The Cyclicality of the Labor Force Participation Rate*

Andreas Hornstein†

First Draft, May 3, 2013

Abstract

Gross flow data indicate that over the business cycle unemployed workers are less likely to exit the labor force and inactive participants are more likely to join the labor force as unemployed when unemployment rates are high. This observed cyclical pattern for labor market transitions between unemployment and out of the labor force is the opposite of commonly held perceptions. This observed cyclical pattern also introduces a positive correlation between the unemployment rate and the labor force participation (LFP) rate over the business cycle. The observed negative correlation between the unemployment rate and LFP rate over the business cycle can be attributed to two other factors. First, high unemployment rates imply a high average exit rate from the labor force, which in turn lowers the LFP rate. Second. transition rates from out of the labor force to employment without an intervening unemployment spell decline as unemployment rates increase. In other words, the negative correlation between the unemployment rate and the LFP rate should not be interpreted as low current LFP rates indicating relatively high future unemployment rates, as commonly held views often do, but as current high unemployment rates inducing low current LFP rates.

*Any opinions expressed are those of the author and do not necessarily reflect those of the Federal Reserve Bank of Richmond or the Federal Reserve System. E-mail address `andreas.hornstein@rich.frb.org`.

†Federal Reserve Bank of Richmond

In the Great Recession the unemployment rate increased rapidly within two years from about 4 percent in 2007 to about 10 percent in 2009. Yet over the ensuing recovery, the unemployment rate has declined only gradually and, more than four years after the end of the recession, it now stands at about 8 percent. At the same time the labor force participation rate has declined steadily over this time period and now stands at 63.5 percent, a level comparable to the early 1980s. Many observers view the decline in the labor force participation rate as an indication that further declines in the unemployment rate will come only slowly. The expectation is that if the labor market improves, many participants that have left the labor market will return and contribute to the pool of unemployed, and many unemployed participants will no longer exit the labor force, but continue to search for work.[1]

Generalizing this conjecture about the relation between the unemployment rate and movements between unemployment and out-of-the-labor-force, one would expect that in the short run the unemployment rate and the labor force participation (LFP) rate move in opposite direction. In this article we first document that cyclical movements of the unemployment rate and the LFP rate are indeed negatively correlated, with the LFP rate lagging the unemployment rate. We then go on to use observations on gross flows between labor market states to evaluate the conjecture about cyclical comovements between the unemployment rate and gross flows between unemployment and out-of-the-labor-force, or inactivity for short. For the time period from 1990 on the conjecture cannot be confirmed. In the short run, as the unemployment rate declines, the rate at which labor market participants transition from inactivity to unemployment declines and the rate at which they transition from unemployment to inactivity increases. We show that the negative correlation between the unemployment rate and the LFP rate is actually driven by a negative correlation between the unemployment rate and transitions from inactivity to employment (without an intervening unemployment spell) and the unemployment rate itself. Since employed workers are much less likely to exit the labor force than are unemployed workers, a declining unemployment rate reduces the

[1] For example, Hatzius (2012), Daly, Elias, Hobijn, and Jorda (2012), Davidson (2013), or Tankersley (2013).

average exit rate from the labor force, and thereby supports a higher LFP rate.

Over the long run we observe significant and persistent changes in the unemployment rate and the LFP rate, that is, changes in the trend of each variable. These long-run changes are more apparent for the LFP rate than for the unemployment rate. For example, the average U.S. unemployment rate was somewhat higher in the 1970s than for the rest of the post-WWII period, but the short-run movements in the unemployment rate are significantly larger than these long-run changes, Figure 1.A. The LFP rate on the other hand increased gradually and persistently since the 1960s to reach a peak around 2000, and changes in the trend of the LFP rate have for the most part dominated short run fluctuations of the LFP rate around this trend, Figure 1B. Despite these differences in the trend for the two variables, the deviations from trend display a systematic pattern, namely the LFP rate increases as the unemployment rate declines.

Taken at face value, the negative correlation between the unemployment rate and the LFP rate appears to be consistent with the above mentioned concern that further improvements in the labor market will lead to a return of participants to the labor force, which will increase unemployment, if only temporarily, and slow down further declines in the unemployment rate. In the following we call this the inactivity-unemployment (IU) model of the negative correlation between the unemployment rate and the LFP rate. We argue that the IU-model is not consistent with observed transitions between labor market states. We first show that, consistent with the IU-model, indeed more participants join the labor force as unemployed when the unemployment rate declines, but we also show that more unemployed leave the labor force. The underlying story for the negative comovement of unemployment and the LFP rate involves, however, changes in the decision making of individuals, in particular, it is assumed that as the labor market improves, that is, as the unemployment rate declines, individuals are more likely to make the transition from inactivity to unemployment, and they are less likely to make the transition from unemployment to inactivity. In a second step we therefore study the comovement of transition probabilities between labor markets states, and we show that the probability that a worker makes the transition from inactivity to unemployment actually declines, and the probability for the reverse move increases, as the unemployment rate declines. This pattern is the direct opposite of what is assumed for the IU-model.

We resolve the issue of why the unemployment rate and LFP rate is negatively correlated by accounting for the contributions coming from short-run variations in the transition rates between labor market states. This approach shows that the observed variations in the transition rates between inactivity and unemployment would indeed induce a positive correlation between the unemployment rate and the LFP rate. There are two countervailing forces which generate a negative correlation. First, we note that the rate at which people leave the labor force from employment is much lower than the rate at which they leave the labor force from unemployment. This means that as the unemployment rate declines and a larger share of the labor force becomes employed, the average exit rate from the labor force declines and the LFP rate increases. In turn, since most of the variation of the unemployment rate is actually accounted for by variations in the rates at which people make the transition between unemployment and employment, these variations also induce a strong negative correlation between the LFP rate and the unemployment rate. This negative correlation is reinforced by variations in the transition rate from inactivity to employment, such that the net-effect after adding up all the contributions coming from the variations in the different transition rates is a negative correlation between the unemployment rate and the LFP rate.

This paper is based on a line of research that accounts for changes in labor market ratios through changes in the rates at which labor market participants transition from one state to a different state. Early work in this literature mostly ignored variations in the LFP rate, and focused on variations in transition rates between the two labor market states employment and unemployment, for example, Shimer (2012), Fujita and Ramey (2009), and Elsby, Michaels, and Solon (2009). This work finds that variations in unemployment exit rates contribute relatively more to unemployment rate volatility than do variations in employment extt rates.

Recently, a similar approach has been applied to a more general accounting framework that adds a third labor market state, out of the labor force, and allows for variations in the labor force participation rate, for example, Elsby, Hobijn, and Şahin (2013), and Barnichon and Figure (2010).[2] Our work is closest to Elsby et al (2013), but their main focus is on accounting for the relative contributions of transition rate volatility to unemployment rate volatility.[3] Nevertheless, they also point out that the cyclical behavior of measured transition rates between unemployment and inactivity is at odds with common pre-conceptions about that behavior, and they also note that the observed cyclical behavior of these transition rates would induce a positive correlation between the unemployment rate and the LFP rate.

