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# Accounting for Unemployment in the Great Recession: Nonparticipation Matters\*

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## Abstract

We conduct an accounting exercise of the role of worker flows between unemployment, employment, and labor force nonparticipation in the dynamics of the aggregate unemployment rate across four recent recessions: 1982–1983, 1990–1991, 2001, and 2007–2009 (the “Great Recession”). We show that, whereas during earlier recessions it was sufficient to examine the flows between employment and unemployment to account for the dynamics of the unemployment rate, this was not true in the Great Recession. The increased importance of the flows between nonparticipation and unemployment is documented across all age and gender groups.

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# 1 Introduction

From the second quarter of 2007 to the fourth quarter of 2009, the aggregate unemployment rate in the U.S. increased from 4.5% to 10.1%. In the fourth quarter of 2011, eight quarters after its peak, the aggregate unemployment rate was still at 8.7%. Such a rapid increase and subsequent persistence of the elevated unemployment rate place it at the forefront of research and policy discussions.

The U.S. labor market is characterized by substantial worker flows between employment, unemployment, and out-of-labor force (hereafter, nonparticipation). These flows define the changes in the stocks of the unemployed and employed, and, as a result, the unemployment rate. Research that studies the behavior of unemployment by examining gross worker flows has typically focused on two labor force statuses: employment and unemployment.<sup>1</sup> We argue that adding a third status, nonparticipation, allows for a better account of worker behavior.

In this paper, we conduct an accounting exercise of the role of worker flows between unemployment, employment, and labor force nonparticipation in the dynamics of the aggregate unemployment rate across four recent recessions: 1982–1983, 1990–1991, 2001, and 2007–2009. We show that, whereas it is sufficient to examine the flows between employment and unemployment to understand the dynamics of the unemployment rate during earlier recessions, the flows between nonparticipation and unemployment matter for the dynamics of the unemployment rate in the Great Recession. We also separately examine unemployment rates by age and gender.

We use micro data from the Current Population Survey to construct six transition rates: employment to unemployment, unemployment to employment, nonparticipation to employment, employment to nonparticipation, unemployment to nonparticipation, and nonparticipation to unemployment. Then we employ the inflow-outflow model of unemployment to analyze the changes in the aggregate unemployment rate.

Our results suggest that the flows between nonparticipation and unemployment play a larger role in driving the changes in the aggregate unemployment rate during the 2007–2009 recession. We find that during earlier recessions, flows between nonparticipation and the labor force have a noticeable but economically small impact on the dynamics of the aggregate unemployment rate. In contrast, during the 2007–2009 recession these flows matter. In particular, for each recessionary episode we construct the counterfactual unemployment rate consistent with constant transition rates in and out of nonparticipation. We find that

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<sup>1</sup>See seminal work by Darby, Haltiwanger, and Plant (1997), Fujita and Ramey (2009), Elsby, Michaels, and Solon (2009), and Shimer (2012).

in the 2007–2009 recession, had flows in and out of nonparticipation remained constant, the aggregate unemployment rate would have increased by 3 percentage points, while the actual unemployment rate increased by 5.5 percentage points. The flows to and from nonparticipation also accounted for a substantial part of the persistence of unemployment during the recovery. Two years after the 2009 unemployment peak, the counterfactual aggregate unemployment rate would have been 2 percentage points higher than at the start of the rise in unemployment, while the actual unemployment rate is 4 percentage points higher. In contrast, in the 1981–1982 recession, the counterfactual aggregate unemployment rate increases by 2.5 percentage points, while the actual unemployment rate increased by 3.75 percentage points. Two years after the 1982 unemployment peak, the counterfactual aggregate unemployment rate and the actual unemployment rate were equal to the rate at the start of the rise in unemployment.<sup>2</sup>

Our accounting exercise attributes the discrepancy between the actual and the counterfactual unemployment rates to a larger than usual increase in the transition rate into unemployment from nonparticipation during 2007-2009 and to a lower than usual transition rate from unemployment to nonparticipation in the recovery phase, defined as the two years after the 2009 unemployment peak. Transition rates into unemployment, both from employment and nonparticipation, typically increase during recessions and decrease during recoveries. The opposite is true for the transition rates out of unemployment. During the 2007-2009 unemployment rise, the transition rate from nonparticipation to unemployment increased by 50%, compared to an increase of 11% during the 1981-1982 episode. Eight quarters after the 2009 unemployment peak, the transition rate out of unemployment to nonparticipation increased only by 12%, compared to an increase of 34% during the 1981-1982 episode.

We proceed to examine the unemployment rates and transition rates by age and gender. Comparing the 2007-2009 recession to the earlier periods, we find that the increase in the aggregate unemployment rate is larger for all age and gender groups. Overall, the patterns of relative changes in the unemployment rates across different demographic groups are consistent with the patterns observed during the earlier recessions. In particular, the unemployment rate increased relatively more for men than for women. However, the recovery for women was much slower than in the previous recessions. Examining the contribution of different transition rates, we find that the aggregate patterns described above are pervasive, with the transition rates between nonparticipation and unemployment playing an important role in determining unemployment in the 2007-2009 recession across all demographic groups.

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<sup>2</sup>The unemployment rate is a nonlinear function of the six transition rates. Thus, our work shares the same criticism as some other works (for example, Shimer (2012)) that the values of the counterfactual depend on the values at which we fix the transition rates.

What accounts for the increased role of transition rates between nonparticipation and unemployment during the Great Recession and afterward? One interpretation could be that the reported changes reflect actual changes in the economic environment that contributed to a shift in the incentives of looking for work compared to dropping out of the labor force. For example, the relatively large drop in household wealth due to the stock market crash and the devaluation of housing wealth that took place during 2007-2009 could have contributed to an unusually large increase in the proportion of workers moving from out of the labor force into unemployment. A second change in the environment was the extension of unemployment benefits during the Great Recession, which increased the incentive for workers to keep searching in order to retain the benefits, thus contributing to an unusually low transition rate from unemployment to nonparticipation after the 2009 unemployment peak.

This paper is related to the growing literature that studies the changes in the unemployment rate using gross flow data. Among the notable works are Fujita and Ramey (2009), Elsby, Michaels and Solon (2009) and Shimer (2012). The literature mostly focuses on understanding the importance of the roles of the transitions into and out of unemployment. Our work brings attention to the importance of the transitions between unemployment and nonparticipation in accounting for changes in the aggregate unemployment rate. The paper is related to recent works that explicitly consider transitions between nonparticipation and unemployment: the empirical papers include Petrongolo and Pissarides (2008), Elsby, Smith, and Wadsworth (2011), Smith (2011), and Gomes (2012) for UK data, and Barnichon and Figura (2012) for U.S. data; the theoretical contributions are Veracietro (2008) and Krusell, Mukoyama, Rogerson, and Şahin (2012).

One important issue that we leave aside is the role of measurement error in employment status. Earlier research by Abowd and Zellner (1985) and Poterba and Summers (1986) argue that in any given month, a significant number of unemployed in the CPS data are misclassified as nonparticipants. If true, this would introduce spurious transitions into employment state data; the more people who are unemployed, the greater the measurement problem. To understand to what extent the misclassification error has contributed to the reported increased role of the transitions between nonparticipation and unemployment to the changes in the aggregate unemployment rate, it is desirable to explore whether data on flows between nonparticipation and unemployment are more prone to misclassification error during periods that are characterized by a high unemployment rate and a large share of long-term unemployed as was the case in 2009-2011.<sup>3</sup>

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<sup>3</sup>Preliminary results by Hornstein (2012) find that if classification errors are constant over time and have the same structure as found by Pobera and Summers (1986), then the role of flows in and out of nonparticipation in accounting for unemployment in the Great Recession are in fact less than what we find.

The rest of the paper is organized as follows. Section 2 describes the data. Section 3 compares the behavior of the unemployment rate and transition rates during the Great Recession to their behavior during earlier recessions. Section 4 presents the unemployment accounting exercise, and Section 5 concludes.

## 2 Data

The data in the analysis come from the Current Population Survey (CPS) and cover the period from January 1976 to December 2011.<sup>4</sup> The CPS is a rotating panel of approximately 60,000 households. The households are interviewed for the same four consecutive months of a year for two consecutive years. We match the records of individuals across two consecutive interview months using information on the month of interview, household identification number, and the number of the household at the address. To eliminate incorrect matches, we use the procedure described in Shimer (2012).

We use the CPS labor status classification to classify each member of the civilian non-institutionalized population of age 16 or older as employed ( $E$ ), unemployed ( $U$ ) or out of the labor force ( $I$ ). The distinction between unemployment and nonparticipation hinges on whether the individual is considered to be actively seeking employment. Under the definition used by the Bureau of Labor Statistics, a jobless adult (16 years and older) is unemployed in a given week if he or she was available for work and “made specific efforts to find employment” during that week or in the preceding three weeks. Otherwise, a jobless adult is considered a nonparticipant; some examples include students, stay-at-home parents, and those who have stopped actively searching for a job.

