of these skills, techniques and knowledge.

However, human capital theory also comes with several limitations and criticizes by several researchers. The human capital theory provided only a little insight or information into the processes of education and the improper and inefficient training provided by the firm are translated into higher wages (Bowles & Gintis, 1975; Fallahi, Sojoodi, & Aslaninia, 2011). For instance, the education and training account leave about 30 percent of the wage variability unexplained in the statistical models (Netcoh, 2016). Therefore, it would be critical for policymakers to choose an alternative framework in

conjunction with human capital theory to fully understand the relationship between education and wages. In spite of that, the assumption of higher levels of educations will have a higher productivity in human capital theory is problematic as each individuals or groups will have different process of human capital formation (Netcoh, 2016). The quality of education may be effective in one group but ineffective in the other. Therefore, it required the policymakers to consider the dependency of human capital investments to ensure the policy interventions and allocation of resources is effective all time. Besides that, another major problem of human capital theory is the imbalance of the education spending between developed and developing area and countries (Bowles & Gintis, 1975; Su & Heshmati, 2011). For example, government tends to spent more education spending on developed countries instead of developed countries. This resulting in imbalance of quality and motivates education system, and thus leading to low productivity (Bronchi, 2003; Castronova, 2002; Crepaz & Monser, 2004).

2.0.5 Others Theories

Neoclassical growth theory is paying high attention to the process of capital accumulation and argued that aggregate savings would act as a finance addition to the national capital stock (Solow, 1956; Brems, 1970; Kida, 2014). Brems (1970) suggests that FDI increases the capital stock by financing capital formation and thus enhances the productivity of the host country. He believes that an economy would have a high marginal product capital if the initial capital-labor ratio is low. Solow (1956) also shows in his research that the marginal product of capital will not be declined with an advancement of technology due to capital per worker increases. Instead, this improvement will augment the stock of “effective” workers. Therefore, the capital stock will be

still growing in the long run even with a constant population in order to get on with the effective labor force.

However, some of the researchers found that FDI only has a short run impact on the productivity growth (Grossman & Helpman, 1994; Hassen & Anis, 2012). Hassen and Anis (2012) argues that FDI has no permanent impact on productivity growth as the marginal productivity of capital decreases over time and the host country will converges to a steady-state. Nonetheless, according to Grossman and Helpman (1994), if a fixed proportions of generated by the new equipment is being saved, then the gross investment in new capital goods may exceed the amount needed to offset depreciation and to increase the number of workforce. Therefore, the marginal products will fall over time and the savings generated through accruing new capital will also fall.

On the other hand, Parkinson (1957) established Parkinson's Law when he has first observes that when the time allocated to a particular task become shorter, the task become simpler and easier to solve. He states that people tends to work hard, productive best and concentrating deeply when the time is shorter to complete a work (Aronson & Gerard, n.d.; Klimek, Hanel, & Thurner, 2009; Jochimsen, 2007). Aronson and Gerard (n.d) further supports that excess time is wasteful and incessantly affects the following task, thus, one shall shorten duration of a task to be completed. As a result, overtime or extending working hours is only expanding the time available to complete work which eventually reduce the productivity of the workers. However, Andre (n.d.) states that minimizing the duration of deadlines do not contribute to high productivity. This is because individuals are often being pushed for completion of task which result in increase of errors when pace of performing increase.

The cost-push inflation theory emphasizes the fact that rise prices due to the increasing cost of production and these cost is passed along higher cost of wages. Thus, increase in price will lead to inflation (Javed, Farooq, & Akram, 2010; Makochekanwa, 2007; Totonchi, 2011). They suggest that raise of price of goods and services will lead to inflation and this cannot be change with any other appropriate substitution. Cost-push inflation happened by increasing the unit cost production like oil price, commodity shortage and crop failure from the supply side of the economy, so the real output or productivity decreases and cause inflation (Gaomab II, 1998). Therefore, inflation occurs and consequently lead to decreases in output which lower the labor productivity.

2.1 Previous Empirical Studies

2.1.1 Working Hours and Labor Productivity

The variation in working hours in a country often raises attention to the movement in labor productivity. Regulations like work time balance, flexi time are being enforced to take into control the length of working hours in various industries. Working hours can be known as the duration of an employee is committed to his job. According to Spurgeon (2003), experiments were performed at the Mather and Platt engineering works in Manchester, United Kingdom during the late 19th century. The abolishment of before-breakfast working by the management has successfully demonstrated that the reduction in weekly hours gives rise to productivity along with fall on sickness absenteeism. This has then brought up the change in attitude on employees' wellbeing in industrial sectors.

As mentioned by Jerome (2013), reasonable working hours and necessary breaks are critical to achieve above outcome. Most of the developed countries have adopted the national laws that prescribed working hours and the limitation of numbers for consecutive working hours, weekly maximum work hours and minimum duration for breaks during work (Seo, 2011). The various aspect of working hours as in duration and flexibility have contributed different level of outcome to labor productivity of a country.

Based on the researchers, the negative relationship between working hours and labor productivity was found (Kelliher & Anderson, 2009; Pencavel, 2014; Griffith & Miller, 2010; Chris, 2016; Inagaki & Azetsu, 2013). It is believed that decrease in working hours will result in increase in labor productivity, vice versa. According to Pencavel (2014), though the fluctuations of working hours does not contribute the same changes in labor productivity, individuals tend to perform at greater efficacy at shorter duration of working hours. Workers were seen to be more productive in a shorter working week. When the working hours are below 40 hours per week, higher level of productivity is observed as employees seen to have motivation and willingness to work efficiently (Chris, 2016). He then emphasized that productivity does not only focus on health but also on the important connection with psychological effect of long working hours. Ahmad, Idris, and Hashim (2013) further supported by stating that adequate working hours provide a balance between working hours and time spend with family will result in high motivation as employee will be motivated when they receive enough leisure time. It is believed that enhancing motivation by providing flexible working hours provides growth on productivity level.

However, the decline in working hours did not indicate that the fall on their workload. Due to the shorter working hours, it has given motivation to workers to increase on their extensive and intensive efforts while working or

even when they are not scheduled to any task (Kelliher & Anderson, 2009). The motivation arise from less fatigue being experienced by workers since they are no longer attached in long working hours. The ability of adjusting employees' working hours has result in high satisfaction. In return, it enable them to carry out task calmly and in a comfortable condition that uplift their motivation level, thus productivity. Moreover, in Golden (2012) recent studies, he indicated that when organization implement reduce hour arrangement, talent of employee can be retained. Self-reported performance of employee is improved. This has given provision on job flexibility which significantly associated with higher productivity. Part time workers are seen to be more enthusiastic than full time workers and have extensive energy while performing their daily tasks which result in higher productivity. Other than part time workers, shift work is also more preferable than overtime as it eliminate the physical fatigue caused by working long hours (O'Neill & Panuwatwanich, 2013).

Researchers (Bryson & Forth, 2007; Inagaki & Azetsu, 2013) further supported that fatigue was one of the major reason for the deterioration on labor productivity. The evidence shown that the timing of labor inputs bring consequences such as error rates, absence or accidents arise from fatigue. For example, workers that encountered fatigue will develop difficulty on concentrating that will negatively contribute to performance in workplace. In Inagaki and Azetsu (2013) recent research, healthcare industry is in charge of enhancing the population's health. Nurses and doctors are more likely to make error while at work after working for a longer duration. It will then lead to fatigue and absenteeism which result in productivity loss. Thus, working hours is critical for the above industry's labor productivity.

Labor department (2012) argued that during the previous publication by ILO, the negative empirical relationship between working hours and productivity is weak in developing country. Positive relationship between the two variables were obtained as the increase of overtime has result in increase in labor output (Lee, McCann, & Messenger, 2007). For instance, Mexico's rise in productivity was mainly result from long workdays instead of efficient use of working hours (Esponda, 2001). In contrast, Deloitte stated that in comparison of various industries, the effects of change in working hours may display a strong outcome on certain industry while other industries remain constant on their productivity growth (Deloitte, 2010). Thus, the exact relationship between the two variables are still under investigation. Ng and Tsang (2014) further supported that the statistical results of both working hours and productivity are not significant in both long working hours (food service industry) and median working hours (information and communication) industries. Since information technology skills, working environment, job contents and many more are all equally critical to enhance labor productivity, therefore, Ng and Tsang (2014) believed that the above two variables are insignificant.

Motivation contributed to growth in productivity while motivation can be enhanced through employees' flexible working hours. The need of work life balance plays a significant role in this matter. The reduced on working hours has provided a favorable working condition to the employees which has given motivation to workers to increase their efforts while working or even when they are not assigned to any task. Moreover, less fatigue has given rise to motivation since employees are no longer involved in long working hours. Hence, we would assume the existence of adverse relationship between working hours and labor productivity after taken into account the above research conducted by the researchers.

2.1.2 Wages and Labor Productivity

Based on the previous research, a positive and significant relationship was found (Goh & Wong, 2010; Tamasauskien & Stankaityte, 2013; Kumar, Webber, & Perry, 2009; Narayan & Smyth, 2009; Huizinga & Broer, 2004; Nayak & Patra, 2013; Trpeski, Eftimov, & Cvetanoska, 2016; Erenburg, 1998).

Nayak and Patra (2013) who explore the relationship between wages and labor productivity in the manufacturing sector of Odisha, found a positive correlation between the 2 variables. Based on their finding, it is reasonable to say that a well-planned monetary or non-monetary schemes can boost the motivation among the labors and lead to an increase of productivity. According to Kumar, Webber, and Perry (2009), wages and productivity is often hypothesized as a relatively higher wages would be able to increase the opportunity cost of job loss and motivated the worker to put more effort to avoid redundancy. Moreover, Wakeford (2004) and Gordon (1997) realized that the firm will substitute capital for labor as a higher wages put upward pressures on the firm labor costs, thereby increase the marginal productivity of labor.

According to Goh and Wong (2010), there is a long run equilibrium relationship between wages and productivity regardless of unemployment appears to be dichotomized in the equilibrium relationship. They found that the real wages are very responsive to the changes of labor productivity as the productivity elasticity of real wages is more than 1 which signaling that gain in labor productivity is lag behind the increase in wages.

There is also other studies who focus on regional differences between wages and labor productivity. Tamasauskien and Stankaityte (2013) argued that an uneven economic and social development is critical in identifying the relationship between wages and productivity. The regional differences would arise from differences in foreign direct investment and concentration of quality labor force. Rural areas would have a lower productivity comparatively to urban areas as the quality and level of investment in urban area is better.

On the other hand, Trpeski, Eftimov, and Cvetanoska (2016) has researched on the relationship between the labor productivity and wages in Macedonia shortly before the commencement and after the Great financial and economic crisis. A positive relationship is found before the crisis but a weak or no relationship is found during post crisis period. They found that wages are under the influences of some other factors like level of socio-economic development, living standard, competences among employees and etc. during the post crisis period.

In contrary, some researcher like Huizinga and Broer (2004) and Tsoku and Matarise (2014) has found that there is a positive relationship in short run but has no impact in the long run. Hondroyiannis and Papapetrou (1997) and Gneezy and Rustichini (2000) emphasized that relationship between wage and productivity is not monotonic where offering higher wages does not always encourage productivity. Initially, the labor productivity will rise with the increase of capital labor ratio. Then, it will readjust and back to the original level as does the capital labor ratio. Therefore, an initial wage push only increase labor productivity in a short time which is not sustainable as it is based on excess capital which commands a very low return.

Based on the efficiency wages theory, we can said by rationally that if a worker is paying for a higher wages than the market clearing level, that particular worker will eventually being more productive as a higher wages would increase the living standard of the worker which motivates them and increase the opportunity cost for job changing. Nonetheless, UK has a stagnation of wages since financial crisis in 2008 and this would lead to insecurity in terms of employment. Furthermore, after taking into consideration the findings of previous researcher, we would assume that wages and labor productivity has a positive relationship.

