

UNIVERSITY OF PIRAEUS
DEPARTMENT OF BANKING AND FINANCIAL MANAGEMENT



GRADUATE STUDIES PROGRAM IN BANKING AND FINANCIAL MANAGEMENT

DISSERTATION

**<< ANALYSIS OF STRUCTURAL PROBLEMS IN THE U.S. ECONOMY. WHY LONG
TERM UNEMPLOYMENT REMAINS SIGNIFICANTLY ELEVATED? >>**

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PIRAEUS, JULY 2015

Abstract

After the last recession the number of long term unemployed in the U.S. increased to more than double its previous all time high and remained extraordinarily elevated even as the economy recovered. This led economists to question if that rise is a normal consequence of the recession or if the economy changed structurally in a way that even if it expanded and created new jobs a large number of specific workers would remain unemployed. This paper uses an equilibrium search and matching framework and empirical data from the labor market to examine if the structural unemployment rose after the recession and if it did which factors contributed to that rise. Then the paper examines if the rise in structural unemployment is enough to explain the rise in long term unemployment, and if not, identifies the factors responsible. The analysis suggests that structural unemployment rose 0.5 percent since 2007 mainly caused by a labor market skill mismatch. The structural unemployment itself is not enough to explain the rise in long term unemployment which the paper finds was caused by a secular rise in place for decades and by the normal effects of the recession. Although the labor market is structurally worse than it was before the recession and it is expected to remain so in the near future, it did not deteriorate as much as some economists suggested tempted by the rise in long term unemployment.

Acknowledgements

I would like to express my deepest and sincere gratitude to my supervisor, , who gave me many useful suggestions and encouragement when I writing my dissertation. I really learn a lot in this period, and my knowledge and experience are enriched.

Furthermore, I would like to express my gratitude to my parents. Their encouragement and support make me stronger and let me face to the challenge bravely. Last but not least, I would like to thank all the lecturers and professors who teach me during this year, I really learn a lot from you and make me more interest in the field of finance.

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1. Introduction

After the Great Recession the number of the long term unemployed in the US rose to extraordinary levels never observed before. The number of those unemployed for 27 weeks and over rose from a low of 1.07 million in 2006 to a high of 6.8 million in 2010. In order to comprehend how big the rise was it is important to note that before the last recession the highest the long term unemployment has ever been since 1950 was 2.8 million in 1983, so the last recession more than doubled the previous all time high number. Also during the first years into the expansion cycle the number of the long term unemployed stayed close to the all time highs and even now, 6 years after, although it has fallen to 2.5 million it still remains higher than any time before with the exception of 1983.

This unprecedented rise and persistence of long term unemployment led to a discussion amongst economists about the possibility that after the last recession there has been a structural change in the US economy. Some suggested that the long term unemployed were so many because a part of the labor force did not have the right skills for the jobs created during the economic recovery and that firms would have difficulties in finding employees at a time when unemployment would still be high. This implies that even when the economy has fully recovered from the cyclical downturn unemployment would still be higher than it used to be because structural unemployment would have risen or in other words the natural rate of unemployment would have risen. If that was the case it would mean that expansive monetary and fiscal policies would not succeed in reducing unemployment in the long term because these policies only deal with cyclical unemployment and can not fix the structural problems of the labor market and the economy.

This paper firstly answers the question of if structural unemployment has risen after the recession by estimating the natural rate of unemployment. If the natural rate has risen and assuming that frictional unemployment did not change then the structural unemployment has risen as well. The estimation of the natural rate is accomplished by the use of a search and matching framework (Pissarides 2000, chap. 1) and by following the methodology used by Daly, Hobijn, Sahin, Valletta 2012. The model used consists of two curves the Beveridge curve and the job creation curve and the intersection point of these two curves is the point where the labor market is at equilibrium at every moment in time. This paper uses the same long term job creation curve estimated by Daly, Hobijn, Sahin, Valletta 2012 because this curve is supposed to stay unchanged and the contribution it makes is that it uses the latest empirical data to create the Beveridge curve and check if the previous estimations are still consistent with the data. The empirical model suggests that the natural rate has risen by 0.5 percent from 5 percent to 5.5 percent so structural unemployment truly rose by half a percentage point and its main cause is the burst of the construction sector bubble.

Although structural unemployment did actually rise it did not rise enough to explain the extraordinary rise of long term unemployment and so other factors must have an effect as well. In the second part this paper uses the data and the literature to find and analyse the factors which caused and explain this unprecedented spike. The analysis shows that there is a secular rise in place for many years caused by the lower share of manufacturing in the economy and the ageing of both the labor force and the employers and there are also factors specific to the last recession which are the severity and the duration of the recession and the extension of unemployment insurance benefits which all together explain the spike. The long term unemployment spike is only partly caused by structural changes in the US economy and is not as big of a problem as some economist thought during the first stages of the recovery on the other hand it should not be expected that the lows of the previous decade will be reached again any time soon.

The conclusion is that although there has been a rise in structural unemployment the biggest part of the rise in total unemployment after the recession was cyclical and the right way to lower the overall unemployment was the implementation of expansive policies. The policymakers achieved both their mandates of low inflation and lowering unemployment but now they should recognise that full employment is already reached and start following a tighter monetary policy in order to maintain price stability and prevent an overheating of the US economy.

2. Literature review

2.1. Definitions

2.1.1. Labor Force

The Labor Force (**L**) is defined simply as the people who are willing and able to work. It consists of the people who are employed (**E**) and those who are unemployed but would like to find a job (**U**).

$$L = E + U$$

The size of the Labor Force is used to determine the unemployment rate.

2.1.2. Unemployment

A person is unemployed if he or she is willing and able to work but is unable to find a job. Everyone would be willing to work at a certain compensation level but economists separate those willing and those not willing at the current market prevailing wage. Also government defines as unemployed those who are on temporary layoff waiting to be recalled by their previous employer or those without a job who have actively searched for work in the previous month. Therefore by definition, people who are voluntarily idle are not classified as unemployed because they are not actively searching for a job. The unemployment rate (**u**) is number of unemployed divided by the labor force.

$$u = U/L$$

2.1.3. Sources of unemployment

Most people have the impression that unemployment is due to the flow of people who had a job and are laid off from their job. But the truth is that in a typical year when unemployment is not very high only about half the unemployed are job losers. The other half consists of people entering the unemployed from out of the labor force, those with no previous job experience the new entrants and those who had worked before the re-entrants, and of people who voluntarily quit their jobs and are looking for another one.

It is also important to distinguish the discharged between those who have been temporary laid off and permanently laid off. The temporarily laid off are expected to go back at their previous job when demands picks up and stay unemployed for a short period of time. The permanent laid off are expected to stay unemployed for longer. Nowadays discharges are more likely to be permanent than earlier decades and this results in longer spells of unemployment.

2.1.4 Types of Unemployment

The rate of unemployment is important for governments and policymakers as their goal is for unemployment to be as low as possible. In order to achieve the minimum level it is very important to know what the types of unemployment are and how much each contributes to the total rate. Each type of unemployment is caused by different reasons and is tackled by different policies.

- Structural Unemployment

Structural unemployment occurs when there is a mismatch between the available jobs and the unemployed workers. This could be due to either geographical immobility or occupational immobility. The geographical immobility occurs when there are jobs available somewhere but the workers may not be able to move there or the compensation doesn't cover the cost of moving. The occupational immobility occurs when the unemployed workers don't have the necessary skills for the available jobs. When this type of unemployment is present in the economy the policymakers should initiate programs to retrain the unemployed workers so they have the necessary skills. Structural unemployment is difficult to deal with and takes a long time to dissipate.

- Frictional Unemployment

Frictional Unemployment is always present in the economy, resulting from temporary transitions made by workers. It is caused because unemployed workers may not always take the first job offer they receive because of the wages and necessary skills. This may also be caused by workers who will quit their jobs in order to move to different parts of the country. Frictional unemployment can be seen as a transaction cost of trying to find a new job it is the result of imperfect information on available jobs. A more transparent labor market with better information dissemination can reduce frictional unemployment to a minimum but never to a zero rate. So even if the aggregate demand for employment equals the aggregate supply, frictional unemployment would still exist because people would be between jobs.

- Cyclical Unemployment

Unemployment that is attributed to economic contraction is called cyclical unemployment. When there is a decline in aggregate demand in the output market there is also a decline in demand in the labor market. An expanding economy typically has lower levels of unemployment. On the other hand, according to cyclical unemployment an economy that is in a recession faces higher levels of

unemployment. When this happens there are more unemployed workers than job openings due to the breakdown of the economy. This type of unemployment follows closely the economic cycles thus it is called cyclical. This is the type of unemployment that usually is dealt with expansionary monetary and fiscal policies which increase the aggregate demand in the economy.

2.1.5. Unemployment Insurance

All the economic advanced nations offer some form of compensation to the unemployed workers. In order to be eligible for UI benefits someone must have worked and be officially in the unemployment pool for up to certain period. Thus new entrants and re-entrants are ineligible for UI benefits. During and after recessions when the duration of unemployment is longer the duration that a worker is eligible for the benefits increases as well.

The purpose for unemployment insurance to exist is, other than the obvious social reasons, to put a bottom to the fall of aggregate demand in a period of economic contraction and to allow a worker to have the time she needs in order to find a suitable job and thus increase the post unemployment wages. On the other hand generous UI benefits may increase the rate of unemployment that would otherwise exist and tend to increase the duration of unemployment for the recipient. This happens because a worker who receives the UI benefits might be less incentivised to search for a job and may prefer to stay unemployed for as long as she receives the benefits.

2.1.6. Natural Rate of Unemployment

Policymakers are always concerned with the rate of unemployment because it represents the health of the economy. They don't want high rates because in this case many people are unable to support themselves and there is a negative output gap which means that the economy does not operate at the level it should. They also don't want very low unemployment because this is an

indication that there is a positive output gap which means the economy operates at a level above its capacity and creates accelerating inflation. But which rate is too high and which rate is too low? To answer this policymakers need to estimate the natural rate of unemployment and implement the right policies to drive the unemployment close to that rate.