Using monthly matched records, we first construct monthly gross flows  $AB_t$ , where  $A, B \in \{E, U, I\}$ . The gross flow  $AB_t$  is the number of individuals who in month  $t$  are in state  $A$  and in month  $t + 1$  are in state  $B$ . Following Shimer (2012), each individual is weighted by the simple average of the CPS sample weights in  $t$  and  $t + 1$ . Second, we construct monthly transition flow rates,  $n_t^{AB}$ , using gross flows between  $t$  and  $t + 1$  and stocks in  $t$ :

$$n_t^{AB} = \frac{AB_{t+1}}{A_t}. \quad (1)$$

The stocks of  $E$ ,  $U$  and  $I$  calculated from the matched flows data do not necessarily coincide with the stocks data published by the CPS. Sample attrition and the address-based structure of the CPS result in approximately 90-92% of individual records being matched. In the paper we employ the "missing at random" correction to adjust for measurement error, whereby the

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<sup>4</sup>December 2011 was the latest data point available at the time of research.

transitions are reweighted to match the population distribution (see, for example, Shimer (2012)).<sup>5</sup>

We follow Shimer’s (2012) procedure to seasonally adjust the series and correct the monthly transition rates for aggregation. Shimer treats the flow transition rates in equation (1) as elements of a discrete time transition matrix,  $n_t$ . To obtain instantaneous transition rates, he constructs an instantaneous transition matrix  $\lambda_t$ , where (provided that  $n_t$  has distinct, real and positive eigenvalues)  $\lambda_t = p_t \tilde{\mu}_t p_t^{-1}$ ,  $\tilde{\mu}_t$  is a diagonal matrix with diagonal elements equal to the natural logarithm of the eigenvalues of  $n_t$ , and  $p_t$  is the matrix of eigenvectors of  $n_t$ . Thus, all transition rates that we report throughout this article are corrected for aggregation. Finally, we convert the monthly series into quarterly series by simple averaging.

## 3 Unemployment Rate and Worker Transitions during the Great Recession

### 3.1 Unemployment Rate

Table 1 reports the change in the unemployment rate during the four recent recessions and the subsequent recoveries, defined as the two years following the unemployment peak. We report the changes for the total population, and by gender and age. The increase in the unemployment rate during 2007-2009 is the largest that took place during the last four recessions. From the second quarter of 2007 to the fourth quarter of 2009 the aggregate unemployment rate increased by 5.5 percentage points, from 4.5% to 10%. In contrast, during the 1981-1982 recession, when unemployment reached its highest postwar rate of 10.9%, the total increase amounted to 3.5 percentage points, up from 7.4% in the third quarter of 1981.

The patterns of the increase in the unemployment rates for different age and gender groups during the 2007-2009 recession closely resemble the patterns during earlier recessions. The absolute increase in the unemployment rate during recessions is typically larger for younger workers, and the unemployment rate increases much more for males than for females. In particular, during the 2007-2009 recession the unemployment rate among young workers rose by 8.6 percentage points, from 10.4% to 19%, while among the 25-54-year-old workers, the unemployment rate rose by 5.4 percentage points, from 3.7% to 9.1%. From 2007 to

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<sup>5</sup>Abowd and Zellner (1985) suggest a procedure that is based on constructing weights that minimize the distance between stocks computed from flows and stocks directly calculated from the CPS. Fujita and Ramey (2006) allow these weights to differ over the sample period.

2009, the unemployment rate for males increased by 6.6 percentage points, compared to 4.3 percentage points for females.

Table 1 also shows the change in the unemployment rate during the two years after the aggregate unemployment rate reached its peak in each recession episode, which we will refer to as the recovery phase. From its 2009 peak, the aggregate unemployment rate declined by 1.3 percentage points. Such a decline is comparable to the declines after the 1990-1991 and 2001 unemployment rate peaks; however, it is smaller than the 3.5 percentage point decline over the same time frame in the aftermath of the 1981-1982 recession.

During the first recovery phase, the unemployment rate typically declines most steeply for younger workers, and the unemployment rate for males usually drops by a larger amount than the rate for females. This is also the case in the aftermath of the 2007-2009 recession. However, the gender difference was particularly marked in the recovery of the 2007-2009 recession. While the unemployment rate for men fell by 2.1 percentage points, that of women hardly declined (by 0.3 percentage points). In contrast, in the aftermath of the 1981-1982 recession, the unemployment rate for men fell by 3.9 percentage points, compared to a 3 percentage points fall of the unemployment rate for women.

### **3.2 Transition Rates**

In this subsection we describe the behavior of the six transition rates: from employment to unemployment (EU), from unemployment to employment (UE), from unemployment to nonparticipation (UI), from nonparticipation to unemployment (IU), from nonparticipation to employment (IE), and from employment to nonparticipation (EI). First, we show that, as compared to the transition rates between employment and unemployment, the transition rates between nonparticipation and either employment or unemployment are substantial, both in their magnitude and volatility. Second, we describe the behavior of all six rates around the last four recessions.

Figure 1 shows six aggregate transition rates, and Table 2 contains the average transition rates for the economy on aggregate, by gender, and by age. The transition rates between nonparticipation and labor force are large. In particular, the nonparticipation-to-unemployment and unemployment-to-nonparticipation transition rates are almost as large (and for some demographic groups even larger) than the employment-to-unemployment and unemployment-to-employment transition rates.

For example, on average, the aggregate nonparticipation-to-unemployment transition rate is higher (3.6%) than the aggregate employment-to-unemployment transition rate (2%), i.e., on average a worker out of the labor force is more likely to transition into unemployment



than an employed worker. This holds true for the economy in aggregate and for all gender-age groups. The same is true on aggregate (but not necessarily for each individual group) in the opposite direction. A worker has a higher probability of transitioning from employment to nonparticipation (4.3%) than from employment to unemployment (2%). The transition rates between nonparticipation and labor force are particularly large for young workers.

We can decompose each transition rate into its trend and cyclical components by taking the natural logarithm of the series and then filtering the series using an HP-filter with a smoothing parameter  $10^5$ . The cyclical component of the series is defined as the deviations of the logged series from the HP-filtered trend. Table 3 contains the standard deviations of the cyclical components of the six transition rates. The cyclical components of the transition rates between nonparticipation and labor force are almost as volatile as the cyclical components of the transition rates between employment and unemployment. In particular, during 1976-2011, the standard deviation of the cyclical component of the employment-to-unemployment rate is 8.3%, and the standard the deviation of the unemployment-to-employment rate is 14.9%. For comparison, the standard deviation of the cyclical component of the nonparticipation-to-unemployment rate is 8.3%, and the standard the deviation of the unemployment-to-nonparticipation rate is 11%. Also, note that the cyclical component of each of the six transition rates is more volatile for older than for younger workers.

The summary statistics in Tables 2-3 show that studying the behavior of transition rates between nonparticipation and participation in the labor force is important for understanding of the functioning of the labor market. We proceed to examining the behavior of each rate around recessions.

### **3.2.1 Transition Rates around Recessions**

Tables 4 - 9 contain changes for each of the six transition rates around the last four recessions.

We start by discussing the inflows to unemployment. Unemployed workers are either workers who were previously employed, or adults who were out of the labor force and decided to look for a job. The transition rate into unemployment from employment (the rate of job loss) increases during economic contractions and decreases during recoveries. Likewise, the transition rate into unemployment from nonparticipation (workers joining the labor force) also increases during economic contractions and decreases during recoveries.

Table 4 shows that during the 2007-2009 recession, the employment-to-unemployment rate increased by 30.7%, while during the 1981-1982 episode it increased by 20.2%. There are some more notable differences in the increase by demographic groups. The largest increase in the employment-to-unemployment rate in the 2007-2009 recession was for 25-54-year-

old workers, while during earlier recessions the largest increase in the rate was for 55-64-year-old workers. The employment-to-unemployment rate is usually less cyclical for women than for men. However, in the 2007-2009 recession it increased disproportionately more for men (by 48%) than for women (by 9.6%). Two years after the 2009 unemployment peak, the employment-to-unemployment rate declined by 12.6%, with almost all of the decline attributable to prime-working-age and older men. Notably, during the 2007-2009 recovery the employment-to-unemployment rate for younger workers actually increased, especially for young women.

While the increase in the aggregate employment-to-unemployment rate during the 2007-2009 recession was comparable to the increases during earlier recessions, the increase in the aggregate nonparticipation-to-unemployment rate was unprecedentedly large. Table 5 shows that the aggregate nonparticipation-to-unemployment rate increased by 49.6%, while during the 1981-1982 recession it increased by 10.5%. The increase for the prime-working-age and young workers was particularly large. The increase in the rate for the 55-64-year-old workers, while much larger than in the 1981-82 episode, was comparable to the increase for this age group in the 1990-1991 and 2001 recessions. Also, the increase in the nonparticipation-to-unemployment rate was heavily concentrated among men. In the recovery phase from the 2007-2009 recession, the nonparticipation-to-unemployment rate declined by 7.2%, which was mostly driven by the decline in the rate for young and prime-working-age men. There was no decline in the nonparticipation-to-unemployment rate during this period for prime-working-age women.