2.1.3 FDI and Labor Productivity

Globally, FDI is the major source of external finance for developing countries and an important funding source for the developed countries. There are plenty of researches had been done to investigate the significances of FDI towards labor productivity and the findings are contradict with each other.

According to the previous researches, they proved that there is a positive and significant relationship between FDI and labor productivity in both developed and developing countries (Dimelisa & Papaioannou, 2010; Cem, 2010; Farahani, Yazdan, Sadr, & Hossein, 2013; Ahmad, Hayat, Luqman, & Ullah, 2012; Bogheana & Statea, 2015; Alam, Arshad, & Rajput, 2013; Ramirez, 2006; Zhu & Tan, 2002).

The developed countries such as United States, United Kingdom, France and Germany hold more than two-thirds of world FDI stock (UNCTAD, 2003). This relationship only occurs for countries who has a sufficient level of absorptive capacity in assimilating the advanced technologies transferred (Farahani, Yazdan, Sadr, & Hossein, 2013; Dimelisa & Papaioannou, 2010; Cem, 2010). Furthermore, they also found that FDI contributes to the labor productivity when technology gap is small. According to Farahani, Yazdan, Sadr, and Hossein (2013), in order for a developed country to take advantage of FDI, the local structures, institutions and capital endowments are the importance measure. Cem (2010) indicated that the latest technology and managerial skills in developed countries can be transferred to all other countries through FDI in order to increase the labor productivity.

In addition, inflows of FDI also contribute to the increase of domestic investments in the aspect of education and training, which in turn stimulate human resource development (Ahmad, Hayat, Luqman, & Ullah, 2012). Bogheana and Statea (2015) stated that with an improvement in the population's training level and adaptive capacity in technological advancements will be able to enhance the labor quality. In brief, increased in FDI will enhanced the labor resources' quality which will eventually lead to an increase in labor productivity.

Moreover, Alam, Arshad, and Rajput (2013) evidenced that developing countries are looking forward for more FDI inflows as it guarantees skill improvement, advancement of new technology, more capital into the system and expertise. This capital inflows can increase the labor productivity and in turn boost up the economic growth of developing countries. They also revealed that an increases in both of human capital and international trade through FDI can improve the technology adoption and innovation which increases the labor productivity. Apart from that, Ramirez (2006) stated that

FDI-induced positive externalities in the form of a greater technology transfer and managerial know-how that affect the labor productivity of both developed countries and developing countries with a lag term effect.

Last but not least, Zhu and Tan (2002) also proved that the higher the FDI per capita in a particular cities, the higher the labor efficiency and, in turn, increases the labor productivity. They also found that a higher labor efficiency is generated if the FDI flows into the labor intensive industry in China.

In contrast, several studies have found that the relationship between FDI and labor productivity tend to be negative which is contradict with the endogenous growth theory (Alam, Arshad, & Rajput, 2013; Ramirez, 2006). One of the reason is the labors in the host countries has no ability to adapt the new technology brought by the foreign company or the host countries are already developed enough to assume these new technology. In addition, the domestic company's productivity will be negatively affected as the introduction of foreign company. The local company would be forced to reduce part of their production because of the increase in demand for the foreign products. Besides, the negative effects of FDI would be further compounded if the positive spillover effects from the transfer of technology are minimized or eliminated altogether due to the overly restrictive intellectual property rights or the technology that is transferred is not appropriate for the host country's factor proportions (Ramirez, 2006).

However, some of the researchers argued that there is an insignificant relationship between FDI and labor productivity in developing countries (Farahani, Yazdan, Sadr, & Hossein, 2013; Dimelisa & Papaioannou, 2010; Cem, 2010; Sasidharan, 2006).The FDI stock is mainly focus on the developing countries, especially in China, Hong Kong and Brazil (UNCTAD,

2003). World Bank (2005) found that FDI contributes less on the labor productivity in developing countries. The reason behind is that the developing countries was unable to fully utilized FDI. According to the Farahani, Yazdan, Sadr, and Hossein (2013), FDI shows an insignificant growth effects in developing countries due to the occurrence of insufficiencies in domestic structure, capital funding which act as a barriers. Without the existence of local capabilities and government's assistance in promoting policies, FDI would not be able to drive a long-run economic growth and has little or no effect on labor productivity (Lall & Narula, 2004). Besides, Cem (2010) also indicated that FDI only impact on labor productivity on sector-specific and its effect is limited, supported by Sjoholm (2008) and Buckley et al (2006). In addition, Sasidharan (2006) also found a similar conclusion in India that FDI has no any significant technology spillovers effect.

UK as the top receiver of FDI among the developed countries and also the biggest receiver of FDI in EU. According to the Alam, Arshad, and Rajput (2013), the domestic company's productivity will be negatively affected as the introduction of foreign company. The production will be forced to reduce as the demand for foreign products increases. Therefore, we would assume that the relationship between FDI and labor productivity in UK is negatively related after reviewing the previous research.

2.1.4 Human Capital and Labor Productivity

With increased globalization, education is considered as one of the determinants of economic well-being in many developed or developing countries (Hanushek & Wo¨Bmann, 2011). It is important to note that human capital is an important drivers and generators as it increased the productivity of worker, which in turn to boost the economy growth (OECD, 2009). According to journals, many researchers and studies have figured out the relationship between human capital and labor productivity are positively and significantly related to each other (Aggrey, Eliab, & Joseph, 2010; Afrooz, 2010; Lottuma & Zanden, 2014; Arvanitis & Loukis, 2009; Hanushek & Wo¨ Bmann, 2011; Nowak & Kijek, 2016; Mat, Mansur, & Mahmud, 2015; Banerjee & Wilson, 2016).

Aggrey, Eliab, and Joseph (2010) found that with the application of human capital theory, educated workers and trained workers able to performed better with knowledge of technology advancement and imitation, and thus enhanced the productivity. With proper job training, employees get to know the operations and functions of new machine, new techniques and innovation to upgrade or improve the quality of the outputs. According to Mat, Mansur, and Mahmud (2015), Gherghina and Duca (2013), investment in education spending further contributed to economic growth, reducing poverty and inequality in a country. Becker (1964) supported that with the implementation of useful knowledge and skills, technical efficiency and productivity increase, which in turn increased employee's future income as well as their savings for the lifetime. Kavanagh and Doyle (2006) further suggested that when a person with higher skills in technology, they tend to have higher capability to manage technical difficulties and thus enhanced the efficiency in labor productivity. Banerjee and Wilson (2016) also claimed that innovations, skills and

techniques enable the trained workers to learn more quickly. Also, new technologies able to utilised by employees and in return capital diffusion between countries will be completed and more rapidly. Goedhuys, Janz, and Mohnen (2006) also stated that well-educated managers have the capability to monitor and control their employees and thus reduce shirking. Shirking happened when employees avoid or neglect a duty or responsibilities. With a proper and well supervision provided by the managers, employees able to work harder and more discipline, leading to higher outputs as well as labor productivity.

According to Hanushek and Wo¨ Bmann (2010) also found that the qualities of education tend to have a positive relationship with the labor productivity and thus economic growth. Education plays a vital role in this competitive world because it helps the country to grow, whether socially or economically. Majority of skills and human capital comes from formal schooling, and it can be measured by using years of schooling (Hanushek & Wo¨ Bmann, 2010). The longer the years of schooling, the higher the knowledge and information gained. Arvanitis and Loukis (2009) also stated that there were positive and significant relationship between the human capital and labor productivity. An employee with tertiary education level has the stronger effect on the human capital variables. For instance, higher education tend to acquired more knowledge and skills, resulting in employees who are more productive and able to complete the task more efficiently and effectively than those who is unskilled.

Lottum and Zanden (2014) explained the two criterion of human capital which are numeracy and literacy, contributed positive and significant effect on labor productivity. Labors that have specific technical skills are highly needed by the sophisticated company to enhance the labor's ability make use of the company's capitals like technologies, knowledges, management and etc. This

resulting in increased in labor productivity and also helped to decrease the unemployment. Amin and Awung (2005) stated that investment in education has been declared as a growth driver since it helped to increase the labor productivity. This can be further improved the management, lowering the production cost per unit and reduced the marginal cost of the production for the firm which in turn helped to save cost.

In contrary, there are few researchers found that the relationship between human capital and labor productivity are negatively related to each other (Su & Heshmati, 2011; Nurudeen & Usman, 2010; Fallahi, Sojoodi, & Aslaninia, 2011). Su and Heshmati (2011) argued that investment in education lead to a negative effects on the labor productivity. This can be explained by the case happened China which stated educational spending on productivity probably due to the government mainly invest in developing area instead of developed areas. Besides that, developing countries that have larger population received more education spending than developed countries are other reasons the productivity turned to negative sign. Some developing countries might need not to have more investment in education than the developed country, this assumed to be an extra or burdens for the developing country. According to Nurudeen and Usman (2010), government expenditure on education has negative effect on productivity is because the education spending was not properly utilized by those respective authorities. Fallahi, Sojoodi, and Aslaninia (2011) further supported the negative relationship exists was because of the inefficient of training provided by the firms. Employees will not able to perform their labor skills efficiently and effectively without a good proper training. This is because they might have no ideas about what the latest or newest operations and information.

There is an argument that stated the relationship between human capital and labor productivity is insignificant related to each other (Su & Heshmati, 2011; Goedhuys, Janz, & Mohnen, 2006). This can be explained by investment in education spending might takes time to capture the effects. Su and Heshmati (2011) claimed that the skills acquired from education is from abroad and receipt of foreign direct investment. Goedhuys, Janz, and Mohnen (2006) also found that there is insignificant relationship between training and labor productivity. This can be supported by training might decrease the quantity of labor participate in the production although labor productivity increased. By assuming that the firm does not have enough capital to provide training for their employees or some employees does not have the specific qualifications or capabilities to accept the training. Besides that, training may also serve as others purpose or objectives instead of labor productivity. For example like career prospects, employees might care about their salary or working position rather than labor productivity.

Based on the research and studies we found, we assumes that human capital and labor productivity would be positively and significantly related to each other. As for your information, education plays a major role in this competitive world. With proper and well-educated system, employees or workers gets to know more knowledge and information provided by the government or company through some activities such as training program, speech and etc as compared to unskilled workers. For example, discipline employees have the capability to manage and complete the task on time, leading to high labor productivity. Besides, the advancement of technology and innovations received allowed employees to get to know the latest or up-to-date information, solve and manage the problem and difficulties and thus speeding the labor productivity. As a result, its help to boost up the economy too.

2.1.5 Inflation and Labor Productivity

Inflation is one of the factors that will affect economic growth by increase price level of goods and services. Inflation increase is a signal of economic growth while deflation is a signal of weak economic. Bulman and Simon (2003) emphasized the principle with deflation due to cost reduction of product price when higher productivity, hence, represent positive supply shock and reduce inflationary pressure. Besides, inflation raise the risk of business error and potentially affect investment become lower level will result overall productivity reduce. Ram (1984) stated the both variables have the causal impact of productivity change on inflation is insignificant while the depressive impact of inflation on productivity growth is substantial.

According to the findings, there is negatively effect relationship between inflation and labor productivity (Bulman & Simon, 2003; Kumar, Wevver, & Perry, 2009; Ram, 1984; Ulusoy, Cakir, & Ogut, 2008; Yildirim, 2015). Generally, inflation and productivity have adverse relation not only affect worker's purchasing power that leads to demotivate and effortless, but also interrupt price signal and bring to investment plans inefficient (Hussain, 2009; Kumar, Wevver, & Perry, 2009; Papapetrou, 2003; Yildirim, 2015; Zaman, Ali, & Farooq, 2015). On the other hand, Kumar, Wevver, and Perry (2009) and Zaman, Ali, and Farooq (2015) supported that inflation will also depreciation rates of capital and tax system lead to the changes in the choices of production techniques and increase the price of capital and hence reduce labor productivity. Firm will decrease the rate of capital then the price of capital good affected with rises when inflation as the market price of capital consist of liquidity rate to acquire new capital.