The paper is organized as follows. Section 1 documents the negative correlation between the detrended unemployment rate and LFP rate for the total working age population, and men and women separately. Section 2 documents the comovements between the unemployment rate on the one hand, and gross flows and transition probabilities between labor market states on the other hand. Section 3 demonstrates how variations in transition rates contribute to the comovement

1 Comovement of unemployment and LFP

The U.S. Bureau of Labor Statistics (BLS) publishes monthly data on the labor market status of U.S. households that are based on the Current Population Survey (CPS). The CPS surveys about 60 thousand households every month with about 110 thousand household members, a representative sample of the U.S. working age population. Household respondents are asked if the household members are employed, and if they are not employed, whether they want to work and are actively looking for work The latter are considered to be unemployed,

[2] Shimer (2012) also develops tools for the analysis of a multi-state labor market model and studies the role of variations in the LFP rate, but the focus of the paper is on the two state model of the labor market.

[3] An important part of Elsby et al (2013) is their analysis of a measurement issue for gross flows. Since gross flows are derived from survey samples, it is always possible that survey respondents are misclassified with respect to their labor market state. Past research has demonstrated that misclassification is a significant issue. Elsby et al (2013) argue that allowing for the possibility of misclassification does not substantially affect the conclusions drawn from measured gross flows for the issue studied in this paper.

and employed and unemployed household members constitute the labor force. Household members that are not employed and that are not actively looking for work are considered to be not part of the labor force, or inactive for short. The unemployment rate is the share of unemployed workers in the labor force, and the labor force participation rate is the share of the labor force in the working age population.[4]

The unemployment rate tends to be more volatile than the LFP rate in the short run, but changes in the LFP rate tend to be more persistent over the long run. Figure 1 displays quarterly averages of monthly unemployment and LFP rates for the period from 1948 to 2012. The unemployment rate increases sharply in recessions, and then declines gradually over time. Shaded areas in Figure 1 indicate periods when the unemployment rate is increasing, and these shaded periods match periods of NBER recessions quite well. Even though the average unemployment rate appears to be somewhat higher than usual in the 1970s, considering the magnitude of short run fluctuations in the unemployment rate, the average unemployment rate does not change much over sub-samples of the period. The 2007-09 Great Recession stands apart by the magnitude of the increase of the unemployment rate and the rather slow decline of the unemployment rate from its peak.

The LFP rate does not display much short-run volatility, rather it is dominated by long-run demographic shifts. Starting in the mid-1960s, the LFP rate increased gradually from values slightly below 60 percent to reach a peak of 67% in 2000. This slow but persistent increase of the LFP rate can be accounted for by the increasing LFP rate of women, and early on by the baby boomer generation entering the labor force. Since 2000 the LFP rate has declined, first gradually, then at an accelerated rate since the Great Recession and is now at 63.5 percent. The gradual decline in the LFP rate can be attributed to the aging of the baby boomer generation, and declining LFP rates for women and the young (less than 25 years of age). In general, there is not much short run volatility in the LFP rate, the recent accelerated

[4] Households are asked about other features of their labor market status, but the questions about employment and active search for work when not employed are the main questions of interest for determining the unemployment rate and the labor force participation rate. For a detailed description of the survey and the methods used see BLS (2012).

decline following the Great Recession being the exception. This accelerated decline in the LFP rate after the Great Recession shows up in the declining LFP rates of mature workers between 25 and 55 years of age, especially men, and also in declining participation rates of the young.

The average unemployment rate in the 1960s, when the LFP rate was low, does not appear to be much different from the average unemployment rate in the 1990s when the LFP rate was high. In other words, the unemployment rate and the LFP rate do not appear to be correlated over the long run. Over the short-run, the unemployment rate and the LFP rate are, however, negatively correlated, that is, the LFP rate increases as the unemployment rate declines.

We define short run movements of the unemployment rate and the LFP rate as deviations from trend, and we define the trend of a time series as a smooth line drawn through the actual time series. To be precise, we construct the trend through a band-pass filter that extracts movements with a periodicity of more than twelve years.[5] The dashed lines in Figure 1 display the trends for the unemployment rate and the LFP rate. Clearly, deviations from trend are more volatile for the unemployment rate than for the LFP rate. In Table 1 we display the standard deviations and cross-correlations between the unemployment rate and the LFP rate for the total working age population, and for men and women separately.[6] Overall, the unemployment rate is three times as volatile as the LFP rate, and the LFP rate increases as the unemployment rate declines, with the LFP rate lagging about half a year. When we split the sample in the early 1990s we can see that both, the unemployment rate and the LFP rate

[5] We use the method of Baxter and King (1999) to construct the trend. This is just one of several alternative methods to calculate trends. The results do not differ much if instead we use a Hodrick and Prescott (1997) filter, or a random walk band pass filter as described in Christiano and Fitzgerald (2003).

[6] At the beginning and end of the sample, our procedure delivers an ill-defined measure of the the trend. Essentially, the trend of a series is a symmetric moving average of the series. Thus at the beginning and end of the sample we do not have enough data points to calculate the trend. For these truncated periods I simply choose to truncate the moving average filter and reweigh the available data points. This procedure is arbitrary, and it implies that current data points receive much more weight in determining the trend, which explains the high trend value for the unemployment rate in 2012. For the statistical analysis below I therefore discard some observations at the beginning and end of sample and start the sample in 1952q1 and end the sample in 2006q4.

are less volatile in the post 1990s, but they remain negatively correlated.[7] Finally, including the Great Recession and its aftermath significantly increases the measured volatility of the unemployment rate and LFP rate, but, again, it does not much affect the measured negative correlation between the two variables.[8] We now study if this negative correlation between the unemployment rate and the LFP rate can be accounted for by inactive workers becoming more likely to enter the labor force and unemployed workers becoming less likely to exit the labor force.

2 Comovement of unemployment and labor market flows

The CPS household survey not only contains information on how many people are employed, unemployed, and inactive in any month, but it also contains information on how many people switch labor market states from one month to the next. We can use these gross flows between labor market states, and calculate the probabilities that any one household member will within a month transition from one labor market state to a different state, for example, the probability of joining the labor force within a month conditional on being inactive now. We can use this information to see if variations in the transition rates between inactivity and unemployment are consistent with the usual interpretation of the negative comovement of the unemployment rate and the LFP rate.

Households are surveyed repeatedly in the CPS. In particular, the survey consists of a rotation sample, that is, once a household enters the sample it is surveyed for four consecutive months, then it leaves the sample four eight months, after which it reenters the sample and is

[7]This is consistent with the period being part of the 'Great Moderation' in the U.S, which indicates an economy-wide decline in volatility starting in the mid-1980s.We choose to split the sample in 1992 because in the next section we study how changes in gross flows between labor market states contribute to the comovement of the unemployment rate and the LFP rate. Our data on gross flows are limited to the period after 1990, and again I discard some of the beginning and end of sample data on deviations from trend to minimize the problems arising from an ill-defined trend.