We now turn to transitions out of unemployment, as unemployed workers either find jobs or drop out of the labor force. Again, there is co-movement in the two rates, with both the transition rates from unemployment to employment (job finding) and to nonparticipation (out of labor force) decrease during economic contractions and increase during recoveries. Table 6 shows that during the 2007-2009 recession, the unemployment-to-employment rate decreased by 46.0%, while during the 1981-1982 recession it decreased by 28.3%. During the 2007-2009 recession, the aggregate unemployment-to-employment rate reached its lowest level since 1976. In the subsequent recovery, the UE rate increased slowly, by 13.9%, compared to the increase of 32.4% two years after the 1981-1982 peak. The recovery from the 2007-2009 recession followed the jobless pattern of the previous two recessions. It has been particularly jobless for prime-working-age women. In contrast, women had as strong of a recovery in the unemployment-to-employment rate as men in the earlier recessions.

Up until the 2007-2009 recession, unemployed workers were more likely to find a job than to drop out of the labor force, with the aggregate unemployment-to-employment rate exceeding the aggregate unemployment-to-nonparticipation rate, a fact reflected in the sample

average (Table 2). After the fourth quarter of 2008, this relationship is reversed, with unemployed workers being more likely to drop out of the labor force than to find a job (Figure 1). However, this is not because workers were relatively more likely than usual to drop out of the labor force, in fact the opposite is true. After the 2009 unemployment peak, both rates were depressed. Table 7 shows that in the recovery phase, the transition rate from unemployment to nonparticipation failed to pick up compared to the earlier recession episodes. In particular, after the 2007-2009 unemployment peak, the UI rate increased by 11.5%, while it increased by 34.2% two years after the 1981-1982 peak. Compared to the post 1981-1982 recovery, the unemployment-to-nonparticipation rate is particularly depressed among prime-working-age men (an increase of only a 18.5% compared to 72.5% after the 1981-1982 recession), 16-24-year-old men (an increase of only a 2.6% compared to 47.4% after the 1981-1982 recession), and 55-64-year-old women (an increase of only a 0.7% compared to 35.8% after the 1981-1982 recession).

Lastly, we report the transition rates between nonparticipation and employment. Table 8 shows that during the 2007-2009 recession, the nonparticipation-to-employment rate decreased at a rate comparable to the decrease during the 1981-1982 recession. However, two years after the 2007-2009 unemployment peak, the IE rate increased by 0.2%, while it increased by 13.4% two years after the 1981-1982 peak. The transitions are particularly depressed among the prime-working-age group: two years into the recovery the IE rate for the prime-working-age group actually decreased by 8.8%, while after the 1981-1982 recession it increased by 16.4%. Table 9 shows that the behavior of the employment-to-nonparticipation transition rate in the 2007-2009 recession is similar to its behavior in the earlier recessions.

Summarizing, the data indicate that, compared to previous recessions, the 2007-2009 recession is characterized by a particularly large increase in the unemployment rate and by a particularly slow decline in the unemployment rate from its peak. The employment-to-unemployment transition rate increased by a larger percentage than in the earlier recessions, and the burden of the increase was on 25-54-year-old workers compared to the 55-64-year-old workers, as was the case in earlier recessions. In the opposite direction, the unemployment-to-employment transition rate decreased by a larger percentage than in the earlier recessions and the decline was widespread. In comparison, the changes in the transition rates between nonparticipation and labor force during the 2007-2009 recession have been particularly striking. First, the nonparticipation-to-unemployment transition rate increased by a much larger percent than during earlier recessions. Second, the unemployment-to-nonparticipation transition rate did not pick up after the 2009 unemployment peak as fast as after earlier recessions.

## 4 Contribution of Worker Flows to Changes in Unemployment

### 4.1 Inflow-Outflow Model of Unemployment

The inflow-outflow model of unemployment allows linking changes in the unemployment rate to changes in the transition rates between unemployment, employment, and nonparticipation. In this section we summarize the model presented in Fujita and Ramey (2009), Elsby, Michaels and Solon (2009), and Shimer (2012), among others.

Consider an economy populated by a continuum of individuals. Each individual can be employed, unemployed, or out of labor force. Time is continuous. The transitions between two states  $A$  and  $B$  are governed by a Poisson process with Poisson transition rate  $\lambda^{AB}$ , where  $A, B = \{E, U, I; A \neq B\}$ . An econometrician observes the economy at discrete time intervals  $t = \{0, 1, 2, \dots\}$ . Assume that the Poisson transition rates between  $A$  and  $B$  are constant between  $t - 1$  and  $t$  and equal to  $\lambda_t^{AB}$ .

In this economy the law of motions for unemployment and employment, respectively, are

$$\frac{dU_t}{U_t} = \lambda_t^{EU} E_t + \lambda_t^{IU} I_t - (\lambda_t^{UE} + \lambda_t^{UI}) U_t. \quad (2)$$

$$\frac{dE_t}{E_t} = \lambda_t^{UE} U_t + \lambda_t^{IE} I_t - (\lambda_t^{EU} + \lambda_t^{EI}) E_t. \quad (3)$$

Shimer (2012) and Petrongolo and Pissarides (2008), among others, note that because the transition rates are large, the unemployment rate converges to its steady state within a period. Thus, we can approximate changes in the actual unemployment rate with changes in its steady state values. In steady state, set  $\frac{dU_t}{U_t} = \frac{dE_t}{E_t} = 0$  and rearrange (2) and (3) to obtain steady state values,  $\overline{U}_t$  and  $\overline{E}_t$ , i.e.,

$$\overline{U}_t = I_t \frac{\lambda_t^{IU} + \lambda_t^{IE} \frac{\lambda_t^{EU}}{\lambda_t^{EU} + \lambda_t^{EI}}}{\lambda_t^{UI} + \lambda_t^{UE} \frac{\lambda_t^{EI}}{\lambda_t^{EU} + \lambda_t^{EI}}}. \quad (4)$$

$$\overline{E}_t = I_t \frac{\lambda_t^{IE} + \lambda_t^{IU} \frac{\lambda_t^{UE}}{\lambda_t^{UE} + \lambda_t^{UI}}}{\lambda_t^{EI} + \lambda_t^{EU} \frac{\lambda_t^{UI}}{\lambda_t^{UE} + \lambda_t^{UI}}}. \quad (5)$$

Using (2) and (3) yields the following expression for the steady state unemployment rate,  $\overline{u}_t \equiv \frac{\overline{U}_t}{\overline{U}_t + \overline{E}_t}$ :

$$\overline{u}_t = \frac{\lambda_t^{EU} \lambda_t^{IU} + \lambda_t^{EU} \lambda_t^{IE} + \lambda_t^{EI} \lambda_t^{IU}}{\lambda_t^{EU} \lambda_t^{IU} + \lambda_t^{EU} \lambda_t^{IE} + \lambda_t^{EI} \lambda_t^{IU} + \lambda_t^{UE} \lambda_t^{IU} + \lambda_t^{UE} \lambda_t^{IE} + \lambda_t^{UI} \lambda_t^{IE}}. \quad (6)$$

## 4.2 Unemployment Accounting

Equation (6) is the key equation in accounting for the dynamics of the unemployment rate. To calculate the contributions of the different transition rates to changes in the unemployment rate, we use (6) and construct counterfactual unemployment rates. For example, to estimate how much of the change in the unemployment rate can be associated with the change in the employment-to-unemployment transition rate, we generate an unemployment rate in equation (6) by using the actual values of the employment-to-unemployment transition rate while holding the remaining five transition rates constant.<sup>6</sup> Such an exercise is similar to the exercises performed Pissarides (1986) and Shimer (2012).

The main focus of our analysis is on the contribution of the transitions between non-participation and labor force to changes in the unemployment rate. To gauge the effect of these transitions, we first construct the counterfactual unemployment rate driven only by the changes in the transition rates between employment and unemployment,  $\overline{u}_t^{EU,UE}$ , and examine how much of the changes in the actual unemployment rate can be attributed to the changes in this counterfactual rate.

Our main result is shown in Figure 2. The broken lines in the figure show the change in the aggregate unemployment rate for each of the four most recent recessions, measured against the quarter when the unemployment rate began its rise. Each line continues until eight quarters after the unemployment peak.<sup>7</sup> The solid lines show counterfactual unemployment rates in which the contributions of transitions into and out of nonparticipation are held constant at their levels at the beginning of the rise in the aggregate unemployment rate.

All four recessions begin with a period in which the aggregate unemployment rate and the counterfactual unemployment rate generally track each another closely, except for the period close to the peak of the actual unemployment rate. For the 2007-2009 recession, however, starting in 2009, the gap between the actual and counterfactual unemployment rates quickly climbs to 50 percent of the change in the actual rate. Eight quarters into recovery after the 2007-2009 recession, the gap is still 50 percent, while in the previous recessions, it was almost nonexistent.