The natural rate represents the rate of unemployment to which the economy naturally gravitates in the long run. The natural rate of unemployment is the sum of frictional plus structural unemployment. Therefore, is caused by supply side factors so when the economy is at full output the rate of unemployment that exists is the natural rate of unemployment. There are more than one definition for the natural rate of unemployment. One defines it as the rate at which wage inflation and price inflation are either stable or at acceptable levels. Another defines it as the rate of unemployment at which job vacancies equal the number of unemployed workers, and yet another defines it as the level of unemployment at which any increases in aggregate demand will cause no further reductions in unemployment. Overall it is the average level of unemployment that is expected to prevail in an economy in the absence of cyclical fluctuations.

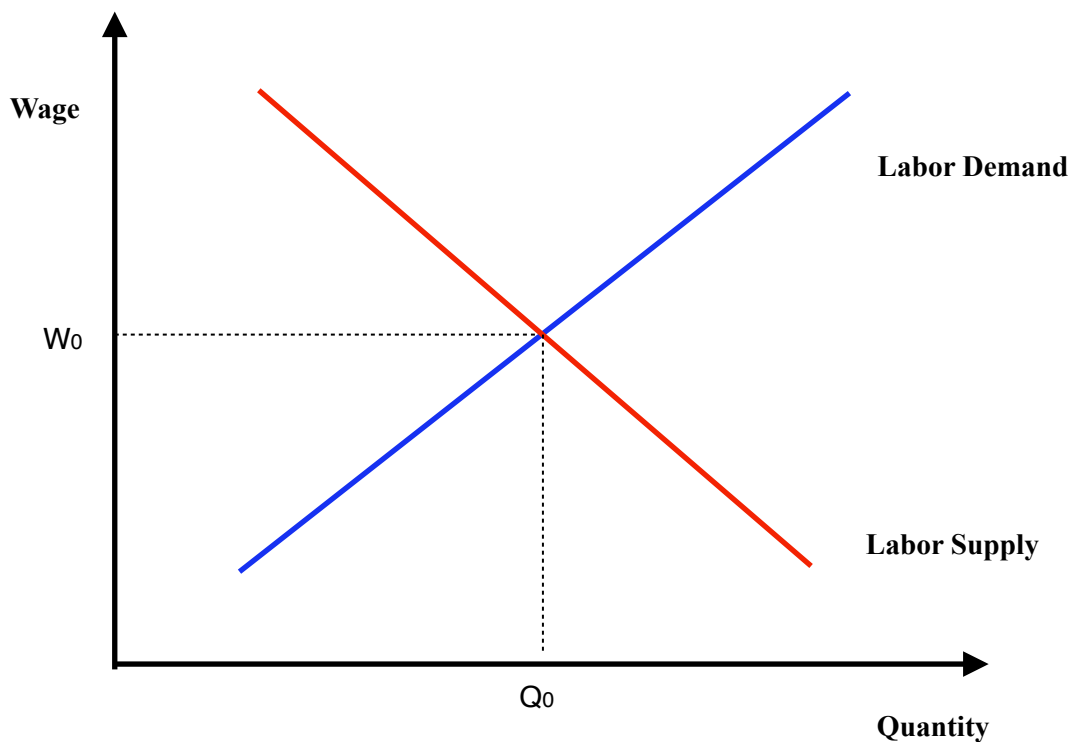
Even if estimating the natural rate of unemployment is of utmost importance it is a very difficult task and only close estimations can be made, as Milton Friedman said “I don't know what the natural rate is and neither do anyone else.”

2.2 Modelling the labor market

2.2.1. The fault of the neo-classical model

Neo-classical economists viewed the labor market as similar to other markets in that the forces of supply and demand jointly determine a specific price and quantity of labor. However the labor market is known to have problems clearing. Economists have long recognised this fact and attribute the labor markets inability to effortlessly match workers and jobs to frictions. These frictions occur because labor is not homogenous. Not being homogeneous means that there is not one specific price

that can be exchanged for one unit of labor. This makes it a market that acts much differently from other commodities, like gold where the law of one price allows it to consistently clear. We are dealing with a commodity that can speak, feel, learn and prides itself of differentiation and individuality. The heterogeneity of labor makes it difficult for employers to distinguish the productive from the unproductive, and even the process of moving from one job to the next is not costless.



The neo-classical model supposes that in a free market in the long term there would be no unemployment but in reality this is not the case, because the heterogeneity of labor and the existence of frictions in the labor market means that there must be an equilibrium rate of unemployment, thus another model is needed to describe the labor market more accurately. The DMP search and matching model of unemployment created by the combined efforts of Peter Diamond, Dale Mortensen and Christopher Pissarides provides the theoretical groundwork to effectively model the labor market and find the equilibrium rate of unemployment.

2.2.2. Creating a model with search frictions

The first to contribute to the creation of a search and matching model was William Beveridge, a British Lord, lawyer, member of parliament and founder of the modern British state. Beveridge first discussed the relationship between labor demand captured by the vacancies and unemployment rate in a 1944 report titled, Full Employment In a Free Society. Although he refrained from explicitly plotting the relationship, he provided detailed data on the variables and discussed them at length. His work was the first to imply that there is a negative relationship between vacancies and the unemployment rate. His early contributions even tackled many of the issues that remain under study today. These include the potential mismatch between unemployed workers and job openings, trend versus cyclical changes in the unemployment rate, measurement issues, and aggregate demand versus reallocation factors.

The early literature of the late 1950's and the 1960's dealt with the Beveridge curve in the context of understanding excess demand in the labor market and its direct influence on wage inflation. More progress was made later when the Unemployment-Vacancies curve was created and it interacted at different levels of disequilibrium, with the markets at points off both labor supply and demand curves. The final search and matching model was created by Diamond, Mortensen and Pissarides during the 1970's and 1980's.

Dale Mortensen showed that the realism provided by the search model's characterization of the individual workers experiences moving in and out of employment and among jobs is a substantially more valuable tool for empirically understanding the labor market than the intertemporal substitution model which described the decisions workers must make between leisure and work.

Peter Diamond first showed that the mere presence of costly search and matching frictions prevented the law of one price from holding. Diamond found that even a minute search cost moves the equilibrium price far from the the competitive price and that the only equilibrium price was a monopoly one. Christopher Pissarides that brought to light and demonstrated that the transactions

approach to the labor market can serve as a useful framework for macro labor analysis. He helped develop the idea of a matching function and pioneered the empirical work on its estimation.

Diamond, Mortensen and Pissarides were awarded the Nobel prize in 2010 for their analysis in markets with search frictions. Their work allows us to consider simultaneously how workers and firms jointly decide whether to match or to keep searching, in case of a continued match how the benefits from the match are split into a wage for the worker and a profit for the firm, firms decisions to create jobs and how the match of a worker and a firm might develop over time possibly leading to a separation. The DMP model brought a level of practicality that previous models of the labor market lacked thus made it possible for great empirical work to be made. Moreover, the DMP model is used to analyse how aggregate shocks affect the labor market and lead to cyclical fluctuations in unemployment, vacancies and employment flows. Because of its focus on job flows into and out of employment and its potential to greatly enhance the way we analyze the labor market, the Bureau of Labor Statistics in 2000 started the Job Openings and Labor Turnover Survey (JOLTS) to specifically fit this model.

2.2.3. Equilibrium unemployment model with frictions

Pissarides (2000, chap. 1) described an equilibrium unemployment model with frictions consisting of two curves: the Beveridge curve and the Job Creation curve. The point where these two curves intersect is the equilibrium unemployment rate with search frictions. The model can be used to estimate both short term and long term equilibrium unemployment.

The Beveridge curve is the relationship between the unemployment rate and the job vacancies rate. The job vacancies rate is derived by the number of vacancies divided by the sum of the total employed plus the number of vacancies. This relationship is a negative one meaning that the higher the unemployment is the lower the vacancies are and reverse.

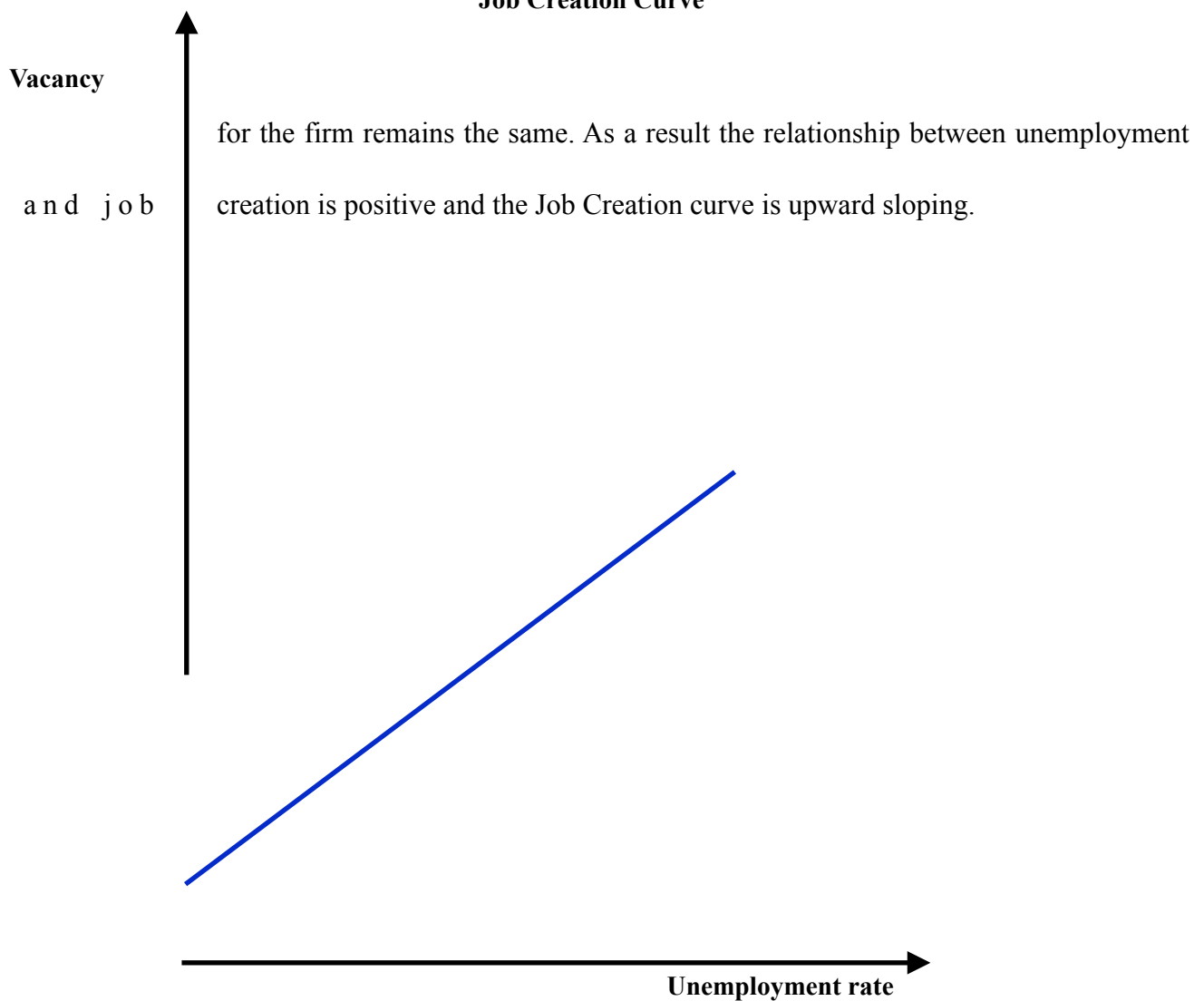
Movements along the Beveridge curve suggest cyclical fluctuations. For example during cyclical upturns the equilibrium point moves upward on the curve because the economy creates a lot of new jobs which means that the rate of unemployment would drop and at the same time the vacant positions would rise because it would be more difficult for firms to find the right workers out of a smaller unemployment pool. The reverse situation when the equilibrium point moves downward on the curve is a cyclical downtrend where the economy destroys jobs and as a result the unemployment rate rises and the vacancies rate drops because it is easier for firms to find the right workers from a bigger unemployment pool.