Besides, the uncertainty about future inflation is likely to affect investment plan result in inefficient economic which difficult for firm to hedge. Moreover, Papapetrou (2003) claimed that labor supply decisions of the households will affected by the inflation. Inflation will cause less incentive to supply labor, therefore, productivity of human and physical capital reduced. Researchers Ulusoy, Cakir, and Ogut (2008) stated productivity growth will decline when the supply of money increase at the time. The relationship between inflation rate and money supply show positive which cause labor productivity reduce, vice versa. Furthermore, the research Yildirim (2015) claimed that maintaining the low-interest rate can control inflation in long-term economic growth. Therefore, to boost the productivity, keeping a low-interest rate has played an important role. Inflationary pressures not created from the labor market is also one of the ways to increase the productivity. However, some argument about negative relation of inflation and productivity are inefficient combination of production factors, decrease in research and development expenditures, and increase in product stock to supply it after increase in prices to control prices which is buffer stocks (Zaman, Ali, & Farooq, 2015).

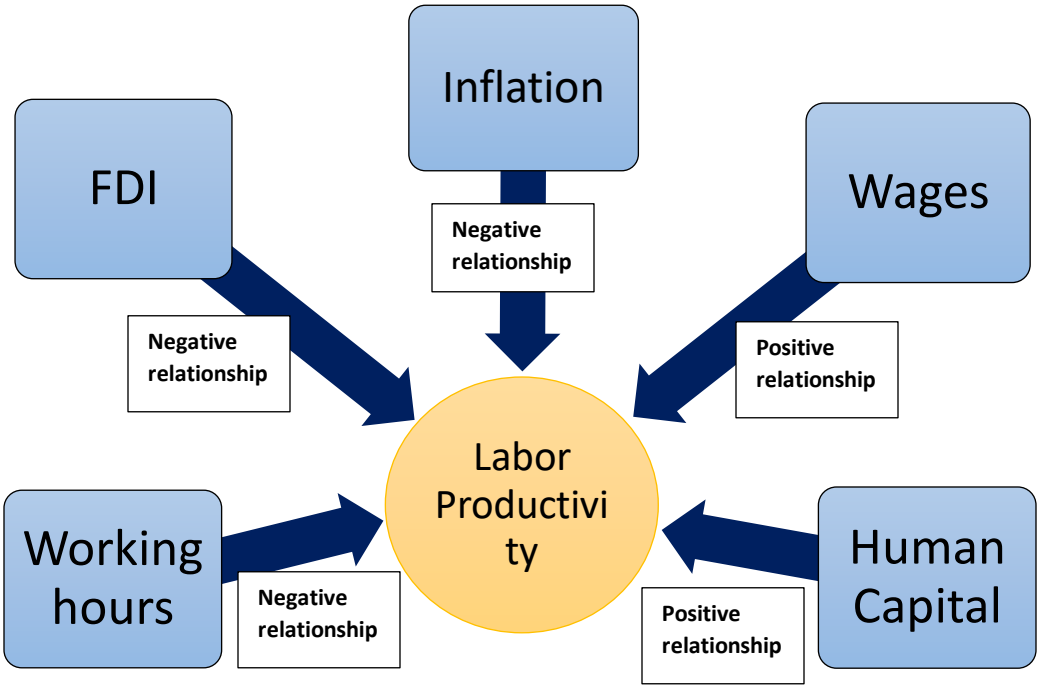
However, the relationship is uncertain because the impact of inflation on productivity is not constant. The effect will be different due to the different time period or different economic factors. Similarly, the researchers find that it is a strong insignificant relationship between inflation and productivity (Hussain, 2009; Papapetrou, 2003; Ulusoy, Cakir, & Ogut, 2008; Zaman, Ali, & Farooq, 2015; Ram, 1984). According to Hussain (2009), there is no causal relationship between both variable, however, other type of inflation such as food inflation and medical inflation should take into consideration as to examine the relationship. Papapetrou (2003) emphasized there is insignificant effect in short run when monetary policy has controllable. When manage for capability influence of monetary policy on the relationship between price level and productivity, will cause fragile endogenous. Therefore, it is rely on that inflation is destructive to productivity or from productivity in long-run and

result insignificant effect in short run of inflation to productivity or from productivity when monetary policy has controllable. Beside, Ulusoy, Cakir, and Ogut (2008) claimed that in economy shock, productivity is statistically insignificant in long run, but when in short run, the inflation and productivity are related. The reason insignificant relationship may be explain by technological shock as disturbances and inflation shock which lower productivity comply with same pattern but inverse direction. According to Ram (1984), United States had encountered high inflation and low productivity which raised concern regard association between the inflation and productivity. It is likely to determine the indirect or a direct causality from inflation to productivity, vice versa. The little raise of hours work and drop in output growth, which possibly happen promptly will give effect of inflation on productivity in a not significant relationship. In contrast, Zaman, Ali, and Farooq (2015) argue that negative fragile relationship between inflation and productivity attempt to unclear and vague relation.

UK is one of the develop countries which suffer fluctuate inflation condition. According to the cost-push inflation theory, whenever the cost of production increase, inflation occurs and eventually lead to decreases in output. In the recent years, the fuel price is fluctuate, any increase of it will lead to the increase of cost of production. Furthermore, most of the researcher has found a negative relationship between inflation and labor productivity in their study. Therefore, we would assume that the relationship between inflation and labor productivity in UK are negatively related.

2.2 Theoretical Framework

According to efficiency wages theory, endogenous growth theory, Maslow's need hierarchy theory, human capital theory and cost-push inflation theory, the following theoretical framework is constructed.



Adapted from: Agbola, F. W. (2014). Modelling the impact of foreign direct investment and human capital on economic growth: empirical evidence from the Philippines. *Journal of the Asia Pacific Economy*, *19*(2), 272-289.

H_1: Working hours and labor productivity has a negative relationship.

H_2: FDI and labor productivity has a negative relationship.

H_3: Inflation and labor productivity has a negative relationship.

H_4: Wage and labor productivity has a positive relationship.

H_5: Human capital and labor productivity has a positive relationship.

2.3 Gap of the Study

The world is changing in a fast pace and the evolution of technology and industry has create an infirm result in the real world. Therefore, this study is to find out the long run and short run relationship between the labor productivity and macroeconomics variables which is FDI, wage, working hour, human capital and inflation rate by using time series data. According to Dimelisa and Papaioannou (2010), a higher FDI to a host country would possess a higher level of productivity. On the other hand, productivity of a country is closely related to the employees itself. The reason behind is work life balance for an employee is important as a shorter working hours and higher wage level would greatly motivate the employee in their works (Ahmad, Idris, & Hashim, 2013). A better pay for employees would create a better living standard as well as reduce the insecurity for an employee. Meanwhile, a better education or training system could possibly increases the productivity where the employee itself has the ability to adopt and manage the new task efficiently (Becker, 1964). In addition, the fluctuation of fuel price in recent years has led to an increase of cost of production. According to the cost-push inflation theory, the increases in cost of production will causes the price to be inflated and lead to a drop in productivity level. Thus, this study is able to fill the gap by focusing more on macro level in studying the impact of each determinants towards productivity in UK.

CHAPTER 3: METHODOLOGY

3.0 Introduction

Chapter 3 comprises of data description, variables and measurement, and econometric technique. Data description clearly indicated each of the variables and source of data used. This study is to investigate the impact of each factor towards the labor productivity in UK. The factors are gross enrollment, FDI, working hours, wages and inflation rate.

The first econometric technique applied is unit root test. This test is needed to distinguish the difference variation of trend and difference stationary behavior of time series. Unit root test able to determine the type of trend whether it is stochastic, deterministic or both (Xiao & Phillips, 1998). Another unit root test applied is Dickey-Fuller (DF) test. In long auto regression, this t-test is called Augmented Dickey-Fuller (ADF) test. In respect of possibility of serial correlation, ADF has become the improved version of DF test.

Moreover, Auto regressive distributive lag (ARDL) is applied to examine the relationship between labor productivity and macroeconomic variables in long run such as FDI, wages, inflation rate, human capital and working hours (Pesaran & Pesaran, 1997; Pesaran, Shin, & Smith, 2001).

Besides, Engle and Granger (1987) stated that Vector Error Correction Model (VECM) is applied when the time series variable are stationary in the first difference but have a unit root level. The ability of VECM is to provide a more accurate and efficient of cointegrating vectors as it is a perfect information maximum likelihood model.

In addition, Granger causality test is applied to test the causal relationship between two variables in order to identify the direction of causality among the variables in the model (Granger, 1969). The two series could be unidirectional, bidirectional or independent of each other (Granger, 1969).

Last but not least, all of the test such as Autoregressive Conditional Heteroscedasticity (ARCH) Test, Ramsey RESET Test, Breusch-Godfrey Serial Correlation LM Test, and Jarque-Bera Test are applicable for the diagnostic checking. In order to test the stability of the parameters, CUSUM and CUSUMSQ are widely used in our study (Brown, Durbin, & Evans, 1975; Pesaran & Pesaran, 1997).

3.1 Data Description

Time series analysis is apply to investigate the impact of each factors towards the labor productivity in UK. The factors are government expenditure, FDI, working hours, wages and inflation rate. We collected the secondary data from different sources from the year 1985 to 2015 on annual basis.

3.1.1 Econometric Model

$$Pr = f\ (Wages, CPI, FDI, WH, Sec) \quad \text{(Eq. 3.1)}$$

$$Pr = \alpha_0 + \alpha_1 Wages + \alpha_2 CPI + \alpha_3 FDI + \alpha_4 WH + \alpha_5 Sec + \varepsilon \quad \text{(Eq. 3.2)}$$

$$LPr = \alpha_0 + \alpha_1 LWages + \alpha_2 CPI + \alpha_3 FDI + \alpha_4 LWH + \alpha_5 LSec + \varepsilon$$

where LPr = Labor productivity (GDP per hour worked)

$LWages$ = Wages (Average Annual Wages)

CPI = Inflation Rate (Consumer Price, Annual %)

FDI = Foreign Direct Investment (net FDI, current US$)

LWH = Working Hours (Average Annual Working Hours)

$LSec$ = Average Enrollment Number (Secondary)

ε = residual of the model

3.1.2 Sources of Data and Definition

Table 3.1 Summary of Variables and Data Sources

	Abbreviation	Variable	Source
Labor productivity	LPr	GDP per hour worked	OECD
Human Capital	LSec	Average Enrollment Number (Secondary)	World Bank
Foreign Direct Investment	FDI	FDI (net FDI, current US$)	World Bank
Working Hours	LWH	Average Annual Working Hours	OECD
Wages	LWages	Average Annual Wages	OECD
Inflation Rate	CPI	Consumer price (annual %)	World Bank

3.1.3 Variables and Measurement

3.1.3.1 Labor Productivity

GDP per hour worked is a measure of labor productivity. GDP measures the productivity of the country and also measure how efficiently labor input is in the production process while combine with other factors of production (OECD, 2017). The personal capacities of workers or the greatness of their effort reflects partially of the labor productivity. The large degree on the existence or use of other inputs directly affect the ratio between output measure and the labor input, for example capital, technical, organizational and other factors. This indicator is measured in USD with the constant prices 2010 and Purchasing Power Parties and indices (OECD, 2017).

3.1.3.2 Foreign Direct Investment

FDI is classifies as the cross border investment which associated with a resident having significant degree of influence on the management of an enterprise (WorldBank, 2017). At least ten percent of ordinary shares of voting stock is to determine the actuality of a direct investment relationship. Foreign direct investment was calculated by the change in assets minus the change in liabilities. Net FDI outflows are assets and net FDI inflows are liabilities.

3.1.3.3 Human Capital

Gross enrollment number in secondary is uses as a proxy for the human capital variable. It is the total number of students enrolled at public and private secondary education institutions regardless of age (WorldBank, 2017).

3.1.3.4 Working Hour

Working hour is the total number of hours actually work per year divided by the average number of people employment per year is the best to define the average annual hours worked (OECD, 2017). Regular work hours of full-time, part-time and part-year workers, paid and unpaid overtime, hours worked in additional jobs are also in the actual worked hours. Employees' and self-employed workers' data were covered in it. This indicator is measured in terms of hours per worker per year.