The gap between the two lines in Figure 2 represents the change in the aggregate unemployment rate not accounted for by the transitions between unemployment and employment. These results show that up to the 2001 recession, it was possible to account for almost the entire change in the unemployment rate without accounting for the transitions between non-

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<sup>6</sup>Note that the unemployment rate in equation (6) is a non-linear function of the transition rates. Hence, the change in the counterfactual unemployment rate depends both on the change in the transition rate that is being varied and on the values at which the remaining transition rates are fixed.

<sup>7</sup>The start and end dates thus differ slightly from NBER-determined recession dates.

participation and labor force. This was no longer true in the 2007-2009 recession. In the 2007–2009 recession, the transitions between employment and unemployment would have implied an unemployment rate increase of 3 percentage points, while the actual unemployment rate increase was 5.5 percentage points. Two years after the 2009 unemployment peak, the transitions between employment and unemployment would have implied the unemployment rate 2 percentage points higher than at the start of the unemployment rise, while the actual unemployment rate is 4 percentage points higher. In contrast, two years after the 1982 unemployment peak, the actual unemployment rate and the counterfactual unemployment rate driven by the transitions between employment and unemployment are equal to the rate at the start of the rise.

To analyze the individual contributions of each of the four transition rates between non-participation and labor force, we construct additional counterfactuals, varying one transition rate and keeping the other five at their starting levels. The resulting counterfactuals are shown in Figure 3. As in Figure 2, for each recession we plot the period from the quarter when the unemployment rate began its rise to eight quarters after the unemployment peak. Within each period, each of the six lines shows counterfactual unemployment rates corresponding to one of the six possible transitions.

Figure 3 shows that at the beginning of each recession the changes in the aggregate unemployment rate are driven by the increase in the employment-to-unemployment transition rate and the decrease in the unemployment-to-employment transition rate. The counterfactual unemployment rate driven by the employment-to-unemployment transition rate starts declining half way during the increase in the actual unemployment rate, while the unemployment-to-employment transition rate keeps driving the increase in the unemployment rate until the unemployment rate peaks.

Figure 3 shows that a year into the 2007-2009 recession, the increase in the counterfactual unemployment rate driven by the nonparticipation-to-unemployment transition rate exceeds the increase in the counterfactual unemployment rate driven by the employment-to-unemployment transition rate. The figure also shows that the counterfactual unemployment rates driven by the nonparticipation-to-unemployment and unemployment-to-nonparticipation rates remain almost unchanged after 2009. This suggests that the decline in the unemployment rate after its 2009 peak was mostly driven by the changes in the unemployment-to-employment and employment-to-unemployment transition rates, while the changes in the nonparticipation-to-unemployment and unemployment-to-nonparticipation rates contributed to a slowdown of the decline.

The results in Figure 3 can be tracked back to the description of the behavior of the transition rates in Section 3. In particular, the unusually large increase of the nonparticipation-

to-unemployment transition rate during 2007-2009 and the failure of the unemployment-to-nonparticipation rate to pick up after the 2009 unemployment peak have contributed to an increase of the aggregate unemployment during 2007-2009 and its slow decline in the aftermath.

### 4.3 Unemployment Accounting by Gender and Age

To understand whether the results above are driven by a particular demographic group or represent a wide-spread phenomenon, we repeat the counterfactual unemployment exercises by age and gender. Figure 4 shows the extent to which only the flows between employment and unemployment can explain the change in the unemployment rate by age and gender around recessions. The pattern observed in the economy on aggregate carries through to all age and gender groups. In particular, in contrast to the earlier recessions, in the 2007-2009 recession, the transition rates between nonparticipation and labor force account for a large share of the changes in the unemployment rate of different demographic groups. Figure 4 shows that the gap between the actual unemployment rate and the counterfactual unemployment driven by the transitions between employment and unemployment is larger for females than for males. It also shows that in the 2007-2009 recession the gap is particularly pronounced for 55-64-year-old workers; however, for this age group the gap had already been increasing in the 2001 recession. For 16-24 and 25-54-year-old workers, the 2007-2009 recession is the first one in which the transitions between nonparticipation and labor force accounted for a significant share of the changes in the unemployment rates of these groups.

Figure 5 shows the counterfactual unemployment rates driven by each of the six transition rates for different age and gender groups. The contribution of each of the six transition rates to the unemployment rate differs by age and gender. However, for all groups we observe an increased importance of the transitions between nonparticipation and labor force in driving the changes of the unemployment rate during the 2007-2009 recession.

## 5 Discussion and Conclusion

We find that non-participation decisions matter for the unemployment rate dynamics in the 2007-2009 recession, while it was not the case during the earlier recessions. In particular, the transition rate into unemployment from nonparticipation increased sharply during 2007-2009, while the transition rate out of unemployment to nonparticipation failed to pick up after 2009 at a rate comparable to the earlier recoveries. What can explain the increased role of transition rates between nonparticipation and unemployment during the Great Recession

and afterward?

One view is that the changes reflect an increased number of marginally attached workers, i.e., workers who want a job but are not looking for one at the time of the survey and thus they are not counted as being in labor force. Since marginally attached workers do not look for jobs consistently, they might often switch between being categorized as unemployed and being categorized as out of the labor force. However, it is unlikely that such behavior can entirely explain, for example, the reported increase in the nonparticipation-to-unemployment transition rate during 2007-2009 because the data do not show a corresponding increase of unemployment-to-nonparticipation transition rate during a similar time period.

A closely related issue is the misclassification error identified by Poterba and Summers (1986) and Abowd and Zellner (1985). They argue that in any given month, a significant number of unemployed are misclassified as nonparticipants. If true, this would introduce spurious transitions into employment state data; the more people who are unemployed, the greater the measurement problem. Recently, Hornstein (2012) applies the correction matrix from Poterba and Summers (1986) to the 2007-2011 gross flow data and does not find a substantially increased role of the flows between nonparticipation and unemployment during the Great Recession. For future work, it is important to obtain new data on the classification error during 2007-2011 and explore whether the data on flows between nonparticipation and labor force are more prone to misclassification error during the periods of high unemployment.

Lastly, the reported changes can reflect actual changes in the economic environment that contributed to a shift in the incentives between looking for work and dropping out of the labor force. With regard to the transitions from nonparticipation to unemployment, one such change is a relatively large drop in household wealth due to the stock market crash and to the devaluation of housing wealth during the 2007-2009 recession (see Şahin, Song, and Hobijn (2010), who first noted the increased transition rate of nonparticipation to unemployment among men aged 25 to 54.) Alternatively, the fact that the transition rate from unemployment to nonparticipation did not pick up after the 2009 unemployment peak as it did after the earlier recessions could be due to the extension of unemployment benefit eligibility, since often workers will be required to report that they are searching for jobs in order to remain eligible. More research is needed to sort out the possible explanations of the increased role of the flows between nonparticipation and unemployment in accounting for the changes in the unemployment rate during the Great Recession.



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Table 1: THE UNEMPLOYMENT RATE, BY RECESSION, PERCENT

