ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL OF ARTS AND SOCIAL SCIENCES

THE BEVERIDGE CURVE AND LABOUR MARKET DYNAMICS IN OECD COUNTRIES

M.A. THESIS

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İSTANBUL TEKNİK ÜNİVERSİTESİ ★ SOSYAL BİLİMLER ENSTİTÜSÜ

OECD ÜLKELERİNDE BEVERIDGE EĞRİSİ VE EMEK PİYASASI DİNAMİKLERİ

YÜKSEK LİSANS TEZİ

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İktisat Programı

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MAYIS 2015

Lina Barokas, a M.A student of ITU Graduate School of Art and Social Sciences student ID 412131011, successfully defended the thesis entitled ‘’The Beveridge curve and labour market dynamics in OECD countries’’, which she prepared after fulfilling the requirements specified in the associated legislations, before the jury whose signatures are below.

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FOREWORD

I would like to thank my advisor Prof. Dr. Bülent Güloğlu for his encouragements, guidance in writing the thesis and patience while directing me to scientific study and Assoc. Prof. Dr. İpek İlkkaracan Ajas for her advices and suggestions to build more comprehensive theoretical background. I am grateful to my parents for their endless support and love.

During my education at Istanbul Technical University, I have gained the ability of scientific thinking and it has helped me to build a solid background to extend my degree concentrating on Economics. I am glad to have opportunity to study in competitive environment where there are continuous exchanges of ideas.

May 2015 Lina Barokas

CONTENT

ABBREVIATIONS

AMG : Augmented Mean Group
CCE : Comman Correlated Errors
CCEMG : Comman Correlated Errors Mean Group
DHP: Durbin-Haussman Panel Cointegration Test
DOLS : Dynamic Ordinary Least Squares
FD: First Difference
FGLS: Feasible Generalized Least Squares
FMOLS: Fully Modified Ordinary Least Squares
GDP: Gross Domestic Product
ILO : International Labour Organization
LFS: Labour Force Survey
LPRO: Real Labour Productivity
LSDV: Least Square Dummy Variables
OECD: The Organisation for Economic Co-operation and Development
OLS: Ordinary Least Squares
PCSE: Panel Corrected Standard Errors
PPP: Purchasing Power Parity
VAC: Job vacancy rate
VAR: Vector Autoregression Model
W: Wages
UNEMP: Unemployment rate
US or USA: The United States of America

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THE BEVERIDGE CURVE AND LABOUR MARKET DYNAMICS IN OECD COUNTRIES

SUMMARY

This thesis examines Beveridge curve and its increasing importance in labour market dynamics. This curve studies mismatch ratio of the employee skills to skills that jobs needed and it is often used to identify the state of the labour market. In essence, in this study is concentrated on the graphical negative relationship between unemployment and the job vacancy rate with an application to 12 OECD countries between years 2000 and 2012. Movements in Beveridge Curve is defined and explained by statistical analysis as well as illustrations. The analysis aims to explain unemployment rate of selected countries by the real minimum wage and the labour productivity based on the previous literature. The real minimum wage is included based on it will extend the search duration of candidates if it rises. Real labour productivity is added to the equation based on the idea that an increase in labour productivity can cause a decrease in unemployment rate by accelerating the overall economic growth of a country. The common correlated errors (CCE) and augmented mean group (AMG) estimators are calculated to show both panel data results and country-specific results. On the other hand, fixed effect model is estimated by feasible generalized least squares, fully modified ordinary least squares and Prais-Winsten regression methods. As a result, negatively sloped Beveridge Curve is verified.The estimated values of job vacancy coefficient express an inelastic behaviour of the Beveridge curve in selected OECD countries. The labour costs, in terms of real minimum wages, have worsened the matching rate of unemployed workers and job vacancies; it is leading to an outward shift of the Beveridge Curve. An increase in wages has decreased the labour market efficiency. Labour productivity has a negative impact on the unemployment and this indicates that the labour productivity have improved the matching rate of unemployed workers and job vacancies. In other words, rises in labour productivity have positive impact on increasing the labour market efficiency. Even though the panel data analysis of unemployment and vacancies as well as real minimum wages and real labour productivity shows inefficiency in the labour markets of the selected countries, some of the country specific results of real minimum wages and real labour productivity support the alternative hypothesis of the higher real minimum wages result in an increase in economic activity and growth might cause a decrease in unemployment and the higher real labour productivity result in less demand for labour and thus, increases the unemployment rate.

OECD ÜLKELERİNDE BEVERIDGE EĞRİSİ VE EMEK PİYASASI DİNAMİKLERİ

ÖZET

Bu tezde, Beveridge eğrisi ve Beveridge eğrisinin emek piyasası dinamiklerinde artan önemini anlatılmaktadır. Beveridge eğrisi, genellikle emek piyasasının durumunu belirtmek için kullanılır ve işçilerin sahip olduğu yetkinlikler ile işlerin gerektirdiği yetkinliklerin arasında uyuşmazlık oranını inceler. Esas itibariyle bu çalışmada 2000 ve 2012 yılları arasında, 12 OECD üyesi ülke uygulaması ile birlikte, işsizlik oranı ve açık iş ilanları oranı arasındaki grafiksel negatif ilişkinin üzerinde durulmuştur. Beveridge eğrisinin hareketleri istatistiksel açıklamalar ve şekiller ile birlikte tanımlanmıştır. Daha önceden yapılmış araştırmalara dayanarak, seçilen ülkelerin işsizlik oranları ilave değişkenler ile açıklanmıştır. Bu ilave değişkenler reel minimum ücret ile reel emeğin verimliliğidir. Reel minimum ücret artışının iş arama sürecini uzatarak, işsizlik üzerinde olumsuz etki yaratacağı varsayımı altında modele eklenmiştir. Reel emeğin verimliliği artışı, ülkelerdeki ekonomik büyümeyi pozitif yönde etkileyeceği varsayılarak, işsizliğe azaltıcı bir etki sağlayacağı öngörülmüştür. Ortak ilişkili hatalar (Common Correlated Errors) ve genişletilmiş ortalama grupları (Augmented Mean Group) tahmin edicileri, hem panel tahmini için hem de ülkelerin bireysel katsayılarını tahmin etmek için kullanılmıştır. Aynı zamanda, sabit etki modeli katsayıları, tahmin edilebilinir genelleştirilmiş en küçük kareler (Feasible Generalized Least Squares), tam değiştirilmiş en küçük kareler (Fully Modified Ordinary Least Squares) ve Prais Winsten regresyonları analizleri ile tahmin edilmiştir. Sonuç olarak, negatif eğilime sahip Beveridge eğrisi onaylanmıştır. Seçilen ülkelerde panel veri analiz sonuçları, emek piyasasındaki verimsizliğe işaret etmektedir. Tahmin edilen açık iş ilanları katsayıları, seçilen ülkelerde Beveridge eğrisinin inelastik bir davranışa sahip olduğunu vurgulamaktadır. Emek ücretlerindeki artış, işsizler ile açık ilanları arasındaki eşleşme oranını daha kötü bir hale getirmektedir ve Beveridge eğrisini dışa doğru kaydıracağı gözlemlenmiştir. Reel minimum ücretlerdeki artış, emek piyasasındaki verimliliği düşürmektedir. Emeğin verimliliğinin işsizlik üzerindeki etkisi negatiftir. Emeğin verimliliği yükseldikçe, işsizler ile açık ilanları arasındaki eşleşme oranı daha iyi bir hal almaktadır. Emeğin verimliliği, emek piyasasının verimliliğini arttırmada pozitif bir role sahiptir. İşsizlik, açık iş ilanları, reel minimum ücretler ve emeğin reel verimliliğinin panel veri sonuçları, seçilen ülkelerdeki emek piyasasında verimsizliği işaret etse de, bireysel ülke sonuçları farklılık göstermektedir. Bazı ülkelerde artan reel minimum ücretlerin, tüketim yolu ile ekonomik büyümeye katkı sağlayarak işsizliği azaltabileceği sonuca varılmıştır. Aynı zamanda bazı ülkelerde artan emek verimliliğin daha az emek talebine neden olarak işsizliği arttırabileceği yönünde bir varsayım yapılmıştır.

1 INTRODUCTION

There were two empirical relationships became a current issue in macroeconomics, both of which had a significant impact on economic thought: the Phillips curve and the unemployment–vacancy (UV) curve (named as Beveridge curve after William Beveridge and it is developed by Dow and Dicks-Mireaux in 1958). The Phillips curve and its place in economic theory are well defined in the literature.

At first, UV curve was a measurement to lead economic policy, its impact in economic theory was not clearly defined. At the beginning, William Beveridge defined the negative relationship between unemployment and job vacancies to state how far the economy was from full employment[1]. His definition of full employment was when the vacancies slightly exceed unemployment. Afterwards, Beveridge curve's role has changed since its first perspective. In 1944, Beveridge had embraced a more Keynesian vision, which supports the concept that unemployment is due to a lack of effective demand (Beveridge, 1944). Despite this change of vision, Beveridge does not disenable his thesis in 1909.

Dow and Dicks-Mireaux (1958) used the vacancy and unemployment data to estimate excess demand in the labour market as an as an indicator for the excess demand in the goods market. They argued that vacancies should represent the excess demand of labour, if the unemployment data represents the excess supply of labour in the labour market. In the process of time, Beveridge curve has become important to identify the causes of changes in unemployment. Thereafter, Beveridge curve helps to classify unemployment into different types of unemployment which are cyclical and structural unemployment. Nowadays, Beveridge curve is often used to summarize the state of the labor market.

‘’Structural unemployment arises when there is a mismatch between skills demanded and supplied in a given area or an imbalance between the supplies of and demands

[1] Full employment does not mean literally no unemployment…Full employment means that having always more vacant jobs than unemployed men … It means that the jobs are at fair wages, the lag between losing one job and finding another will be very short, the labour market should always be a seller's market rather than a buyer's market… (Beveridge 1944, pp. 18–20)

for workers across areas'' (Ehrenberg and others, p.510). On the other hand, since the labour markets are dynamic and information flows are imperfect, cyclical unemployment (also called as demand-deficit unemployment) arises. This type of unemployment is associated with fluctuations in business cycles and it occurs when a decrease in aggregate demand in the output market causes a decrease in the aggregate demand for labour over against the downward rigidity in real wages.

The topic of skills mismatch has received attention new in advanced economies after the global economic crisis in 2008 - 2009. The goal of this paper is to examine the dynamics of labour market in 12 OECD countries after year 2000 within the context of the Beveridge curve. Annual data are used from the OECD, World Development Indicators and Turkish Employment Agency database for the period 2000 and 2012. It is found that the Beveridge curve shows a negative relationship between vacancies and unemployment in line with the literature.

To the best of our knowledge, Turkey has not been included in any Beveridge curve study which involves OECD countries and this study fills this gap in the literature. The work of Bayraktar and Günalp (2012) is the first contribution to literature with the analysis of the Turkish Beveridge curve. Even though the choice of the variables for the Beveridge curve analysis is based on the considerations regarding the aim of the study and the model of Bayraktar & Günalp (2012), this study departs from the analysis of theirs on several points. First, it is focused on the recent decade for the estimation of the Beveridge curve. Secondly, the different estimation techniques are used and the estimations are compared. Lastly, this study involves panel data which includes 11 more OECD countries, other than Turkey.

This thesis is structured as follows; the section 1 describes the shifts and movements of Beveridge curve and provides a brief explanation of the overview of labour market status. Section 2 briefly outlines the previous studies about the Beveridge curve. The data, the model and methodology is introduced in Section 3. Section 4 discusses empirical results and compares outcomes in 12 OECD countries. Section 5 states conclusions and summarizes the study.

1.1 The Overview of Labour Market

1.1.1 The Turkish labour market

There are lots of measures to evaluate the state of labour market. Some of them are listed at table 1.1. Last year, approximately 1.300.000 million people are added to working population and there exists around 1.300.000 million unemployed in 2014. The unemployment rate is remained high in 2014 which is %9,9. Until 2008 global crises, unemployment was decreased, but during the global crises it has climbed its maximum value to 14% and after 2010 it has again started to fall down. The employment increased by 4352.000 million people between the years 2000-2014 but the labour force participation rate is still low in 2014 (%50,5).