[8]Related to the discussion in footnote xx, we should note that if the unemployment rate continues to decline, then future measures of the trend unemployment rate that include these data points will indicate a lower trend unemployment rate that our current measures do. Thus our current measure very likely understates the cyclical deviations from trend

once more surveyed for four consecutive months. Thus in any month, for three fourths of the household members in the sample, we potentially have observations on their current labor market state and their state in the previous month. We can use this information to calculate the gross flows between labor market states from one month to the next. The measurement of gross flows suffers from two problems, missing data points and misclassified data points. We will use data series for gross flows that have been adjusted for missing data, but not for misclassification.[9]

Data points are missing because the actual unit of observation in the CPS is not a particular household, but the household that is residing at a particular address. Thus even for those addresses that have entered the sample in the previous month, we may not have observations on the previous month's labor market states for the members of the current resident household. This might happen for various reasons. The household could have a new member that did not live at the current address in the previous month, for example, a dependent returning to the family household after a longer absence. Alternatively, the household previously residing at the address moved away and a new household moved in. About 15 percent of the potential observations cannot be matched across months, and these observations are not missing at random, Abowd and Zellner (1985). One can use 'margin adjustment' procedures to generate gross flow data consistent with unconditional marginal distributions, and these procedures take into account the possibility that observations are not missing at random. In the following I use the BLS provided margin adjusted research series on labor force status flows from the CPS.[10]

[9] The evidence for misclassification in the BLS, that is, that a participant is assigned the wrong labor market state in the survey has been discussed for a long time, for example, Poterba and Summers (1986). There is currently no generally accepted procedure to adjust CPS data on labor market states for misclassification. Recently Feng and Hu (2010), and Elsby, Hobijn, and Sahin (2013) have worked on possible corrections for misclassification.

[10] The research series is described at http://www.bls.gov/cps/cps_flows.htm. Frazi, Robison, Evans and Duff (2005) describe the BLS procedure used to construct the series.

2.1 Gross flows

In Figure 2 we display the gross flows between employment (E), unemployment (U), and inactivity (I) for the period from 1990 to 2012. A panel labeled AB denotes the total number of people that are in labor market state A in a month and are in state B in the following month. For example, the center panel in the bottom row, labeled IU, denotes the number of people that have made the transition from inactive to unemployed within a month.

Are the observed gross flows consistent with an interpretation of the negative cyclical comovement of unemployment and LFP that emphasizes flows between inactivity and unemployment? The first thing to notice in Figure 2 is that there is a trend in almost all of the gross flows. This trend simply reflects the fact that working age population has been growing for most of the period considered. To help focus our discussion on the cyclical movements of the gross flows, shaded areas again indicate periods when the unemployment rate increases, and white areas indicate periods when the unemployment rate declines. Consider now the gross flows between inactivity and unemployment, that is, panels labeled UI and IU. These two panels provide mixed support for the usual interpretation of the cyclical comovement of unemployment and LFP. As the labor market improves and the unemployment rate declines, gross flows from unemployment to inactivity indeed decline, but at the same time gross flows from inactivity to unemployment also decline. For a more formal representation of this observation consider Table 2 which displays the cross correlations of the detrended unemployment rate with detrended gross flows.[11] There is a clear positive correlation between the unemployment rate and the gross flows between inactivity and unemployment, rather than the expected negative correlation. The same pattern holds, not only for the overall working age population, but also for men and women separately.

Figure 2 and Table 2 also display the cyclical properties of the gross flows between unemployment and employment, and between inactivity and employment. Note that an

[11] Again, we construct the trend for gross flows by applying a Baxter and King (1999) band pass filter to each series, and we define the cyclical component of each series as the percentage deviation from its trend value. The gross flow trends are displayed in Figure 2 as dashed lines.

increase in the unemployment rate is associated with more churning in the labor market: more people lose their job, and more unemployed people return to work, with job losses slightly leading the unemployment rate; see the panels labeled EU and UE in Figure 2, and the corresponding correlations in Table 2. Considering the magnitude of these flows and their variation over time, it is apparent that variations in these flows are a major source of unemployment volatility, for example, Shimer (2012) or Elsby et al (2013). On the other hand, increasing unemployment is associated with fewer people make the transition from inactivity to employment and vice versa; see the panels labeled IE and EI in Figure 2, and the corresponding correlations in Table 2. The cyclical properties of these gross flows for men and women are roughly the same, the only exception being that gross flows for women tend to be somewhat less volatile overall, and that women's gross flows from unemployment to employment are somewhat less cyclical.

2.2 Transition probabilities

Gross flows may change because the rate at which participants make the transition between labor market states changes or because the base changes. For example, more people might make the transition from unemployment to inactivity because there are more unemployed people, or because each unemployed is more likely to make the transition. Our intuition for the IU-model is more grounded in variations in transition rates, than variations in the levels of flows. In particular, as the labor market improves gross flows from inactivity to unemployment are supposed to increase because inactive participants are more likely to rejoin the labor force. In Figure 3 we display the transition probabilities that are implied by the observed gross flows between labor market states. Regions that are not shaded again denote periods when the unemployment rate declines. Looking at panels IU and UI we now see that as the unemployment rate declines, it becomes more likely that an unemployed worker exits the labor force and less likely that an inactive worker becomes unemployed. This is exactly the opposite of the IU-model. This pattern is confirmed by Table 3 which displays the cross correlations of the detrended unemployment rate with the detrended transition probabilities for the overall working.age population and men and women separately.[12]

The difference between the cyclical pattern of gross flows and transition probabilities also shows up in transitions between employment and unemployment. Whereas gross flows between unemployment and employment are both positively correlated with the unemployment rate, the transition probability from unemployment to employment is clearly negatively correlated with the unemployment rate. This conforms with the idea that unemployment is not only high because people are more likely to lose a job, but it is also high because it is more difficult to find employment. Despite the lower transition probability, gross flows from unemployment to employment increase with the unemployment rate because there are more unemployed.

The transition probabilities between inactivity and employment have the same cyclical pattern as the corresponding gross flows: as the unemployment rate increases it becomes less likely that people make the transition in either direction. The cyclical properties of the transition probabilities for men and women are roughly the same, the only exception being that transition probabilities for women tend to be somewhat less volatile overall, and that men's transition probabilities from employment to inactivity appear to be acyclical.

So far we have shown that the direct evidence on labor market transitions does not support the usual interpretation of why the LFP rate increases as the unemployment rate declines. In particular, as the labor market improves and the unemployment rate declines, participants become less likely to make the transition from inactivity to unemployment and they become more likely to make the transition from unemployment to inactivity. So what accounts for the negative correlation of unemployment and the LFP rate?

[12] The transition probability trends are displayed as dashed lines in Figure 4.

3 Sources of comovement

Recent research on labor markets using the stock-flow approach points to the importance of variations in the job finding rate and job loss rate for the determination of the unemployment rate. We now argue that variations in the job finding and job loss rate are also important for the cyclical comovement between the unemployment and the LFP rate. As a first step note that the exit rate from the labor force is an order of magnitude smaller for employed workers than it is for unemployed workers; panels EI and UI in Figure 3. This means that as the unemployment rate declines, the average exit rate from the labor force declines, and the LFP rate will increase. Furthermore, as we have just seen, when the unemployment rate declines, more people join the labor force without an intervening unemployment spell. We now formalize this argument by constructing counterfactuals for the unemployment rate and the LFP rate.

Consider the trend paths for the transition probabilities that we have calculated for Figure 3 and Table 3. We can interpret the deviations of the unemployment rate and the LFP rate from their respective trends as arising from deviations of the transition probabilities from their respective trends. In the Appendix we describe a procedure that allows us to decompose the cyclical movements of the unemployment rate and the LFP rate into parts that originate from the cyclical movements of the various transition probabilities.[13] In Figure 4 we graph the contributions to trend deviations of the unemployment rate and LFP rate, black lines, coming from variations in the transition probabilities between (1) employment and unemployment, red lines; (2) inactivity and unemployment, blue lines; and (3) inactivity and employment, green lines.[14] These are the three counterfactuals for the trend deviations

[13]The procedure used to derive the contributions coming from variations in month-to-month transition probabilities is actually based on a model that allows for continuous transitions between labor market states in between the monthly survey dates.