Average unemployment rate	Recessions																							
	1981-1982				1990-1991				2001				2007-2009											
	At the start of the rise	At the end of the rise	Total change during the rise	Unemployment rate	At the start of the rise	At the end of the rise	Total change during the rise	Unemployment rate	At the start of the rise	At the end of the rise	Total change during the rise	Unemployment rate	At the start of the rise	At the end of the rise	Total change during the rise	Unemployment rate								
1976-2011	Q3 1981	Q4 1982	Q4 1982-1984	Q2 1990	Q3 1992	Q3 1992-1994	Q3 1992-1994	Q4 2000	Q2 2003	Q2 2003-2005	Q2 2003-2005	Q2 2007	Q4 2009	Q4 2009-2011	Q4 2009-2011	Q4 2009-2011								
16+	7.4	10.9	3.5	-3.5	5	7.4	10.9	3.5	-3.5	9	5.4	7.6	2.2	-1.5	10	3.9	6.2	2.2	-1.0	10	4.5	10.1	5.5	-1.3
16-24	14.5	19.5	4.9	-5.7	13.0	15.0	20.8	5.8	-6.5	16-24	11.1	14.3	3.2	-1.9	16-24	9.1	12.9	3.8	-1.5	16-24	10.4	19.0	8.6	-2.3
25-54	5.6	9.0	3.4	-3.1	25-54	5.2	9.2	3.9	-3.5	25-54	4.3	6.4	2.0	-1.5	25-54	3.0	5.1	2.2	-1.0	25-54	3.7	9.0	5.4	-1.2
55-64	3.6	5.9	2.2	-1.3	55-64	3.6	6.0	2.4	-1.3	55-64	3.0	5.5	2.4	-1.5	55-64	2.7	4.4	1.7	-1.1	55-64	3.0	7.3	4.3	-0.8
Males	7.1	11.1	4.0	-3.9	Males	7.1	11.1	4.0	-3.9	Males	5.4	7.9	2.5	-1.8	Males	4.0	6.5	2.4	-1.4	Males	4.6	11.2	6.6	-2.1
16+	15.0	20.8	5.8	-6.5	16+	15.0	20.8	5.8	-6.5	16+	11.4	14.9	3.4	-1.9	16+	9.8	13.9	4.2	-1.5	16+	11.6	22.1	10.5	-3.6
16-24	5.2	9.2	3.9	-3.5	16-24	5.2	9.2	3.9	-3.5	16-24	4.3	6.7	2.4	-1.9	16-24	2.9	5.3	2.3	-1.4	16-24	3.5	10.0	6.5	-2.1
25-54	3.6	6.0	2.4	-1.3	25-54	3.6	6.0	2.4	-1.3	25-54	3.4	6.0	2.6	-1.7	25-54	2.8	4.9	2.1	-1.7	25-54	3.1	8.2	5.1	-1.3
55-64	7.8	10.5	2.7	-3.0	55-64	7.8	10.5	2.7	-3.0	55-64	5.3	7.2	1.8	-1.3	55-64	3.9	5.8	2.0	-0.6	55-64	4.4	8.7	4.3	-0.3
Females	14.0	18.0	4.0	-4.9	Females	14.0	18.0	4.0	-4.9	Females	10.6	13.5	2.9	-1.9	Females	8.4	11.8	3.4	-1.4	Females	9.2	15.7	6.5	-0.9
16+	6.2	8.8	2.6	-2.5	16+	6.2	8.8	2.6	-2.5	16+	4.4	6.0	1.6	-1.1	16+	3.1	5.0	1.9	-0.5	16+	3.8	7.9	4.1	-0.2
16-24	3.7	5.6	1.9	-1.2	16-24	3.7	5.6	1.9	-1.2	16-24	2.5	4.8	2.3	-1.2	16-24	2.4	3.8	1.4	-0.4	16-24	2.8	6.2	3.5	-0.4
25-54	3.7	5.6	1.9	-1.2	25-54	3.7	5.6	1.9	-1.2	25-54	2.5	4.8	2.3	-1.2	25-54	2.4	3.8	1.4	-0.4	25-54	2.8	6.2	3.5	-0.4
55-64	3.7	5.6	1.9	-1.2	55-64	3.7	5.6	1.9	-1.2	55-64	2.5	4.8	2.3	-1.2	55-64	2.4	3.8	1.4	-0.4	55-64	2.8	6.2	3.5	-0.4

Notes: The series are quarterly averages of monthly series, constructed from CPS microdata. See text for details.

Table 2: AVERAGE FLOW TRANSITION RATES, Q1 1976 - Q4 2011, PERCENT

	Unemploy ment rate	Inflows		Outflows		Between employment and inactivity	
		EU	IU	UE	UI	EI	IE
All							
16 +	6.5	2.0	3.6	35.6	31.1	2.8	4.3
16-24	13.0	4.3	11.1	39.1	44.2	6.6	9.8
25-54	5.2	1.6	5.6	34.1	25.4	1.7	6.5
55-64	3.9	1.1	1.5	28.7	28.6	2.9	3.1
Males							
16 +	6.5	2.2	4.5	37.0	24.8	2.1	5.1
16-24	13.7	5.0	12.3	39.8	39.1	6.1	10.9
25-54	5.1	1.8	9.6	36.4	17.3	0.9	9.0
55-64	4.1	1.2	2.0	28.9	24.7	2.3	3.5
Females							
16 +	6.5	1.8	3.2	33.7	39.3	3.8	4.0
16-24	12.2	3.6	10.3	38.3	51.2	7.3	9.0
25-54	5.4	1.4	4.8	31.1	35.6	2.7	5.9
55-64	3.7	1.0	1.2	28.8	35.6	3.8	2.9

Notes: Means of the corrected for aggregation quarterly averages of seasonally adjusted monthly series. Authors' calculations using gross flows from CPS microdata. See text for details.

Table 3: STANDARD DEVIATION OF THE CYCLICAL COMPONENT OF FLOW TRANSITION RATES, 1976 - 2011, PERCENT

	Inflows		Outflows		Between Employment and Inactivity	
	EU	IU	UE	UI	EI	IE
All						
16+	8.3	8.3	14.9	11.0	4.8	6.7
16-24	7.2	8.0	14.7	7.6	6.4	9.8
25-54	10.9	9.9	15.5	13.5	5.6	7.2
55-64	14.7	17.1	19.0	17.4	6.9	8.7
Males						
16+	10.6	9.7	15.7	13.5	5.6	7.8
16-24	9.2	9.9	16.1	10.2	7.4	11.9
25-54	14.2	12.5	16.6	16.2	7.6	10.2
55-64	18.4	21.0	21.1	21.8	9.1	11.1
Females						
16+	7.2	8.3	14.9	8.3	5.4	6.9
16-24	8.9	8.6	14.6	6.9	7.6	10.2
25-54	9.4	10.0	15.9	10.4	6.4	7.4
55-64	20.0	18.3	22.5	20.3	8.8	9.8

Notes: The cyclical component is calculated as the difference between the natural logarithm of the series and the corresponding HP-filtered trend. The series are HP-filtered with a smoothing parameter of  $10^5$ .

Table 4: EMPLOYMENT-TO-UNEMPLOYMENT TRANSITION RATES, BY RECESSION

	1981-1982				1990-1991				2001			2007-2009																
	Average rate	Period of the aggregate u rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %	Period of the aggregate u rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %	Period of the aggregate u rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %	Period of the aggregate u rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %											
																		Q3 1981- Q4 1982- Q4 1984			Q2 1990- Q3 1992		Q3 1981- Q2 2003- Q2 2005			Q2 2007- Q4 2009- Q4 2011		
																		Q3 1981	Q4 1982	Q4 1984	Q2 1990	Q3 1992	Q3 1981	Q4 1982	Q2 2005	Q2 2007	Q4 2009	Q4 2011
All																												
16+	2.0	5	2.3	20.2	-20.9	9	2.0	6.9	-2.2	10	1.6	17.8	-7.0	10	1.6	30.7	-12.6											
16-24	4.3		4.7	12.4	-13.5		4.4	14.6	-10.6		3.8	0.0	4.1		3.8	5.6	1.3											
25-54	1.6		1.8	27.8	-23.5		1.5	6.5	0.2		1.2	31.9	-9.7		1.3	51.9	-17.2											
55-64	1.1		1.1	50.4	-38.9		1.1	10.7	4.5		0.8	58.2	-22.8		1.0	30.1	-17.1											
Males																												
16+	2.2		2.5	20.9	-18.6		2.1	9.7	-8.2		1.7	14.2	-8.9		1.7	48.0	-17.1											
16-24	4.9		5.3	8.7	-0.1		4.9	15.7	-10.1		4.3	-0.5	9.8		4.4	17.2	-9.0											
25-54	1.7		1.9	34.3	-25.7		1.7	9.8	-10.0		1.3	26.0	-13.8		1.3	74.9	-18.9											
55-64	1.2		1.1	39.4	-44.5		1.2	10.6	-5.1		1.0	53.1	-29.2		1.0	56.4	-26.6											
Females																												
16+	1.8		2.1	18.4	-25.7		1.7	2.6	6.8		1.4	22.8	-5.6		1.5	9.6	-5.0											
16-24	3.6		3.9	19.2	-34.0		3.7	12.7	-10.8		3.3	-0.8	-3.4		3.2	-9.4	20.2											
25-54	1.4		1.6	17.2	-20.8		1.3	1.3	15.6		1.0	40.5	-6.2		1.2	25.0	-14.1											
55-64	1.0		1.1	65.5	-32.2		0.9	8.2	19.1		0.6	75.4	-17.1		1.0	2.7	-0.2											

Notes: The series are quarterly averages of seasonally adjusted monthly series constructed from the gross flows using the CPS microdata and corrected for aggregation using Shimer (2012) procedure.