Table 1.1 : Labour force status (thousands), Turkey (2000-2014)

Year	Population in working age (15+)	Labour Force	Employed	Unemployed	Labour Participation Rate %	Unemployment Rate %	Employment Rate %	Not in Labour Force
2014	56 986	28.786	25.933	2.853	50,5	9,9	45,5	28.2
2013	55.608	28.271	25.524	2.747	50,8	9,7	45,9	27.337
2012	54.724	27.339	24.821	2.518	50,0	9,2	45,4	27.385
2011	53.593	26.725	24.11	2.615	49,9	9,8	45,0	26.867
2010	52.541	25.641	22.594	3.046	48,8	11,9	43,0	26.901
2009	51.686	24.748	21.277	3.471	47,9	14,0	41,2	26.938
2008	50.772	23.805	21.194	2.611	46,9	11,0	41,7	26.967
2007	49.994	23.114	20.738	2.377	46,2	10,3	41,5	26.879
2006	49.174	22.751	20.423	2.328	46,3	10,2	41,5	26.423
2005	48.358	22.454	20.066	2.388	46,4	10,6	41,5	25.904
2004	47.544	22.016	19.632	2.385	46,3	10,8	41,3	25.527
2003	48.912	23.64	21.147	2.493	48,3	10,5	43,2	25.272
2002	48.041	23.818	21.354	2.464	49,6	10,3	44,4	24.223
2001	47.158	23.491	21.524	1.967	49,8	8,4	45,6	23.667
2000	46.211	23.078	21.581	1.497	49,9	6,5	46,7	23.133

Source: Prepared by Turkstat database

The rates of unemployment and job vacancies are illustrated in Figure 1.5 for Turkey, between years 2000 and 2012[2]. At the considered period, ratio of unemployed workers is quite a few higher than the number of job vacancies. Even though there are a huge number of unemployed workers who is willing to work, there are not enough open vacancies for the all years considered. This indicates that the labour supply in Turkey exceeds the labour demand. The biggest gap between unemployment rate and job vacancy rate in 2009.After 2009, the job vacancy rate started to increase and but it is still far below the unemployment rate.

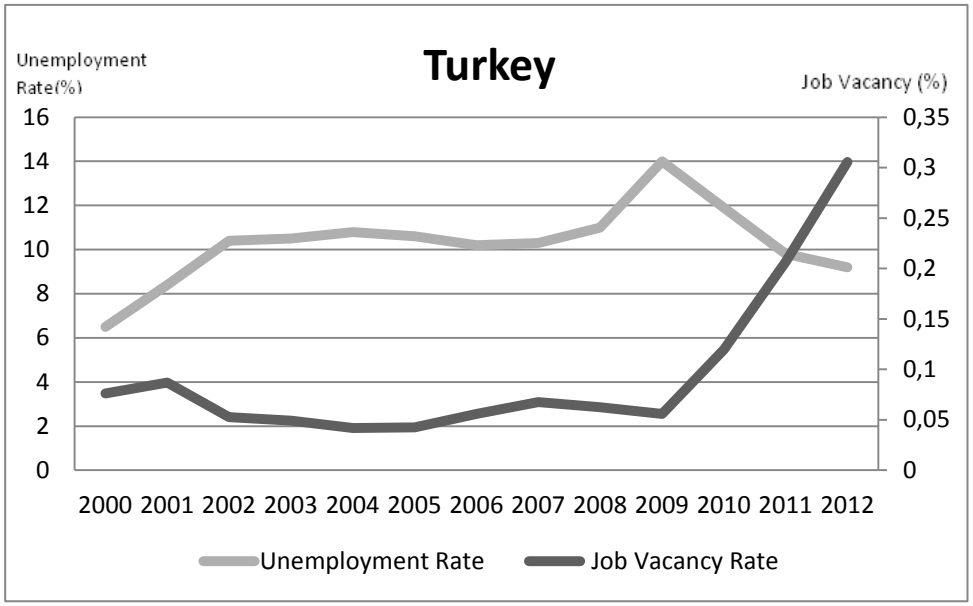

Figure 1.1: Job vacancy vs. Unemployment (2000 vs. 2012)
Source: Prepared by Turkstat database

1.1.2 The Labour market around the world

Unemployment rates are not enough to make comments about the state of labour markets. The duration of unemployment is also important and when it is longer, it reflects structural problems in the labour market which creates higher skill mismatch. In the short-run, the higher skill mismatch rate can cause a decrease in aggregate demand and in the long-run; it can be resulted in decrease in economic growth.

[2] The other selected OECD countries' rates of unemployment and job vacancy are illustrated in Appendix A.

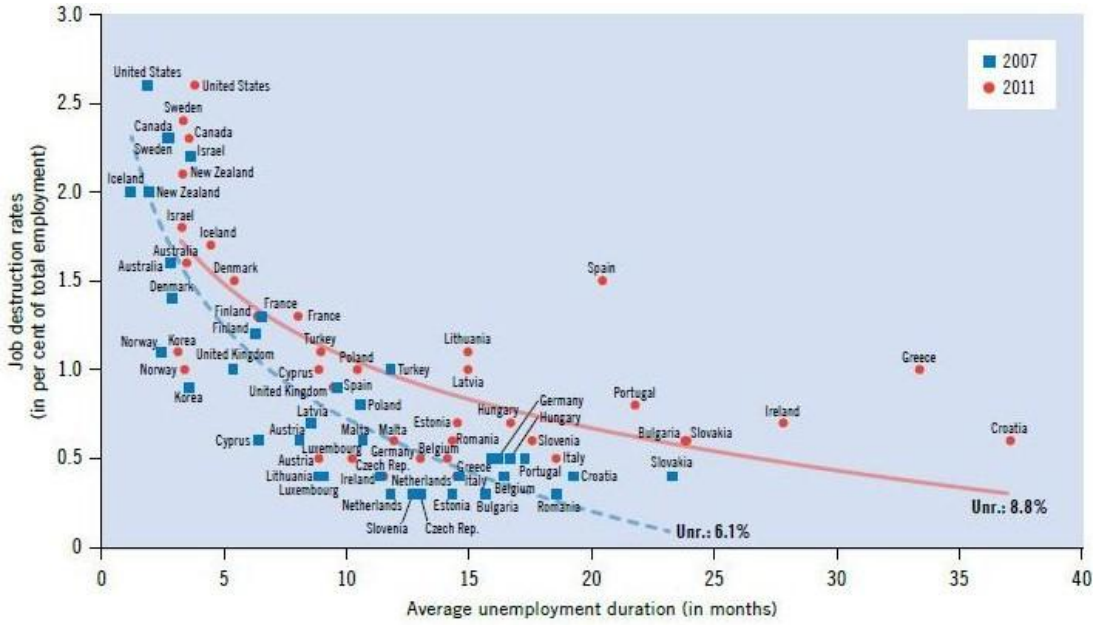

Figure 1.2: Job destruction vs. unemployment duration (2007 vs. 2011)
Source**:** ILO, Global Employment Trends 2013, Recovering from a second jobs dip, p.34

In figure 1.2, the job destruction rate is measured by unemployment inflows. Some countries experience increase in both job destruction rates and unemployment. Between 2007 and 2011, Turkey's unemployment duration is lower but job destruction rate is more than before. The increases in long-term unemployment can be defined as strength in labour market stress, weak job creation, an increase in unemployment benefits that unemployed receives and growing skills mismatches.

The skills mismatch is often a complex topic because of the many factors might influence demand and supply for skills, such as the level of economic development of a country, technological change and mobility of employed. According to Key Indicators of Labour Market (KILM) report (ILO, 2011), there is no internationally agreed method to measure skills mismatch. Skills mismatch can refer to various types of imbalances between skills offered and skills needed in the labour market.

In figure 1.3 and 1.4, the skill mismatch by the dissimilarity index(measured as % in y-axis) in selected developed and developing countries is showed. In developed economies, the skill mismatch is higher than in the developing economies. The skills mismatch may consist of mismatch between the qualification requirements of jobs held by workers and the qualifications these workers possess. In developed economies, the supply of tertiary-educated workers has been growing and their jobs

previously held by workers with lower educated workers. This increase in supply of tertiary-educated workers might cause a competition for vacant jobs and better educated workers are hired into jobs that usually taken by those with lower educated workers. In times of economic crises, since there are not enough employment opportunities and unemployment rate is high, this type of skill mismatch tends to increase more. In developing economies, educational levels are often lower than developed economies.

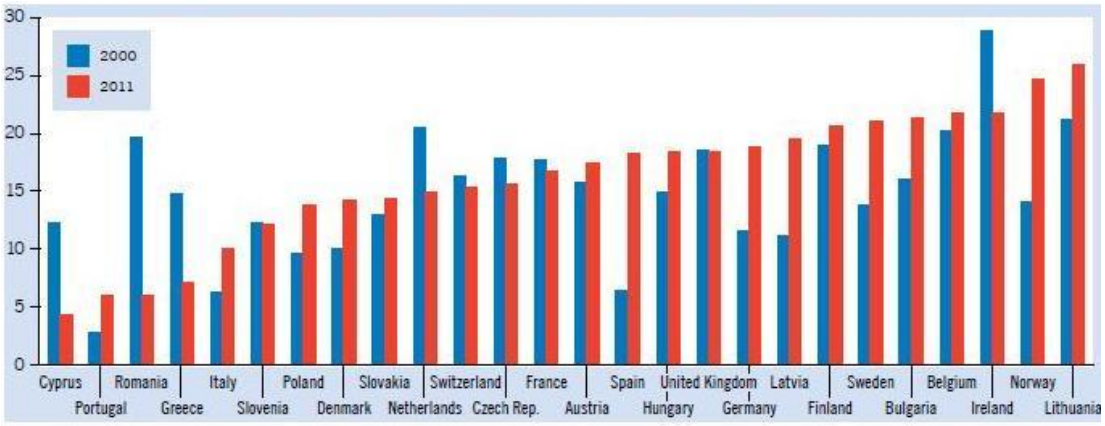

Figure 1.3: Skill Mismatches in Selected Developed Economies (2000 vs. 2011)
Source: ILO, Global Employment Trends 2013, Recovering from a second jobs dip, p.35

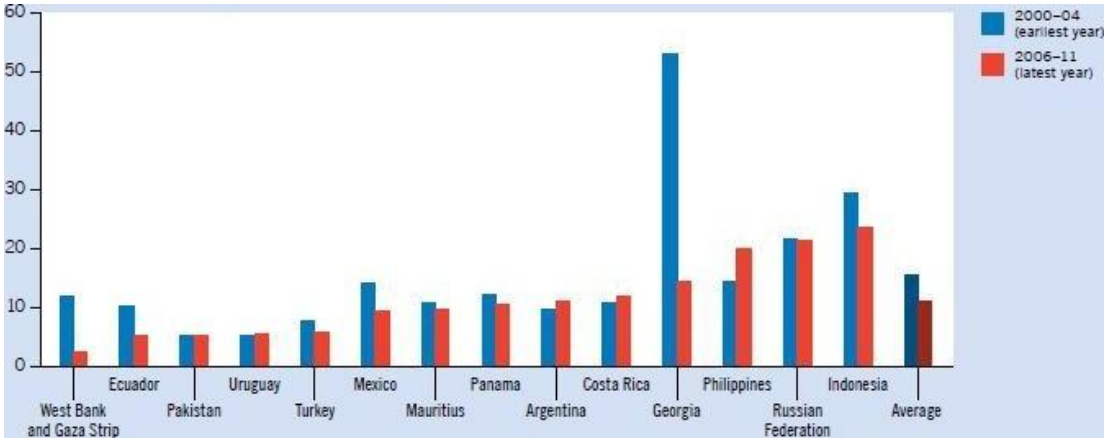

Figure 1.4: Skill Mismatches in Developing Economies (earliest and latest year available)
Source: ILO, Global Employment Trends 2013, Recovering from a second jobs dip, p.35

In figure 1.5, the labour productivity output per worker is compared at last 20 years in different regions of the world. The emerging and developing countries are improving productivity levels, but their level is still less than those in the advanced economies. East Asia has seen the fastest improvement in productivity levels over

the past 20 years (see figure1.6). East Asia region continues to grow labour productivity at the very rapid speed. Average productivity levels in sub-Saharan Africa and South Asia are below current levels in the developed economies.