[14]Since our trend is a symmetric moving average filter, we face a problem at the beginning and end our sample period, see footnote 6. If for this part of the sample the deviations from a presumed trend are very large, such as is the case for the years 2007 to 2012, then this problem is even more pronounced and our adjustment to the filter will understate deviations from trend. For this reason, we replace the calculated trend values from 2008 on with the trend values in the fourth quarter of 2007. This essentially keeps the trend unemployment rate fixed at 6.2 percent and the trend LFP rate fixed at 65.5 percent from 2008. Thus

of the unemployment rate and LFP rate, and they approximately add up to the overall trend deviation of the two rates. In Table 4 we calculate the cross-correlations between the counterfactual unemployment and LFP rates implied by these experiments.

Past research has shown that variations in the transition probabilities between employment and unemployment are a major determinant of the unemployment rate, e.g. Shimer (2012) or Elsby et al (2013). This observation is confirmed by Figure 4.A, in that variations in these probabilities account for a substantial part of the unemployment rate variation. Figure 4.B, demonstrates that these variations also introduce substantial volatility into the LFP rate, in fact, the counterfactual LFP rate is more volatile than the actual LFP rate. Furthermore, variations in the transition probabilities between employment and unemployment generate a strong negative comovement between the unemployment rate and the LFP rate, Table 4, first row.

The comovement of the actual unemployment rate with the transition probabilities between inactivity and unemployment, is such that people are more likely to join the labor force as unemployed and less likely to exit the labor force from unemployment when the unemployment rate is high. Thus these movements simultaneously increase the unemployment rate and the labor force participation rate. In other words, the observed variations in transition probabilities between inactivity and unemployment contribute to the volatility of the unemployment rate, and they introduce a positive comovement between the unemployment rate and the LFP rate; see blue lines in Figure 4 and second row in Table 4.

For the LFP rate, the variations of transition probabilities between employment and unemployment on the one hand, and between inactivity and unemployment on the other hand, tend to almost offset each other. This means that the joint effect of the variations in these transition probabilities is a very weak negative correlation between the unemployment rate and the LFP rate; see third row of Table 4. The stronger negative actual correlation between the unemployment rate and the LFP rate is then determined by the pattern of transition

our procedure is likely to overstate deviations from trend from 2008, especially for the LFP rate.

probabilities between inactivity and employment. As the unemployment rate increases, the probability of making a direct transition from inactivity to employment declines, that is, the LFP rate declines. Adding this feature is enough to generate a significant negative correlation between the unemployment rate and the LFP rate.

We can interpret these results using a simplified version of the dynamics between labor market states described in the Appendix. Suppose that participants make the transition from labor market state i to labor market state j at rate $\lambda_{\iota j}$. The transition rates between employment and unemployment are λ_{EU} and λ_{UE}, and the transition rates between unemployment and inactivity are λ_{UI} and λ_{IU}. Assume also that participants can make the transition between in and out of the labor force only by going through unemployment, that is, there are no direct transitions between employment and inactivity, $\lambda_{EI} = \lambda_{IE} = 0$. This is the limiting case for the observation that $\lambda_{UI} \gg \lambda_{EI}$, and $\lambda_{IU} \gg \lambda_{IE}$. For fixed transition rates the unemployment rate and LFP rate converge to their steady states,

$$u^* = \frac{\lambda_{EU}}{\lambda_{EU} + \lambda_{UE}} \text{ and } l^* = \left[1 + \frac{\lambda_{UI}}{\lambda_{IU}} u\right]^{-1}.$$

It turns out that monthly unemployment and LFP rates tend to be close to the steady states implied by their monthly transition rates.

For this special case, the unemployment rate is independent of transitions between the labor force and inactivity. Similar to a simple two-state model of the labor market that ignores variations in the LFP rate, the unemployment rate is determined by the transition rates between employment and unemployment. On the other hand, the LFP rate does depend on the unemployment rate and transition rates between unemployment and inactivity. In particular, a lower unemployment rate implies a higher LFP rate, which helps generate the observed negative correlation between the unemployment rate and the LFP rate. The cyclical movements in the transition rates between unemployment and inactivity on the other hand introduce a positive correlation between the unemployment rate and the LFP rate, and thereby dampen the comovement.

4 Conclusion

Many observers of the U.S. labor market perceive the LFP rate to be below its long run trend and the unemployment rate to be above its long run trend. In fact, the low cyclical LFP rate is seen as keeping the cyclical unemployment rate from being even higher, because poor employment prospects have induced discouraged unemployed workers to leave the labor force and have prevented marginally attached inactive participants from a return to job search. In this paper I have documented that direct observations on transition rates between unemployment and out of the labor force are inconsistent with this perception. It turns out that at times of high unemployment, unemployed workers are less likely to exit the labor force and inactive workers are more likely to return to the labor force. This pattern holds not only for the period since the Great Recession, but more generally for most of the post WWII period, and it would have introduced a positive correlation between cyclical movements of the unemployment rate and the LFP rate. Yet we have observed a negative correlation between the two rates. I have shown that the negative comovement is actually induced by movements in the unemployment rate itself, and by a pro-cyclical transition rate from inactivity to employment without an intervening unemployment spell. To summarize, a low cyclical LFP rate simply seems to reflect a high current unemployment rate, rather than to indicate an elevated future unemployment rate.

An altogether different issue is the assessment of the magnitude of the LFP rate's current cyclical deviation from trend. The LFP rate peaked around 2000, after an uninterrupted increase since the mid-1960s, and it has been declining since, with an acceleration of that trend during the Great Recession. Part of the more recent decline in the LFP rate may reflect temporary cyclical effects that will be reversed over time, but a significant part of it reflects demographic change that will persist over time. Current forecasts call for a further decline of the LFP rate over the next ten years, for example, Toossi (2012). Even as the unemployment rate continues to decline, a falling LFP rate will then dampen any increase in employment and corresponding increase in per capita GDP. Thus whereas the increasing trend for the LFP rate contributed to per capita GDP growth before 2000, the declining trend from 2000 will reduce the trend growth rate of per capita GDP. Depending how much the LFP rate is currently below trend, a return to trend might dampen this negative effct for per capita GDP growth in the near term.

References

[1] Abowd, John M., and Arnold Zellner.1985. Estimating Labor-Force Flows. Journal of Business & Economic Statistics 3 (3), 254-283.

[2] Barnichon, Regis, and Andrew Figura. 2010. What Drives Movements in the Unemployment Rate? A Decomposition of the Beveridge Curve. Finance and Economics Discussion Series. Federal Reserve Board. At http://www.federalreserve.gov/pubs/feds/2010/201048/201048pap.pdf

[3] Christiano, Lawrence J., and Terry J. Fitzgerald. 2003. The Band-Pass Filter. International Economic Review 44 (2), 435-465.

[4] Baxter, Marianne; King, Robert G.; Measuring Business Cycles: Approximate Band-Pass Filters for Economic Time Series, Review of Economics and Statistics, November 1999, v. 81, iss. 4, pp. 575-93

[5] Bureau of Labor Statistics. 2012. Labor Force Data Derived from the Current Population Survey. From BLS Handbook of Methods, Chapter 1. http://www.bls.gov/opub/hom/ Version of September 5, 2012.

