The Ins and Outs of European Unemployment

Barbara Petrongolo and Christopher A Pissarides*

In this paper we study the contribution of inflows and outflows to the dynamics of unemployment in three European countries, the United Kingdom, France and Spain. All countries are interesting in their own right and in the comparison with each other. Britain's labour markets were strictly regulated up to the mid 1980s but they have been liberalized since then. France is still a regulated economy compared with Britain, with unemployment averaging about 8%. Spain has had the biggest rise in unemployment in Europe, reaching 24% in the mid 1990s, but policy reforms and fast growth since then brought it down to a level below France's.

We compare performance in these three countries making use of both administrative and labor force survey data. We find that the impact of the 1980s reforms in Britain is evident in the contributions of the inflow and outflow rates. The inflow rate became a bigger contributor after the mid 1980s, although its significance subsided again in the late 1990s and 2000s. In France the dynamics of unemployment are driven by the outflow rate virtually entirely, which is consistent with a regime with strict employment protection legislation. In Spain, however, both rates contribute significantly to the dynamics, perhaps as a consequence of the prominence of fixed-term contracts since the late 1980s.

I. Accounting for the dynamics of unemployment

Several authors have recently addressed the question of unemployment dynamics. They follow a similar approach, albeit with some variations. Features that might differ across

*Department of Economics and Centre for Economic Performance, London School of Economics, Houghton Street, London WC2A 2AE, U.K. Email addresses: b.petrongolo@lse.ac.uk; c.pissarides@lse.ac.uk.
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studies include (a) whether it is explicitly assumed that there are three states (employment, unemployment and out of the labor force, henceforth, inactivity) or two (employment and unemployment), and (b) what "time aggregation" is used to deal with the fact that flows in and out of each state are taking place continually but data observations are taken at discrete times. Robert Shimer (2007) uses a method based on observations of short term and long term unemployment to deal with time aggregation in the two-state case.[1] For the three-state case he uses an alternative procedure which has no analytic solutions for his three states, but has a solution for the two states. The latter is also used by Shigeru Fujita and Garey Ramey (2006), who deal with two states, and it is also the procedure that we follow in this paper.[2]

We make use of two types of data. The first is administrative data that record all the workers who join or leave unemployment during a period, usually a month. The definition of unemployment used in these data, however, is also administrative, and it usually covers workers who qualify for unemployment compensation or who are registered at government agencies. In Britain the unemployment series constructed in this way is known as the "claimant count".

The second data source is the quarterly Labor Force Survey, which includes a rotating panel. In each quarter we observe the state in which the worker belongs, and from this we construct the flows. This data source is similar to the US CPS but it is quarterly and typically of much shorter duration.

Because the administrative data are for benefit claimants, it is biased towards workers who come from employment. When analyzing this series we therefore assume the existence of two states, employment and unemployment. We take from official sources the time series for monthly unemployment and new claims during the month and make use of the identity linking the change in the stock to the difference in the rates to derive the outflow, to correct for small inconsistencies in the series. We then seasonally adjust the series using the X12

[1] Michael Elsby, Ryan Michaels and Gary Solon (2007) use a discrete-time variant of this procedure, based on the fact that the CPS uses the week as its reference period. But they find that their alternative procedure does not significantly affect their results.

[2] See Eran Yashiv (2006) for a discussion of these and other issues in the analysis of labor market dynamics based on flows.

filter.

From the seasonally adjusted series we compute continuous-time transition rates, assuming that these are constant during the month. Let t denote the month and $\tau \in [0,1)$ denote the time elapsed since the beginning of the current month. The total unemployment outflow during t, denoted by F_t, is given by

$$F_t = \left(1 - e^{-f_t}\right) U_t + \int_0^1 \left[1 - e^{-f_t(1-\tau)}\right] S_{t+\tau} d\tau, \tag{1}$$

where U_t is unemployment at the start of the period and $S_{t+\tau}$ is the unemployment inflow at $t + \tau$. Assuming that the unemployment inflow is uniform during the month gives

$$F_t = \left(1 - e^{-f_t}\right) U_t + \left(1 - \frac{1 - e^{-f_t}}{f_t}\right) S_t, \tag{2}$$

where S_t is the total inflow during the period. Equation (2) is solved for f_t using available data on F_t, U_t and S_t. Similarly, the unemployment inflow rate s_t can be obtained from

$$S_t = \left(1 - e^{-s_t}\right) N_t + \left(1 - \frac{1 - e^{-s_t}}{s_t}\right) F_t, \tag{3}$$

where N_t denotes employment at the beginning of period t.