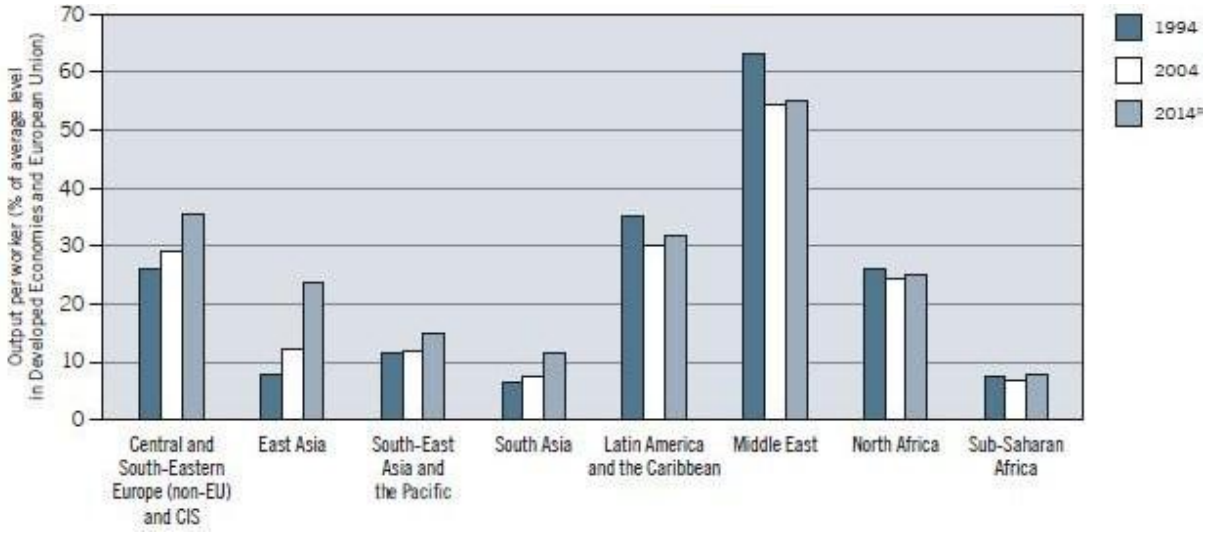

Figure 1.5: Labour productivity (output per worker), 1994, 2004 and 2014
Source: ILO, World of Work 2014 Developing with Jobs, Revised Edition, p.6

The level of minimum wage changes across the regions and it largely depends on the level of economic development. Figure 1.6 shows that, in 2012, minimum wages ranged from less than US$50 per month (almost global extreme poverty level of US$1.25 per day) to US$1,000 or more. African countries mostly have the lowest levels of minimum wages, while European countries have the highest minimum wages.

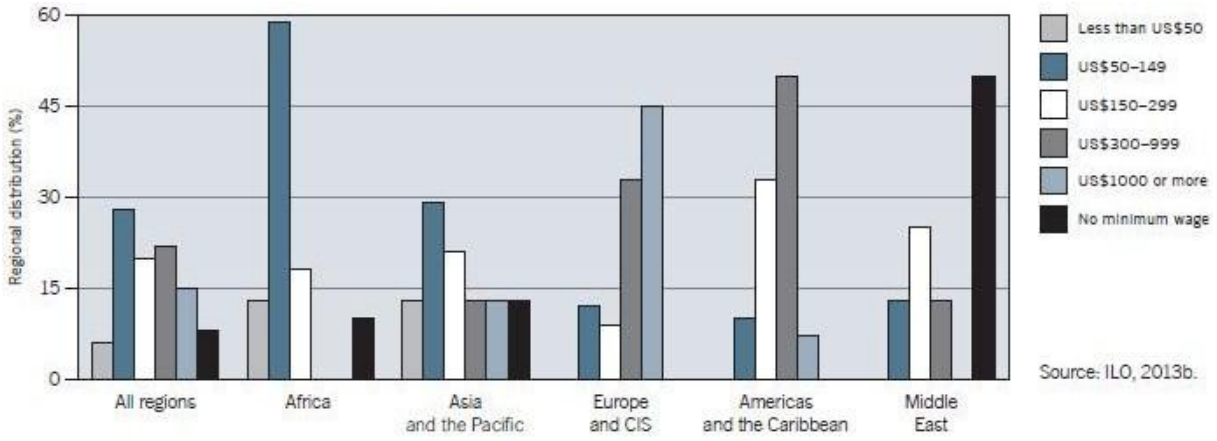

Figure 1.6: Monthly minimum wages, 2012 (% distribution within each region, US$)
Source: ILO, World of Work 2014 Developing with Jobs, Revised Edition, p.88

2 LITERATURE SURVEY

2.1 Theoretical Background

The population can be divided into two groups; who would like to work and who do not. The people who would like to work is called labour force (L), it can be estimated by summation of the people who is currently working in a job (employed) and the people who would like to work in one(unemployed). Let E be the number of employed workers, U the unemployed, and N the workers not in the labour force. At beginning, we determine the number of labour force, L as given:

$$L = E + U \tag{2.1}$$

The concept of unemployment is somewhat complicated. Employment is defined by individual's willingness to be employed at market wage. In other words, it can be defined as people who have not got a job and are actively seeking a job. Unemployment rate (u) is measured as the ratio of the number of the unemployed to the number of labour force.

$$u = \frac{U}{L} \tag{2.2}$$

The Beveridge curve represents the graphical relationship between unemployment rate and the job vacancy rate. Job vacancy rate is defined by the number of unfilled jobs as a proportion of the labour force. The curve studies mismatches between available jobs and unemployed. The mismatch can arise for several reasons such as; there might be not enough application to jobs, among the applicants there might be no one who have enough adequate qualifications or applicants who have enough qualification are not permanent or do not accept to job offer, because they do not like the salary, they think the working conditions are unpleasant, they have transportation problems etc.In general, vertical axis shows the unemployment rate and horizontal

axis shows the job vacancy rate. It is often used to identify the state of the labour market (see figure 2.1).

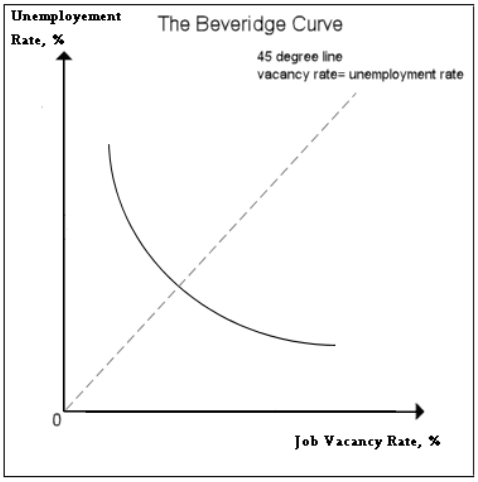

Figure 2.1: The Beveridge Curve
Source: Wikipedia

2.1.1 Shifts and Movement Along in Beveridge Curve

The current state of the economy in the business cycle and efficiency of labour market can be demonstrated by curve's position. According to Solow (2000), position of Beveridge curve to the origin can be a measurement of labour market inefficiency. When the Beveridge curve moves outwards, it is indicated that a given level of vacancies are associated with higher levels of unemployment, in other words it implies decreasing efficiency in the labour market. Decreasing efficiency corresponds to mismatches between available vacancies and unemployment. At the same time, Solow (2000) argued that Beveridge curve's location implies the summary of rigidity of labour market. Beveridge curve is also good instrument for the quantification of structural unemployment.

According to Pissarides (2003) both the cycle and structural changes can shift the Beveridge curve. A number of studies argue that the shifts of Beveridge curve could be associated to structural factors affecting the matching between vacant jobs and the unemployed workers while a movement along a Beveridge curve could be explained

by cyclical factors. (Blanchard & Diamond, 1989; Petrongolo and Pissarides, 2001; Bouvet, 2012; Günalp and Sağlam, 2012).

Bouvet (2012) stated that there exist four theories to explain outward shifts of the Beveridge curve which are unemployment hysteresis, the insider-outsider theory, the duration theory (Blanchard and Summers, 1987; Roed, 1997) and the union membership theory. The shocks in labour supply and demand can induce an unemployment hysteresis and outward shift in the Beveridge curve. The insider-outsider theory is about the labour market supply side and the duration theory focuses on the both the supply and the demand side of labour market. According to the duration theory, long-term unemployment can cause a decrease human capital of the unemployed; in return the unemployed's productivity can fall below their reservation wages. Because of long job search period, unemployed might become demoralized; this can affect their job search concentration. The union membership theory is based on the insiders and outsiders theory. The wage settings are mostly determined by the firm's workers, not by the unemployed. This results that the insiders has more market power than unemployed workers. Lilien (1982) explains that sectoral shifts also cause a shift in the Beveridge curve.

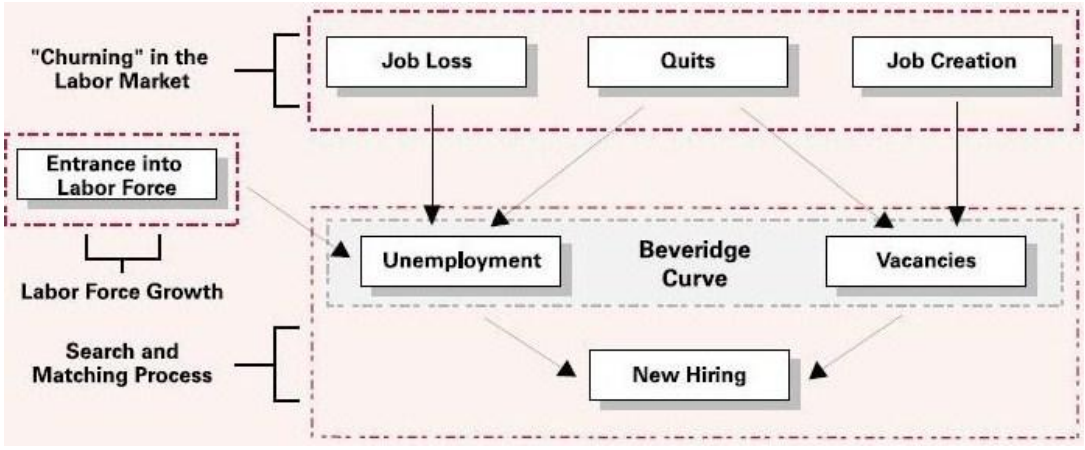

Figure 2.2: A simple model unemployment and vacancies underlying Beveridge curve

Source: Bleakley H. And Fuhrer J. C. (1997), New England Economic Review, p.7

The figure 2.2 is the model presented by Blanchard and Diamond (1989) and illustrated by Beakley and Fuhrer (1997). In this model, Beveridge curve is not the principal economic relationship. As the result of churning in the economy; which are flows of job losers and flows into labour force and quits, unemployment is occured.

Vacancies form from the job creation and quits. When workers find a job and once a worker is hired, jobs are not vacant anymore, so new hires are the outflow of Beveridge curve.

There are three categorized flows: labour market churning, labour force growth, and the search and matching process. First, churning arises even when the economy is stable. The reallocation increases during times of big economic changes, such as recessions or rapid expansions, and this leads greater flows of workers and jobs. More churning means that every month more workers flow into unemployment and more new vacancies are posted. This would cause a outward shift in the Beveridge curve. Second, under the assumption of ceteris paribus, higher levels of labour force growth stand for more unemployment and more workers are searching for jobs. In the short run, vacancies may not adjust to an increase in labour force growth; in the long run, vacancies will likely increase approximately toward with unemployment. Therefore, Beveridge curve would shift out and to the right. Finally, the more efficient job-matching efficiency would cause an inward shift. There are lots of reasons behind the changes in efficiency such as improvements in communications, shifts to unemployment from outside the labour force, a decrease in the number of workers searching for jobs and firms searching for workers.

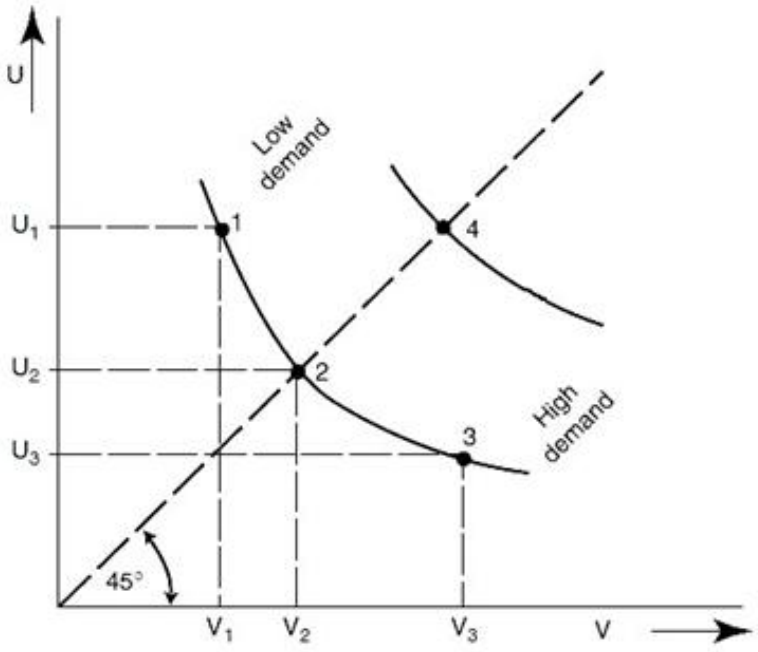

Figure 2.3: Shifts and movement along in Beveridge curve
Source: Dow and Dicks-Mireaux (1958); Blanchard (2013), p.414

In figure 2.3, the upward sloping line through the origin at a 45 angle separates the areas of excess supply and demand for labour and each point on that line correspond where unemployment equals unfilled vacancies. For example, point 2 and point 4 represents the full employment. This figure allowed Dow and Dicks-Mireaux (1958) to measure excess demand for labour. For instance, at point 3 in Figure 1.3, the excess demand can be measured as v_3-v_2. Also, the excess supply for labour can be measured as u_1-u_2. On the other hand, movement along in the Beveridge curve is associated with recessionary and expansionary times. It is far away from the origin in recession, it plots high unemployment and low vacancies at point 1 (above 45 degree line) because it is argued that the higher job destruction that takes place in recession. When there is expansionary periods in the economy, the firms usually hire more workers, which are illustrated at point 3 in figure 2.3, corresponds to high vacancies and low unemployment (below 45 degree line).