[6] Current Population Survey (2000). Design and Methodology. Technical Paper 63. www.bls.census.gov/cps/tp/tp63.html

[7] Daly, Mary, Early Elias, Bart Hobijn, and Òscar Jordà. 2013. Will the jobless rate drop take a break? FRBSF Economic Letter 2012-37, December 17, 2012.

[8] Davidson, Paul. 2013. Drop in Labor Particiaption Rate is Distress Signal. USA Today, April 7, 2013. http://www.usatoday.com/story/money/business/2013/04/07/march-labor-force-participation/2057887/

[9] Elsby, Michael W.L., Hobijn, Bart, Şahin, Ayşegül. 2013. On the Importance of the Particiaption Margin for Labor Market Fluctuations. mimeo. http://www.newyorkfed.org/research/economists/sahin/40483_EHS.pdf

[10] Elsby, Michael W.L., Ryan Michaels, and Gary Solon. 2009. The Ins and Outs of Cyclical Unemployment. American Economic Journal: Macroeconomics 1(1): 84-110.

[11] Frazis, Harley, Robison, Edwin L., Evans, Thomas D., and Duff, Martha A. 2005. Estimating Gross Flows Consistent with Stocks in the CPS. Monthly Labor Review September 2005, v. 128, iss. 9, pp. 3-9.

[12] Feng, Shuaizhang, and Yingyao Hu. 2010. Misclassification Errors and the Underestimation of U.S. Unemployment Rates. Johns Hopkins University. mimeo.

[13] Fujita, Shigeru, and Garey Ramey. 2009. The Cyclicality of Separation and Job Finding Rates. International Economic Review 50 (2): 415-30.

[14] Hatzius, Jan. 2012. Still lots of slack in the labor market. US Economics Analyst 12/41. Goldman Sachs Economics Research

[15] Hodrick, Robert J.; Prescott, Edward C.; Postwar U.S. Business Cycles: An Empirical Investigation, Journal of Money, Credit, and Banking, February 1997, v. 29, iss. 1, pp. 1-16

[16] Poterba, James M., and Lawrence H. Summers. 1986. Reporting Errors and Labor Market Dynamics. Econometrica 54 (6), 1319-1338.

[17] Shimer, Robert. 2012. Reassessing the Ins and Outs of Unemployment. Review of Economic Dynamics 15, 127-148.

[18] Tankersley, Jim. 2013. Vanishing Workforce Weighs on Growth. Washington Post, April 6, 2013. http://www.washingtonpost.com/business/economy/vanishing-workforce-weighs-on-growth/2013/04/06/2bc46116-9e20-11e2-9a79-eb5280c81c63_story.html?tid=pm_business_pop

[19] Toossi, Mitra. 2012. Labor Force Projections to 2020: A More Slowly Growing Workforce. Monthly Labor Review Janaury 2012, 43-64. From http://www.bls.gov/opub/mlr/2012/01/art3full.pdf

5 Appendix: Some math

Let $f_{ij,t}$ denote the gross flow between labor market state i in period $t-1$ and state j in period t, with $i, j \in \{E, U, I\}$ Disregarding inflows to and outflows from the working age population, the total number of people in labor market state i at time $t-1$ is

$$s_{i,t-1} = \sum_k f_{ik,t} = \sum_k f_{ki,t-2}. \tag{1}$$

The probability that a participant makes the transition from state i in period $t-1$ to state j in period t is simply

$$p_{ij,t} = f_{ij,t}/s_{i,t-1}. \tag{2}$$

The unemployment rate and LFP rate are

$$u_t = \frac{s_{U,t}}{s_{U,t} + s_{E,t}} \text{ and } l_t = \frac{s_{U,t} + s_{E,t}}{s_{U,t} + s_{E,t} + s_{I,t}}. \tag{3}$$

Conditional on initial values for the stocks, s_{i0}, we can obtain the sequence of future stocks from the sequence of transition probabilities by iterating on the equation

$$s_{i,t} = \sum_j p_{ji,t} s_{j,t-1}. \tag{4}$$

This defines a mapping from the sequence of transition probabilities, p, to the sequence of stocks, s,

$$s = G(p; s_0), \tag{5}$$

conditional on initial stocks s_0. Suppose we have a series for the trend transition probabilities, $p_{ij,t}^T$ then we can use the above mapping to construct the implied trend values for stocks

$$s^T = G\left(p^T; s_0\right), \tag{6}$$

and we calculate the implied trend values for the unemployment rate and LFP rate, u^T and l^T.

In order to evaluate the contribution of a group of transition probabilities to the overall variation of the unemployment rate and LFP rate we simply construct a counterfactual path for the stocks where we keep all but the probabilites of interest at their trend values and set the probabilities of interest to their actual values. For example, in order to evaluate the contribution of variations in the k-th transition probability, we construct the series

$$s_k^{CF} = G\left(p_k, p_{-k}^T; s_0\right). \tag{7}$$

with implied series for the unemployment rate and LFP rate, u_k^{CF} and l_k^{CF}.The contribution of the k-th probability to unemployment rate variations is then defined as $u_k^{CF} - u^T$.

The actual implementation of the procedure in Section 3 is slightly more complicated in that we allow for inflows and outflows to the working age population, and we replace the discrete time month-to-month transition probabilities with a continuous time process as described in Shimer (2012).

Modelling labor market transitions as a continuous time process deals with issues of time aggregation in the data. For example, if the exit rate from unemployment is relatively high, as it is most of the time, our estimates of entry probabilities to unemployment from month to month gross flow data might be biased since we are missing the people that do become reemployed within the month. In fact, the month to month transition probabilities between two particular labor market states, for example, employment and unemployment, will be an amalgam of the continuous time transition rates between all labor market states. The procedure of Shimer (2012) simply provides a way to recover the continuous time transition rates between labor market states that give rise to the observed discrete time transition probabilities.

The continuous time representation of labor market transitions also provides a convenient tool to interpret the role of transitions between unemployment and inactivity for the path of the unemployment rate and the LFP rate. The continuous time analog for the discrete time transition equation for labor market states (4) is given by

$$\begin{aligned} \dot{s}_E &= -(\lambda_{EU} + \lambda_{EI})\, s_E + \lambda_{UE} s_U + \lambda_{IE} s_I \\ \dot{s}_U &= \lambda_{EU} s_E - (\lambda_{UE} + \lambda_{UI})\, s_U + \lambda_{IU} s_I \\ \dot{s}_I &= \lambda_{EI} s_E + \lambda_{UI} s_U - (\lambda_{IE} + \lambda_{IU})\, s_I \\ 1 &= s_E + s_U + s_I \end{aligned} \tag{8}$$

where a dot denotes the time derivative of a variable, λ_{ij} denotes the continuous time transition rate from state i to state j, and we have normalized the size of the working age population to one. For example, on the one hand, employment declines because employed workers make the transition to unemployment at the rate λ_{EU} and exit the labor force at the rate λ_{EI}. On the other hand, employment increases because unemployed workers find employment at the rate λ_{UE} and inactive participants join the labor force and inmmediately find employment at the rate λ_{IE}. Subtracting outflows from inflows yields the net change of employment.