With LFS data we observe the labor force status of interviewees at quarterly intervals. In order to recover f_t and s_t we use the following relation between discrete- and continuous-time transition rates:

$$\widehat{f_t} = \frac{f_t}{f_t + s_t} \left[1 - \exp(f_t + s_t)\right], \tag{4}$$

$$\widehat{s_t} = \frac{s_t}{f_t + s_t} \left[1 - \exp(f_t + s_t)\right], \tag{5}$$

where $\widehat{f_t}$ is obtained by dividing the number of individuals who are unemployed in quarter $t-1$ and employed in quarter t by unemployment at $t-1$, and $\widehat{s_t}$ is obtained by dividing the number of individuals who are employed in quarter $t-1$ and unemployed in quarter t by employment at $t-1$ (see Fujita and Ramey, 2006, pp. 9-10 and 24-25). Equations (4) and (5) can be solved for f_t and s_t.

Given the continuous-time f and s, the unemployment rate evolves according to $\dot{u} = (1-u)s - uf$. Because s and f are large, under the assumption that s and f are constant during the period unemployment practically converges to its steady-state during the period. So changes in unemployment across periods are mainly driven by changes in the transition rates. Another way of stating this fact is to write monthly unemployment as $u = (s - \dot{u})/(s+f)$. When comparing unemployment rates across months, the differences due to the steady-state term $s/(s+f)$ overwhelm and differences that might be due to differences in $\dot{u}/(s+f)$ across months.

We therefore approximate monthly unemployment by

$$u_t = \frac{s_t}{s_t + f_t}. \tag{6}$$

Computing directly the change $u_t - u_{t-1} \equiv \Delta u_t$, we obtain

$$\Delta u_t = (1-u_t)u_{t-1}\frac{\Delta s_t}{s_{t-1}} - u_t(1-u_{t-1})\frac{\Delta f_t}{f_{t-1}}. \tag{7}$$

This is our key equation for accounting for the dynamic evolutions of unemployment in the two-state case.

With LFS data we can also take into account the third state, inactivity. Let f_{0t} and f_{1t} respectively be the transition rates from unemployment to inactivity and employment; s_{0t} and s_{1t} be the transition rates from employment to inactivity and unemployment; and e_{0t} and e_{1t} be the transition rates from inactivity to unemployment and employment. Then the steady-state conditions for unemployment and employment are

$$s_{1t}N_t + e_{0t}I_t = (f_{0t} + f_{1t})U_t \tag{8}$$

$$f_{1t}U_t + e_{1t}I_t = (s_{0t} + s_{1t})N_t, \tag{9}$$

where all symbols have been defined except for I_t, which denotes inactivity in t. We solve these two equations for the conventional unemployment rate:

$$u_t \equiv \frac{U_t}{U_t + N_t} = \frac{s_{1t} + \frac{e_{0t}}{e_{0t}+e_{1t}}s_{0t}}{s_{1t} + \frac{e_{0t}}{e_{0t}+e_{1t}}s_{0t} + f_{1t} + \frac{e_{1t}}{e_{0t}+e_{1t}}f_{0t}}, \tag{10}$$

and write it as

$$u_t = \frac{s_{1t} + i_{0t}}{s_{1t} + i_{0t} + f_{1t} + i_{1t}}, \tag{11}$$

where $i_{0t} \equiv e_{0t}s_{0t}/(e_{0t}+e_{1t})$ and $i_{1t} \equiv e_{1t}f_{0t}/(e_{0t}+e_{1t})$ can loosely be interpreted as the contributions of inactivity transitions (respectively to unemployment and employment) to equilibrium unemployment.

Let now $s_t \equiv s_{1t} + i_{0t}$ and $f_t \equiv f_{1t} + i_{1t}$. Equation (11) becomes formally identical to (6) and so the decomposition in (7) holds. Taking first differences,

$$\frac{\Delta s_t}{s_{t-1}} = \frac{\Delta s_{1t}}{s_{1t-1}+i_{0t-1}} + \frac{\Delta i_{0t}}{s_{1t-1}+i_{0t-1}} \tag{12}$$

$$\frac{\Delta f_t}{f_{t-1}} = \frac{\Delta f_{1t}}{f_{1t-1}+i_{1t-1}} + \frac{\Delta i_{1t}}{f_{1t-1}+i_{1t-1}}, \tag{13}$$

so the contributions of the total inflow and outflow rates can themselves be divided into terms that can respectively be attributed to the flows between employment and unemployment and the flows between employment and inactivity.