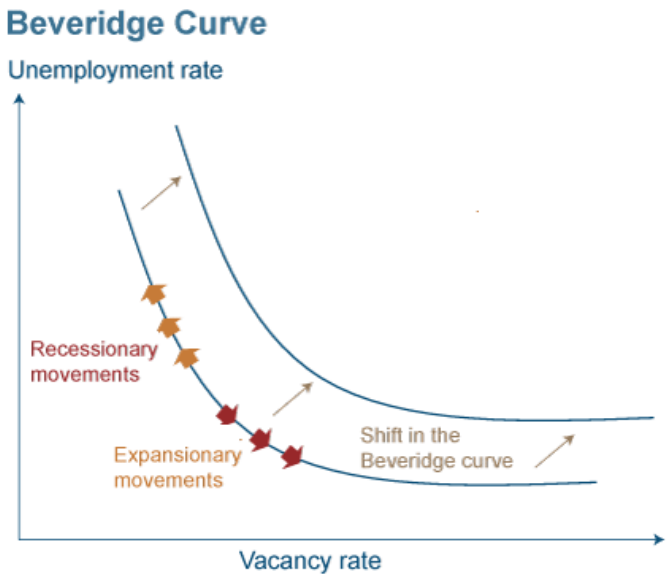

Figure 2.4: Recessionary and expansionary movements in Beveridge curve
Source: http://econfix.files.wordpress.com

Another point I would like to emphasize is the convex shape of the Beveridge curve which represents the feature that an increase in demand leads to a disproportionately small decrease in unemployment rates. This situation is called 'increasing insensitivity of unemployment', by Dow and Dicks-Mireaux (1958) and they remind

us the neoclassical idea of decreasing returns to input factors in production and utility functions.

2.1.2 Unemployment and real wage

Mainstream macroeconomic models emphasize the supply side rather than the demand side of the economy; and assume that demand will follow supply. In this thesis, wages are treated merely as a component of cost, but their role as a source of demand is not neglected.

Bhaduri and Marglin (1990) emphasize the two sided (demand and supply side) variations of wages, by introducing wage-led and profit-led regimes. Their analysis is conducted from a Keynesian perspective which supports the importance of effective demand and their study focused the centrality of effective demand rather than supply-side problems. Their study accepts the direct positive effects of higher profits on investment and net exports but also they compare these positive effects with the negative effects on consumption. They developed the framework of high real wages can be beneficial to economic growth, since it generates high effective demand. The consumption is expected to increase when the income increases, since the marginal propensity to consume of capital income is higher than before. According to their perspective, they cannot be only seen as high labour cost which discourages production. A higher wages or lower profit shares is expected to slow down investment for a given level of aggregate demand. The net exports will depend negatively on labor costs. Since higher labor costs may diminish the competitiveness of domestic goods and services, thereby reducing net exports, and can also lessen the profits for private investment.

Onaran and Galanis (2012) offered important findings to understand this adverse development. First, the consumption is much more sensitive to an increase in the profit share than is investment; thus an economy is profit-led only when the effect of distribution on net exports is high enough to offset the effects on domestic demand. Second, foreign trade form only a small part of aggregate demand in large countries, and therefore the positive effects of a decline in the wage share on net exports do not suffice to offset the negative effects on domestic demand.

As a result, the case dominated by greater consumption expenditure due to higher real wages and lower profit share is called wage-led, whereas the case dominated by

greater investment expenditure due to higher profit share and lower real wages is termed as profit-led. The distinction is that in a wage-led economy an increase in the wages can increases economic activity and growth, whereas in a profit-led economy it has the reverse effects. If economies are wage-led, the increase in the wage can be effective to raise growth and lower unemployment or the converse can hold for economies that are profit-led.

2.1.3 Unemployment and labour productivity

From a policy perspective, it is important to be able to estimate the impact of labour productivity. On one hand, an increase in labour productivity can cause a decrease in unemployment rate if it is large enough to accelerate the overall economic growth of a country. On the other hand; Marx argued that labour productivity might be raised from increasing the specialization and is improved by technology (Hunt, 2005). By the improvement of technology, human capital in working process is replaced by machines. Before technology was used to improve the productivity of a labour and in the process drove rapid economic progress. Today, technology is substituted for worker's place and it started to make workers useless. An increase in labour productivity could result in less demand for labour and this might support unemployment positively.

2.2 Empirical Background

The paper of Bayraktar and Günalp (2012) is the first contribution toward the analysis of the Turkish labour market with a Beveridge curve. They investigated the dynamics of unemployment and job vacancy rates in Turkey by time-series analysis with annual data, during the period 1951 to 2008. The Beveridge model was extended with real minimum wage and real labour productivity. Cointegration equation parameters are estimated by using Dynamic Ordinary Least Squares. The estimated coefficient of job vacancy is negative and significant. This supports the existence of a downward slope Beveridge curve in Turkey. This result confirms the negative relationship between unemployment and job vacancy. With additional variables, estimated coefficient showed that the labour market becomes less responsive. The real labour productivity has no significant effect on unemployment rate. The real wage has a positive and significant impact on unemployment rate.

Their findings argue that the rises in wages have deteriorated the labour market efficiency in Turkey. Bayraktar & Gunalp (2012) repeated the same analysis by adding long-term unemployment rate and their results suggest the existence of a hysteresis effect.

Kanık, Sunel and Taşkın (2014) examine the cyclical properties of Turkish labour market in the last decade with Beveridge curve and the matching function. Unlike the study of Bayraktar and Günalp (2012), they used job vacancy data collected by the government employment agency and by private sector, which is the most popular private recruitment website "kariyer.net". Before Kanık, Sunel and Taşkın (2014)'s study, the matching function of Turkey has not been estimated. Their estimation results state a positive relationship between the job finding rate and the tightness of the labour market. It is argued that the applicant pool of the public employment agency might display much less differentiation in terms of skill, ability and experience of the applicants, compared to the applicant pool of kariyer.net, who collects applications by the Internet. They investigated that the unemployment and job vacancy follow a counter clockwise move as the economy is passing from contraction into the recovery.

Mortensen and Pissarides (1994) modelled a job specific shock process in the matching model of unemployment with non-cooperative wage behaviour and obtained endogenous job creation and job destruction processes. They showed that an aggregate shock induces negative correlation between job creation and job destruction. The job destruction process has more volatile dynamics than the job creation process. They developed a model of endogenous job creation and job destruction and incorporate it into the matching approach to equilibrium unemployment and wage determination and examined the implications of the model for the processes of job creation and job destruction and for the aggregate behaviour of unemployment and job vacancies. They concluded the changes in the dispersion of productivities with constant aggregate productivity do not seem consistent with the finding that job creation and job destruction move in opposite directions during the cycle, so they are unlikely to be the dominant driving force of the unemployment cycle. Mortensen-Pissarides (1994) job matching model has become the standard framework for analysing macroeconomic labour adjustments but there is question whether the model can account for dynamic labour market. But Fujita and Ramey

(2005) showed that the Mortensen-Pissarides (1994) model cannot account for the cyclical pattern of unemployment and vacancies when applied to US data or dynamic labour market. Fujita and Ramey (2005) underlined one of the reasons for a poor performance of this model can be too rapid adjustment of vacancies following a shock. Including sunk costs for creation of new job positions into the model, improved the performance of the model. Because if there are additional costs for creating job positions, it is argued that this could tend to slow the adjustment of positions in response to shocks, leading to sluggishness in vacancy adjustment. In the matching model with sunk costs, vacancies react sluggishly to shocks, leading to more realistic dynamic behaviour.

Petrongolo and Pissarides (2001) worked on the existence and stability of the aggregate matching function, with emphasis on micro foundations. Mostly they discussed estimate a matching function directly, either at the aggregate or the sectoral level. The matching function has been used to study their implications for wage and price determination. It has been found that aggregation problems have played a role in some of the shifts in the aggregate matching function, though not to an extent that can render the aggregate function "unstable." The results showed that the stable, constant returns aggregate function used in macroeconomic modelling finds strong support in the data of virtually all modern economies where tests have been conducted. Although a constant return is supported by the results, there have been no rigorous tests of the plausible property that the quality of matches is better in larger markets, on the grounds that participants have more choices. They argued that the most popular functional form, Cobb-Douglas with constant returns to scale, is driven by its empirical success and lacks micro foundations and some other most popular microeconomic models do not perform as well empirically.

Börsch-Supan (1991) investigated whether the Beveridge curve is helpful for the quantification of structural unemployment. He studied on a panel of nine regions in West Germany for the years between 1963 and 1986. He argued that the observed shifts of the Beveridge curve are too sudden to be explained by structural changes; there exists evidence for aggregation bias; and variables associated with structural unemployment do not substitute for the explanatory power of dummy variables for the observed shifts while cyclical variables do so. He did not confirm the hypothesis that variables which typically characterize structural unemployment have generated

this shift to the right. Consequently, he pursued the question of whether the Beveridge curve can be interpreted as a macroeconomic relation which is stable during the business cycle, because only then is the Beveridge curve an appropriate instrument for the quantification of structural unemployment departing from a labour market model developed by Pissarides (1985). He showed that the outward shifts of the Beveridge curve are theoretically and empirically also compatible with an increase in Keynesian or classical unemployment while structural unemployment remains unchanged. Indeed, the outward shifts vanish almost completely. According to Börsch-Supan, neither theory nor regression results appear to support the notion that a shift of the Beveridge curve must represent changes in structural unemployment, while cyclical factors generate movements only along an otherwise stable Beveridge curve. In fact, he argued that the outward shifts of the Beveridge curve were caused by changes in Keynesian demand parameters (i.e. a decline in commodity demand) or classical price relationships (i.e. an increase of the productivity corrected real wage index).

Wall and Zeoga (2002) estimated recent shifts in the Beveridge Curve for the United Kingdom and analysed whether these shifts can be based on structural changes in the matching process, or in the business cycle. They have assumed that structural changes can only affect the position of the Beveridge curve, not its slope. They have also used Börsch-Supan (1991)'s specification and they have obtained nearly identical results with him. Also, their results are consistent with who argue that the position of the Beveridge curve can be related to the business cycle, and not solely to structural variables.

Amador, Nicolas and Vila (2012) examined the effects of job-worker mismatches on job satisfaction by Spanish data in the European Community Household Panel, for the periods between years 1994-2001. It is estimated the effects of job-worker mismatches by means of a longitudinal analysis, which lead to a more robust estimate of the effects of educational and skill mismatches on job satisfaction by considering unobserved heterogeneity, state dependence. Their results show that educational mismatches do not influence workers' job satisfaction, while job-worker skill mismatches have a significant and negative impact. ''Years of over-education decrease the probability of job satisfaction, while the job-worker mismatch attributed to under-education increases it'' (Amador, Nicolas and Vila, 2012).

Davis, Faberman and Haltiwanger (2013) studied behaviour of vacancies, hires and vacancy yields at the establishment level in the Job Openings and Labour Turnover Survey, a large sample of US employers. A simple model is developed to identify the flow of new vacancies and the job-filling rate for vacant positions. They showed that job-filling rates rise steeply with employer growth rates but it falls with employer size and rises with worker turnover rates. It varies by a factor of four across major industry group. They showed how to interpret the evidence through a generalize matching function and they construct a new index of recruiting intensity which explains the recent breakdown in the standard matching function, creates a better-fitting empirical Beveridge curve and explains for a large share of fluctuations in aggregate hires. The effective vacancy concept embedded in their generalized matching function leads to a more stable Beveridge curve in national and regional data.