3.1.3.5 Wages

The average wages is calculates by dividing the total wage bill of the national-accounts-based of the average number of employees in the total economy (OECD, 2017). After dividing then multiplied the ratio of the average usual full-time employees weekly hours to the ratio of all employees usually weekly hours. U.S. dollar (USD) constant price using 2012 base year is used up in measure this indicator and Purchasing Power Parties for private consumption of the same year.

3.1.3.6 Inflation

Consumer price index (CPI) is uses as a measurement for inflation and it imitates the proportion change in the cost to the consumer of obtaining goods and service that might be fixed or changed at indicated interims such as annually. Generally, the Laspeyres formula has been used to measure inflation (WorldBank, 2017).

3.2 Econometric Technique

3.2.1 Unit Root Testing

In a trend stationarity model, the elimination of non-stationarity has brought up two effects (Wolters & Hassler, n,d.; Xiao & Phillips, 1998). The ability to dispose the linear trend, however causes the stationary stochastic part to be over differenced, suggesting the spurious of short-run cycles. Conversely, long run spurious cycles is suggested when the residuals of a regression on a constant and on time being used as explanatory variables to eliminate non-stationarity in a difference stationarity model. In a result, the occurrence of artificial business cycles causes the wrong economic interpretations. In order to solve this problem, formal tests are then needed to distinguish the difference variation of trend and difference stationary behavior of time series. Xiao and Phillips (1998) stated that unit root testing assists in determination of type of trend whether it is stochastic, deterministic or both.

Dickey-Fuller (DF) test, by using the observed variable's regression on its one-period lagged value, including an intercept and time trend was being extended by Said and Dickey (1984). They had shown that the DF test for a unit root remain asymptotically valid for general Autoregressive–Moving-Average Model (ARMA) process of unknown order. This t-test in long auto regression is called Augmented Dickey-Fuller (ADF) test. The validity of the above test in general time series model has contributed the rise of lag length in autoregression along with sample size. According to Gujarati and Porter (2009), ADF test is carried out by including the lagged value of the dependent variable in augmenting the preceding three equations. The inclusion of lagged difference terms has allowed the error term to be serially uncorrelated, in a result, unbiased estimation can be obtained. Moreover, ADF test has improved DF test in terms of possibility of serial correlation.

However, there are a few critiques concerning the unit root testing (Gujarati & Porter, 2009). The exclude of moving average (MA) components from the model caused the distortion of the test's size. Furthermore, the low power of test for DF has prompted the frequency on acceptance of null unit root. In other words, in actual situation, there might be no occurrence of unit root.

To compute test statistic:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-1} + \varepsilon_t$$

(Eq. 3.3)

H_0: All variables contain unit root and are not stationary.

H_1: All variables do not contain unit root and are stationary.

When the value of probability is lower than the stated significance level, hence, the null hypothesis will be rejected, indicating the stationary of model. As the number of ADF is in negative, it shows that higher negativity of number, will then lead to stronger rejection of the hypothesis

3.2.2 ARDL Approach to Co-integration

Auto regressive distributive lag (ARDL) is using in this study to investigate the long run relationship between labor productivity and macroeconomic variables such as FDI, wages, inflation rate, human capital and working hours (Pesaran, 1997; Pesaran, Shin, & Smith, 2001). According to Gujarati and Porter (2010), ARDL is a general dynamic specification model to provide that whether 2 or more series are to form a long run relationship. The series will still tend to move together over time, even though each series is not stationary.

The advantages of using ARDL is that different variables can be assigned to different lag-lengths. According to Pesaran (1997), all the independent variables does not required to be integrated in the same order solely at I(0) or I(1). As compare to Johansen and Juselius test, ARDL approach is able to produce higher accuracy and reliability result as it is able to tolerate the model with uneven lag length (Harris & Sollis, 2003).

There are two stages procedures by using ARDL approach to determine the relationship between labor productivity and macroeconomic variables such as FDI, wages, inflation rate, human capital and working hours in UK. Firstly, it is to identify the existence of long run relationship. Next, it is to estimate the criteria to move to second stage and the coefficient in term of short run and long run. The equation of unrestricted error correction model is specify as follow:

$$\begin{aligned}\Delta lnLPr_t = {} & \alpha_0 + \alpha_{Wages} lnWages_{t-1} + \alpha_{Inf} Inf_{t-1} + \alpha_{FDI} lnFDI_{t-1} \\ & + \alpha_{WH} lnWH_{t-1} + \alpha_{HC} HC_{t-1} + \sum_{i=0}^{P} \alpha_i \Delta lnLPr_{t-1} \\ & + \sum_{j=0}^{q} \alpha_j \Delta lnWages_{t-1} + \sum_{k=0}^{r} \alpha_k \Delta Inf_{t-1} + \sum_{l=0}^{s} \alpha_l \Delta lnFDI_{t-1} \\ & + \sum_{m=0}^{t} \alpha_m \Delta lnWH_{t-1} + \sum_{n=0}^{u} \alpha_n \Delta HC_{t-1} + \varepsilon_t\end{aligned} \qquad \text{(Eq. 3.4)}$$

The null and alternative hypothesis is stated as follow:

$H_0: \alpha_{LPr} = \alpha_{WAGES} = \alpha_{INF} = \alpha_{FDI} = \alpha_{WH} = \alpha_{HC} = 0$

$H_1: at\ least\ one\ of\ the\ \alpha_i \neq 0$

$(where\ x = lnLPr, lnWages, Inf, lnFDI, lnWH\ and\ HC)$

The null hypothesis specifies that there is no long run relationship whereas the alternative hypothesis specifies long run relation exist if one of the independent variables is not equal to zero.

Thereafter, F-statistics is used to determine the existence of long run relationship by rejecting or accepting H_0. F statistic follow non-standard distribution which depends on several criteria (Narayan & Narayan, 2004):

1.) Whether the variables are covered in the Unrestricted Error Correction Model (UECM) and categorized into I(0) and I(1).
2.) Whether the UECM consist of drift
3.) The numbers of independent variables included

According to Pesaran, Shin, and Smith (2001), the null hypothesis will be rejected and conclude that there is a long run relationship in the model if the F-statistic is higher than the upper critical bound. In contrary, the null hypothesis will not be rejected if the F-statistic is lower than the lower critical bound, and there shows the absences of long run relationship between the variables. However, if the F-statistic falls between the lower and upper critical bound, the test is inconclusive.

Cointegration is established, the long run model can be regressed as follow:

$$\begin{aligned} lnLPr_t = \ & \beta_0 + \sum_{i=0}^{n} \beta_1 lnLPr_{t-1} \\ & + \sum_{i=0}^{n} \beta_2 lnWages_{t-1} + \sum_{i=0}^{n} \beta_3 Inf_{t-1} \\ & + \sum_{i=0}^{n} \beta_4 lnFDI_{t-1} + \sum_{i=0}^{n} \beta_5 lnWH_{t-1} + \sum_{i=0}^{n} \beta_6 HC_{t-1} \\ & + \varepsilon_t \end{aligned} \qquad \text{(Eq. 3.5)}$$

Lastly, to form a short run model as follow, the error correction model is incorporated with an error correction term related with the long run equation:

$$\Delta lnLPr_t = \gamma_0 + \sum_{i=0}^{n} \gamma_1 \Delta lnLPr_{t-1} + \sum_{i=0}^{n} \gamma_2 \Delta lnWages_t + \sum_{i=0}^{n} \gamma_3 \Delta Inf_t + \sum_{i=0}^{n} \gamma_4 \Delta lnFDI_t + \sum_{i=0}^{n} \gamma_5 \Delta lnWH_t + \sum_{i=0}^{n} \gamma_6 \Delta HC_t + \delta ECT_{t-1} + \varepsilon_t$$

(Eq. 3.6)

The adjustment of the coefficient ECT_{t-1} is to identify how long is the model can adjust to reach long run equilibrium by capturing the long run model's residual. According to Ahmed, Muzib, and Roy (2013), ECT_{t-1} must statistically significant, being a negative number and fall within the range from 0 to -1.

3.2.3 Vector Error Correction Model

According to Engle and Granger (1987), if the time series variable are stationary in the first difference but have a unit root level, VECM can be used to overcome it. VECM able to provide a more accurate and efficient of cointegrating vectors as it is a perfect information maximum likelihood model. Nonetheless, the variables doesn't need to be normally distributed in VECM. VECM does not only provide short run dynamics but also the long run relationship between the variables by using the significant error correction term (Pala, 2013). The significance of the coefficient would be tested by comparing the t-statistics to determine whether the long-run relationship is significant. Engle and Granger (1987) emphasized that a failure of including the ECT will lead to misspecified models and poor forecast results.

3.2.4 Granger Causality Test (Wald Test)

According to Gujarati and Porter (2009), regression analysis is used to identify the existence of relationship between variables but it does not able to identify the causality relationship between variables. In order to identify the direction of causality among the variables in the model, Granger causality test is used after to test the causal relationship between two variables (Granger, 1969). Engle and Granger (1987) has proved that if a set of series are cointegrated, error-correction model is always exists as a generating mechanism which force the variables to move closely together over time, which allows a wide range of short run dynamics. Granger (1969) mentioned that the two series could be unidirectional, bidirectional or independent of each other. However, Granger causality can only detect the direction of the causality without showing any impact of a particular variables. The null and alternative hypothesis is stated as follow:

H_0 = X does not granger cause the dependent variables Y

H_1 = X granger causes the dependent variables Y.

If the p-value is lower than the significance level, the null hypothesis is rejected and concluded that the dependent variable is granger caused by the independent variable. Otherwise, we do not reject the null hypothesis.

3.3 Diagnostic Checking

3.3.1 Autoregressive Conditional Heteroscedasticity (ARCH) Test

According to Engle (1982), Autoregressive Conditional Heteroscedasticity (ARCH) is an economic term and it is used to detect or test heteroscedasticity in time series data analysis. It considered a problem when it is use in the cross-sectional data analysis (Gujarati & Porter, 2009). The variance of error terms are vary depends on the value of the independent variables and are inconsistent which will causes heteroscedasticity problem. There are few ways to detect heteroscedasticity which are ARCH test, Glejser, White test, and etc. For the hypothesis testing, the null hypothesis states that there is no heteroscedasticity problem while the alternative hypothesis states that there is heteroscedasticity problem. The null hypothesis is rejected if the p-value of chi square ($\chi 2$**)** or F-statistics is less than significance level (α) at 1%, 5% or 10%. This can be assumed that the model errors are uniform and uncorrelated, leading the variances to be underestimated by Ordinary Least Squares (OLS) estimator.

3.3.2 Breusch-Godfrey Serial Correlation LM Test

Generally, Breusch-Godfrey LM Test is uses to test for serial correlation in a regression model. When the error terms are correlated with each other in time-series data, serial correlation occurred. According to Gujarati and Dawn

(2009), Breusch-Godfrey Serial Correlation LM test is preferred to use because it takes into account of higher orders of autocorrelation and lagged dependent variable as compared to Durbin's h test and Durbin-Watson. Durbin-Watson and Durbin's h test have the limitations which only available to detect result with non-stochastic independent variables and are only available for the first-order autoregressive model. For the hypothesis testing, the null hypothesis states that there is no autocorrelation problem while the alternative hypothesis states that there is an autocorrelation problem. The null hypothesis is rejected if the p-value of chi square ($\chi 2$) is less than significance level (α) at 1%, 5% or 10%.

3.3.3 Ramsey RESET Test

Ramsey RESET is uses to detect functional form specification of dependent and independent variables in a linear regression model. More specifically, it tests whether non-linear combinations of the estimated values would explain the exogenous variable. For the hypothesis testing, the null hypothesis is states there is no model misspecification while alternative hypothesis states that there is a model misspecification. The null hypothesis is rejected if the p-value of F-statistic is less than the level of significance at 1%, 5% or 10%. This means that there is model misspecification problem in the model which can lead to inaccurate result.