In contrast shifts of the Beveridge curve suggest fluctuations of the efficiency of the labor market in creating matches. An outward shift of the curve is the result of a less efficient labor market with more frictions leading to either making it more difficult for firms to find workers for a certain rate of unemployment thus increasing vacancies rate or for workers to find a job for a certain rate of vacancies thus increasing the unemployment. When the Beveridge curves shifts outwards there is a rise of either frictional or structural unemployment or in other words the natural rate of unemployment rises. An inward shift of the Beveridge is the result of a more efficient labor market with less frictions where matches are made quicker and easier. A more efficient labor market leads to a drop of the natural rate of unemployment.

To find the equilibrium point the Beveridge curve is not enough and the Job Creation curve is also needed. It shows the relationship between the unemployment rate and the willingness of the firms to create more job openings.

Searching for workers is associated with a certain cost for the firm. When unemployment is low it takes more effort from the firm to find the right worker so the cost of creating a job match is higher. When unemployment is high the cost of creating a job match is lower. This means that firms would post more vacancies for a higher rate of unemployment as long as the value of the job match

Job Creation Curve



Source: Pissarides, C., 2000, Equilibrium Unemployment Theory, 2nd ed, USA: MIT Pres

The degree of the upward slope is constantly changing over time and it depends on the state of the economy. During an expansion cycle when aggregate demand is higher the value of a job match is higher rotating the Job Creation curve to a steeper position. During a recession aggregate demand is lower so the value of creating a job match is lower and the curve rotates down to a lower position.

This is the channel through changes in aggregate demand are causing changes in unemployment even when the Beveridge curve does not shift. A steeper Job Creation curve intersect the Beveridge curve at a higher point where the equilibrium unemployment is lower. A flatter Job Creation curve intersects the Beveridge curve at a lower point where the equilibrium unemployment is higher. Also in the absence of economic cycles the slope of the Job Creation curve changes due to structural reasons. The cost of finding a worker for a specific unemployment rate is not the same through

time. The more efficiently the labor market creates matches the flatter the Job Creation curve would be.

3. Method - Natural rate of unemployment estimation

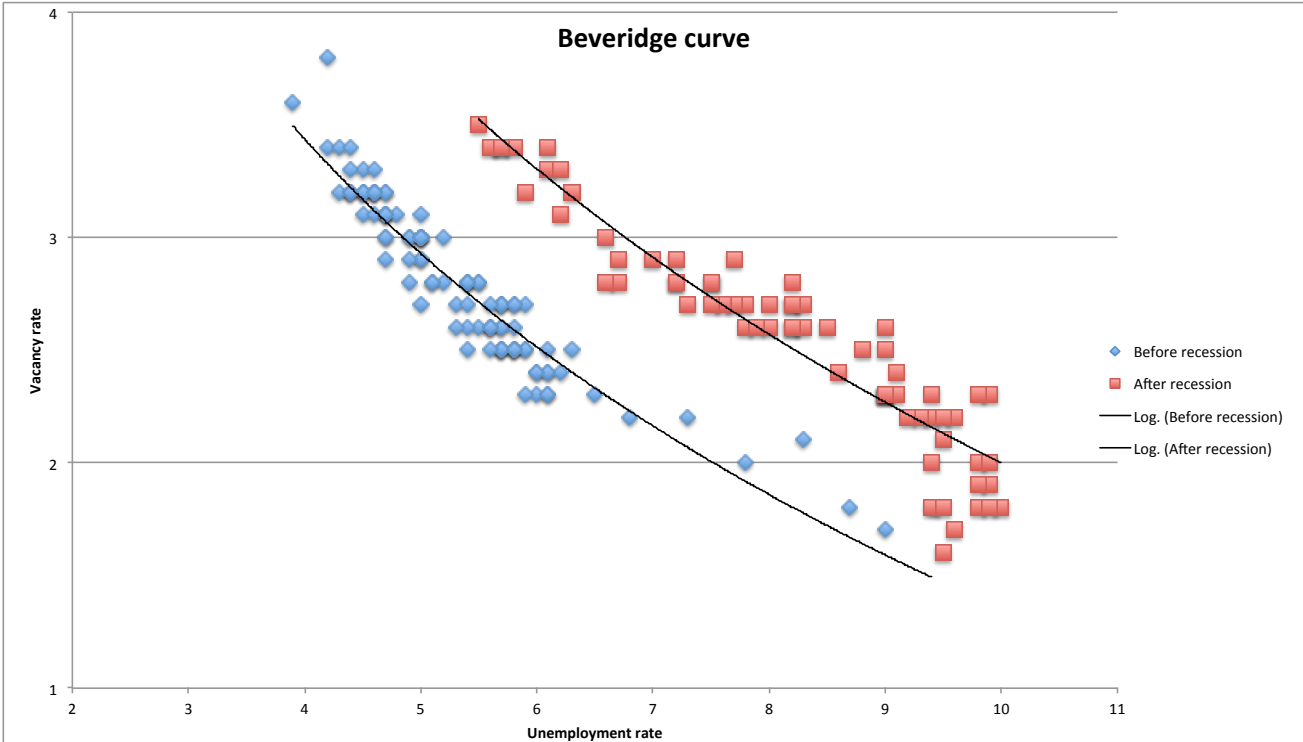
The estimation of the natural rate of unemployment will be accomplished by following the methodology used by Daly, Hobijn, Sahin, Valletta 2012. This method is using data to construct the empirical Beveridge curve and the empirical long run Job Creation curve and the intersection point of the two curves would be the equilibrium unemployment rate according to Pissarides model.

The data used are collected and published by the Bureau of Labor Statistics and are a combination of the Current Population Survey (CPS) and the Job Openings and Labor Turnover Survey (JOLTS). The Current Population Survey collects data from about 60,000 households in the United States and is the primary source of labor force statistics including the national unemployment rate and data on a wide range of issues relating to employment and earnings. The CPS also collects extensive demographic data that complement the understanding of labor market conditions among many different population groups. The JOLTS data which are collected and published each month since 2000 on the other hand are data collected from employers including retailers, manufacturers and different offices about vacancies, hires, quits and involuntary separations. The CPS and the JOLTS data show a complete picture of the US labor market each month from both the employer's and the employee's sides.

4. Findings

4.1. Natural rate of unemployment estimation

4.1.1. The empirical Beveridge curve



Source: Bureau of Labor Statistics, JOLTS data and Authors calculations

The graphical representation of the Beveridge curve shows a very strong and stable relationship between the vacancy and the unemployment rate from the start of the JOLTS data survey in December 2001 until when unemployment started to peak at 2009. Afterwards there is a clear outward move of the curve. Unfilled job openings are back to the highest levels they have been since 2000 but the rate of unemployment is higher. Many economists were tempted to interpret this