Şahin, Song, Topa and Violante (2013) developed a theoretical framework and apply this to measure how much of the recent rise in the United State unemployment rate is attributable to mismatch across sectors. First, the Beveridge Curve had outward movement for the period 2009–2012 in the United States, in other words, aggregate matching efficiency has declined. They found that around half of the job losses in this downturn were concentrated in construction and manufacturing sectors. They found that increase in the unemployment rate is the largest among college graduates. Their results indicated that mismatch can explain at most one-third of the total observed increase in the unemployment rate where the average job finding rate dropped sharply. It is argued that geographical mismatch unemployment plays no significant role.

Petrongolo and Pissarides (2008) studied the contribution of inflows and outflows to the dynamics of unemployment in three European countries, the United Kingdom, France, and Spain. They used of two types of data. The first is administrative data that record all the workers who join or leave an unemployment register during a period, usually a month. The second data source is the quarterly Labour Force Survey (LFS), which includes a rotating panel. Their results show that the impact of the 1980s reforms in Britain is an evidence for the contributions of the inflow and outflow rates. The inflow rate became a bigger contributor after the mid-1980s, although its significance subsided again in the late 1990s and 2000s.In France, they

found that the dynamics of unemployment were driven virtually entirely by the outflow rate, which was consistent with a regime with strict employment protection legislation. In Spain, both rates contributed significantly to the dynamics, very likely as a consequence of the prominence of fixed term contracts since the late 1980s.

Pissarides (2013) is concentrated on the differences in the response of unemployment across the OECD and made inferences about the functioning of different types of labour markets in recession. He argued that the countries that suffered most from sovereign debt experienced a deeper recession, if it is measured by the rise in unemployment. His results have shown that the introduction of structural reforms in the UK and Germany that increased the flexibility of the labour market avoided the structural problems of previous recessions. This contrasts with the USA, where the recovery of employment was slower in this recession than in previous ones, most likely because of temporary structural problems introduced by the extension of unemployment insurance to nearly two years and the secular decline in labour mobility.

Giorgio and Giannini (2011) investigated the Beveridge curve dynamics in the USA and Italy by means of a cointegrated structural VAR model. At first, they presented a simple labour market model, in a way to identify a market tightness equilibrium relation. They found a stable long-run relationship for both countries and in both countries, the data shows a downward trend. In order to study the dynamic behaviour of the model, they identified three common stochastic trends which are a technology shock, a labour supply shock and a reallocation shock. The empirical results also suggest that there are some sources of hysteresis in unemployment in both countries which are technology and reallocation shocks. These can have permanent effects on unemployment.

Bouvet (2012) used national and regional data of five European countries and their 60 regions, between years 1975-2004, to estimate Beveridge curves. The shifts in European Beveridge curve was analysed whether shifts are due to changes in the composition of the unemployed pool, labour market rigidities or cyclical and structural shocks. The results support the changes in labour market rigidities, long term unemployment and cyclical shock are responsible for outward shifts in European Beveridge curves but do not support the state that cyclical shocks generate only movements along a stable Beveridge curve. Business cycles were captured with

a measure of the output gap; and positive output gap and productivity growth are associated with inward shift of the curve. This article contributes to the literature on unemployment hysteresis by analysing more carefully the impact of labour market institutions. For doing so, he controlled the five aspects of national labour markets: the real national minimum wage, labour union density, the size of unemployment benefits relative to the national economy, employment protection legislation and the degrees of centralization and coordination in the wage-setting process. Outward shifts of the Beverdige curve are also associated with higher hourly minimum wage law and more generous unemployment benefits. His findings stated that stricter employment protection laws are negatively related to unemployment.

Hobijn and Şahin (2013) studied the Beveridge curves and recent labour market outcomes of a set of countries to compare and contrast their experiences with those of the United States. They quantify deviations from the Beveridge curve for 13 OECD countries, including the United States, since the Great Recession. They introduced a new method, based on the one used in Barnichon (2012), to construct fitted Beveridge curves for OECD countries. They calculated these fitted Beveridge curves as the vacancy rate at which the unemployment rate is equal to its turnover-steady-state value. The advantage of using this method to construct fitted Beveridge curves is that it provides a direct empirical link between movements in the Beveridge curve and measures of changes in labour market frictions. They found that the United States, Portugal, Spain and the United Kingdom have experienced a rightward shift in their Beveridge curves. In addition, they put the recent Beveridge curve shifts in historical context and they estimate the Beveridge curve shifts that took place between 1975 and 1985 and 1991– 2007 in many of the countries in the sample. These shifts were much larger than those observed since the Great Recession. It is argued that changes in labour market institutions and policies played an important role in these shifts.

3 EMPIRICAL FRAMEWORK

3.1 The Data

In this section, the data selection process is presented and the model is discussed. The choice of the variables for the Beveridge curve analysis is based on the considerations regarding the aim of the study and the model of Bayraktar & Gunalp (2012).

The data contains 12 OECD countries (Australia, Czech Republic, France, Hungary, Luxembourg, Netherland, Poland, Portugal, Slovenia, Turkey, The United Kingdom and The United States)[3] between years 2000 and 2012. The job vacancy and the real minimum wage data are available from OECD Database. The real minimum wage is calculated annually by US$PPP. The job vacancy rate is calculated as proportion of the labour force. The labour force, unemployment data and labour productivity data are from World Development Indicators Database. Labour Productivity is calculated by GDP per person employed (constant 1990 PPP $).

3.2 The Model

Beveridge curve is often estimated as ;

$$UNEMP_{it} = \beta_0 + \beta_1 VAC_{it} + \varepsilon_{it} \quad \textbf{(3.1)}$$

where UNEMP is the logarithm of unemployment rate, and VAC the logarithm of job vacancy rate. Both variables defined as proportions of the labor force. The empirical part of the analysis aims to explain unemployment rate of selected countries by the following extended model with additional variables based on the previous literature. It is included two additional variables to form the modified Beveridge curve, the real minimum wage, W and the real labour productivity, LPRO (both in logarithm) which is calculated by ratio of real GDP over employment. Thus, the multivariate framework of the Beveridge curve model becomes;

$$UNEMP_{it} = \beta_0 + \beta_1 VAC_{it} + \beta_2 W_{it} + \beta_3 LPRO_{it} + \varepsilon_{it} \quad \textbf{(3.2)}$$

[3] The countries which data were available are selected.

The real wage is also included in Bayraktar and Günalp (2012) based on the fact that higher real wages make firms more selective therefore extending the search duration of candidates. The other variable is the real labor productivity. The real labour productivity is added to the equation based on the idea that an increase in labour productivity can cause a decrease in unemployment rate by accelerating the overall economic growth of a country.

3.3 Methodology

3.3.1 Unit root tests and cointegration test

The significance of cross-section correlations is tested using the bias-adjusted LM (LM_AD) test proposed by Pesaran et al. (2008). The panel unit root tests results and the bias adjusted LM test statistics (LM_AD) are presented in Table 3.1. According to the bias adjusted CD test results the null hypothesis of absence of cross-sectional dependency is significantly rejected. For this reason, the second generation panel unit root tests are used to test the unit root hypothesis.

The panel unit roots tests, which are recently developed by Pesaran (2007) and Hadri and Kurozumi (2012), are used to check the stationary properties of the cross-sectional varying variables. The main advantage of these tests over the first generation tests is that they allow for cross-sectional dependence in the data. According to the CIPS test statistics, the null hypothesis of non-stationary cannot be rejected for the all variables, so there exists a unit root. Critical values for the CIPS test are obtained from Pesaran (2007). As for the Z_ASPC and Z_ALA statistics they test the null hypothesis of stationary. According to test results we can reject the null hypothesis of stationary for all variables. The CIPS test results confirms those obtained with the Z_ASPC and Z_ALA. It is worth noting that the stationarity of the series in first difference are confirmed by all tests.

To sum up, the panel unit root tests lead to the conclusion that the variables used in the study are integrated of same order.

Table 3.1: Panel unit root tests results

	CIPS	CIPS	Z_A^{SPC}	Z_A^{LA}	Z_A^{SPC}	Z_A^{LA}	LM_AD	LM_AD
	intercept	intercept + trend	intercept	intercept	intercept + trend	intercept + trend	intercept	intercept + trend
UNEMP	-1.2168	-2.0224	36.944***	27.415***	1.911	1.214	43.763***	73.178***
VAC	-1.6984	-1.7986	17.689***	52.406***	-1.357	-3.07	40.983***	73.178***
W	-2.214	-2.902	-1.291	-1.402	2.298**	2.443**	48.062***	42.214***
LPRO	-1.0416	-1.3136	-1.069	-1.884	-2.316	-1.546	48.062***	42.214***

*, **, *** indicate that statistics are significant at the 10%, 5% and 1% level of significance respectively.

For the CIPS test the null hypothesis is nonstationarity and for Hadri-Kurozumi tests the null hypothesis is stationarity. Critical values for the CIPS test are obtained from Pesaran (2007). Test statistics for CIPS test are 1%=-2.97, 5%=-2.52 and 10%=-2.31 for intercept only and 1%=-3.88, 5%=-3.27and 10%=-2.98 for intercept and trend.

LM_AD statistics test for the absence of cross section dependence.

Since the variables are not stationary in level we can test whether or not the series are cointegrated. For this purpose we employ the Durbin–Hausman Panel (DHp) cointegration test, which is recently developed by Westerlund (2008). This test allows also us to test the existence of a cointegration relationship when series are integrated of different order. Moreover, the test takes into account cross-sectional correlations in the residuals. The DHp test results along with the results of the LM test for residuals of cointegration equation are illustrated at Table 3.2. As seen the absence of cross sectional dependence across the residual of cointegration equation is rejected. The DHp test results also reject the hypothesis of no-cointegration at a 5% level of significance; it means that cointegration exists for all cross-sections.

Table 3.2: Cross sectional dependence and cointegration tests results

Test-Statistics	Critical Value
DHg	3.096***
DHp	1.965**
LM	4.822***

*** indicates that statistics are significant at the 10%, 5% and 1% level of significance respectively.

LM :Bias-corrected LM test for cross sectional dependence Pesaran et al. (2008)

DHg and DHp: tests for cointegration Westerlund (2008) test which has critical values for 10% =1.28, 5%=1.645, 1% =2.333.

3.3.2 Estimation methods

The Common Correlated Errors Mean Group (CCEMG) estimator was first developed by Pesaran (2006) and then extended by Kapetanios et al. (2011) to consider the case where the unobservable common factors follow unit root processes and could be cointegrated. The CCE estimator takes into account parameter heterogeneity and cross-sectional dependence and it is robust to structural breaks. In a similar way, the Augmented Mean Group (AMG) estimator developed by Eberhardt and Teal (2010, 2011) and Eberhardt and Bond (2009) Parameter heterogeneity and cross-sectional dependence are allowed by this estimator.

The difference between these estimators is the way of the unobserved common factors (f_t) estimation. Pesaran (2006) suggests the CCEMG estimator, which eliminates the unobserved common factors by including cross-section averages of the dependent and the explanatory variables, and then running standard panel regressions augmented with these cross section averages. After the common factors are approximated, OLS is used to estimate each individual regression. AMG estimator (Eberhardt & Teal, 2010) is a two-step procedure to approximate the unobserved common factors and conceptually similar to the Pesaran (2006) CCE estimator. First, the equation augmented with time dummies, it is estimated by the first difference (FD) estimator, and then the coefficients on the time dummies are collected. Secondly, the estimated coefficients on the time dummies substituted to the unobserved common effects and the individual regressions are estimated by OLS. After the individual regressions are estimated, the mean group estimator can be obtained in order to make extraction about the whole panel.

Moreover, the robust estimators are also estimated to obtain panel CCEMG and AMG estimates, as described by Hamilton (1991). Robust Panel CCEMG and AMG estimators, which are based on simple arithmetic means, are less sensitive to outliers than the standard CCEMG and AMG estimators.

Another estimator is the panel fixed effects model. Fixed effects model is appropriate when the study is focusing on a specific set of countries and the inference is restricted to the behaviour of these countries (Baltagi, 2005, p.12). It is worth noting that before the fixed effects estimation, it should be checked whether there exists time and/or individual effects in the model to decide our model is one-way or two-

way fixed effects model. For this reason, the F tests as in Baltagi (2005, p.34) are used to check for the absence of time and/or individual effects. The F test results are illustrated in table 3.3. According to the F_1 test results we can reject the absence of individual and time effects, so there is at least one of the effects. The F_2 and the F_3 test results show that we reject also the absence of individual and time effects respectively. Thus we can conclude that the appropriate model is two-way fixed effects model.