The continuous time representation of the monthly transition probabilities assumes that the transition rates remain fixed for a month. The observed transitions rates between labor market states tend to be sufficiently large such that the steady state of the system (8) for the given monthly transition rates is a good approximation of the actual stock values. The steady state of the system for fixed transition rates is an allocation of the population over labor market states such that inflows and outflows cancel and the stock values do not change, $\dot{s} = 0$. Solving equations (8) for steady state stocks and the implied steady steady state unemployment rate and LFP rate is a bit messy, but it simplifies considerably if we assume that transitions between in and out of the labor force have to proceed through unemployment, that is, $\lambda_{EI} = \lambda_{IE} = 0$. For this case we find that the steady state unemployment rate and

LFP rate are

$$u^* = \frac{\lambda_{EU}}{\lambda_{EU} + \lambda_{UE}} \text{ and } l^* = \left[1 + \frac{\lambda_{UI}}{\lambda_{IU}} u\right]^{-1}$$

For this special case the unemployment rate is independent of transitions between the labor force and inactivity. Similar to a simple two-state model of the labor market that ignores variations in the LFP rate, the unemployment rate is determined by the transition rates between employment and unemployment. On the other hand, the LFP rate does depend on the unemployment rate and transition rates between unemployment and inactivity. In particular, a lower unemployment rate implies a higher LFP rate, which helps generate the observed negative correlation between the unemployment rate and the LFP rate. From Section 2 we have that the transition rates from unemployment to inactivity (inactivity to unemployment) are negatively (positively) correlated with the unemployment rate. This would imply that the LFP rate increases as the unemployment rate increases. Thus the movements in the transition rates between in and out of the labor force alone would yield a counterfactual positive correlation between the unemployment rate and the LFP rate.

6 Tables

Table 1. Cyclicality of Unemployment and Labor Force Participation

Sample	σ_u	σ_l	Corr(u(t), l(t+s)) for s=								
			-4	-3	-2	-1	0	1	2	3	4
Total											
1952Q1 to 2006Q4	0.87	0.28	-0.10	-0.20	-0.30	-0.38	-0.44	-0.50	-0.54	-0.53	-0.46
1952Q1 to 1991Q4	0.93	0.31	-0.09	-0.19	-0.29	-0.37	-0.43	-0.49	-0.53	-0.51	-0.44
1992Q1 to 2006Q4	0.69	0.20	-0.18	-0.25	-0.41	-0.56	-0.61	-0.65	-0.65	-0.66	-0.64
1992Q1 to 2013Q1	0.98	0.33	0.08	-0.07	-0.24	-0.41	-0.53	-0.63	-0.70	-0.75	-0.75
Men											
1952Q1 to 2006Q4	0.98	0.28	-0.04	-0.17	-0.29	-0.37	-0.43	-0.50	-0.53	-0.53	-0.46
1952Q1 to 1991Q4	1.04	0.28	-0.09	-0.22	-0.34	-0.41	-0.46	-0.52	-0.55	-0.53	-0.44
1992Q1 to 2006Q4	0.82	0.25	0.15	0.05	-0.18	-0.41	-0.50	-0.59	-0.66	-0.73	-0.73
1992Q1 to 2013Q1	1.19	0.41	0.07	-0.09	-0.27	-0.45	-0.57	-0.67	-0.73	-0.78	-0.78
Women											
1952Q1 to 2006Q4	0.75	0.36	-0.17	-0.23	-0.29	-0.34	-0.37	-0.42	-0.45	-0.43	-0.37
1952Q1 to 1991Q4	0.81	0.40	-0.13	-0.20	-0.25	-0.32	-0.35	-0.41	-0.45	-0.43	-0.36
1992Q1 to 2006Q4	0.56	0.24	-0.40	-0.44	-0.50	-0.52	-0.48	-0.46	-0.42	-0.36	-0.33
1992Q1 to 2013Q1	0.77	0.32	0.07	-0.04	-0.17	-0.29	-0.39	-0.49	-0.58	-0.63	-0.64

Notes. Standard deviations and cross correlations of detrended unemployment, u, and labor force participation rate, l, for total, men and women. Quarterly averages of monthly data. Trend for each variable is calculated as a Baxter-King band-pass filter with periodicity more than twelve years for data from 1948q1 to 2013q1. Unemployment and labor force participation rate in percent and detrended values are level deviations from trend. Statistics are calculated for the indicated subsamples.

Table 2. Cylicality of Gross Flows

Transition	σ_{ij}	Corr(u(t), l(t+s)) for s=								
		-4	-3	-2	-1	0	1	2	3	4
Total, $\sigma_u = 0.76$										
EU	6.26	0.70	0.82	0.86	0.84	0.79	0.65	0.54	0.43	0.34
UE	4.85	0.42	0.56	0.66	0.72	0.79	0.77	0.70	0.64	0.59
IU	8.23	0.35	0.49	0.61	0.73	0.81	0.80	0.79	0.77	0.71
UI	9.47	0.25	0.42	0.58	0.69	0.80	0.85	0.87	0.84	0.79
IE	4.24	-0.22	-0.33	-0.46	-0.51	-0.58	-0.59	-0.53	-0.48	-0.38
EI	4.00	-0.10	-0.14	-0.25	-0.41	-0.50	-0.62	-0.64	-0.60	-0.50
Men, $\sigma_u = 0.88$										
EU	7.61	0.74	0.84	0.87	0.86	0.80	0.66	0.55	0.44	0.35
UE	6.54	0.48	0.60	0.69	0.76	0.82	0.82	0.76	0.67	0.59
IU	9.60	0.40	0.50	0.62	0.73	0.83	0.80	0.77	0.74	0.70
UI	10.83	0.26	0.44	0.59	0.67	0.77	0.81	0.82	0.79	0.77
IE	4.49	-0.26	-0.36	-0.44	-0.48	-0.51	-0.52	-0.46	-0.38	-0.30
EI	3.97	-0.13	-0.07	-0.11	-0.20	-0.27	-0.42	-0.44	-0.46	-0.42
Women, $\sigma_u = 0.63$										
EU	5.66	0.35	0.53	0.62	0.61	0.62	0.49	0.40	0.32	0.27
UE	4.69	0.03	0.14	0.21	0.27	0.37	0.34	0.33	0.37	0.37
IU	7.74	0.25	0.40	0.53	0.65	0.76	0.72	0.71	0.70	0.62
UI	8.73	0.22	0.37	0.53	0.69	0.80	0.86	0.86	0.82	0.75
IE	4.67	-0.15	-0.26	-0.40	-0.41	-0.55	-0.55	-0.49	-0.48	-0.36
EI	4.76	-0.08	-0.17	-0.28	-0.46	-0.55	-0.63	-0.63	-0.56	-0.46

Notes. Standard deviations and cross correlations of detrended unemployment, u, and gross flows from labor market states A to B, f_{AB}, with labor market states being employed

(E), unemployed (U), and out-of-the-labor-force/inactive (I). Data are quarterly averages of monthly data. Trend for each variable is calculated as a Baxter-King band-pass filter with periodicity more than twelve years for data from 1990q1 to 2013q1. Unemployment in percent and detrended unemployment is the absolute deviation from trend, and detrended gross flows are the percentage deviations from trend. Statistics are calculated for the sub sample 1992q1 to 2007q4.