3.3.4 Jarque-Bera (JB) Test

According to Gujarati and Porter (2009), the normality of error term can be determined by using Jarque-Bera normality test in order to ensure that OLS estimators are best, linear, unbiased and efficient (BLUE). This can result in a straightforward and reliable hypothesis. The error term (μ) in null hypothesis (H_0) is normally distributed whereas the error term (μ) in alternative hypothesis (H_1) is not normally distributed. In the hypothesis testing, the null hypothesis is rejected if p-value of variables less than the level of significance at 1%, 5% or 10%.

3.3.5 CUSUM and CUSUMSQ Test

CUSUM and CUSUMSQ test are widely uses in testing the stability of the parameters (Brown, Durbin, & Evans, 1975; Pesaran & Pesaran, 1997). Researchers examines this hypothesis test by plotting based on the cumulative sum of recursive residuals and squared recursive residuals. The null hypothesis is rejected once the plot falls within the range of 5% significance level. In brief, there is an absence of the instability of the parameters in a model.

CHAPTER 4: EMPIRICAL RESULTS

4.1 Unit Root Test

Table 4.1 Result of Augmented Dickey-Fuller Unit Root Test for the variables in UK.

Variables	ADF	
	Level Form	First difference
	Trend and Intercept	Intercept
LPR	0.035134 (0.9948)	-3.696137 * (0.0098)
CPI	-1.860576 (0.6487)	-4.287221 * (0.0023)
FDI	-3.579736 *** (0.0501)	-6.902828 * (0.0000)
LSEC	-3.122373 (0.1201)	-5.331182 * (0.0002)
LWAGE	-2.481091 (0.3337)	-2.953353 *** (0.0520)
LWH	-1.889627 (0.6340)	-5.509604 * (0.0001)
Remarks: *, ** and *** referring to the rejection of null hypothesis at significant level 1%, 5% and 10% respectively.		

H_0: There is a unit root in the variable.

H_1: There is no unit root in the variable.

Augmented Dicky Fuller (ADF) test is carried out In order to test the stationary of the variables. Table 4.1 shown the results of ADF unit root test at level form with trend and first difference form. Both of these test results are vital to the interpretation of unit root test. By comparing the test statistic and critical value of statistic, the stationarity of variables can be identified. H_0 is rejected if the test statistic value is lower than critical value of statistic, or else, do not reject H_0. In this situation, it indicates that the series is not stationary at level form. Therefore, first difference will be carried out until stationarity of variables is obtained. Intercept has to be included in the mentioned test. The first difference process is a step where it is used to eliminate any trend that is not of interest.

From the test result shown in Table 4.1, the time series variables indicate a unit root in level form when ADF test is being carried out earlier by using significant level of 1%, 5% and 10%. The existence of unit root signifies the non-stationary in level form. Foreign direct investment is only stationary at significant level of 10% but not in 1% and 5%. As the intention is to achieve overall significant level in order to ensure the accuracy of result by unit root test, thus, unit root testing in first difference form is required to carry out to verify on stationarity of variables. According to the result shows in table 4.1, it is clear that all variables have fulfill the requirement of being stationary after carried out first difference form in unit root testing while using significant level of 1%, 5% and 10%. Thus, stationarity of variables in the model has been attained in first difference form.

4.2 Diagnostic Checking

There are several tests to be conducted for diagnostic checking such as ARCH test, Breusch-Godfrey Serial Correlation LM Test, Ramsey RESET test, Jarque-Bera test, CUSUM and CUSUMSQ test in order to prove that our model is free from economic problems. The significance level of 1% is used in detecting the economic problems.

4.2.1 Multicollinearity

4.2.1.1 Correlation Matrix

Table 4.2 Result of Multicollinearity for the variables in UK.

	CPI	FDI	LSEC	LWAGE	LWH
CPI	1.000000	0.022262	-0.011503	-0.524040	0.489756
FDI	0.022262	1.000000	-0.198954	-0.053081	0.114339
LSEC	-0.011503	-0.198954	1.000000	0.334461	-0.361777
LWAGE	-0.524040	-0.053081	0.334461	1.000000	-0.921985
LWH	0.489756	0.114339	-0.361777	-0.921985	1.000000

The pair-wise correlation coefficient analysis is uses to further detect multicollinearity. When the pair-wise coefficient between two regressor is higher than 0.5 in both positive and negative number, multicollinearity may exist. According to the above results, the correlation coefficient between LWAGE and CPI, LWAGE and LWH are -0.5240 and -0.9220 respectively, which is a strong negative correlation. Therefore, the model is suspect to have suffer from multicollinearity.

4.2.1.2 Computation of Variance Inflation Factor (VIF)

Table 4.3 Result for the computation of VIF for the variables in UK.

Variables	R^2	VIF = $\frac{1}{1-R^2}$	Conclusion
CPI	0.307163	1.4433	No serious multicollinearity
FDI	0.060713	1.0646	No serious multicollinearity
LSEC	0.194063	1.2408	No serious multicollinearity
LWAGE	0.860142	7.1501	No serious multicollinearity
LWH	0.856681	6.9774	No serious multicollinearity

As a rule of thumb, if VIF between two independent variable exceeds 10, means that the variables is considers to be having serious multicollinearity (Gujarati & Porter, 2009). If VIF between two independent variables is equal to one, means that the variables has no multicollinearity (Gujarati & Porter, 2009). Based on the results above, it shows that the VIF values for all independent variables are in the range of 0 < VIF < 10. Therefore, there is sufficient evidence to conclude that there is no serious multicollinearity in the model.

4.2.2 Heteroscedasticity

Table 4.4 Result of Heteroscedasticity for the variables in UK.

Model	P-value	Alpha level(α)
Heteroskedasticity ARCH Test	0.8426	0.01

H_0: There is no heteroscedasticity problem.

H_1: There is heteroscedasticity problem.

ARCH test is applicable in the time series data model in order to detect the heteroscedasticity (Engle, 1982). The p-value obtained from ARCH test is 0.8426, which is greater than the significance level at 1%. Therefore, the null hypothesis is not rejected and resulting there is no heteroscedasticity problem.

4.2.3 Autocorrelation

Table 4.5 Result of Autocorrelation for the variables in UK.

Model	P-value	Alpha level(α)
Breusch-Godfrey Serial Correlation LM Test	0.0299	0.01

H_0: There is no autocorrelation problem.

H_1: There is autocorrelation problem.

As the result generates from Breusch-Godfrey Serial Correlation LM Test, the model proves that no autocorrelation problem is occurred. Since the p-value of chi square, which is 0.0299 greater than the significance level at 1% and thus do not reject the null hypothesis.

4.2.4 Model Specification error

Table 4.6: Result of Model Specification Error for the variables in UK.

Model	P-value	Alpha level(α)
Ramsey RESET Test	0.0825	0.01

H_0: The model specification is correctly formed.

H_1: The model specification is wrongly formed.

Ramsey RESET test is suitable to detect whether model misspecification problem arouses in the model. The null hypothesis is not rejected since the p-value of F-statistic (0.0825) is greater than the significance level at 1%. Thus, there is insufficient evidence to conclude that the model specification is wrongly formed.

4.2.5 Normality test

Table 4.7 Result of Normality Test for the variables in UK.

Model	P-value	Alpha level(α)
Jarque-Bera (Normality Test)	0.8052	0.01

H_0: The error term is normally distributed.

H_1: The error term is not normally distributed.

By ensuring that OLS estimators are best, linear, unbiased and efficient (BLUE), Jarque-Bera (JB) test is appropriate to test whether the error term is normality or not (Gujarati & Porter, 2009). As the result shown above, the p-value (0.8052) is greater than the significance level at 1% and therefore do not reject the null hypothesis which states that the error term is normally distributed.

4.2.6 Stability test

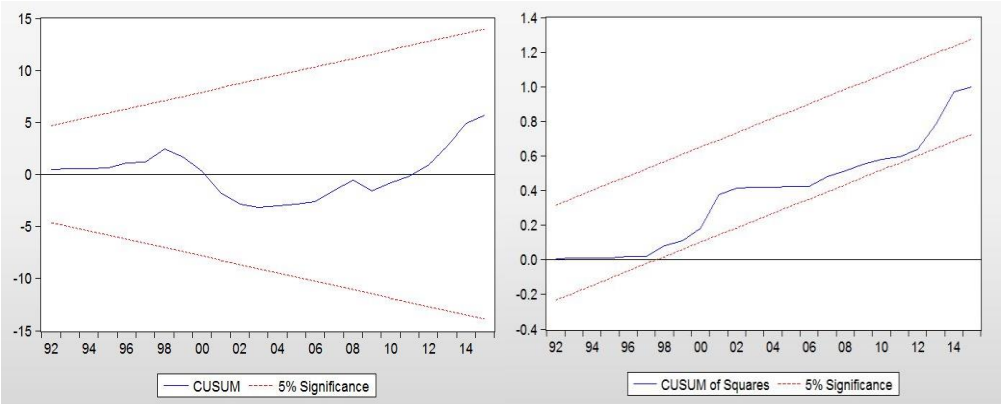


Figure 4.1 Result for Stability Test.

For testing the stability of the parameters, CUSUM and CUSUMSQ test can be used to apply in our model. From the result, all the plots of CUSUM and CUCUMSQ falls within the range of 5% significance level which shown that the parameters are stable.

4.3 ARDL Bound Test

ARDL bound test is uses to identify or examine the existence of the long run relationship between labor productivity and macroeconomic variables such as wages, inflation rate, working hour, FDI, average enrollment in secondary and tertiary. ARDL is more appropriate as the study's sample size is small (Harris & Sollis, 2003). According to Pesaran, Shin, and Smith (2001), the null hypothesis will be rejected and conclude that there is a long run relationship exists in the model if the F-statistic is greater than upper critical bound. On contrary, the null hypothesis will not be rejected if the F-statistic is lower than the lower critical bound and it indicates an absences of long run relationship between the variables. However, the decision is inconclusive if F-statistic fall between lower and upper critical bound.

The Wald F-statistic show in table 4.8 is to identify whether there is a long run relationship exist between the variables and labor productivity in UK. According to Pesaran, Shin, and Smith (2001), upper critical value that follows I(1) is 3.79, while lower critical value that follows I(0) is 2.62 at significance level of 5%. A conclusion can be made that a long run relationship is found between the variables and UK's labor productivity as the F-statistic is 6.6265, which is greater than the upper critical value of 3.79 at 5% significance level. In spite of that, the optimal lag length for labor productivity, inflation rate, FDI, gross enrollment in secondary, wage and working hours (4,1,2,0,0,2) respectively.

Table 4.8 Bound Test for Cointegration Result

Equation 3.1	Optimal Lag Length	F-statistic	Conclusion
$FPr\ (CPI, FDI, LSEC, LWage, LWH)$	(4,1,2,0,0,2)	6.6265	Cointegration
Remarks: The critical values are extracted from Table C1.iii: unrestricted intercept and no trend by Pesaran et al. (2001). ** indicates significant at 5% for k=5			

4.3.1 Long run and short run relationship of the model

On the other hand, a 1 % increase in inflation rate and working hours will decelerates UK's labor productivity growth by 0.02% and 2.10% respectively in the long run based on table 4.9. This finding is consistent with the results of Chris (2016) who emphasizes that psychological effect of employees has a very important connection with productivity and must not be ignored. A shorter working hours for an individual tend to provide greater efficiency as the individuals are more motivated and willingly to work harder (Pencavel, 2014). In spite of that, with an increase in inflation rate, an individual's spending power would be affected and being demotivated as their income is not sufficient to pay for the inflation (Papapetrou, 2003). Meanwhile, the firm will also change their production technique to a cheaper way as the price of capital increase and thus reduce the productivity.

Apart from that, an increase in FDI would be able to enhance the human capital development as the domestic investments in education and training increases (Ahmad, Hayat, Luqman, & Ullah, 2012). Yet, the findings show that there is no changes on labor productivity in the long run when FDI increases by 1%. It could be possibly due to the companies failed to combine both people and technology to improve the output (Giles, 2017). At the same

time, the increment of wage rate according to the education and skill level would also motivate the employee and avoid redundancy. As a result, the labor productivity is largely contributed by the working hours followed by the wage rate. At the same time, a higher inflation rate will impedes labor productivity in the long run.