Table 5: NONPARTICIPATION-TO-UNEMPLOYMENT TRANSITION RATES, BY RECESSION

	1981-1982				1990-1991				2001			2007-2009																
	Average rate	Period of the aggregate u rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %	Period of the aggregate u rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %	Period of the aggregate u rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %	Period of the aggregate u rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %											
																		Q3 1981- Q4 1982- Q4 1984			Q2 1990- Q3 1992		Q3 1981- Q2 2003- Q2 2005			Q2 2007- Q4 2009- Q4 2011		
																		Q3 1981	Q4 1982	Q4 1984	Q2 1990	Q3 1992	Q3 1981	Q4 1982	Q2 2005	Q2 2007	Q4 2009	Q4 2011
All																												
16+	3.6	5	3.8	10.5	-3.2	9	3.2	16.9	12.2	10	3.0	19.6	-9.9	10	2.9	49.6	-7.2											
16-24	11.0		12.2	7.7	-4.6		10.1	14.7	10.6		10.7	2.4	-10.4		7.5	31.7	-13.2											
25-54	5.5		5.3	15.3	5.6		5.7	13.3	8.9		4.4	28.5	-11.6		4.8	57.9	-5.4											
55-64	1.4		1.1	11.5	20.8		0.9	99.6	6.8		1.0	81.1	-23.8		1.3	80.9	3.0											
Males																												
16+	4.5		5.0	12.3	-3.3		3.7	22.1	11.1		3.8	19.5	-14.0		3.5	59.0	-14.5											
16-24	12.2		14.7	0.0	3.0		11.0	21.0	5.8		11.4	2.2	-7.4		8.8	28.9	-16.6											
25-54	9.5		11.8	17.9	2.1		9.7	16.4	-3.0		7.1	33.2	-25.0		6.5	86.1	-16.1											
55-64	2.0		1.5	23.4	28.5		1.0	158.6	-0.2		1.2	88.5	-34.5		1.5	89.1	-2.9											
Females																												
16+	3.2		3.4	9.5	-4.9		3.0	12.1	11.3		2.6	19.1	-6.4		2.5	41.1	-0.7											
16-24	10.2		10.8	13.7	-13.0		9.6	7.9	14.3		10.1	2.1	-13.5		6.4	34.3	-9.6											
25-54	4.7		4.5	11.1	5.4		4.9	11.3	8.7		3.6	23.1	-1.3		4.2	38.8	1.5											
55-64	1.2		1.0	5.0	12.2		0.8	49.3	11.5		0.8	71.3	-10.7		1.2	70.1	9.7											

Notes: The series are quarterly averages of seasonally adjusted monthly series constructed from the gross flows using the CPS microdata and corrected for aggregation using Shimer (2012) procedure.

Table 6: UNEMPLOYMENT-TO-EMPLOYMENT TRANSITION RATES, BY RECESSION

	Average rate	Period of the aggregate u rate rise, q	1981-1982			1990-1991			2001			2007-2009					
			At the start of the rise	Change during the rise, %	2-year change after the peak, %	Period of the aggregate u rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %	Period of the aggregate u rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %	Period of the aggregate u rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %
			Q3 1981- Q4 1982- Q4 1984			Q2 1990- Q3 1992			Q3 1981- Q2 2003- Q2 2005			Q2 2007- Q4 2009- Q4 2011					
			Q3 1981	Q4 1982	Q4 1984	Q2 1990	Q3 1992	Q3 1981	Q4 1982	Q2 2005	Q2 2007	Q4 2009	Q4 2011				
All																	
16+	34.9	5	33.9	-28.3	32.4	9	39.8	-24.7	25.2	10	46.7	-32.7	16.2	10	36.6	-46.0	13.9
16-24	38.4		34.9	-27.4	43.2		43.0	-11.6	13.4		51.1	-27.1	5.1		38.3	-49.2	31.3
25-54	33.4		32.5	-28.1	30.2		38.4	-29.7	30.6		45.1	-33.2	18.8		36.2	-43.1	9.5
55-64	28.0		28.8	-22.4	-15.9		33.3	-39.2	37.0		33.6	-36.5	43.5		29.5	-49.2	21.5
Males																	
16+	36.3		35.4	-31.9	38.8		40.3	-23.7	23.2		48.7	-34.4	18.8		37.5	-45.7	18.5
16-24	38.9		35.7	-32.0	56.8		42.6	-9.4	16.3		48.7	-19.1	-2.9		36.8	-49.9	37.3
25-54	35.7		35.1	-30.6	33.5		40.4	-30.5	26.4		49.8	-39.2	26.7		38.6	-43.8	19.5
55-64	28.0		28.8	-33.1	-0.8		31.0	-29.8	7.5		37.7	-44.7	61.8		28.5	-45.7	5.8
Females																	
16+	33.0		31.8	-23.4	24.6		39.1	-26.9	27.8		44.2	-30.2	12.5		35.4	-46.6	8.0
16-24	37.6		33.7	-20.5	27.4		43.6	-15.0	9.5		53.6	-35.8	16.0		40.7	-48.3	22.3
25-54	30.4		29.1	-25.0	26.9		35.8	-30.0	37.6		39.8	-24.0	9.5		33.1	-42.8	-2.1
55-64	27.8		29.0	-6.9	-33.7		37.9	-55.1	83.9		29.5	-26.3	23.6		30.9	-53.4	42.5

Notes: The series are quarterly averages of seasonally adjusted monthly series constructed from the gross flows using the CPS microdata and corrected for aggregation using Shimer (2012) procedure.

Table 7: UNEMPLOYMENT-TO-NONPARTICIPATION TRANSITION RATES, BY RECESSION

	Average ln(flow rate)	Period of the aggregate u rate rise, q	1981-1982			1990-1991			2001			2007-2009					
			At the start of the rise	Change during the rise, %	2-year change after the peak, %	Period of the aggregate u rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %	Period of the aggregate u rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %	Period of the aggregate u rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %
			Q3 1981- Q4 1982- Q4 1984			Q2 1990- Q3 1992			Q3 1981- Q2 2003- Q2 2005			Q2 2007- Q4 2009- Q4 2011					
			Q3 1981	Q4 1982	Q4 1984	Q2 1990	Q3 1992	Q3 1981	Q4 1982	Q2 2005	Q2 2007	Q4 2009	Q4 2011				
All																	
16+	30.8	5	29.3	-24.3	34.2	9	29.6	-15.0	36.1	10	36.6	-16.8	16.1	10	35.1	-30.4	11.5
16-24	43.8		37.6	-12.9	20.6		42.7	-11.4	22.6		52.0	-4.6	12.9		49.5	-11.9	-1.8
25-54	25.1		24.4	-32.6	54.3		24.3	-16.1	42.0		29.9	-21.0	14.2		29.2	-35.9	18.8
55-64	28.0		24.7	-12.7	26.5		23.3	0.6	71.3		32.9	-21.1	13.9		30.8	-33.8	9.7
Males																	
16+	24.3		22.3	-31.9	49.9		21.0	-10.8	48.1		32.4	-19.7	22.5		29.6	-31.5	14.8
16-24	38.5		33.3	-23.7	47.4		35.3	-6.8	17.1		49.1	-6.9	17.8		44.5	-12.9	2.6
25-54	16.8		14.3	-37.0	72.5		14.7	-9.6	71.8		24.1	-22.1	18.8		23.6	-38.6	18.5
55-64	23.8		21.9	-21.5	15.8		15.0	41.5	86.1		28.1	-15.5	9.5		21.6	-22.6	16.2
Females																	
16+	39.2		38.7	-15.9	18.8		41.2	-17.1	24.6		41.9	-13.7	8.6		42.2	-26.7	5.2
16-24	51.0		43.8	-0.5	-2.1		53.2	-15.7	27.9		56.4	-2.6	8.8		57.4	-10.1	-8.0
25-54	35.3		37.8	-26.7	35.9		37.0	-16.1	19.5		37.0	-18.7	7.0		35.8	-27.7	12.3
55-64	34.6		31.2	-6.9	35.8		41.5	-33.2	53.6		39.8	-25.8	11.1		44.1	-41.3	0.7

Notes: The series are quarterly averages of seasonally adjusted monthly series constructed from the gross flows using the CPS microdata and corrected for aggregation using Shimer (2012) procedure.

Table 8: NONPARTICIPATION-TO-EMPLOYMENT TRANSITION RATES, BY RECESSION

	Average rate	1981-1982				1990-1991				2001				2007-2009			
		Period of the aggregate rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %	Period of the aggregate rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %	Period of the aggregate rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %	Period of the aggregate rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %
			Q3 1981	Q4 1982	Q4 1984		Q2 1990	Q3 1992		Q3 1981	Q4 1982	Q2 2005		Q2 2007	Q4 2009	Q4 2011	
			Q3 1981	Q4 1982	Q4 1984		Q2 1990	Q3 1992		Q3 1981	Q4 1982	Q2 2005		Q2 2007	Q4 2009	Q4 2011	
All																	
16+	4.3	5	4.3	-13.2	13.4	9	4.7	-11.8	-1.9	10	4.9	-12.8	6.5	10	4.3	-14.0	0.2
16-24	9.6		10.8	-19.7	19.7		11.4	-14.4	-4.0		11.1	-21.7	4.4		8.3	-22.3	7.3
25-54	6.4		5.5	-4.6	16.4		7.1	-8.9	-3.2		8.0	-9.0	-2.3		7.1	-14.4	-8.8
55-64	3.1		2.7	-13.2	27.8		3.3	-10.7	0.7		3.7	-10.9	18.8		3.2	-11.4	10.4
Males																	
16+	5.0		5.7	-24.9	21.9		5.2	-6.0	-6.9		5.6	-14.6	5.1		4.8	-16.5	6.6
16-24	10.7		14.0	-35.1	39.2		12.4	-10.3	-9.2		11.9	-25.9	2.0		8.3	-24.6	12.6
25-54	9.0		9.6	-19.1	26.9		8.6	17.4	-26.2		10.8	-11.8	-3.4		9.9	-21.7	-4.9
55-64	3.5		3.4	-21.7	41.3		4.0	-22.9	9.4		3.8	2.1	10.5		3.3	-11.8	15.4
Females																	
16+	3.9		3.8	-6.8	9.2		4.4	-15.5	0.9		4.5	-12.4	7.5		4.1	-12.1	-4.0
16-24	8.9		9.0	-7.2	6.5		10.8	-17.6	-0.7		10.5	-17.1	6.0		8.2	-20.1	3.1
25-54	5.9		5.0	-2.1	14.0		6.8	-17.6	4.8		7.1	-10.1	-1.1		6.2	-10.4	-10.8
55-64	2.8		2.3	-7.9	20.0		2.9	-1.1	-4.8		3.6	-20.9	27.5		3.1	-10.8	6.6

Notes: The series are quarterly averages of seasonally adjusted monthly series constructed from the gross flows using the CPS microdata and corrected for aggregation using Shimer (2012) procedure.