Table 3. Cyclicality of Transition Probabilities

Transition	σ_{ij}	Corr(u(t), l(t+s)) for s=								
		-4	-3	-2	-1	0	1	2	3	4
						Total, $\sigma_u = 0.76$				
EU	0.10	0.70	0.83	0.88	0.88	0.85	0.72	0.62	0.51	0.42
UE	2.35	-0.48	-0.64	-0.78	-0.89	-0.95	-0.94	-0.88	-0.78	-0.65
IU	0.21	0.36	0.49	0.61	0.71	0.79	0.78	0.77	0.75	0.70
UI	1.39	-0.59	-0.68	-0.75	-0.79	-0.77	-0.68	-0.55	-0.36	-0.16
IE	0.21	-0.24	-0.35	-0.50	-0.57	-0.65	-0.66	-0.60	-0.55	-0.45
EI	0.09	-0.02	-0.02	-0.10	-0.24	-0.32	-0.45	-0.48	-0.45	-0.36
						Men, $\sigma_u = 0.88$				
EU	0.13	0.73	0.85	0.89	0.90	0.86	0.73	0.63	0.53	0.43
UE	2.54	-0.46	-0.62	-0.76	-0.86	-0.92	-0.91	-0.85	-0.77	-0.65
IU	0.30	0.47	0.56	0.66	0.76	0.84	0.79	0.76	0.72	0.68
UI	1.47	-0.54	-0.62	-0.70	-0.77	-0.77	-0.71	-0.59	-0.41	-0.17
IE	0.27	-0.20	-0.33	-0.45	-0.53	-0.58	-0.62	-0.58	-0.50	-0.43
EI	0.07	-0.03	0.08	0.09	0.03	-0.00	-0.16	-0.19	-0.23	-0.20
						Women, $\sigma_u = 0.63$				
EU	0.07	0.39	0.57	0.67	0.68	0.70	0.57	0.48	0.40	0.34
UE	2.31	-0.50	-0.62	-0.77	-0.86	-0.91	-0.90	-0.84	-0.73	-0.59
IU	0.18	0.21	0.35	0.48	0.60	0.71	0.68	0.69	0.68	0.61
UI	1.30	-0.54	-0.62	-0.68	-0.68	-0.66	-0.53	-0.40	-0.22	-0.08
IE	0.21	-0.21	-0.32	-0.46	-0.48	-0.61	-0.60	-0.53	-0.51	-0.39
EI	0.14	-0.03	-0.08	-0.18	-0.34	-0.43	-0.53	-0.54	-0.47	-0.36

Notes. Standard deviations and cross-correlations of detrended unemployment rate, u, and transition probabilities from labor market i to j, p_{ij}, with labor market states being employed

(E), unemployed (U), and out-of-the-labor-force/inactive (I). Quarterly averages of monthly data. Trend for each variable is calculated as a Baxter and King (1999) band-pass filter with periodicity of more than twelve years for data from 1990q1 to 2013q1. Unemployment rate and transition probabilities in percent and detrended values are the absolute deviations from trend. Statistics are calculated for the subsample 1992q1 to 2007q4.

Table 4. Crosscorrelations between Unemployment Rate and LFP Rate for Counterfactuals, Deviations from Trend, 1990q1-2013q1

Counterfactual	Corr(u(t), l(t+s)) for s=								
	-4	-3	-2	-1	0	1	2	3	4
UE and EU	-0.39	-0.55	-0.69	-0.81	-0.91	-0.97	-0.99	-0.97	-0.93
IU and UI	0.28	0.45	0.60	0.74	0.87	0.94	0.96	0.95	0.90
UE,EU,UI and IU	0.27	0.26	0.25	0.20	0.13	0.02	-0.12	-0.25	-0.38
IE and EI	-0.74	-0.83	-0.90	-0.96	-1.00	-0.95	-0.91	-0.87	-0.83

Notes. Cross-correlations of counterfactual trend deviations for the unemployment rate, u, and the labor force participation rate, l. For a counterfactual all monthly transition rates, except for the ones listed in the counterfactual column are kept at their trend values. Quarterly averages of counterfactual monthly time series. Detrended unemployment rate and LFP rate are level deviations from trend.