Table 3.3: Tests for time and individual effects in fixed effects model

	Critical Value	Prob.
F_1	12.278855***	0
F_2	16.678694***	0
F_3	15.288803***	0

*, **, *** indicate that statistics are significant at the 10%, 5% and 1% level of significance respectively.
F_1: tests for absence of individual or time effects
F_2: tests for absence of individual effect
F_3: test for absence of time effect

After estimating the two way fixed effects models we test for serial correlation and heteroscedasticity using the tests developed by Wooldridge (2002) and Greene (2008) respectively. As is well known the existence of serial correlation/heteroscedasticity biases the standard errors and causes the results to be inefficient. Wooldridge (2002) implements a test for serial correlation in the idiosyncratic errors of a linear panel data model. This test runs a regression the pooled OLS model in first difference and predicts the residual and then estimates a regression for the residuals on its first lag and test the coefficient on those lagged residuals. It is important to note that if we focus only the panel estimates rather than country-specific coefficients, the AMG and CCEMG estimators are not influenced by the presence of serial correlation or heteroscedasticity as these estimators average the coefficients over cross sections. As seen in table 3.4, the null hypothesis of no first-order autocorrelation is strongly rejected for the fixed effects model. For testing heteroscedasticity, we use the LM developed by Greene (2008). According to test result, we reject the null hypothesis of homoscedasticity at 5% significance level (see table 3.4). In order to overcome the problem of heteroscedasticity, robust estimators are also calculated.

4 EMPIRICAL FINDINGS

4.1 Panel Results

The panel results are shown in Table 4.1. The first two lines show the panel CCEMG and Robust CCEMG estimates respectively, while the following two lines show the panel AMG and Robust AMG estimates, the following four lines indicates the estimation methods for fixed effects model and the last line shows the fully modified ordinary least square estimates.

First of all, as mentioned previously in the literature section, it is observed that unemployment elasticises to job vacancy rate are all negative for the whole panel and all of them are significant at 1% at significance level, except for those obtained by the robust AMG estimates which is significant at 5% significance level. The estimated coefficient of vacancy rate is negative and it confirms the downward slope of Beveridge curve for all type of estimation techniques. The results are in line with those studies that found a negative relationship. Note that, since the variables in logarithm, the coefficients measure the elasticity of Beveridge Curve.

The CCEMG and AMG estimates are similar with robust estimates of the CCEMG and AMG. According to the CCEMG and robust CCEMG estimators, a 1% increase in the job vacancy rate is associated with about a 0.3 % decrease in unemployment rate. On the other hand, the AMG and robust AMG estimate show that, a 1% increase in the job vacancy rate is associated with about a 0.35 % decrease in unemployment rate. The estimated value for job vacancy rate coefficient is 0.35 which indicates an inelastic behaviour of the Beveridge curve. The results obtained by the fixed effects (within) estimators reported in the fifth line of table 4.1 are in line with the theoretical expectations. It should be noted that this results have not been corrected for the heteroscedasticity and serial correlation and robust fixed effect estimator just corrects the heteroscedasticity problem but not the serial correlation. In order to overcome both the heteroscedasticity and serial correlation problem in fixed

effect model, we use another two different regressions which are FGLS and Prais-Winsten. The results are also coherent with the other estimators, and there is no such a big difference. As we can see from the seventh and eighth lines of the table 4.1, the coefficients estimates between the two models are similar. The estimated value for job vacancy rate coefficient is 0.36 and 0.37 respectively, which also indicates an inelastic Beveridge curve. The FMOLS estimator has slightly higher elasticity of unemployment to job vacancy rate than the other estimators. A 1% increase in the job vacancy rate is associated with about a 0.43 % decrease in unemployment rate.

Table 4.1: Panel CCEMG, AMG, fixed effect and fully-modified OLS results

Estimator	**VAC**	**W**	**LPRO**
CCEMG	-0.3***	-0.69	1.07
	(-3.03)	(-0.93)	(0.97)
RCCEMG	-0.295***	0.45	0.99
	(-2.71)	(-0.65)	(0.92)
AMG	-0.35***	-0.65	0.27
	(-2.58)	(-0.67)	(0.21)
RAMG	-0.34**	0.31	0.25
	(-2.38)	(0.53)	(0.18)
Fixed Effects (within)	-.0.35***	0.004	-1.41***
	(-6.65)	(0.02)	(-3.11)
Robust Fixed Effects (within)	-0.35***	0.004	-1.41
	(-4.34)	(0.01)	(-1.25)
FGLS	-0.37***	0.08	0.2
	(-8.03)	(0.39)	(0.54)
Prais Winsten Regression	-0.36***	0.08	0.41
	(-6.93)	(0.35)	(0.99)
FMOLS	-0.43***	1.14***	-0.62**
	(-8.30)	(3.77)	(-1.67)

*, **, *** indicate that statistics are significant at the 10%, 5% and 1% level of significance respectively.

Regarding the elasticity of unemployment to real minimum wage, just FMOLS estimator has empirical significance and it is positive as expected. According to FMOLS, a 1% increase in the real minimum wage is associated with about a 1.14 % increase in unemployment rate. This result indicates that the labour costs in terms of real wages have worsened the matching rate of unemployed workers and job

vacancies; it can lead to an outward shift of the Beveridge Curve. We can say that an increase in wages has deteriorated the labour market efficiency in OECD countries.

The elasticity of unemployment to real labour productivity has no significance in all estimates except in fixed effects (within) estimator and FMOLS. After heteroscedasticity is considered, fixed effects (within) estimator becomes statistically insignificant. Real labour productivity has a negative and significant impact on the unemployment and this show that the labour productivity has improved the matching rate of unemployed workers and job vacancies. In other words, rises in labour productivity have enhanced the labour market efficiency. According to FMOLS, a 1% increase in the labour productivity is associated with about a 0.62 % decrease in unemployment rate.

On the other hand, within estimate shows that the time dummies between years 2003 and 2012 are significant (see table 4.2) which is coherent with the test results of the absence of time effect for fixed model. The positive and significant coefficients of time dummies indicate that the common shocks occurred over the period of 2000 to 2012 affect adversely the unemployment rate.

Table 4.2: Comparing fixed effects (within) dummy estimators

	Fixed Effects (within)	**Robust Fixed Effects (within)**
year2003	0.18**	0.18**
	(-2.12)	(1.99)
year2004	0.30***	0.30**
	(3.42)	(2.26)
year2005	0.36***	0.36**
	(3.95)	(2.32)
year2006	0.40***	0.40**
	(4.15)	(2.21)
year2007	0.36***	0.36*
	(3.60)	(1.88)
year2008	0.31***	0.31
	(3.18)	(1.66)
year2009	0.43***	0.43**
	(4.36)	(2.74)
year2010	0.05***	0.05**
	(5.50)	(3.07)
year2011	0.61***	0.61***
	(6.01)	(3.17)

year2012	0.65***	0.65***
	(6.36)	(3.30)

*, **, *** indicate that statistics are significant at the 10%, 5% and 1% level of significance respectively.

4.2 Country-Specific Results

The country coefficients (elasticises) are estimated using the CCE and the AMG estimators are shown in Table 4.3. The serial correlation, heteroscedasticity and correlation in the error terms can be corrected by the Newey West estimator. The group specification result for CCEMG estimators with Newey-West Standard Errors is given at Appendix A. Note that, since AMG estimator is taking the first difference of the variables, it is not needed to correct the serial correlation.

Table 4.3: Group specification results

	CCEMG Estimator			**AMG Estimator**			
Country	**VAC**	**W**	**LPRO**	**VAC**	**W**	**LPRO**	**Country**
Australia	0.31	-1.08	1.03	-0.77***	1.09	-6.39**	**Australia**
	(0.98)	(0.55)	(0.68)	(-2.69)	(0.34)	(-2.44)	
Czech Republic	-0.17	0.83	1.40	-0.05	0.237	-2.80**	**Czech Republic**
	(0.54)	(1.39)	(0.38)	(-0.26)	(0.64)	(-2.28)	
France	-0.12	2.51*	-3.42	0.41	0.02	-4.82	**France**
	(-0.24)	(1.68)	(-0.31)	(0.69)	(0.19)	(-1.22)	
Hungary	-0.31**	-0.61***	2.34	-0.03***	-0.43**	-0.29	**Hungary**
	(-2.40)	(-2.89)	(1.55)	(-3.54)	(-1.97)	(-0.55)	
Luxembourg	-0.83**	-1.66	-6.06***	-0.27	3.31	3.81**	**Luxembourg**
	(-2.41)	(-0.75)	(-3.80)	(-1.57)	(1.09)	(2.43)	
Netherlands	-0.86***	-5.44**	0.96	-1.29***	-10.03***	7.99***	**Netherlands**
	(-4.30)	(-2.24)	(0.25)	(-4.70)	(-4.11)	(3.11)	
Poland	-0.44	-3.21***	2.33	-0.52***	-3.01***	2.90**	**Poland**
	(-1.43)	(-4.63)	(0.85)	(-6.06)	(-9.44)	(2.25)	
Portugal	0.03	-2.13	3.21	-0.14	-0.3	4.94***	**Portugal**
	(0.14)	(-0.86)	(0.53)	(-0.98)	(-0.30)	(2.98)	
Slovenia	-0.03	1.15	3.81	0.32**	1.91***	-4.75***	**Slovenia**
	(-0.09)	(1.39)	(0.96)	(2.21)	(4.17)	(-8.82)	
Turkey	-0.26***	0.04	-0.92	-0.29***	-2.35***	1.98***	**Turkey**
	(-4.25)	(0.07)	(-0.66)	(-4.88)	(-2.92)	(2.64)	
United Kingdom	-0.56***	1.87	-1.06	-0.61***	0.47	-0.73	**United Kingdom**
	(-5.29)	(1.30)	(-0.38)	(-3.35)	(0.34)	(-0.25)	
United States	-0.36	0.42	9.12	-0.64***	0.97*	1.40	**United States**
	(-1.42)	(0.66)	(2.42)	(-2.56)	(1.87)	(0.71)	

*, **, *** indicate that statistics are significant at the 10%, 5% and 1% level of significance respectively.

Starting with the job vacancy rate elasticises, it seen that 10 out of 12 elasticises were negative, but only 5 of them have significance (Hungary, Luxembourg, Netherlands, Turkey and the United Kingdom). The job vacancy rate elasticity of unemployment varied between -0.86 and +0.31, with the all of them are less than unity in absolute value. The all values for job vacancy rate express an inelastic behaviour of the Beveridge curve. Elasticises of unemployment with respect to job vacancy rate are also obtained by the AMG estimator. As in the CCE results, elasticises varied across countries. The majority of the job vacancy rate elasticises were negative, but 8 of them are significant (Australia, Hungary, Netherlands, Poland, Slovenia, Turkey, the United Kingdom and the United States). The job vacancy rate elasticity of unemployment varied between -1.29 and +0.41, with the all of them are less than unity in absolute value and express an inelastic behaviour of the Beveridge curve, except Netherlands which has elastic behaviour of Beveridge curve. Only Slovenia surprisingly had positive and significant coefficient.

Even though the panel results support the supply-side variation of wages, some of the country specific results are unexpected and statistically significant.Elasticises of unemployment with respect to real minimum wage are illustrated in the third and sixth column of Table 4.3. As shown, 7 countries have statistically significant coefficients. There are 3 countries which have positive and significant coefficients (France, Slovenia and The United States). Onaran and Galanis (2012) compare wage-led demand regimes and profit-led demand regimes by studied 16 of the G20 countries and found that all countries in their sample had wage-led domestic demand. Their results support that Euro area in aggregate is wage-led and among the developing countries, only Turkey and Korea are wage-led. According to table 4.3, the AMG estimators of real minimum wage coefficients for Hungary, Netherlands, Poland and Turkey can support the wage-led hypothesis of Onaran and Galanis (2012). The unexpected and significant negative coefficients of real minimum wages might mean, the higher real minimum wages result in an increase in economic activity and growth and a decrease in unemployment.

In the fourth column and seventh column of table shows elasticises of unemployment with respect to labour productivity obtained by CCEMG and AMG estimator, respectively. Australia, Czech Republic and Slovenia have negative and significant

coefficients as expected. According to table 4.3, the AMG estimators of real labour productivity coefficients for Luxembourg, Netherlands, Portugal and Turkey have statistically significant but positive coefficients which were unexpected. The unexpected and significant positive coefficients of real labour productivity might mean the higher real labour productivity result in less demand for labour and thus, increases the unemployment rate.