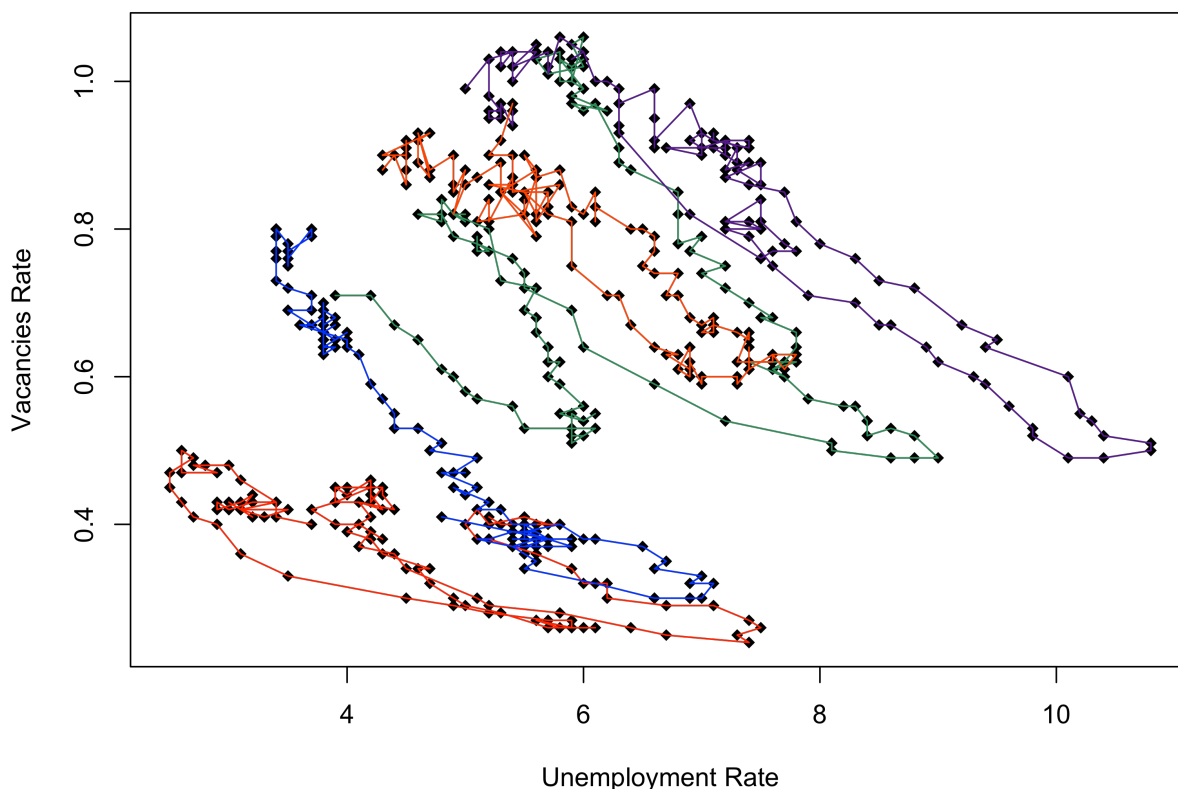
outward move as a permanent one for one rise of the structural unemployment and as a result the potential output of the U.S. economy would be lower and the unemployment would remain high even if expansionary fiscal and monetary policies were to be introduced. One of the policymakers who shared this view was the Governor of the Minneapolis Federal Reserve Narayana Kocherlakota who said at a speech in 2010 that “Monetary stimulus has provided conditions so that manufacturing plants want to hire new workers. But the Fed does not have a means to transform construction workers into manufacturing workers” and believed that a more conservative monetary policy was required because the expansionary would not have the expected results.

An outward shift of the curve clearly is a sign a higher natural rate of unemployment and of less efficient labor market. But the shift alone does not reveal how much the natural rate rose because to find the equilibrium the Job Creation curve is also needed. It is also important to estimate how the Beveridge curve is likely to behave in the future because policymakers are not planing according to the past but need to see into the future in order to adopt the right policies. To estimate how the curve will shift tin the future we need to know how it tended to shift in the past and for which reasons.

4.1.2 Is it common for the Beveridge curve to shift?

Economists thought that the Beveridge curve was a very stable relation and that a shift would mean a structural change had occurred in the economy. But since the JOLTS data are only going back 14 years this stable relation could be proved wrong. That happened when the beveridge curve with the Composite Help-Wanted Index data going back to 1951 was created (Diamond, Sahin, 2014) and showed that the curve moved outward after every recession except the one of 2001. They explained that it is usual for the Beveridge curve to move counterclockwise and this move is not an

Unemployment and Vacancies (January 1951 - December 1998)



Source: Diamond, P. and Sahin, A., 2014, Shifts in Beveridge Curve

indication of a persistent rise in structural unemployment. In fact the unemployment rate after a recession was more strongly correlated with the duration of the expansion than the shift of the curve.

Even though it is common for the curve to shift over time it is important to analyse the factors that may have contributed to the most recent shift in order to find out if there is a rise of structural unemployment and if it will be permanent or transitory.

4.1.3. Job Creation curve

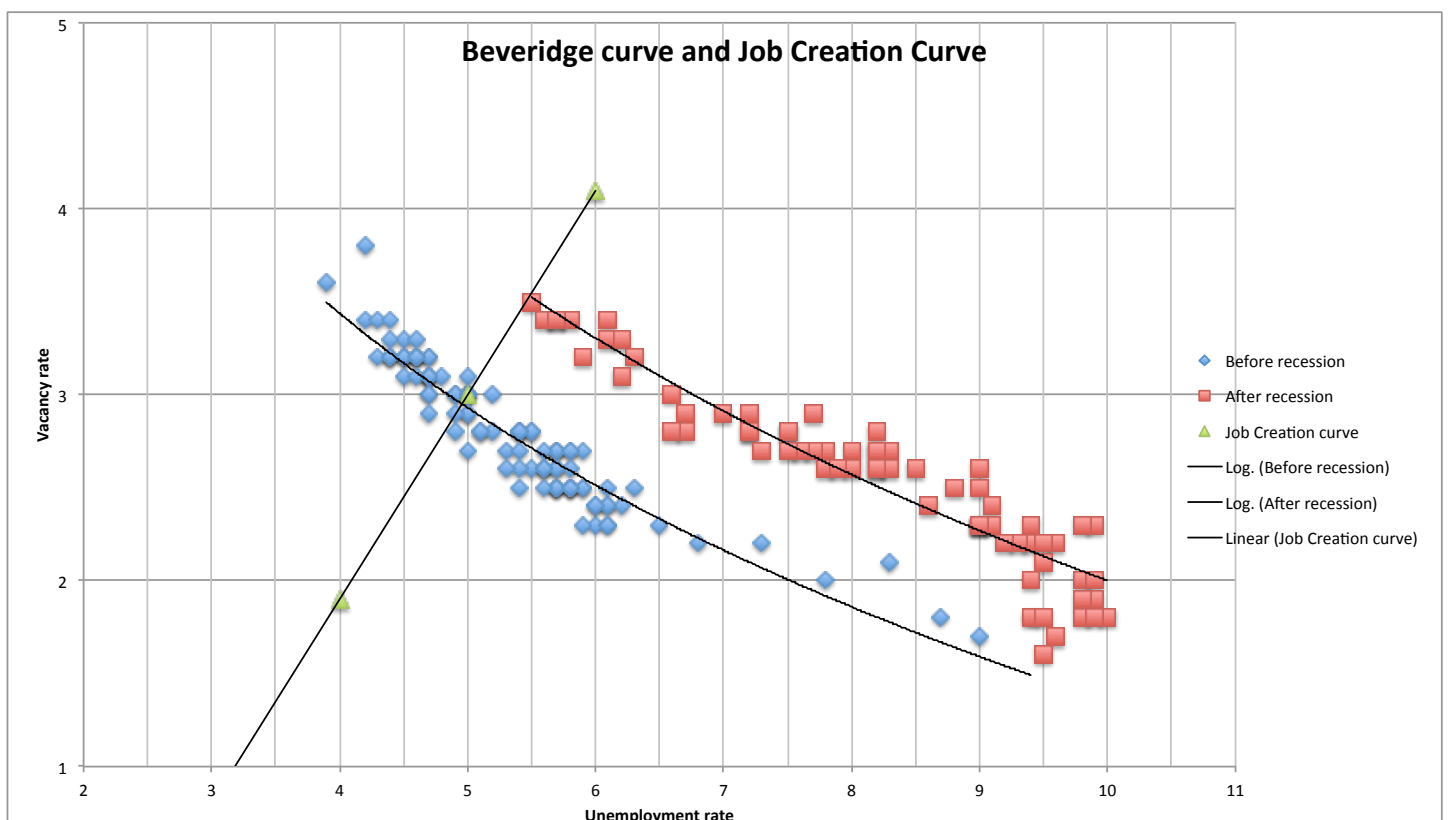
To complete the model the construction of the empirical Job Creation curve is needed. But the Job Creation is constantly rotating so that at every moment the labor market is at equilibrium. In

order for the model to estimate the long term equilibrium unemployment or natural rate of unemployment then the long term Job Creation curve should be estimated and used.

The long term Job Creation curve is the Job Creation curve that naturally exists in the absence of economic cycles. It would be the Job Creation curve that for every different position of the Beveridge curve the intersection point would be the natural rate of unemployment. The long term Job Creation curve remains the same through time and when the Beveridge curve shifts there is a change in the natural rate.

Since it is historically the same there is no need to follow the methodology of Daly, Hobijn, Sahin, Valletta 2012 to estimate it again because even with the new data the result would be exactly the same. Instead this paper will use their estimated long term Job Creation curve and find out if the new data incorporated in the Beveridge curve changes their estimation of the natural rate of unemployment. Daly, Hobijn, Sahin, Valletta 2012 estimated the long term Job Creation curve to be $Vacancy\ rate = -2.5 + 1.1 * Natural\ rate\ of\ unemployment$.

4.1.4. The equilibrium point



Source: Bureau of Labor Statistics, JOLTS data and Authors calculations

Putting the two curves together gives a graphical representation of the long term equilibrium points in the labor market. The intersection point of the curves before the recession is slightly below 5 per cent unemployment rate which is consistent with the pre recession estimation of the natural rate of unemployment by the Congressional Budget Office. The intersection point with the shifted after recession Beveridge curve is at 5.5 per cent unemployment rate which is still consistent with the estimation made in 2012 by Daly, Hobijn, Sahin, Valletta.

The model shows a rise of the long term equilibrium unemployment rate of half a percentage point after the recession. Although the Beveridge curve shifted to the right by about 2 percentage points the natural rate of unemployment only rose half a point. It is also important to note that currently unemployment is at 5.5 per cent which according with this estimation is the natural rate so currently the labor market is at its long term equilibrium. A further drop in the unemployment rate would probably mean that the economy has a positive output gap and is operating above its potential unless the further drop of unemployment is accompanied by a stable or dropping vacancy rate.