7 Figures

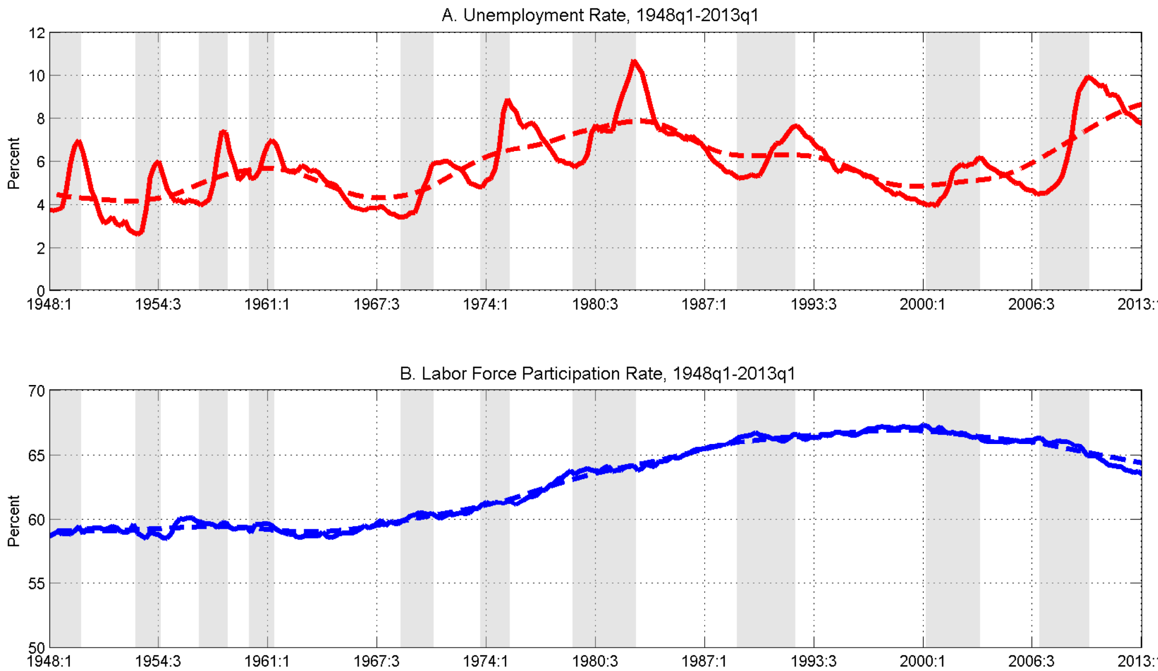

Figure 1. Unemployment and Labor Force Participation, 1948-2013

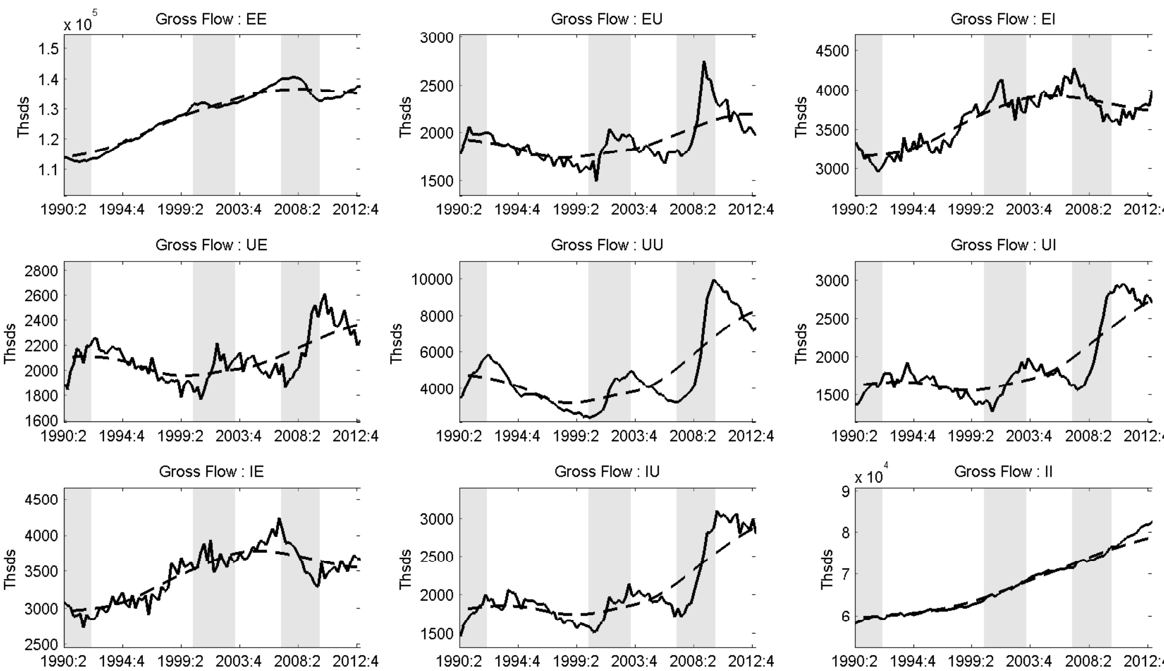

Figure 2. Gross Flows Between Labor Market States, 1990q2-2013q1

Note: Panel AB denotes the gross flows from labor market state A to labor market state B. Quarterly averages of monthly values. Dashed lines are Baxter-King BP filter series with periodicity more than twelve years. Shaded (white) areas are periods when unemployment rate is increasing (declining).

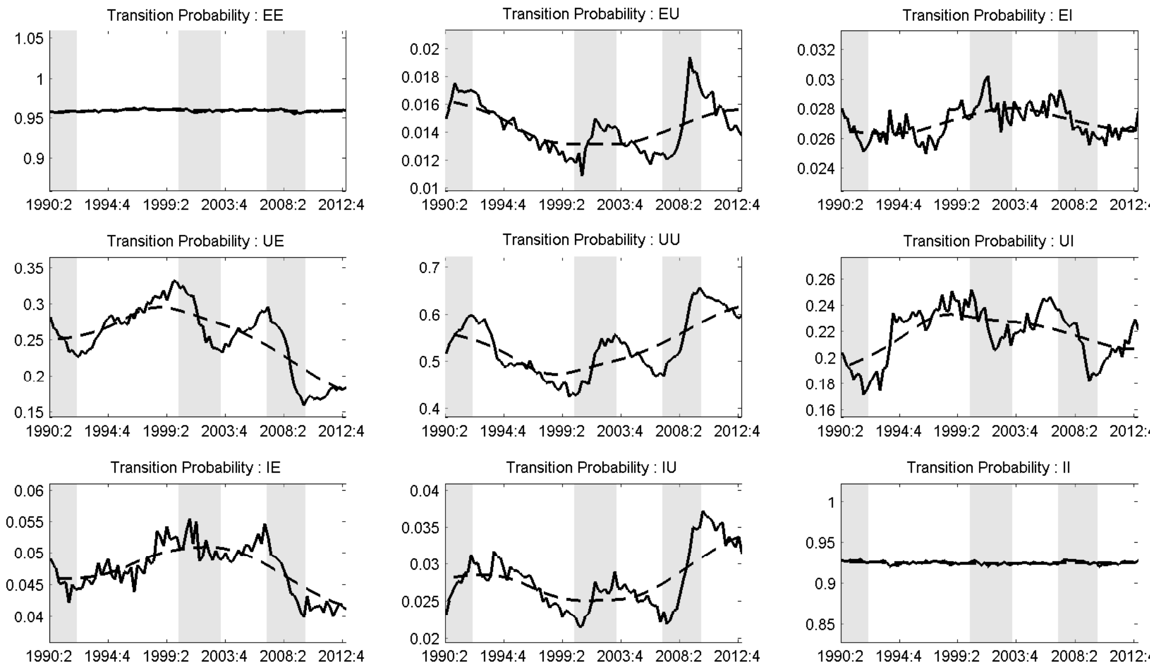

Figure 3. Transition Probabilities between Labor Market States, 1990q2-2013q1

Note: Panel AB denotes the probability of making the transition from labor market state A to labor market state B. Quarterly averages of monthly values. Dashed lines are Baxter-King BP filter series with periodicity more than twelve years. Shaded (white) areas are periods when unemployment rate is increasing (declining)

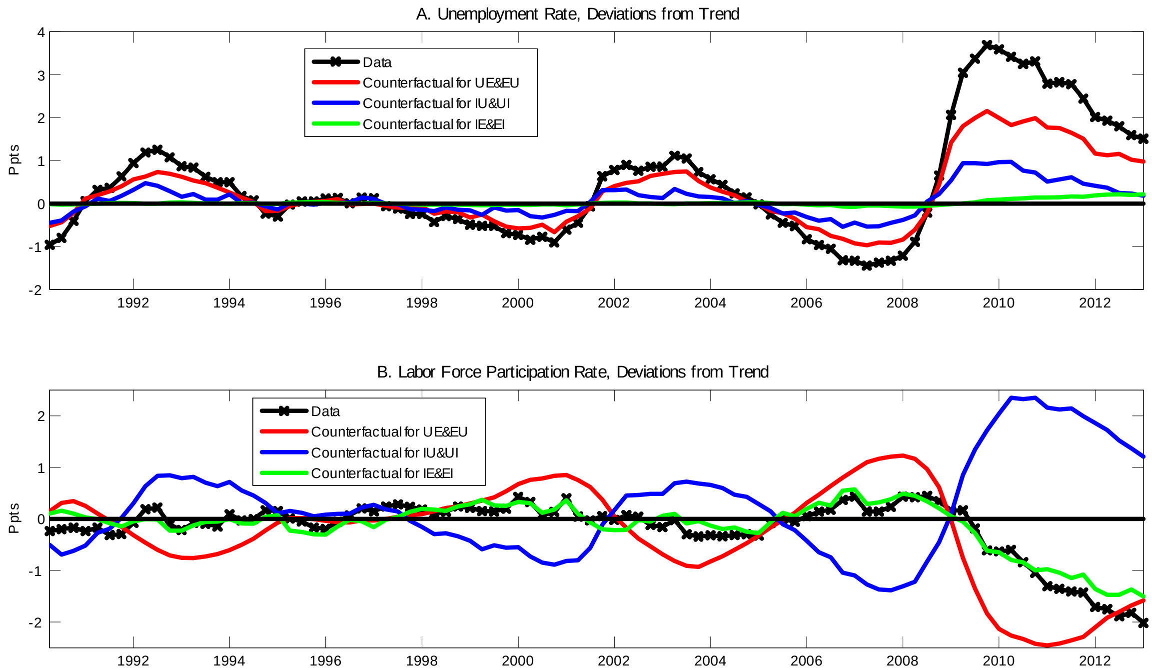

Figure 4. Counterfactuals for Unemployment Rate and LFP Rate