Table 4.9 Estimated Long Run Coefficient of ARDL Approach

Variable	Optimal lag length	Coefficient	Standard error	t-statistic (p-value)
CPI	1	-0.019108	0.003486	-5.481267(0.0002)*
FDI	2	-0.000000	0.000000	-3.370188(0.0063)*
lSec	0	0.031644	0.020931	1.511845(0.1588)
lWages	0	0.469553	0.052426	8.956477(0.0000)*
lWH	2	-2.103175	0.340810	-6.171108(0.0001)*
Remarks: *, **, and *** referring to the rejection of null hypothesis at significance level of 1%, 5% and 10% respectively.				

CPI and wages are statistically significant at 1% while FDI and gross enrollment are statistically significant at 5% and 10% respectively according to table 4.3. In addition, the short run ECT is statistically significant at 1% and it is less than one in absolute value. The coefficient of ECT (-0.5957) indicates that the speed of adjustment is moderate to achieve the long run equilibrium. In order to achieve long run relationship, it will adjust 59.57% each year and takes about 1.7 years to fully adjust to long run equilibrium.

Table 4.10 Estimated Short Run Coefficient of ARDL Approach

Variable	Optimal lag length	Coefficient	Standard error	t-statistic (p-value)
CPI	1	-0.0068	0.0015	-4.4671(0.0010)*
FDI	2	-0.0000	0.0000	2.8492(0.0158)**
lSec	0	0.0188	0.0098	1.9147(0.0819)***
lWages	0	0.2797	0.0740	3.7782(0.0031)*
lWH	2	0.6360	0.3560	1.7863(0.1016)
ECT_{t-1}		-0.5957	0.1290	-4.6187(0.0007)*
Remarks: *, **, and *** referring to the rejection of null hypothesis at significance level of 1%, 5% and 10% respectively.				

4.4 Granger Causality on VECM

H_0: There is no Granger cause relationship between dependent variable and independent variable.

H_1: There is a Granger cause relationship between dependent variable and independent variable.

Table 4.11 Result of Granger Causality between LPR with other variables

Variable	p-value
D(CPI)	0.1769
D(FDI)	0.1125
D(LSEC)	0.7206
D(LWAGE)	0.8994
D(LWH)	0.6282
Remarks: *, **, and *** referring to the rejection of null hypothesis at significance level of 1%, 5% and 10% respectively.	

The table 4.11 shows the Granger Causality results for the research model. The null hypothesis (H_0) means X does not granger cause on the response Y. The null hypothesis (CPI does not granger cause on LPR) is not rejected as the p-value (0.1769) is more than significance level of 1%, 5% and 10%. Thus, there is sufficient evidence to conclude that CPI does not granger cause LPR. The impact is not constant and the effect tends to be different because of different time period or economic factors. Papapetrou (2003) claims that when there is intervention of monetary policy, the price level and labor productivity would be insignificant to each other. Apart from that, a slight movement in hours work and output growth would also causes an insignificant relationship between the CPI and LPR (Ram, 1984).

The null hypothesis (FDI does not granger cause on LPR) is not rejected as the p-value (0.1125) is more than significance level of 1%, 5% and 10%. It is supported by a few researchers like Farahani, Yazdan, Sadr, and Hossein (2013), Lall and Narula (2004) and Cem (2010). It can be explained due to the lacking of domestic structure and capital funding that poses as barriers, as well as the lacking of the local capabilities and guidance of government in promoting policies that cannot fully utilizes the increases FDI. As a result, foreign direct investment has no granger cause on labor productivity.

For the human capital, the null hypothesis (human capital does not granger cause on LPR) is not rejected because of p-value (0.7206) is more than significance level of 1%, 5% and 10%. Su and Heshmati (2011) supported this statement and claims that human capital does granger cause on labor productivity because of limited skills and knowledge gained as compared to labors who acquires knowledge from overseas. Granger causality happens between human capital and labor productivity when education level is higher. Firm are willing to hire labor that has higher education level, more skilled and knowledge as they are more discipline and willing to obey the instructions and rules as assigned by their employers, thus increases the efficiency and labor productivity.

In addition, the null hypothesis (wage does not granger cause on LPR) is not rejected because of p-value (0.8994) is more than significance level of 1%, 5% and 10%. Higher wages does not necessary lead to higher productivity as supported by (Hondroyiannis & Papapetrou, 1997; Gneezy & Rustichini 2000). The initial wage push is not able to sustain the productivity in long run as it is based on the excess capital that brings a very low return.

The null hypothesis (working hours does not granger cause on LPR) is not rejected. The p-value (0.6282) is more than significance level of 1%, 5% and 10%. There are

many other factors that would impact the labor productivity. For example information technology skills, working environment and etc. (Ng & Tsang, 2014).

Table 4.12 Result of Granger Causality between CPI with other variables.

Variable	p-value
D(LPR)	0.3322
D(FDI)	0.6044
D(LSEC)	0.6318
D(LWAGE)	0.1805
D(LWH)	0.9384
Remarks: *, **, and *** referring to the rejection of null hypothesis at significance level of 1%, 5% and 10% respectively.	

The null hypothesis is not rejected because the p-values of LPR, FDI, LSEC, LWAGE and LWH (0.3322, 0.6044, 0.6318, 0.1805, and 0.9384) are more than 1%, 5% and 10% significant level. As a result, there is sufficient evidence to conclude that there are no granger causality between CPI and LPR, FDI, LSEC, LWAGE, LWH.

Table 4.13 Result of Granger Causality between FDI with other variables.

Variable	p-value
D(LPR)	0.7317
D(CPI)	0.8919
D(LSEC)	0.0243**
D(LWAGE)	0.1256
D(LWH)	0.8924
Remarks: *, **, and *** referring to the rejection of null hypothesis at significance level of 1%, 5% and 10% respectively.	

Based on table 4.13, the LPR, CPI, LWAGE and LWH does not Granger cause working hours at 1%, 5% and 10% significance level as the p-value is greater than level of significance while LSEC does granger cause FDI at 5% significance level as the p-value (0.0243) is lower than 0.05.

According to Noorbakhsh, Paloni, and Youssef (2001), human capital is one of the most crucial determinants for FDI. As in the skilled labor intensive sectors, level of education is important in facilitating technological innovation and also to improve productivity. The education quality in the host country would become the attraction for the FDI.

Table 4.14 Result of Granger Causality between LSEC with other variables.

Variable	p-value
D(LPR)	0.9204
D(CPI)	0.3704
D(FDI)	0.7282
D(LWAGE)	0.1671
D(LWH)	0.8183
Remarks: *, **, and *** referring to the rejection of null hypothesis at significance level of 1%, 5% and 10% respectively.	

The null hypothesis is not rejected because the p-values of LPR, CPI, FDI, LWAGE and LWH (0.9204, 0.3704, 0.7282, 0.1671 and 0.8183) are more than 1%, 5% and 10% significant level. As a result, there is sufficient evidence to conclude that there are no granger causality between CPI and LPR, CPI, FDI, LWAGE, LWH.

Table 4.15 Result of Granger Causality between LWAGE with other variables.

Variable	p-value
D(LPR)	0.0701***
D(CPI)	0.2718
D(FDI)	0.0574***
D(LSEC)	0.9332
D(LWH)	0.4755
Remarks: *, **, and *** referring to the rejection of null hypothesis at significance level of 1%, 5% and 10% respectively.	

The results indicates that CPI, LSEC, and LWH does not Granger cause LWAGE at 1%, 5% and 10% significance level while LPR and FDI does granger cause LWAGE at 10% significance level. Jayachandran (2006) states that a shock in labor productivity cause a high fluctuations in the wage, especially those poorer workers, unable to migrate and more credit-constrained due to inelastic labor supply of workers. The poor are become more worsen when productivity shock as there is a larger fluctuations in the wage due to the volatility of labor income they rely on. Likewise, capital stocks would increase both the demand for labor and labor productivity and hence wages increases (Kumar, Webber, & Perry, 2009).

On the other hand, FDI inflows would increase the wage rate in the host country as foreign firms tend to pay higher wages than the domestic firm. Besides that, skilled labor demand tends to increases due to the information asymmetry that exists between them and their foreign employers (Velde & Morrissey, 2002; Mutascu & Fleischer, 2010). Therefore, the skilled labor would have a better negotiation skills to demand for higher wages.

Table 4.16 Result of Granger Causality between LWH with other variables.

Variable	t-statistic (p-value)
D(LPR)	0.1314
D(CPI)	0.3686
D(FDI)	0.0667***
D(LSEC)	0.8741
D(LWAGE)	0.0015*
Remarks: *, **, and *** referring to the rejection of null hypothesis at significance level of 1%, 5% and 10% respectively.	

Based on table 4.16, the LPR, LSEC, and CPI does not Granger cause LWH at 1%, 5% and 10% significance level as the p-value is greater than the level of significance while LWAGE and FDI does granger cause LWH at 1% and 10% significance level respectively.

Researchers have found that wages causes the reduced of working hours (Strobl & Walsh, 2010; Danziger, 2009; Stewart & Swaffield, 2006; Bils & Chang, 1999). According to Danziger (2009), minimum wage rate imposes to diminish the existence of inequality in income and to safeguard the working poors' rights. The imposes of minimum wage rate has adversely affects working hours as well as employment (Neumark, Schweitzer, & Wascher, 2004; Strobl & Walsh, 2010; Stewart & Swaffield, 2006; Bils & Chang, 1999). The rise in minimum wage rate has subsequently shrink the subminimum wage rate to the extent that the expected wage rate falls. Thus results in increase in working hours, profits but reduces workers' welfare. On the other hand, Strobl and Walsh (2010) states that firm's technology may be crucial with respect to minimum wage rate. The effect of minimum wage on working hours may possibly be positive or negative since the elasticity of hours or workers regarding to output for firms varies according to sectors.

Apart from that, FDI would affect working hours as FDI facilitates the foreign takeover in the country. According to Arnal and Hijzen (2008), working hour in foreign firms are usually longer compare to domestic firms in Brazil, Portugal and UK. This is due to the specific characteristics of the firm that takeover by the foreign owner. The working hour will either remain the same or negatively affected.

CHAPTER 5: CONCLUSION

5.0 Introduction

Chapter 5 summarize each chapter of this research. This chapter consists the explanation of the statistical analysis and major findings of previous chapter. Besides, some implications and policies, have been figures out throughout the research. However, there are limitations exists in conducting this paper and recommendations is provided for future researcher.

5.1 Summary

This study presents the impact of macroeconomics variables such as FDI, inflation, working hours, human capital and wages on labor productivity. This research also overviews all variables by using different tests. To analyze for the stationary form of the variables, unit root test is used in order to avoid spurious regressions. According to the results from chapter 4, all variables are not stationary at the significant level of 1%, 5% and 10% except for FDI and are rejected at the significant level of 10% at the first level form. However, all of the variables become stationary after taking into account of the first differencing.

Based on the empirical result, the econometric model is proves to be free from any econometric problems. Both ARCH test and Breusch-Godfrey Serial Correlation LM Test shows that there is no heteroscedasticity and autocorrelation problem in the model. Besides, Ramsey RESET test evidences that the model is free from misspecification. Next, normality of error term is tested using Jarque-Bera test and the model is consistent with it. Lastly, all of the parameters are stable according to CUCUM and CCUMSQ.

Based on the result from ARDL bound test, both inflation rate and working hours will decrease the labor productivity in long run for every 1% increase. Besides, working hours and labor productivity is found to have a negative long run relationship. This is supported by Kelliher and Anderson (2009), Pencavel (2014), Griffith and Miller (2010), Chris (2016), and Inagaki and Azetsu (2013) in Chapter 2. Workers tend to be more productive in a shorter working period as compared to longer period (Pencavel, 2014). Likewise, there is negative long run relationship found between inflation rate and labor productivity. This result is consistent with the following researchers, Bulman and Simon (2003), Kumar, Wevver, and Perry (2009), Ram (1984), Ulusoy, Cakir, and Ogut (2008), and Yildirim (2015). Inflation will affect the labor supply decision of households (Papapetrou, 2003). Both of the human productivity and physical capital will decline during inflation due to the lack of incentive to supply labor.