If the Federal Reserve was focused on accomplishing its objectives of full employment and price stability one would think that it should start to follow a tighter monetary policy. According to this model the economy is at full employment right now which means that a further drop in unemployment would push wage inflation upwards. Since wage inflation is one of the main factors which ultimately cause consumer price inflation and wage inflation accelerates when unemployment is below its natural rate then if the Fed was to accomplish price stability it should prevent a further drop of unemployment below 5.5 per cent. At the moment the Federal Reserve is accomplishing its objectives very well, on one hand prices are stable and on the other hand there is full employment, but it should now be more careful than ever in order to continue accomplishing its objectives in the near future as well.

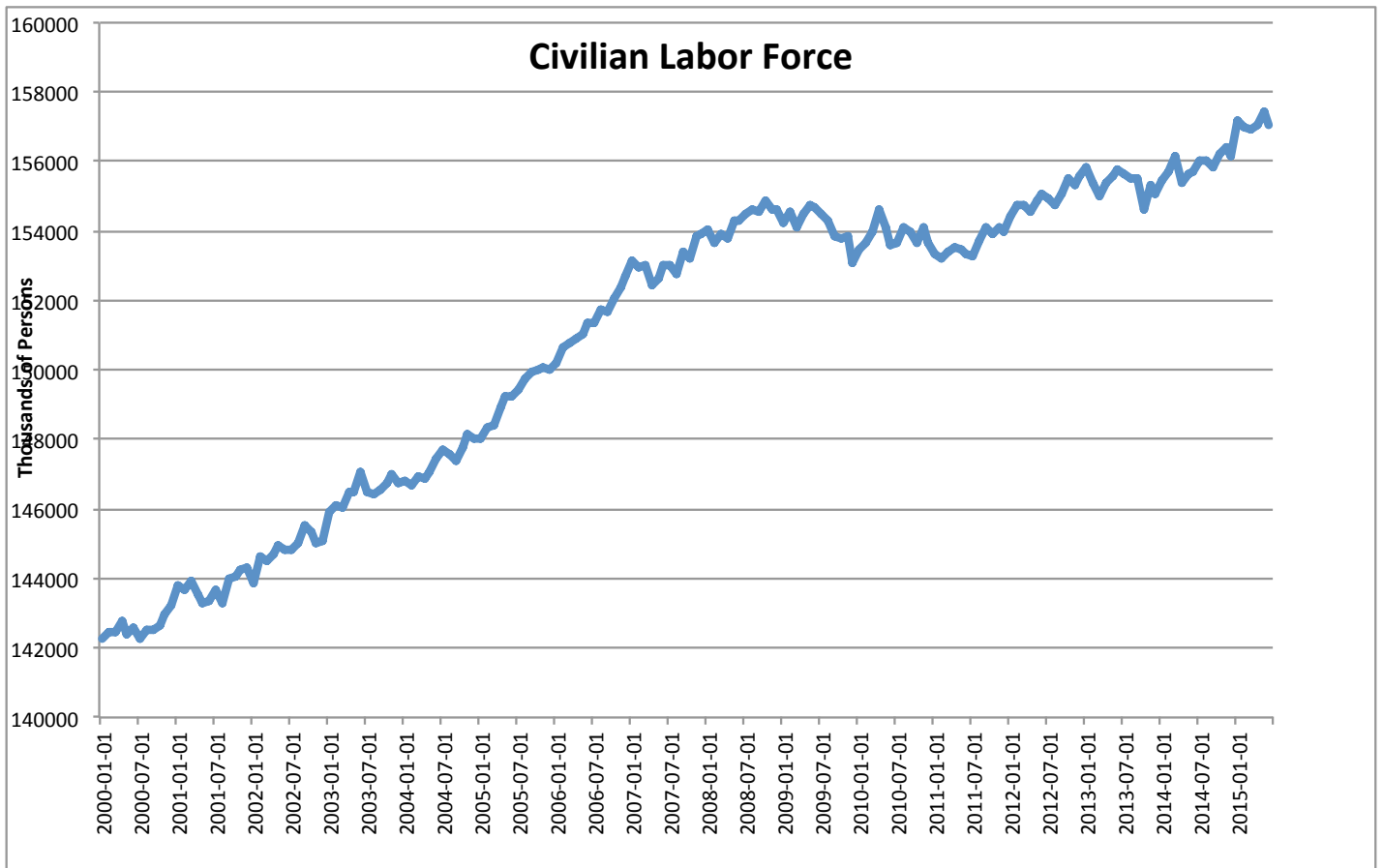
To justify the continuation of a loose monetary policy policymakers say they expect the curve to shift substantially more to the left, but that has yet to happen. The after recession Beveridge curve is a strong relationship between unemployment and vacancies as it used to be before the recession and the shift. If a close look is taken from 2009 until today the curve has shifted counterclockwise to the left only slightly. In order to find out if the curve will shift back to its pre recession position it is necessary to analyse the factors that shifted the curve to the right in the first place and examine if these factors are likely to be temporary or permanent.

4.2. Factors that may caused the Beveridge curve shift

4.2.1. A rise of frictional unemployment: An increase of frictional unemployment would cause the beveridge curve to shift to the right. Frictional unemployment is caused by workers taking time to find the best job available and sometimes quitting their current job to search for a better one. But after the recession there was no confidence in the labor market and workers did not think they had a good chance of finding a better job so they did not quit their job to search for another. Also if unemployment is high unfilled job positions would be filled faster even if they were presumed unattractive when unemployment was low because workers would be searching for any kind of job rather than the best job available.

As a result there is no reason to assume that there was a rise of frictional unemployment that would cause the curve to shift to the right, the opposite scenario would be more probable meaning that the rate of frictional unemployment is a little lower after the recession.

4.2.2. Labor force: A sudden increase of the labor force would cause the unemployment rate to rise because most of the entrants would flow to the unemployment pool rather than to the employment. And because it takes some time for the job matches to be made it would not immediately decrease the vacancies and as a result the curve would move outward. But the data



show that the labor force did not suddenly increased after the recession on the contrary it decreased during the first two years of the recovery meaning there were net outflows from the unemployed to

Source: Bureau of Labor Statistics, Current Population Survey

out of the labor force caused by discouraged workers which decreased the rate of unemployment.

In conclusion the changes in labor force could not have contributed to the outward shift of the Beveridge curve.

4.2.3. Economic uncertainty: A firm who technically has a job opening would be more cautious to hire a worker if it is uncertain of the prospects of the economy. That is because there is a certain fixed cost when hiring and firing workers and the uncertainty about the future aggregate demand makes the benefits of an additional worker less attractive thus lowering the option value of hiring.

The firm would try to boost productivity rather than hire workers in order to increase output. The result would be a longer period of looking for the right candidate for the position (Davis, Faberman, Haltiwanger, 2010). The rise in productivity can only be maintained for a certain period and will be diminished after the restructuring process in the firm is completed. At the first stages of the recovery the firms are able to respond to the increased demand by increasing productivity but as the demand strengthens further and productivity increase diminishes they have to start hiring again.

In order to find out how productivity in behaved the GDP must be divided by the number of employees producing it. The graph below shows that during 2009 and 2010 productivity rose significantly and then rose slower after 2011. The data show that in the middle of the recession workers were being fired at a faster pace than production was going down and that when the expansion started production rose faster than workers were being hired. This is consistent with the assumption that was made above.



Source: Bureau of Labor Statistics, Bureau of Economic Analysis, Authors' calculations

The high level of uncertainty that followed the great recession is a possible explanation for the weakness in vacancy yield and probably contributed to the outward move of the Beveridge curve but the uncertainty dissipates as the recovery strengthens and as a result the outward pressure to the shift would be rather temporary than permanent (Daly, Hobijn, Sahin, Valletta, 2011).

Even if uncertainty about the economy was a factor that shifted the Beveridge curve outwards immediately after the recession now more than five years into the expansion cycle uncertainty should not be a factor any more. But the Beveridge curve did not shift significantly inwards during the expansion cycle and as a result other factors must be more responsible for the shift.

4.2.4. Unemployment Insurance: After the great recession the U.S. government extended the time that a job loser could receive unemployment insurance benefits. The Emergency Unemployment Compensation bill, voted by the congress, provided extended UI benefits to long term unemployed and was extended several times until the end of 2013 when it was left to expire.

Extended UI benefits affect the labor market in two ways and both contribute to an outward shift of the Beveridge curve. Firstly, UI provides a disincentive for unemployed to actively search for a job because the UI income makes the job income less urgently needed. Also the compensation a job offers could become unattractive to UI benefits receiver because the gain from finding a job is the difference between the job salary and the UI compensation instead of the job salary and nothing. So the UI benefits receiver is less likely to give as much effort as she can to find a job and less likely to accept a certain job offer, as a result there is a deterioration of the labor market matching efficiency. Secondly the unemployment rate is artificially higher because people who do not intend to find a job, and thus would be out of the labor force, claim they are looking for a job only to be eligible for receiving the UI benefits. The channel that affects the labor market the most is unemployed not getting out of the labor force to receive the benefits and there is virtually no effect on job finding (Farber, Valletta, 2013).

Although these factors exist their contribution in raising unemployment is rather limited. Research shows that if UI benefits were not extended the unemployment would be 0.2 to 0.5 percentage points lower (Rothstein, 2011). Also only the job losers are eligible for UI and not the voluntarily leavers, new entrants and re-entrants to the unemployment pool. As a result only about half of the shift of the Beveridge curve is explained by the UI policies (Rand Ghayad, 2013). Any effects that extended UI has on the the labor market are transitory and do not cause a long term rise in structural unemployment and the natural rate, after the end of 2013 Emergency Unemployment Compensation has expired and the Beveridge curve moved back inwards only slightly. As a result other factors contributed more significantly to the shift.

4.2.5. Discrimination towards ethnic groups and long term unemployed: When employers post a job advertisement they receive many applications and they must decide which applicants to call for an interview. This process is based on the employers beliefs about the average characteristics of each group or in other words it is based on discrimination. Employers tend to discriminate against some minorities or the long term unemployed, they think that certain population groups don't have the necessary skills or in the case of the long term unemployed that these skills have eroded over time.

Discrimination is obvious in the case of African Americans. While they represent only 11 percent of the employed population their share in the long term unemployed is 23 percent so it is more than double what it should be. Hispanic minority is also overrepresented in the long term unemployed. Whites who are the majority of the employed population in the U.S. have a lower share in long term unemployment than they do in employment (Cho, Cramer, Krueger, 2014).