5 CONCLUSION

In this thesis, the relationship between unemployment and the job vacancy rate is analysed by Beveridge curve for 12 OECD countries for the years between 2000 and 2012. The curve studies mismatches between available jobs and unemployed and it is often used to identify the state of the labour market. It is found that the empirical Beveridge curve suggests a negative relationship between job vacancies and unemployment, which is consistent with theoretical researches. The analysis aims to explain unemployment rate of selected countries by the real minimum wage and the labour productivity based on the previous literature. The real minimum wage is included based on it will extend the search duration of candidates if it rises. Labour productivity is added to the equation based on the idea that an increase in labour productivity can cause a decrease in unemployment rate by accelerating the overall economic growth of a country. The efficiency of labour market can be demonstrated by curve's position. Beveridge curve is also good instrument for the quantification of structural unemployment. When the Beveridge curve moves outwards, it is indicated that a given level of vacancies are associated with higher levels of unemployment, in other words it implies decreasing efficiency in the labour market. When the Beveridge curve is far away from the origin in recession and it plots high unemployment and low vacancies. The reason for that, it is argued that the higher job destruction that takes place in recession. When there are expansionary periods in the economy, the firms usually hire more workers which correspond to high vacancies and low unemployment.

The panel data analysis of unemployment and vacancies as well as real minimum wages and real labour productivity shows inefficiency in the labour markets of the selected countries. The estimated values of job vacancy coefficient can express an inelastic behaviour of the Beveridge curve in selected OECD countries. The inelastic Beveridge curve may result of the less responsive labour market. The increases in

real wages have worsened the labour market efficiency since they make it difficult to create job vacancies and to fill the job vacancies so; it is leading to an outward shift of the Beveridge Curve. A improve in real minimum wages has decreased the labour market efficiency. The real labour productivity has a negative impact on the unemployment and this indicates that the labour productivity have improved the matching rate of unemployed workers and job vacancies.

The filling the job vacancies can be affected by a large number of variables, such as skills and education, institutional, labour market tightness and rigidity etc. For this reason, we cannot expect that the Beverdige curve dynamics follows similar movement in different countries. Even though the panel results support the supply-side variation of wages, some of the country specific results support the demand-side variation of wages. The unexpected and significant coefficients of real minimum wages may mean, the higher real minimum wages result in an increase in economic activity and growth and a decrease in unemployment. The unexpected and significant positive coefficients of real labour productivity might mean the higher real labour productivity result in less demand for labour and thus, increases the unemployment rate.

The current skill mismatch is not just due to a lack of skills. Demand for labour is weak so this cause a competition for jobs and people are more willing to accept jobs which do not match their level of qualification. During the long recession times, many unemployed are facing few job opportunities and they are more likely to accept job offers that are not well matched to their skills. Job creation can be the key to achieve low unemployment in many countries. Some of the occurred mismatch is due to people's preferences, some of them are temporary as people move to new jobs. Firms can have recruitment difficulties if they offer low wages and unpleasant working conditions. Some firms with fewer resources for recruitment and training may have difficulties in hiring or developing talent. If the high levels of mismatch become persistent in an economy, they may have important economic and welfare costs. At the macroeconomic level, skills mismatch may raise unemployment rates, reduce labour market flexibility and reduce output and productivity growth. Some employers argue that they cannot fill vacancies because highly-qualified candidates have the wrong skills. Low labour mobility, seasonal shifts in demand, lack of information and wage rigidities can also affect efficiency of matching and they are

not directly related skills mismatch. In addition to these problems; there are excess supply of highly-qualified unemployed and employers prefer to wait for the perfect applicant rather than provide training and better working conditions to talent.

The policies should be designed to improve the labour market efficiency. It is needed to improve the knowledge and skills of the unemployed workers by introducing more education and training opportunities.Moreover, employers should offer more attractive working conditions and learning opportunities. Governments should provide financial incentives to support employer-provided training. Both employed and unemployed need continuous development and use of skills throughout working life.

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OECD Database

World Development Indicators Database

Turkstat Database

Url-1 < *http://en.wikipedia.org/wiki/File:Economics_beveridge_curve.png* >

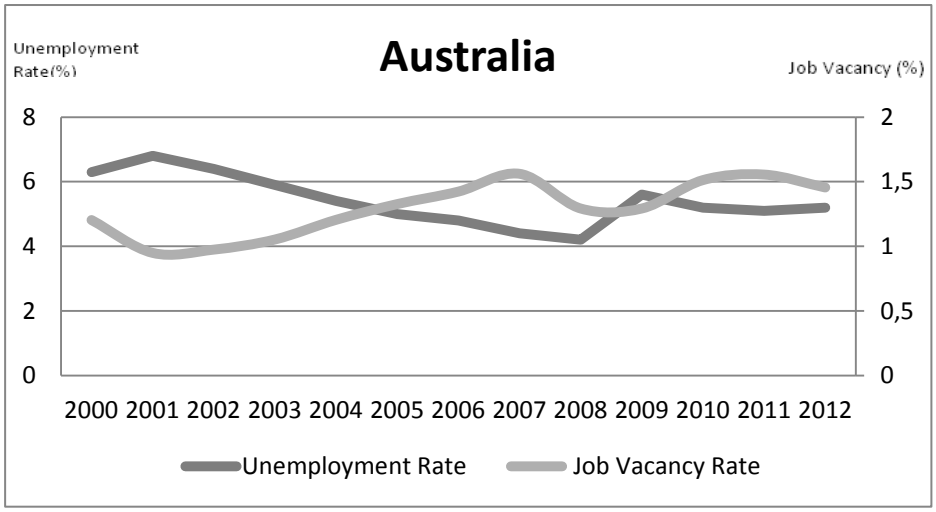
Url-2 < http://econfix.files.wordpress.com >