In long run, labor productivity still remains unchanged for additional 1% increase in FDI. The reason behind is the failure of company to integrate both of the people and technology to improve productivity (Giles, 2017). Furthermore, there is insignificant relationship between human capital and labor productivity in long run, which shows a similar result with Su and Heshmati (2011). Even though labor productivity increases, training still tend to decline the amount of labor in participating the production. This may be due to the firms does not have any adequate capital to provide training for their employees or some employees does not have the specific qualifications or

capabilities to join the training. For the wages and labor productivity, there is a long run relationship exist. The researchers Kumar, Webber, and Perry (2009) revealed that higher wages may increase the opportunity cost of job loss and thus generate great motivation for each worker in order to prevent redundancy.

In order to study the causal relationship between the dependent variables which is the labor productivity and other variables like FDI, inflation, working hours, human capital and wages on labor productivity. The research figures out there is a uni-directional Granger Causality between FDI and the gross enrollment rate, wages and labor productivity, wages and FDI, labor working hours and FDI and lastly labor working hour and wages. On the other hand, some other variables is found to have no any granger cause or relationship due to null hypothesis is not rejected and the P-value is more than significant level at 1%, 5% and 10% respectively.

5.2 Policy Implication

This study emphasize on the relationship between the variables including working hours, inflation, human capital, FDI and wage on labor productivity. The purpose of this study is to provide valuable information to government, investors as well as policy makers.

Firstly, government should promote working schemes such as work life balance and flexible working time. Work life balance given opportunity for employees to manage well between their working hours and time spent with family in order to achieve balance in both perception. The caring responsibilities apply on personal life will then bring positive effect towards one's workplace's attitude. Besides work life balance,

flexible or tailor made working hours systems can be promoted as well in order to enhance labor productivity growth. This could aid in uplifting employee's motivation towards their job performance since they are allow to work according to their preference of working time.

On the other hand, government should implement supply side economic policies as this policy targets to increase productivity in order to sustain lower cost. It can be done by contracting the high income tax level so that individuals can reduce spending on paying taxes. As high taxes possess a large proportion of expenses, hence the subtraction of tax may boost up employees' motivations to work or even participate in challenging tasks since they need not to worry that their income are not in line with their need. Moreover, since the incentives of working has increase, employees thus devote higher effort in skill acquisition to perform their tasks better. When employees' get to save more on their gross income, they may invest in other income generating investment that provides higher earning, consequently affecting the living standard of them.

In spite of that, government should set up the agency. The reason for this to be set up is to improve the employability and affordability of the employees and jobseekers, according to the workforce that meets the needs of UK. In short term, this agency able to enhance the good and positive mindset, multi-skilled, and nimble of the employees and jobseekers. The jobseekers will then be more adaptive to the new environment and different task. While in long term, the mission of this agency is to support the employed workers to stay employed by continuing update the skills, so that the employed workers able to perform the tasks given by the employers. Therefore, the improvement of the human capital allow them to earn higher wages, then they are highly motivated to perform better in their job and lead to the increase of labor productivity.

Moreover, UK government should expand more machinery and equipment investment to foreign company. Their business processes also improve and able to perform efficiently and produce better quality goods and services. With this investment, companies able to control their cost and the output of the companies increase, hence, labor productivity growth. Once they invest more in machinery and equipment, the tariff for competitor had increase to invest in UK and therefore, the FDI will decrease. Invest in M&E not only can control FDI but also increase labor productivity with high volume of production.

Lastly, government should establish collective bargaining to stimulate the enthusiasm of employees' towards their job as they receive greater compensation as a result of their hard work. Collective bargaining assists in sounding out employees' current issues and allow them to stand together to address their problems. By establishing collective bargaining, low-wage workers' wages as well as benefits can be increased and thus eliminating the issue of wage inequality happen among the less-benefited groups. Moreover, government may alter the minimum wage level in accordance with the relevant profession through collective contracts. As different profession requires various level of education and experience, it is advised to revise it accordingly to prevent biased perception from employees.

5.3 Limitation

Although our research has reaches the aims, but there were some unavoidable limitations. Firstly, this research explore the impact of different determinants on labor productivity as measured by GDP per hour worked. However, this measurement does not able to trace the impact of the determinants on productivity of various industry in UK. The changes of productivity in each industry may not be the same as each determinants may have different impact on different sector.

Secondly, gross enrollment number for both gender from primary to tertiary education as a proxy for human capital are failed to be included in the model. Most of the economists attempted to measure the human capital by including "school enrollment rates from primary to tertiary" as a proxy of human capital (Barro, 1991; Barro & Lee, 1993).

Thirdly, this research does not capture the impact of the role of institution on labor productivity. According to Klein and Luu (2003), countries with a stable political system and legal and regulatory framework that facilitates trade and competition tends to be at the best practice in promoting economic development and productivity.

5.4 Recommendations

In the future, the researcher could make further analysis by including the performance of productivity of each industry in UK and how each of the determinant influence each sector's productivity. It is essential to understand how each determinants affect the productivity level by sector in UK.

In addition, the researcher are encourage to use other data as the proxy. School enrollments rates has a drawback that a student effectiveness can only be identified after the student involves in production activities.

On the other hand, the researchers could make an analysis on the relationship between the role of institution and labor productivity as the stability of political system and the legal framework introduced by government plays an important role in affecting the productivity by sector.

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Appendices

Appendix 1: Augmented Dickey-Fuller Test

Level Form: Trend and Intercept

Labor Productivity

Null Hypothesis: LPR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.035134	0.9948
Test critical values:	1% level	-4.309824	
	5% level	-3.574244	
	10% level	-3.221728	

Labor Productivity in CPI

Null Hypothesis: CPI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.860576	0.6487
Test critical values:	1% level	-4.309824	
	5% level	-3.574244	
	10% level	-3.221728	

Labor Productivity in FDI

Null Hypothesis: FDI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.579736	0.0501
Test critical values:	1% level	-4.323979	
	5% level	-3.580623	
	10% level	-3.225334	

Labor Productivity in Human Capital

Null Hypothesis: LSEC has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.122373	0.1201
Test critical values:	1% level	-4.309824	
	5% level	-3.574244	
	10% level	-3.221728	

Labor Productivity in Wages

Null Hypothesis: LWAGE has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.481091	0.3337
Test critical values:	1% level	-4.356068	
	5% level	-3.595026	
	10% level	-3.233456	

Labor Productivity in Working Hours

Null Hypothesis: LWH has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.889627	0.6340
Test critical values:	1% level	-4.309824	
	5% level	-3.574244	
	10% level	-3.221728	

First Difference: Intercept

Labor Productivity

Null Hypothesis: D(LPR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.696137	0.0098
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

Labor Productivity in CPI

Null Hypothesis: D(CPI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.287221	0.0023
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

Labor Productivity in FDI

Null Hypothesis: D(FDI) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.902828	0.0000
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

Labor Productivity in Human Capital

Null Hypothesis: D(LSEC) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.331182	0.0002
Test critical values:	1% level	-3.699871	
	5% level	-2.976263	
	10% level	-2.627420	

Labor Productivity in Wages

Null Hypothesis: D(LWAGE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.953353	0.0520
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

Labor Productivity in Working Hour

Null Hypothesis: D(LWH) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=7)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.509604	0.0001
Test critical values:	1% level	-3.689194	
	5% level	-2.971853	
	10% level	-2.625121	

Appendix 2: Results of Diagnostic Checking

Result of Variance Inflation Factor (VIF) for variables

CPI

Dependent Variable: CPI
Method: Least Squares
Date: 06/21/17 Time: 22:05
Sample: 1986 2015
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDI	5.73E-13	4.25E-12	0.134753	0.8939
LSEC	1.595277	1.480407	1.077593	0.2915
LWAGE	-6.381380	5.622077	-1.135057	0.2671
LWH	7.136017	30.28760	0.235608	0.8157
C	-7.640597	283.4253	-0.026958	0.9787

R-squared	0.307163	Mean dependent var	2.799090
Adjusted R-squared	0.196309	S.D. dependent var	1.740749
S.E. of regression	1.560561	Akaike info criterion	3.878979
Sum squared resid	60.88373	Schwarz criterion	4.112512
Log likelihood	-53.18469	Hannan-Quinn criter.	3.953688
F-statistic	2.770882	Durbin-Watson stat	0.561821
Prob(F-statistic)	0.049282		

FDI

Dependent Variable: FDI
Method: Least Squares
Date: 06/21/17 Time: 22:06
Sample: 1986 2015
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LSEC	-6.19E+10	7.01E+10	-0.882688	0.3858
LWAGE	1.91E+11	2.68E+11	0.712015	0.4830
LWH	1.02E+12	1.41E+12	0.726139	0.4745
CPI	1.27E+09	9.40E+09	0.134753	0.8939
C	-8.67E+12	1.32E+13	-0.656696	0.5174

R-squared	0.060713	Mean dependent var	9.93E+09
Adjusted R-squared	-0.089572	S.D. dependent var	7.03E+10
S.E. of regression	7.33E+10	Akaike info criterion	53.02575
Sum squared resid	1.34E+23	Schwarz criterion	53.25928
Log likelihood	-790.3863	Hannan-Quinn criter.	53.10046
F-statistic	0.403987	Durbin-Watson stat	1.261607
Prob(F-statistic)	0.803937		

Human Capital

Dependent Variable: LSEC
Method: Least Squares
Date: 06/21/17 Time: 22:06
Sample: 1986 2015
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LWAGE	0.272965	0.759415	0.359442	0.7223
LWH	-2.498794	3.973084	-0.628931	0.5351
CPI	0.027824	0.025820	1.077593	0.2915
FDI	-4.89E-13	5.53E-13	-0.882688	0.3858
C	31.03159	36.91320	0.840664	0.4085

R-squared	0.194063	Mean dependent var	15.38604
Adjusted R-squared	0.065113	S.D. dependent var	0.213153
S.E. of regression	0.206097	Akaike info criterion	-0.169932
Sum squared resid	1.061894	Schwarz criterion	0.063600
Log likelihood	7.548986	Hannan-Quinn criter.	-0.095223
F-statistic	1.504950	Durbin-Watson stat	1.381062
Prob(F-statistic)	0.230953		

Wages

Dependent Variable: LWAGE
Method: Least Squares
Date: 06/21/17 Time: 22:07
Sample: 1986 2015
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LWH	-4.624977	0.500844	-9.234370	0.0000
CPI	-0.007680	0.006766	-1.135057	0.2671
FDI	1.04E-13	1.46E-13	0.712015	0.4830
LSEC	0.018835	0.052401	0.359442	0.7223
C	44.67729	4.103260	10.88824	0.0000

R-squared	0.860142	Mean dependent var	10.53221
Adjusted R-squared	0.837765	S.D. dependent var	0.134409
S.E. of regression	0.054138	Akaike info criterion	-2.843549
Sum squared resid	0.073273	Schwarz criterion	-2.610017
Log likelihood	47.65324	Hannan-Quinn criter.	-2.768840
F-statistic	38.43813	Durbin-Watson stat	0.810013
Prob(F-statistic)	0.000000		

Working Hours

Dependent Variable: LWH
Method: Least Squares
Date: 06/21/17 Time: 22:07
Sample: 1986 2015
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	0.000310	0.001318	0.235608	0.8157
FDI	2.02E-14	2.78E-14	0.726139	0.4745
LSEC	-0.006233	0.009911	-0.628931	0.5351
LWAGE	-0.167199	0.018106	-9.234370	0.0000
C	9.296803	0.194565	47.78247	0.0000