If the Beveridge curve is disaggregated to only show the relationship between the vacancies and those unemployed for less than 27 weeks and again to only show the relationship between the vacancies and those unemployed for more than 27 weeks, it is discovered that in the first case the

curve shift only slightly outwards after the recession and that almost all the shift was caused by the long term unemployed (Dickens, Ghayad, 2012). Also Dickens and Ghayad note that the short term unemployed Beveridge curve moved inwards again while the long term unemployed curve continued to move outwards meaning that the short term unemployed were absorbing most of the benefits of the increase in vacant job positions.

These results led Ghayad to make an experiment to find out how unemployment duration affected the possibility of being called for an interview. To perform the experiment he sent fake applications, with all the other characteristics being the same, to vacant job positions. The results as expected showed a negative relationship, with the possibility of being called for an interview rapidly falling for every additional month between the second and the seventh month and stabilising afterwards. He showed clearly that employers discriminate considering unemployment duration and as a result the short term unemployed are more likely to find a job than the long term unemployed.

The employers don't care to find out if these assumptions are actually true because they have the option to find a worker who is not included in those population groups for the same cost. The discrimination effectively decreases for the employers the number of workers they perceive as unemployed and makes jobs matching more time consuming and less efficient. It also causes the workers who are discriminated against to be less likely to find a job and be unemployed for longer periods of time.

This factor is also temporary because as the labor market tightens and the employers get less applications for each vacant job position there will not be a need to discriminate as much as when unemployment was higher. Also if the employers still discriminate against long term unemployed and African Americans they will have to offer higher compensation to the other applicants to hire them. The data show that wage growth is at the same rate as inflation so there is no real wage growth and the long term unemployed are decreasing rapidly, meaning that employers turn to the applicants they discriminated against instead of offering higher compensation to the others.

Discrimination against employees is more relevant during high unemployment periods and a lot less during low unemployment periods.

4.2.6 Skill and geographical mismatch: When a rise of skill or geographical mismatch occurs in the labor market the Beveridge curve shifts outwards. This factor is the most worrying to policymakers because it means that there is a structural change in the economy which is persistent and hard to address. According to Okun's law every percentage point of higher unemployment decreases the GDP by two percentage points so a labor market mismatch would lower the potential output of the U.S economy.

The geographical mismatch occurs when workers need to move to get a new job but the ability to move is limited by economic or other factors. This may happen when the price of houses at the place with the unemployed workers has declined more than the place with the vacant job positions, this situation does not allow the unemployed to sell her house and buy a new one where the vacancy is. As a result in order for the move to be economically viable the vacant position should offer high enough compensation. But taking into account that movement of workers is common in the U.S then a geographical mismatch can not be a factor that contributed a lot to the shift. As is proved by the recent research (Sahin, Song, Topa, and Violante, 2011) geographical mismatch contribution to structural unemployment is insignificant.

A skill mismatch arises when the unemployed workers of a specific sector of the economy that is in prolonged downtrend can not be employed by another sector which creates job positions. The most recent recession, which was caused by a housing bubble, left the construction sector in a lengthy contraction. As a result the unemployment of construction workers more than doubled from the pre-recession levels to a number of about 1.25 million more. But some of the unemployed construction workers are employed in other sectors and as a result the overall contribution of the

decline in the construction sector to the rise in structural unemployment is 0.4 percent (Daly, Hobijn, Sahin, Valletta, 2012).

Although the construction sector has recovered significantly and the unemployment in this sector is getting closer to its pre-recession levels it will probably not employ as many workers in the future as it did before the recession. After all the burst of the construction sector bubble caused the recession in the first place because it was an unsustainably big. As a result the structural unemployment caused by the construction sector is not expected to decline in the near future.

4.2.7. Factors that were responsible for the shift

After having analysed these factors the conclusion is that mostly the decline of the construction sector raised the structural unemployment and caused a permanent outward shift of the Beveridge curve. The skill mismatch caused by the construction sector workers contributes significantly to the shift, the rest is attributed to the extended Unemployment Insurance benefits, economic uncertainty and discrimination towards some population groups but these factors were all temporary and probably have dissipated now. The permanent rise in structural unemployment is about half a percentage point but this does not mean that it is not very important for the government to address the skill mismatch problem even if it only concerns a small portion of the labor force. The skill mismatch caused by the construction sector decline is a factor that caused a permanent shift to the Beveridge curve as result policymakers should expect the Beveridge curve relationship to remain stable and the natural rate to remain at 5.5 per cent in the near future.

4.3. Long term unemployment

If it is assumed that the structural unemployment rose by half a percent and the U.S labor force is 155 million then the structurally unemployed who are not able to get a job would be about 0.75 million more than before the recession. But the long term unemployed rose from 1.3 million before the recession to 6.6 million at the peak and now they are 2.8 million, so the rise of structural unemployment can not explain the extraordinary rise in long term unemployment.



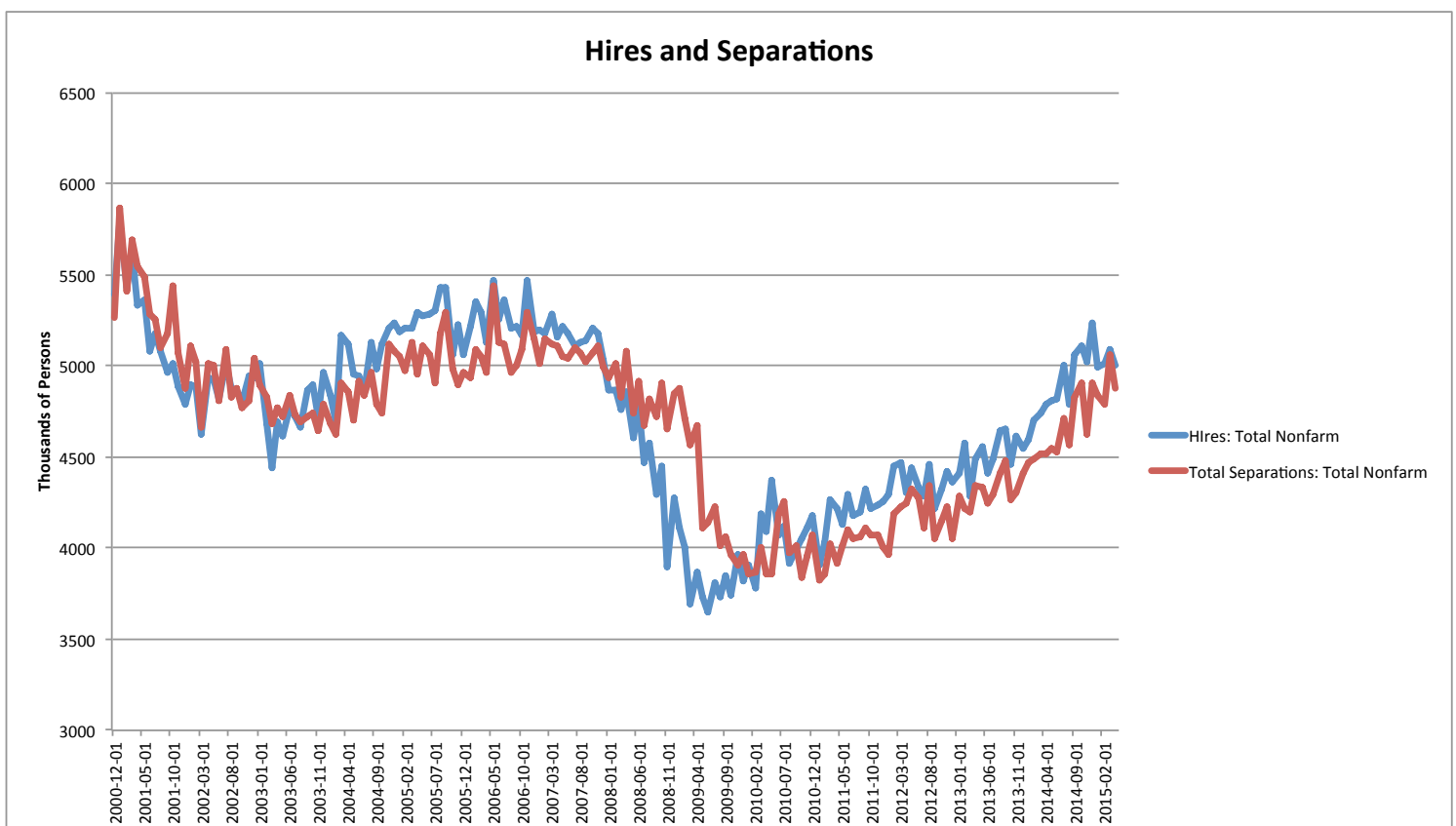
Source: Bureau of Labor Statistics, Current Population Survey

The graph above shows the rise of long term unemployment was severe and unprecedented. The number of long term unemployed rose to more than double the past all time high and until recently

was still higher than the pre recession all time high. As a result many economist were worried that something was fundamentally wrong with the US economy. A rise so significant definitely deserves to be looked into to find out the reasons behind it. So which were the factors that caused this phenomenal rise?

4.3.1. Secular rise

Except from the extraordinary rise of long term unemployment after the last recession the graph of long term unemployed also shows a secular rise which accelerated after the 2001 recession. The share of long term unemployed to total unemployed rose from 11 per cent before the 2001 recession to 17 per cent before the last recession, reached an all time high of 45.5 in 2010 and is currently at 29.8 per cent. This shows that there are some factors in play causing the rise of long term unemployment for at least fifteen years and that not only the last recession is responsible for this extraordinary rise. For which reasons did this secular rise occurred and what does it mean for the US economy?