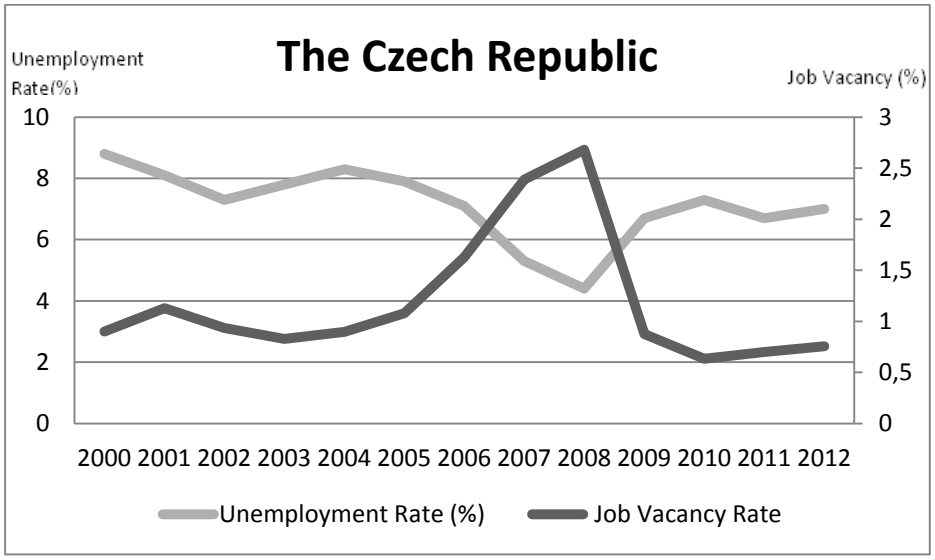
APPENDICES

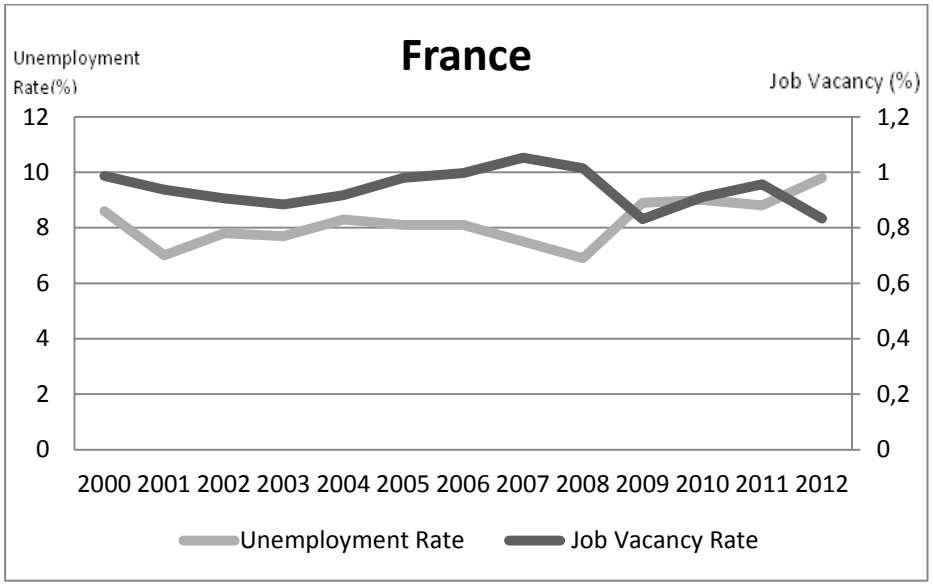
APPENDIX A: Figures

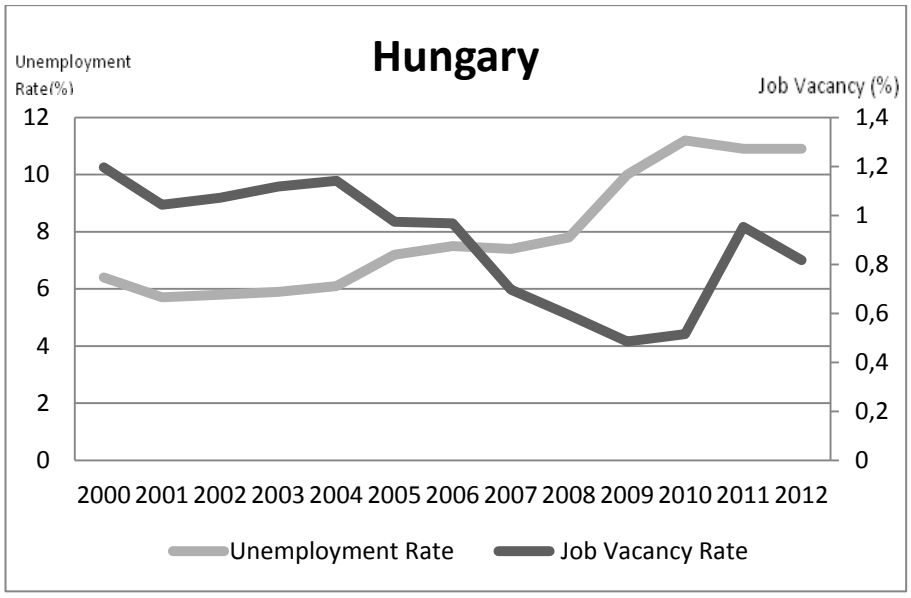
APPENDIX B: Results

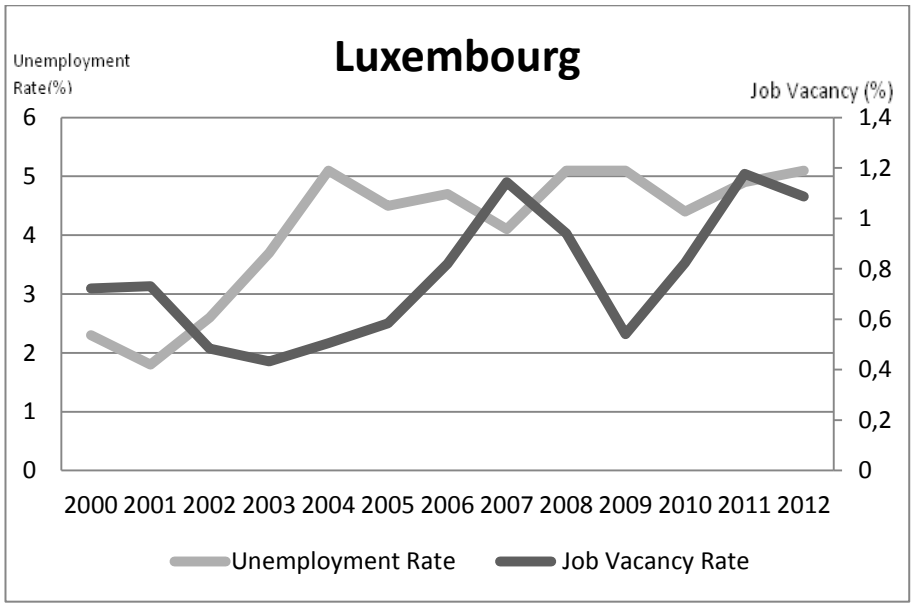
APPENDIX A

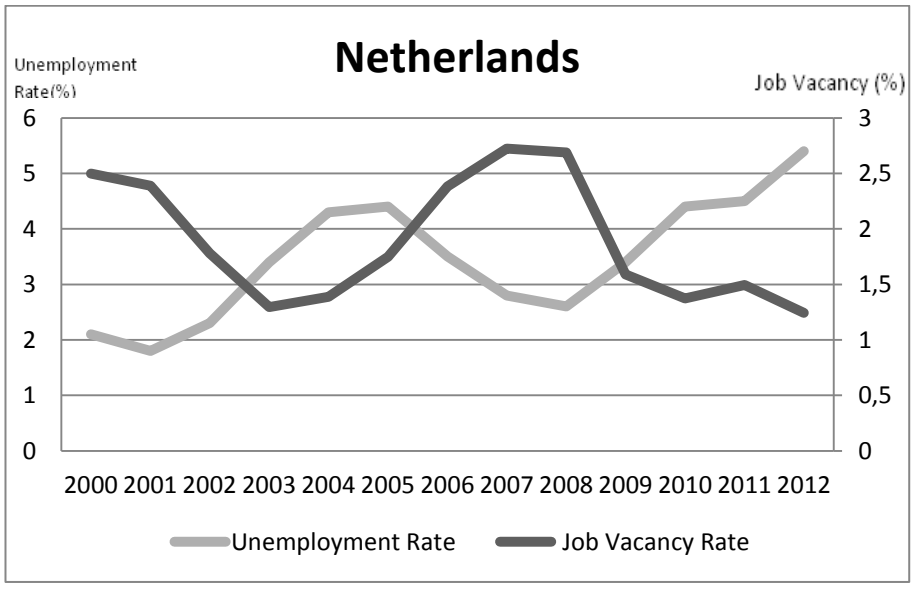

Australia
Unemployment Rate(%)
Job Vacancy (%)
8
6
4
2
0
2
1,5
1
0,5
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
Unemployment Rate
Job Vacancy Rate


The Czech Republic
Unemployment Rate(%)
Job Vacancy (%)
10
8
6
4
2
0
3
2,5
2
1,5
1
0,5
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
Unemployment Rate (%)
Job Vacancy Rate

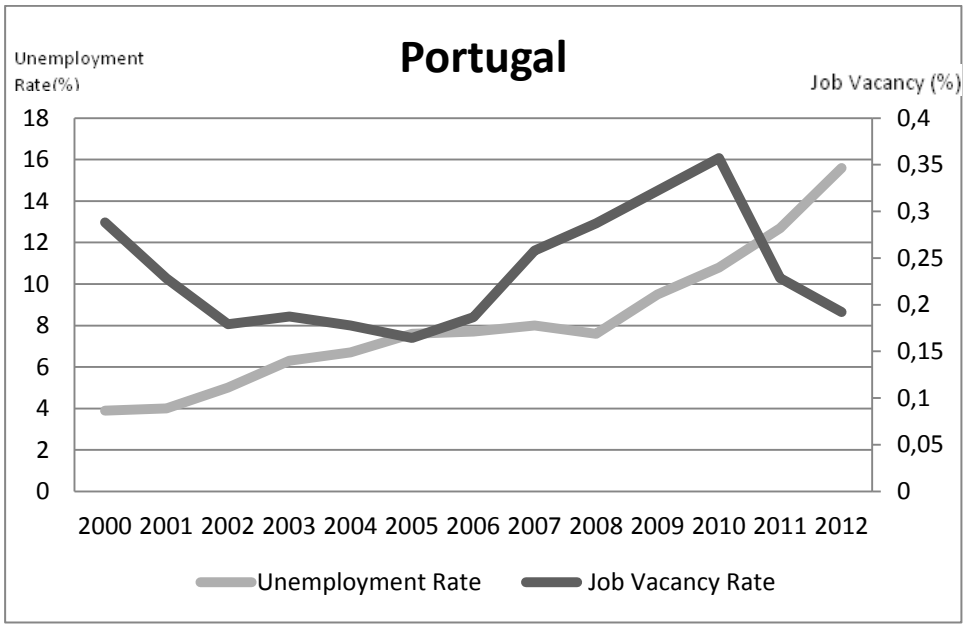

France
Unemployment Rate(%)
Job Vacancy (%)
12
10
8
6
4
2
0
1,2
1
0,8
0,6
0,4
0,2
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
Unemployment Rate
Job Vacancy Rate

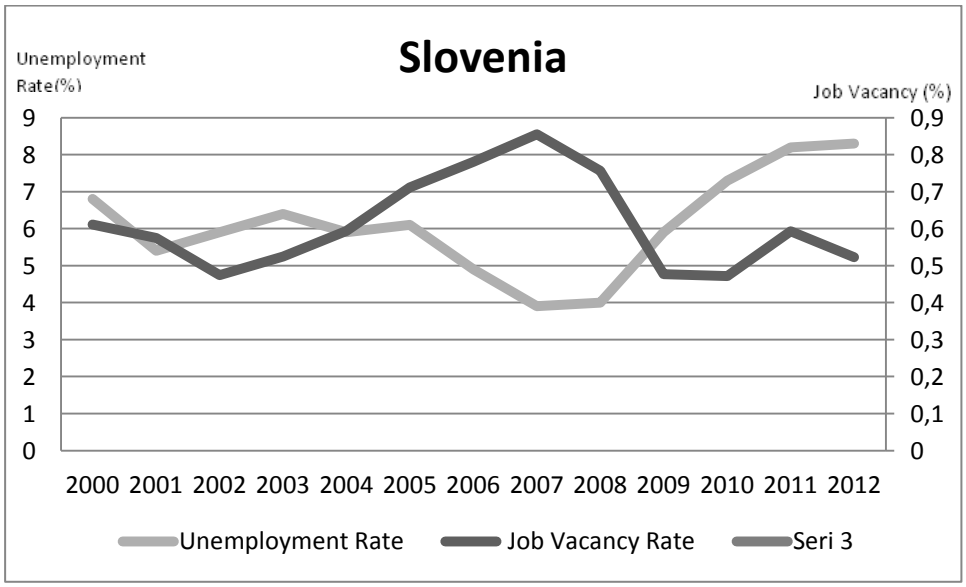

Hungary
Unemployment Rate(%)
Job Vacancy (%)
12
10
8
6
4
2
0
1,4
1,2
1
0,8
0,6
0,4
0,2
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
Unemployment Rate
Job Vacancy Rate


Luxembourg
Unemployment Rate(%)
Job Vacancy (%)
6
5
4
3
2
1
0
1,4
1,2
1
0,8
0,6
0,4
0,2
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
Unemployment Rate
Job Vacancy Rate


Netherlands
Unemployment Rate(%)
Job Vacancy (%)
6
5
4
3
2
1
0
3
2,5
2
1,5
1
0,5
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
Unemployment Rate
Job Vacancy Rate


Poland
Unemployment Rate(%)
Job Vacancy (%)
25
20
15
10
5
0
0,5
0,4
0,3
0,2
0,1
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
Unemployment Rate
Job Vacancy Rate


Portugal
Unemployment Rate(%)
Job Vacancy (%)
18
16
14
12
10
8
6
4
2
0
0,4
0,35
0,3
0,25
0,2
0,15
0,1
0,05
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
Unemployment Rate
Job Vacancy Rate


Slovenia
Unemployment Rate(%)
Job Vacancy (%)
9
8
7
6
5
4
3
2
1
0
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012
Unemployment Rate
Job Vacancy Rate
Seri 3

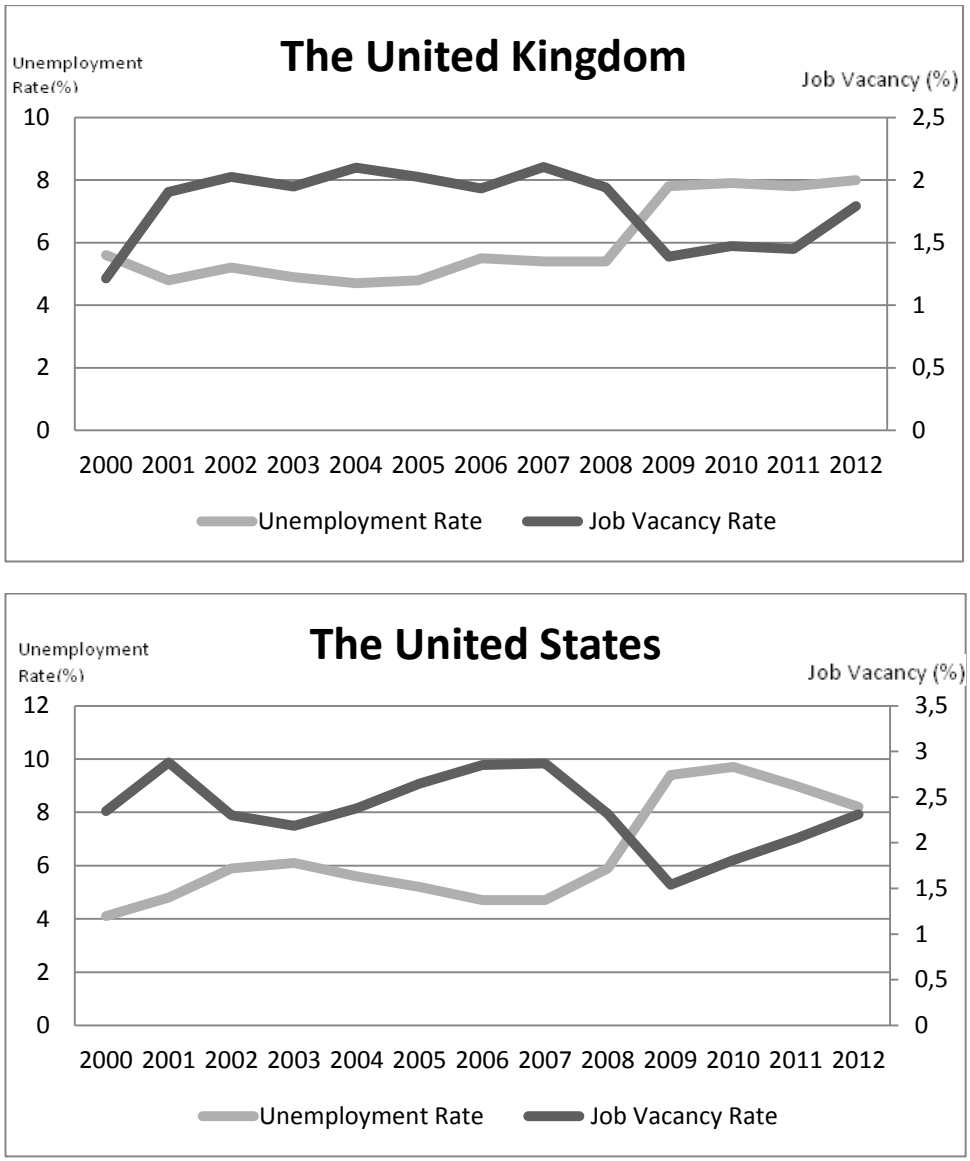


Figure A.1: Job vacancy vs. Unemployment in selected OECD countries (2000 vs. 2012)

APPENDIX B

Table B.1: Group Specification Results with Newey-West Standard Errors

	CCEMG Estimator		
Country	**VAC**	**W**	**LPRO**
Australia	0.64	0.00	0.00
	(0.80)	(-0.63)	(0.18)
Czech Republic	-2.05*	0.00	0.00
	(-2.05)	(0.29)	(0.28)
France	-0.64	0.001	0.002
	(-0.09)	(1.36)	(0.65)
Hungary	-1.17	-0.001**	0.00
	(-1.38)	(-2.92)	(0.15)
Luxembourg	-2.13**	0.00	-0.00**
	(-3.17)	(0.30)	(-.318)
Netherlands	-1.90***	-0.00**	-0.00**
	(-5.79)	(-3.38)	(2.85)
Poland	-32.62	-0.006***	0.003*
	(-1.02)	(-4.61)	(2.23)
Portugal	-12.18	-0.006**	0.006**
	(-1.07)	(-1.07)	(3.39)
Slovenia	8.92*	0.001**	-0.00
	(2.27)	(2.77)	(-0.12)
Turkey	-25.1***	-0.001	0.00
	(-5.61)	(-0.63)	(0.53)
United Kingdom	-2.10**	0.00	0.00
	(-3.75)	(0.43)	(-0.15)
United States	0.97	0.00	0.00
	(0.86)	(1.35)	(1.21)

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