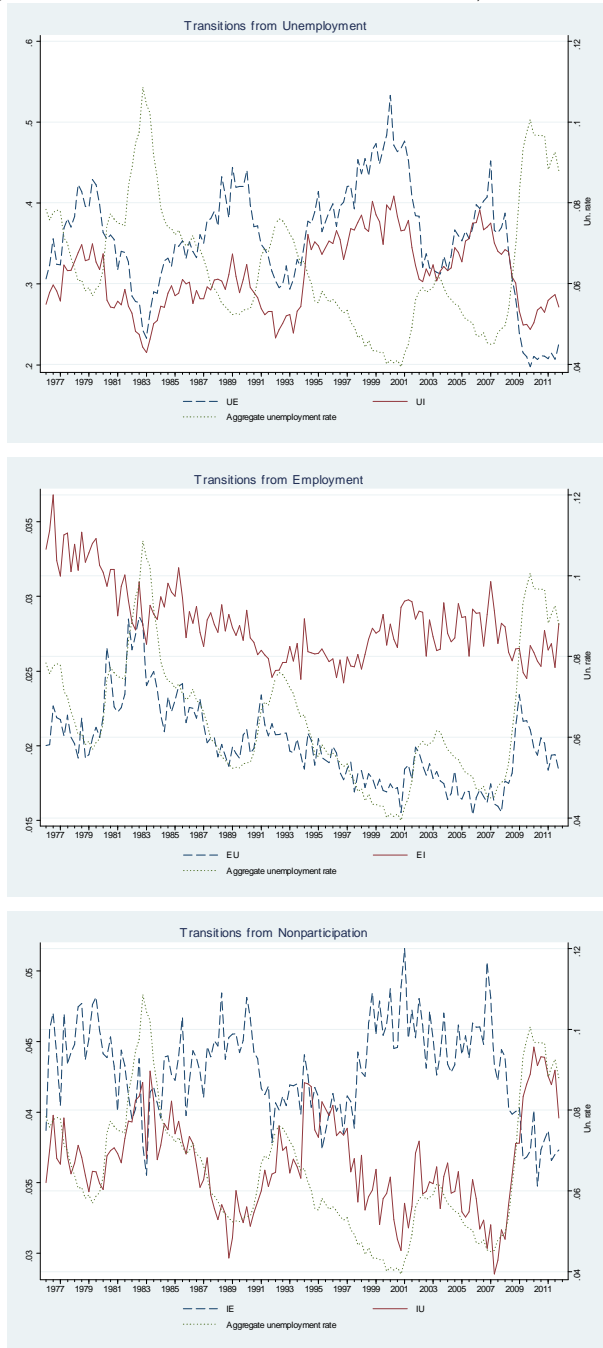
Table 9: EMPLOYMENT-TO-NONPARTICIPATION TRANSITION RATES, BY RECESSION

	Average rate	1981-1982				1990-1991				2001				2007-2009			
		Period of the aggregate rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %	Period of the aggregate rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %	Period of the aggregate rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %	Period of the aggregate rate rise, q	At the start of the rise	Change during the rise, %	2-year change after the peak, %
			Q3 1981	Q4 1982	Q4 1984		Q2 1990	Q3 1992		Q3 1981	Q4 1982	Q2 2005		Q2 2007	Q4 2009	Q4 2011	
			Q3 1981	Q4 1982	Q4 1984		Q2 1990	Q3 1992		Q3 1981	Q4 1982	Q2 2005		Q2 2007	Q4 2009	Q4 2011	
All																	
16+	2.8	5	3.1	-10.6	7.8	9	2.7	-6.0	2.5	10	2.9	-9.8	8.5	10	2.9	-8.0	5.5
16-24	6.6		6.3	-7.6	14.5		6.3	-1.0	1.7		6.5	5.7	7.7		7.6	-8.5	9.4
25-54	1.7		1.8	-9.1	5.4		1.6	-8.4	0.9		1.9	-15.4	6.7		1.7	-6.0	6.1
55-64	2.9		3.1	-11.0	26.1		3.3	-9.6	14.9		3.4	-18.3	0.9		2.6	-2.4	-2.5
Males																	
16+	2.1		2.1	-11.6	10.0		1.9	1.0	0.4		2.3	-0.4	1.7		2.4	-0.3	-5.2
16-24	6.0		5.7	-7.4	13.0		5.5	-0.9	3.8		6.0	13.8	2.1		7.0	-1.9	-2.7
25-54	0.9		0.8	-22.1	22.5		0.7	21.5	-1.4		1.1	-4.5	4.2		1.2	8.1	-4.6
55-64	2.3		2.0	-7.0	33.9		2.6	-8.3	13.2		2.8	-8.7	-18.9		2.2	4.7	-16.7
Females																	
16+	3.7		4.5	-10.7	6.7		3.7	-11.0	3.3		3.7	-15.8	14.3		3.5	-15.4	15.7
16-24	7.2		7.0	-8.7	16.8		7.2	-1.5	0.2		7.1	-0.9	13.1		8.3	-14.8	21.9
25-54	2.7		3.3	-6.2	1.2		2.6	-18.5	0.3		2.7	-19.7	9.5		2.4	-16.8	14.7
55-64	3.8		4.7	-13.7	20.1		4.3	-11.6	15.5		4.0	-25.5	19.5		3.0	-8.7	11.4

Notes: The series are quarterly averages of seasonally adjusted monthly series constructed from the gross flows using the CPS microdata and corrected for aggregation using Shimer (2012) procedure.



Figure 1: FLOW TRANSITION RATES, 16 Y. O. +



Notes: Means of the corrected for aggregation quarterly averages of seasonally adjusted monthly series. Authors' calculations using gross flows from CPS microdata. See text for details.

Figure 2:

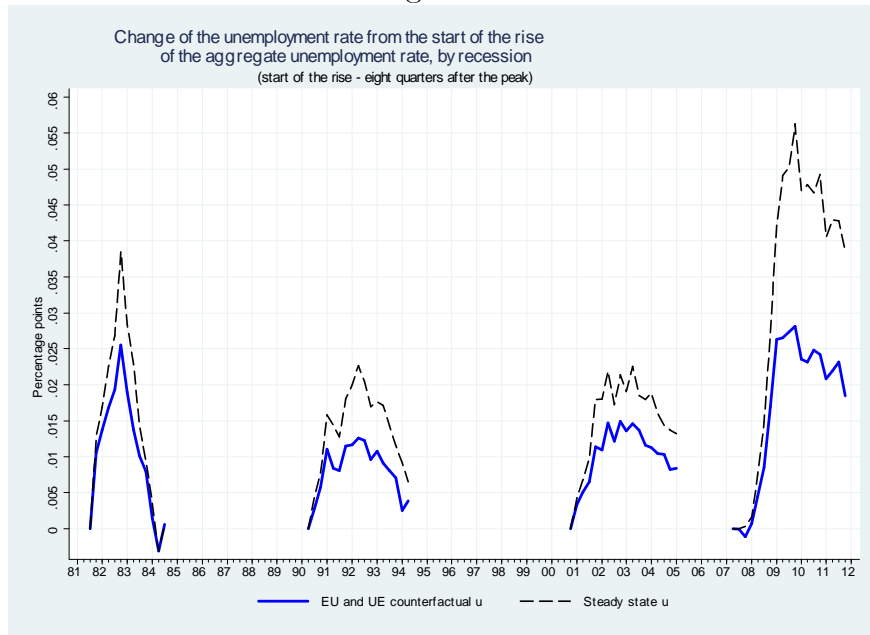


Figure 3:

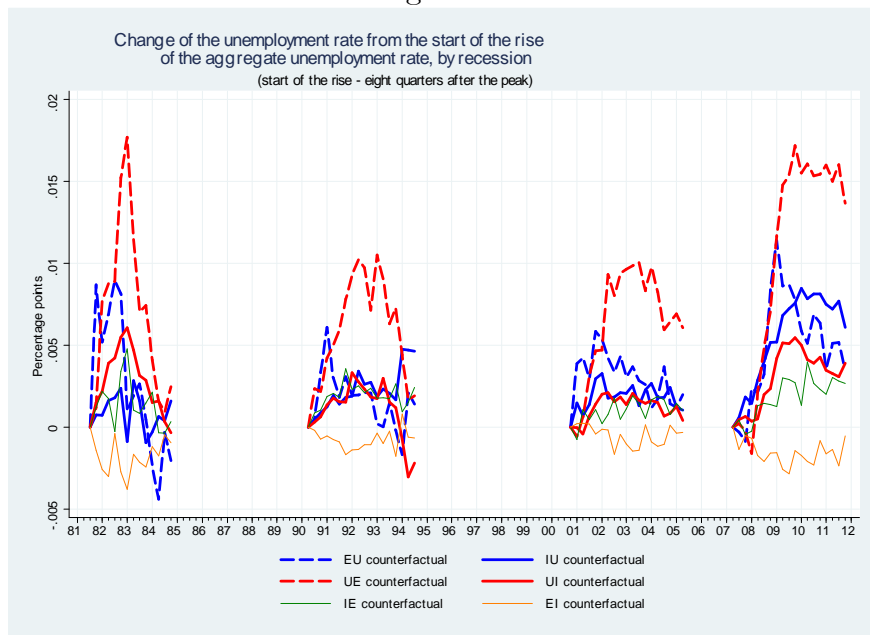
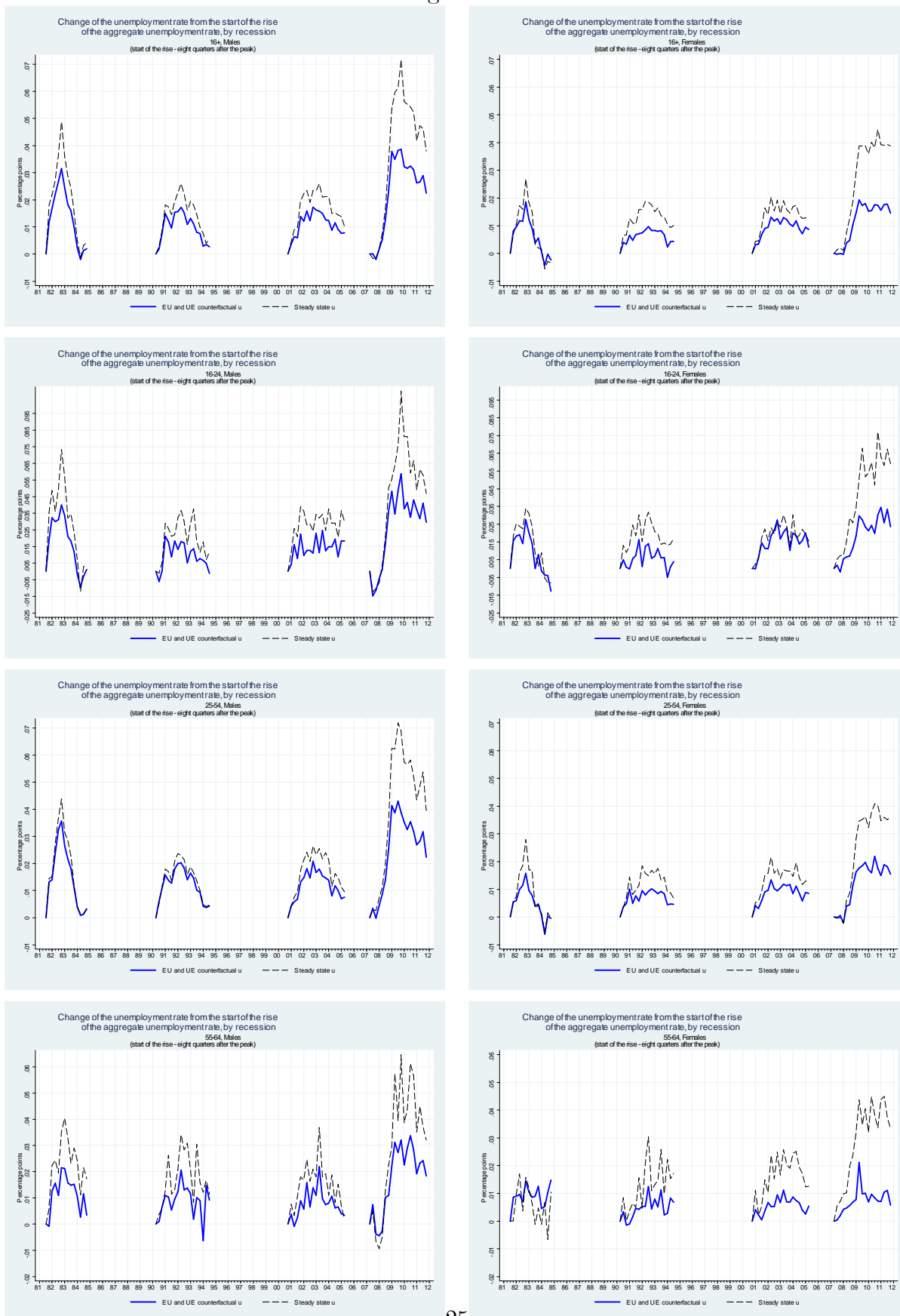
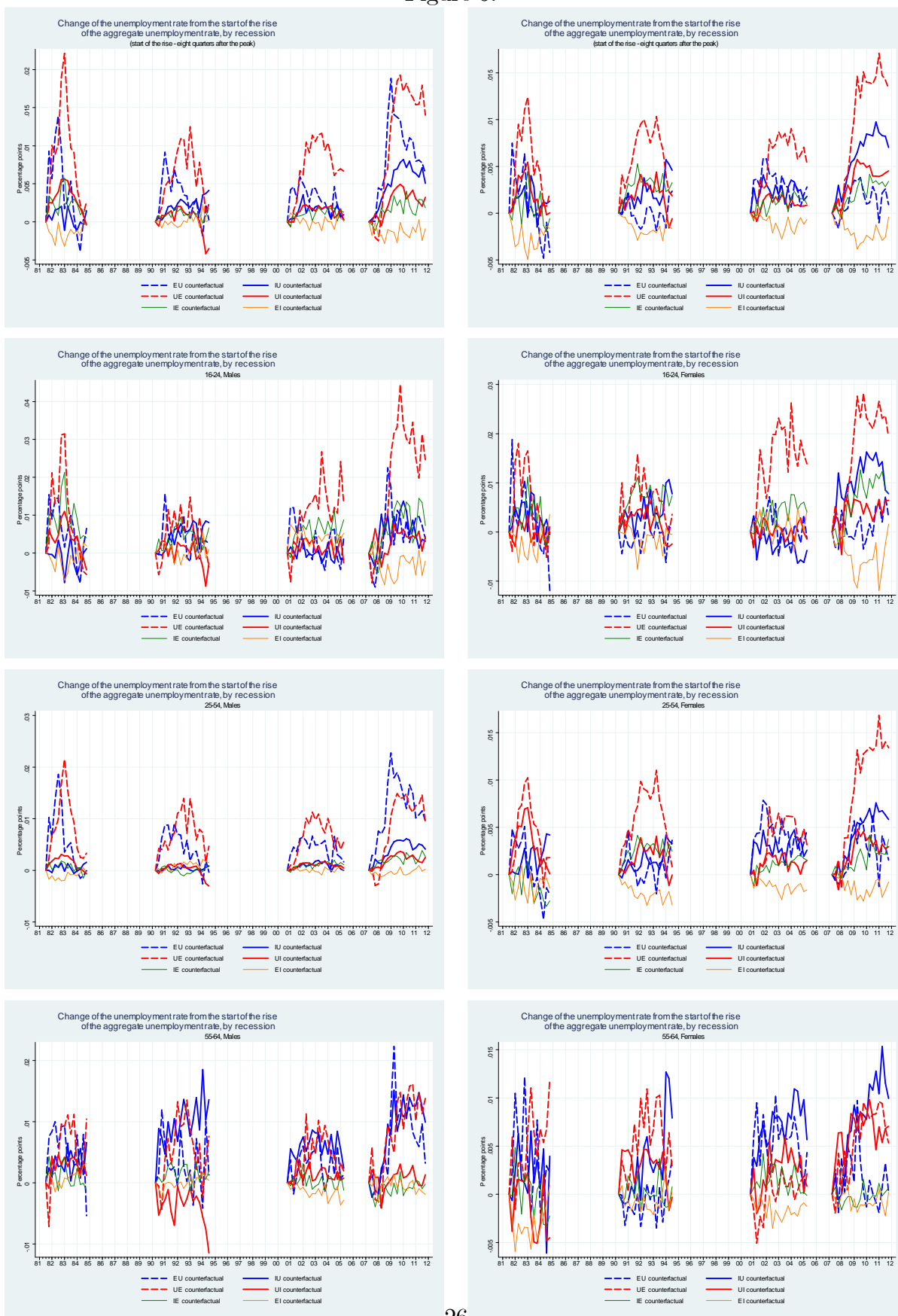


Figure 4:



Notes: Quarterly averages of seasonally adjusted monthly series.

Figure 5:



Notes: Quarterly averages of seasonally adjusted monthly series.