Source: Bureau of Labor Statistics, JOLTS

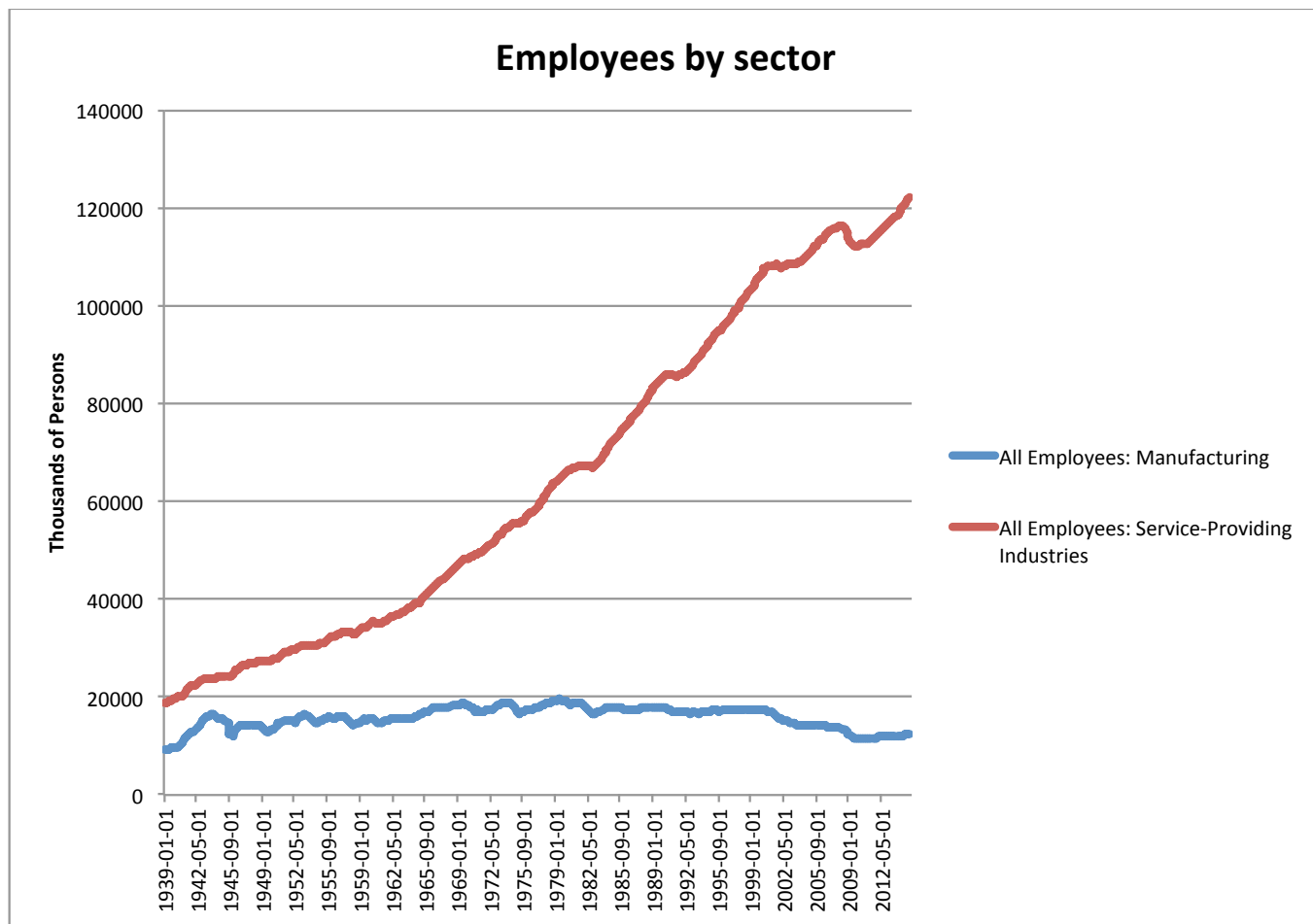
The US economy is known to have a flexible labor market which means that the pace of destroying and creating jobs has been fast. This was part of its advantage compared to other advanced economies like the European where the pace is slower. But the rate of job creation and destruction has been slowing. As a result the duration of employment is longer but as is the duration of unemployment. The slower pace of job turnover is probably explained by the shift of economic activity from manufacturing production to services, the changing demographic characteristics caused by the baby boomers and last but not least by the ageing of the average US firm.

- **Expansion of the service providing sector**

Job creation and destruction behaves differently in the manufacturing sector and the service sector. The pace of job creation and destruction is higher in the good producing sector compared to all other sectors and as a result the manufacturing sector contributes disproportionately more to the volatility of labor turnover (Ritter, 1994). The manufacturing sector is adapting its work force very quickly to aggregate demand and is cyclically sensitive meaning that when there is a cyclical downturn the employees are usually temporarily laid off and then quickly rehired at the same position when demand picks up. On the other hand the service providing sector is slow at laying off employees and even slower at rehiring because when the demand rises the service providers try to boost the productivity of their employees first and only start hiring again when they feel confident about the economic recovery.

The graph below shows a continuous rise of the services sector employees compared to the manufacturing sector. This is normal because as productivity rises historically fewer workers can produce all the products the economy needs but in the services sector the productivity can not rise as much. Also products may be imported at lower prices from lower cost producers like China while services usually have to be produced where they are consumed. The less share of manufacturing in

the economy has contributed to the more and more jobless recoveries that occur in the U.S. and is a reason that the long term unemployment is on a secular rise.



Source: Bureau of Labor Statistics, Current Population Survey, Authors' calculations

- **Change in demographics**

The post world war two baby boom in the United States caused a continuous rise of the median age of the labor force until now that the baby boomers are getting into retirement. “The 55-and-older age group, which made up 13 percent of the labor force in 2000, is projected to increase to 20 percent by 2020” (Toossi, 2002). The baby boomers are still having an effect on the US economy and the labor market changes as they get older.

Because young people tend to get in and out of the labor force often they usually not stay officially unemployed for long and so the decline of their share and the rise of the 55-and-older

group in the labor force is another factor that caused the secular rise of long term unemployment (Aaronson, Mazumder, Schechter, 2010). Although the effect of demographics in long term unemployment might not be that much significant it must be acknowledged as another factor that caused the secular rise.

- **Ageing of employers**

Another factor that contributes to the secular rise of long term unemployment is the rise of the average age of US firms (Dvorkin, 2015). Almost 41 percent of all firms in 2000 had been in operation less than 5 years and accounted for 25 percent of all jobs. In contrast, only 34 percent of firms in 2014 had been in operation less than 5 years and accounted for 14 percent of all jobs. The data show that there older firms are dominating and not as many new are created leading to a rise of the average age of US employers.

Young firms have high rates of job creation and job destruction compared to older firms because usually they either expand rapidly or they go out of business (Haltiwanger, Jarmin, and Miranda, 2013). On the other hand older firms are not creating as many jobs but also they do not go out business and as result destroy many job positions.

As a result a smaller portion of young employers compared with old employers creates a slower pace of job creation and destruction meaning a slower job turnover. This slower job turnover results in workers staying employed for longer periods of time but also the unemployed workers stay unemployed for longer periods as well. That contributes to higher rates of long term unemployment and is a result of a structural change in the economy rather than a cyclical caused by the last recession.

4.3.2 Factors which caused the spike

But although the secular rise of long term unemployment explains the long term uptrend observed since 1950, it does not explain why there was an extraordinary spike after the most recent recession where the long term unemployed were more than 6.5 million. There must be some factors specific to the the great recession that caused this huge rise.

- **Unemployment Insurance benefits extension**

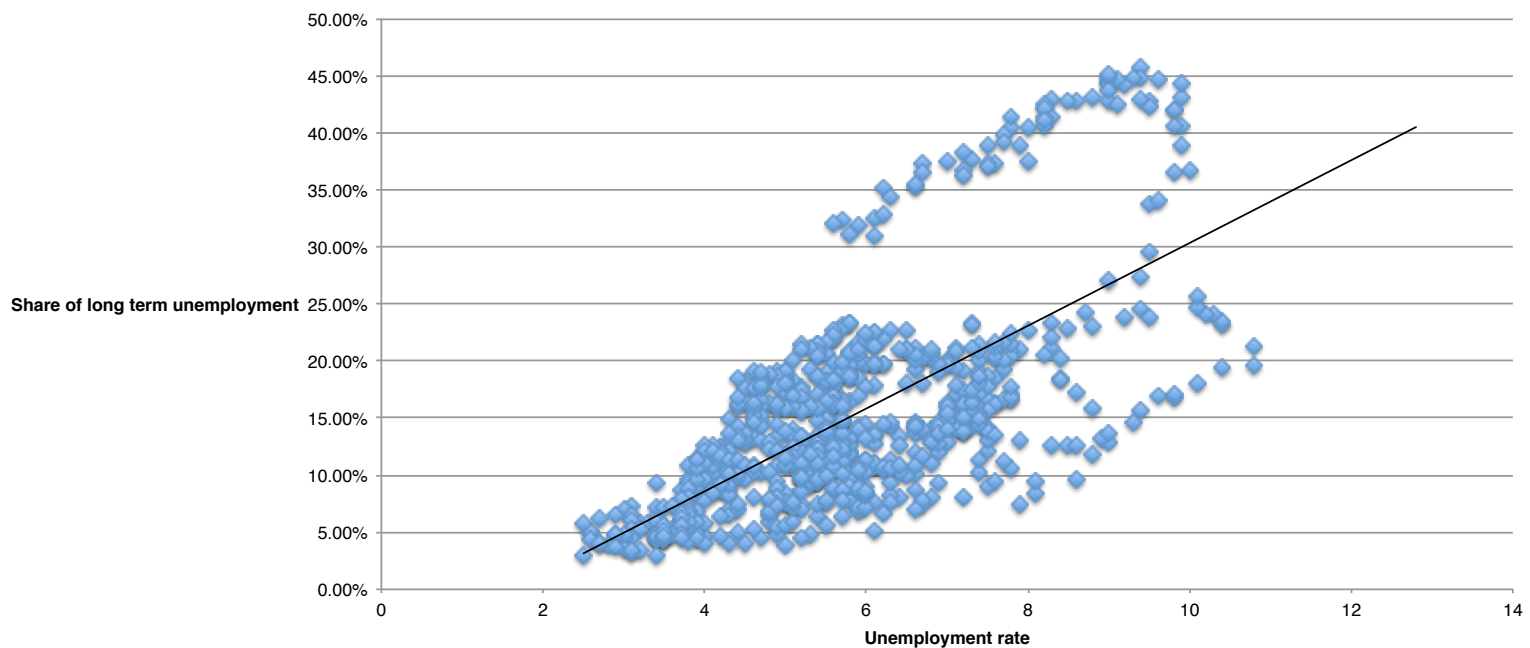
Research has shown that the extension of Unemployment Insurance benefits has modestly contributed to the spike but is not the main factor. UI benefits tend to increase the rate of unemployment through two channels. Firstly the UI decrease the incentive an unemployed has to actively search for a job, so as is explained earlier make the matching process less efficient. Secondly the extension of UI decreases the flow of unemployed out of the labor force because in order for the unemployed to collect the insurance they have to be looking for a job and so be counted as unemployed rather than discouraged and out of the labor force. The first channel helped raise the unemployment by up to 0.5 percent but the biggest was the effect of the second channel which reduce the flow of unemployed to out of labor force rather than to employment (Rothstein 2011). Therefore the extension of the UI benefits led to a higher number of people that would otherwise be out of the labor force count as unemployed.