R-squared	0.856681	Mean dependent var	7.440992
Adjusted R-squared	0.833750	S.D. dependent var	0.025245
S.E. of regression	0.010294	Akaike info criterion	-6.163592
Sum squared resid	0.002649	Schwarz criterion	-5.930059
Log likelihood	97.45388	Hannan-Quinn criter.	-6.088883
F-statistic	37.35891	Durbin-Watson stat	0.920827
Prob(F-statistic)	0.000000		

ARCH Test

Heteroskedasticity Test: ARCH

F-statistic	0.036760	Prob. F(1,27)	0.8494
Obs*R-squared	0.039430	Prob. Chi-Square(1)	0.8426

Ordinary Least Square

Dependent Variable: LPR
Method: Least Squares
Date: 06/21/17 Time: 22:01
Sample: 1986 2015
Included observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	-0.008247	0.003436	-2.400371	0.0245
FDI	-1.26E-13	7.31E-14	-1.729285	0.0966
LSEC	-0.027200	0.026016	-1.045509	0.3062
LWAGE	0.635764	0.099041	6.419219	0.0000
LWH	-2.522687	0.520897	-4.842969	0.0001
C	16.21060	4.869116	3.329271	0.0028

R-squared	0.975301	Mean dependent var	3.692464
Adjusted R-squared	0.970155	S.D. dependent var	0.155186
S.E. of regression	0.026809	Akaike info criterion	-4.223278
Sum squared resid	0.017250	Schwarz criterion	-3.943039
Log likelihood	69.34917	Hannan-Quinn criter.	-4.133627
F-statistic	189.5400	Durbin-Watson stat	1.092309
Prob(F-statistic)	0.000000		

Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:

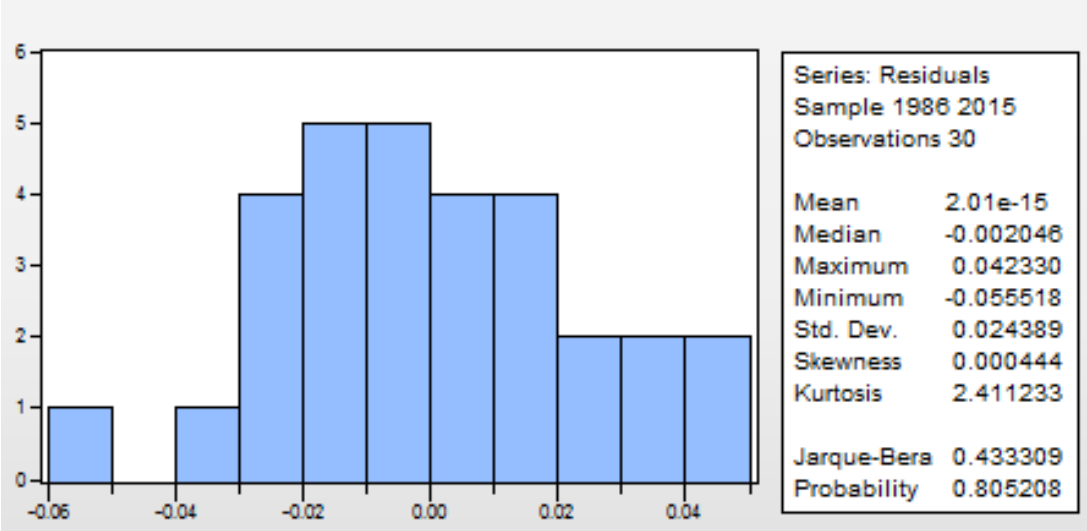
F-statistic	3.361559	Prob. F(2,22)	0.0532
Obs*R-squared	7.021993	Prob. Chi-Square(2)	0.0299

Ramsey RESET Test

Ramsey RESET Test
Equation: UNTITLED
Specification: LPR CPI FDI LSEC LWAGE LWH C
Omitted Variables: Squares of fitted values

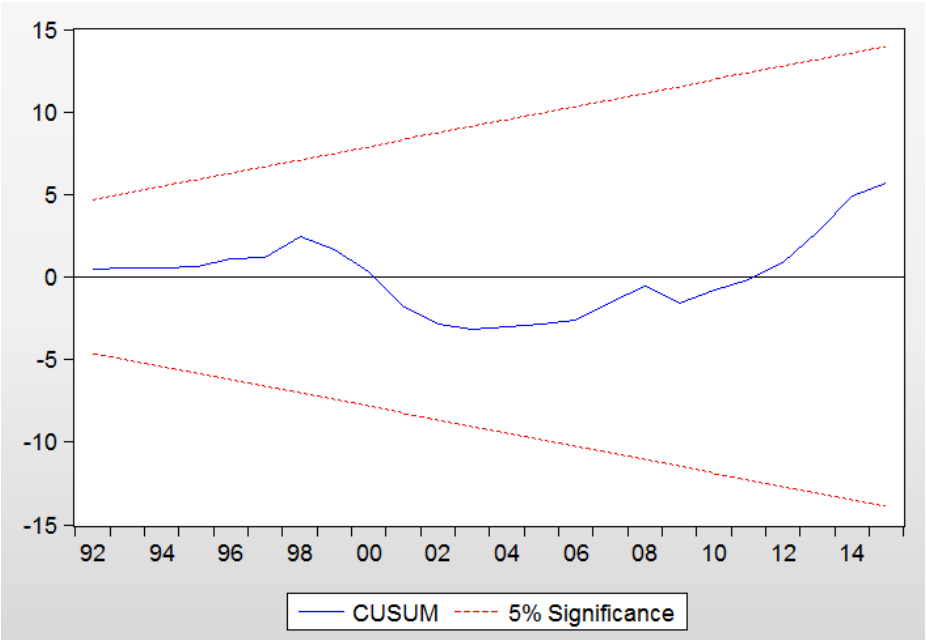
	Value	df	Probability
t-statistic	1.815446	23	0.0825
F-statistic	3.295844	(1, 23)	0.0825
Likelihood ratio	4.017501	1	0.0450

Jarque-Bera Normality Test

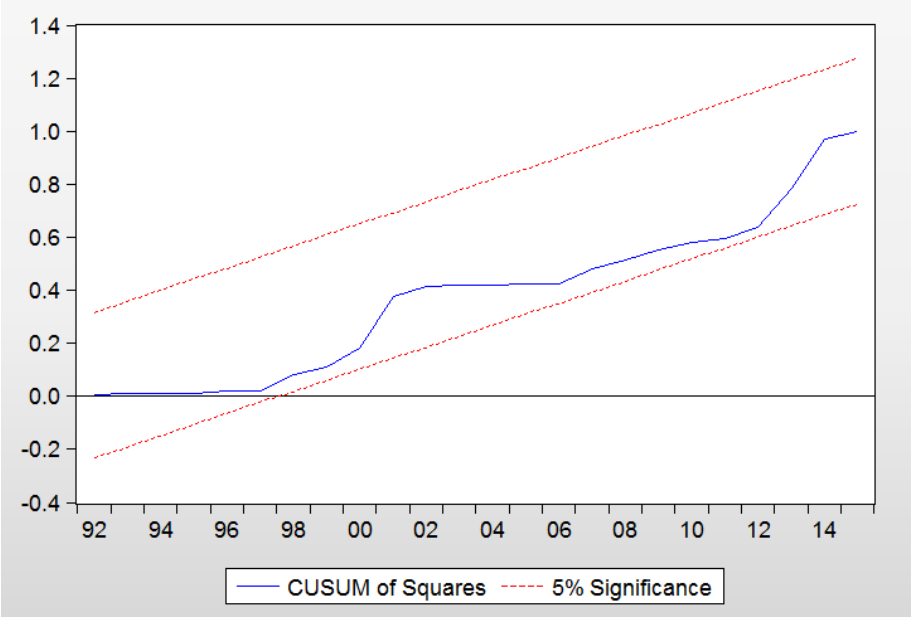


Stability Test

CUSUM



CUSUM SQ



Appendix 3: Results for Bounds Test for Cointegration

ARDL Bounds Test
Date: 06/21/17 Time: 22:15
Sample: 1990 2015
Included observations: 26
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	6.626491	5

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

Estimated Long Run Coefficient of ARDL Approach

ARDL Cointegrating And Long Run Form
Dependent Variable: LPR
Selected Model: ARDL(4, 1, 2, 0, 0, 2)
Date: 06/21/17 Time: 22:15
Sample: 1986 2015
Included observations: 26

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LPR(-1))	-0.392219	0.153568	-2.554042	0.0268
D(LPR(-2))	-0.133375	0.131967	-1.010668	0.3339
D(LPR(-3))	-0.349237	0.141899	-2.461175	0.0316
D(CPI)	-0.006783	0.001518	-4.467094	0.0010
D(FDI)	0.000000	0.000000	0.396458	0.6993
D(FDI(-1))	0.000000	0.000000	2.849239	0.0158
D(LSEC)	0.018849	0.009844	1.914706	0.0819
D(LWAGE)	0.279696	0.074030	3.778165	0.0031
D(LWH)	-0.850876	0.258437	-3.292387	0.0072
D(LWH(-1))	0.635987	0.356042	1.786269	0.1016
CointEq(-1)	-0.595665	0.128969	-4.618662	0.0007

Cointeq = LPR - (-0.0191*CPI -0.0000*FDI + 0.0316*LSEC + 0.4696 *LWAGE -2.1032*LWH + 14.0146)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	-0.019108	0.003486	-5.481267	0.0002
FDI	-0.000000	0.000000	-3.370188	0.0063
LSEC	0.031644	0.020931	1.511845	0.1588
LWAGE	0.469553	0.052426	8.956477	0.0000
LWH	-2.103175	0.340810	-6.171108	0.0001
C	14.014593	3.002899	4.667021	0.0007

Appendix 4: Results for VECM Granger Causality Tests

VEC Granger Causality/Block Exogeneity Wald Tests
Date: 06/21/17 Time: 20:37
Sample: 1986 2015
Included observations: 28

Dependent variable: D(LPR)

Excluded	Chi-sq	df	Prob.
D(CPI)	1.823332	1	0.1769
D(FDI)	2.518094	1	0.1125
D(LSEC)	0.127951	1	0.7206
D(LWAGE)	0.015988	1	0.8994
D(LWH)	0.234454	1	0.6282
All	7.457000	5	0.1888

Dependent variable: D(CPI)

Excluded	Chi-sq	df	Prob.
D(LPR)	0.940253	1	0.3322
D(FDI)	0.268429	1	0.6044
D(LSEC)	0.229692	1	0.6318
D(LWAGE)	1.793898	1	0.1805
D(LWH)	0.005963	1	0.9384
All	2.735635	5	0.7407

Dependent variable: D(FDI)

Excluded	Chi-sq	df	Prob.
D(LPR)	0.117525	1	0.7317
D(CPI)	0.018468	1	0.8919
D(LSEC)	5.072749	1	0.0243
D(LWAGE)	2.346258	1	0.1256
D(LWH)	0.018288	1	0.8924
All	8.314928	5	0.1397

Dependent variable: D(LSEC)

Excluded	Chi-sq	df	Prob.
D(LPR)	0.009978	1	0.9204
D(CPI)	0.802410	1	0.3704
D(FDI)	0.120789	1	0.7282
D(LWAGE)	1.908698	1	0.1671
D(LWH)	0.052777	1	0.8183

All	3.767696	5	0.5833

Dependent variable: D(LWAGE)

Excluded	Chi-sq	df	Prob.
D(LPR)	3.279834	1	0.0701
D(CPI)	1.207511	1	0.2718
D(FDI)	3.610020	1	0.0574
D(LSEC)	0.007025	1	0.9332
D(LWH)	0.509099	1	0.4755
All	9.018287	5	0.1083

Dependent variable: D(LWH)

Excluded	Chi-sq	df	Prob.
D(LPR)	2.276115	1	0.1314
D(CPI)	0.808484	1	0.3686
D(FDI)	3.362824	1	0.0667
D(LSEC)	0.025122	1	0.8741
D(LWAGE)	10.11989	1	0.0015
All	10.98875	5	0.0516