As a result the UI benefits artificially inflated the pool of long term unemployed because unemployed workers who would otherwise count as out of the labor force still counted as unemployed in order to receive the benefits. If the extension of the UI benefits had not happened the spike of long term unemployment would be smaller and out of the labor force pool would be larger.

- **Severity of the recession**

The long term share of unemployment is positively correlated to the total unemployment, this means that the higher unemployment gets the higher the share of long term unemployment to the total unemployment gets. The unemployment peaked at 10 million after the end of the last recession which is the second highest rate in the U.S since 1983 and share of long term unemployment to the total also peaked during the same time. It is easy to understand how an increasing share of long term unemployment in an increasing unemployment rate can cause a spike to form.

Share of Long Term Unemployment vs total Unemployment



Source: Bureau of Labor Statistics, Current Population Survey, Authors' calculations

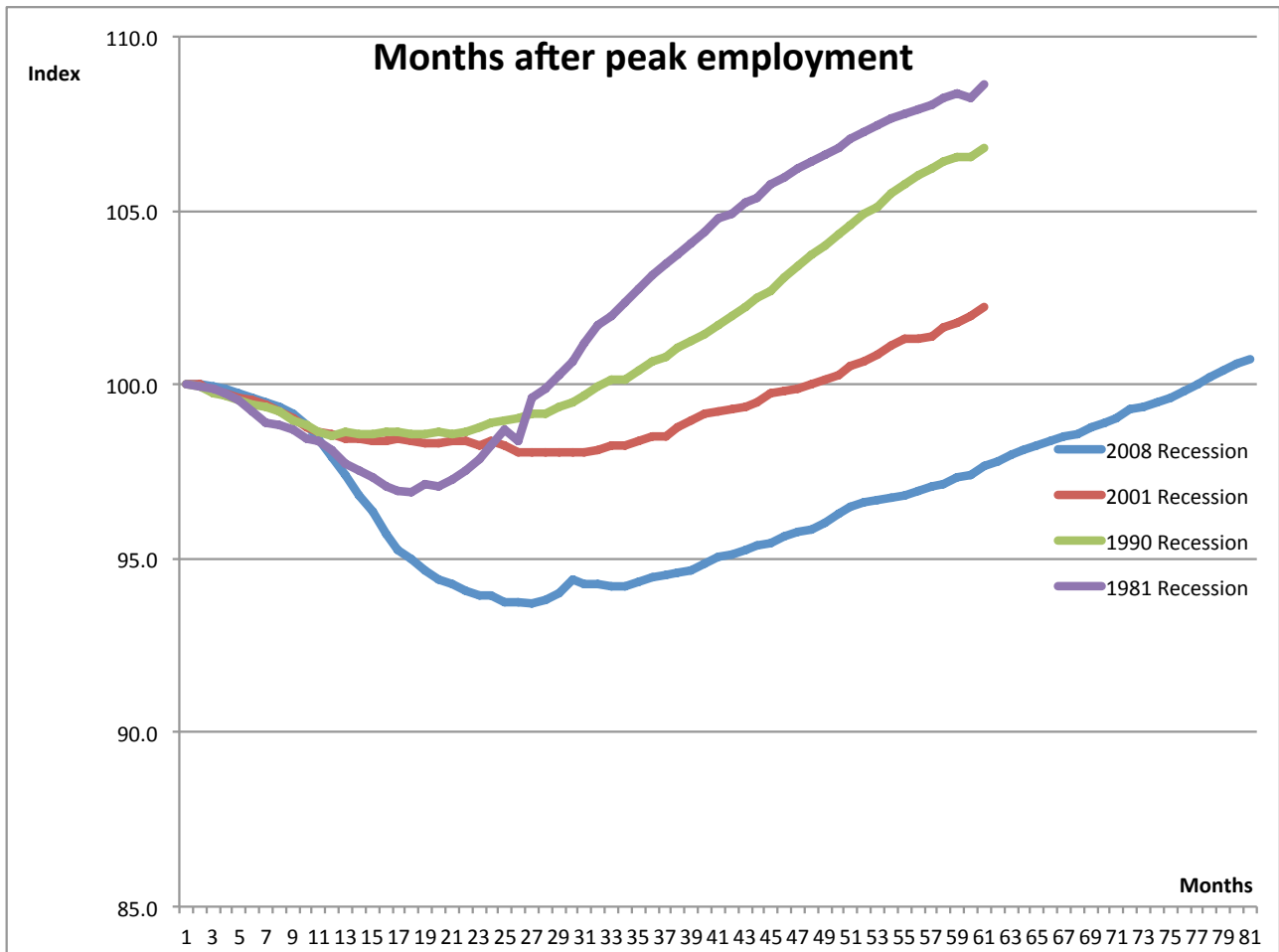
That positive correlation occurs because at the early stages of a recovery the employers prefer to hire those who have been unemployed the shortest time so the unemployment pool is increasingly composed of long term unemployed. This preference by the employers is based at the assumption that skills of the longer time unemployed workers have deteriorated and that they had poor skill quality to begin with. It is easier for employers to follow this strategy when unemployment is high

and lot of short term unemployed workers are available to choose from, leaving the long term unemployed out of consideration for the job position.

This relationship is what causes the long term unemployment to spike after recessions. But the severity of the last recession caused the unemployment rate to rise considerably more than usual and the share of long term unemployment to rise considerably more as well, consequently the relationship described above is one of the main reasons that created the spike of long term unemployment.

- **Duration of the recession and the jobless recovery**

The long duration of the recession and the low job creation rate that followed in the recovery period is one of the main factors that led to the big rise of long term unemployment. The great recession lasted for 18 months, the longest since the great depression, and the GDP declined by 4.3 percent, also the biggest decline since 1945. Slow job creation followed and even now more than five years into the recovery the unemployment rate is still at 5.5 percent. The low rate that the unemployment dropped during the expansion led many economists to characterise the recovery as jobless. Expansions of GDP that are not accompanied by high rate of job creation are becoming steadily more pronounced after every recession.



Source: Bureau of Labor Statistics, Current Population Survey, Authors' calculations

The chart above shows how many it took after each recession for total employment to reach its pre-recession peak. The vertical axis represents total employment with 100 being the pre-recession peak and the horizontal axis represents the months after peak employment. It is clear that for every recession after 1981 every time it took more time for the employment to reach the level it had before the recession started. After the 1981 recession it took only 27 months for employment to reach again the peak it had before the recession, the 1990 recession took 32 months, the 2001 recession took 47 months and the last recession took an extraordinary 76 months. This pattern shows that every time the recovery is accompanied by a slower job creation.

The economic recoveries and the drop of unemployment tend to be every time more U-shaped than before. A reason that explains this phenomenon is that when demand picks up companies, not

confident that recovery will continue, try make the existing workers more productive to meet the demand and do as little hiring as possible. Also the more skilled workers are the ones who get hired first and as a result the productivity of the companies is increased at the first stages of the recovery. The evolution of technology and low cost of capital makes it possible for companies to have a bigger rise in productivity than they used to and also the shift to a more service providing oriented economy as explained above contributes as well. As a result the job creation is slower than in the past and increases the median duration of unemployment during the most recent recoveries.

5. Conclusion

This paper concludes that there is not a significant increase in long term structural problems in the U.S. economy from an employment perspective and that the extraordinary rise in long term unemployment is partly the result of a secular rise but mostly the result of the specific characteristics of the Great Recession.

The natural rate of unemployment according to the DMP model did rise after the Great Recession by about 0.5 percent to 5.5 percent. The factor which caused the rise is the burst of the construction sector bubble which inflated for over a decade before the recession and as a result the construction sector is not expected to employ as many workers in the future. After the recession the US economy grew in other sectors where the not all of the unemployed construction sector workers can be employed. As a result there is a skill mismatch in the US economy accounting for about 0.5 percent of the labor force.

The unprecedented rise in long term unemployment observed after the recession is the result of a secular rise in place for many decades and of the great recession specific factors. The lower share of manufacturing in the economy and the ageing of both the labor force and the establishments caused a secular rise of long term unemployment. The extension of UI benefits, the severity and the duration of the last recession were the specific to the last recession factors that caused the

extraordinary spike. Although the long term unemployment reached levels never observed before, from close to 1 million before the recession to more than 6.5 million after, it is now dropping quickly and is expected to normalise over the near term to less than 2 million because it should only rise by 0.5 percent 0.75 million as much as the natural rate of unemployment rose compared to pre-recession levels.

The conclusion of this paper about the labor market suggests that cyclical unemployment prevailed after the recession and that the right measures to address the unemployment were expansionary monetary and fiscal policies in order to increase aggregate demand in the economy. This suggestion is in line with the policy that the Federal Reserve implemented until now. The paper also finds that the present unemployment rate is exactly as much as the natural rate of unemployment and that wage inflation shows early signs of acceleration meaning that the Federal Reserve is right to be preparing for a tighter monetary policy in the future.

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