II. United Kingdom

A. Claimant count unemployment

The claimant count flows in Britain are quarterly in 1967-1983 and monthly since then. There have been some changes in definitions, most notably in 1983, but consistent time series based on the post-1983 definition are available.[3] The inflow includes all new claims during the quarter or month and when combined with the stock of claimants yields the total outflow during the same period.

We work with quarterly averages of monthly data in order to remove excess volatility that may stem from measurement errors. Claimant count unemployment in our sample is always below the usual survey-based unemployment series (known in Britain as the LFS definition). But the two series move parallel to each other up to the late 1990s, when the gap widens - implying that the fraction of the unemployed who claim benefits is now lower. This change was due to the reform of the benefit system at end 1996, from "unemployment benefit" to the "job seekers allowance", when the criteria for qualification were made more

[3] The data source is the *Employment Gazette* for the pre-1983 period and NOMIS (https://www.nomisweb.co.uk) for the later period. Originally, the pre-1983 series referred to all registrations, in contrast to the post-1983 series that refers to claimants. A small problem that remains is that the series before 1983 refer to Great Britain but after 1983 to the United Kingdom.

Table 1: Contributions from the outflow rate to unemployment volatility, UK Claimant Count

period	feature	β_f	β_f^*
1967Q3-2007Q2	whole sample	0.670	0.657
1967Q3-1982Q4	big u rise	0.725	0.714
1985Q1-1990Q2	falling u	0.573	0.573
1990Q3-1993Q1	rising u	0.546	0.405
1993Q2-2007Q2	steady fall	0.750	0.798

In this and all subsequent tables, β_f is calculated as the ratio of the covariance between the contribution of the rate and the change in steady-state unemployment to the variance of the change in steady-state unemployment. β_f^* is obtained after removing periods for which the difference between the change in steady-state unemployment and the change in actual unemployment was more than 10% of actual unemployment.

strict. The dynamic properties of the two series, however, are very similar to each other. Their correlation coefficient for the entire period is 0.991 and for the 1997-2007 period it is 0.955. The steady-state series derived from (6) follows the claimant count series closely, except when unemployment is changing fast (recall that in general, $u = (s - \dot{u}) / (s + f)$).[4]

The early series to 1983 for men only and without any correction for time aggregation were analyzed by Pissarides (1986), who concluded that with the exception of the fast rise in unemployment in 1979-1981, fluctuations in unemployment were entirely driven by fluctuations in the outflow rate. He studied this question by holding one of the rates constant at a time, and tracing the unemployment rate in (6) by allowing the other rate to take its observed values. The unemployment rate traced by holding s constant virtually coincided with the actual steady-state series. We address this issue here using the more informative breakdown in (7). Following Fujita and Ramey (2007) we compare the contribution of the inflow and outflow rates by calculating the "beta values" of each of the two terms on the right-hand side of (7). We calculate

$$\beta_j = \frac{cov(\Delta u, \Delta u_j)}{var(\Delta u)} \qquad j = s, f \tag{14}$$

where Δu_s and Δu_f are respectively the contribution of s and f to the fluctuations in u shown in each of the two terms on the right side of (7). As $\Delta u = \Delta u_f + \Delta u_s$, $\beta_f + \beta_s = 1$, and so in what follows we present results for β_f alone.

Table 1 shows this decomposition for the whole sample and four sub-periods. The pe-

[4] All data with graphs can be downloaded from our personal websites.

riod up to 1982, when unemployment rose fast, the recovery period of 1985-1990, the brief recession of 1990-1993 and the long recovery and steady-state type of behavior since 1993. Because of some apparent inconsistencies in the data we also report results derived by removing the quarters during which there was a big discrepancy between the change in actual unemployment and in the unemployment implied by flow equilibrium, which do not appear justified by economic events. We remove all quarters for which the discrepancy is more than 10% of actual unemployment, which number 11/160 observations.

In the early period $70 - 75\%$ of the volatility in unemployment is attributed to the outflow rate. The results in Pissarides (1986) are confirmed whichever method is used. A large change seems to have taken place, however, between 1985 and 1993, when the labor market reforms that deregulated the British market were put into place. The contribution of the outflow rate falls to about 55% and to an even lower fraction when the data are purged of some odd observations. But surprisingly, although no policy reforms took place after 1993, the breakdown reverts to the one for the pre-1985 period.[5]

Looking at the direction of the dynamics of unemployment during the four sub-periods there is no apparent correlation between the direction of change and the contribution of each rate. For example, in the 1979-82 recession the rise in unemployment is driven by sharp falls in the job finding rate, with only a moderate increase in the job separation rate early on in the recession. In contrast, the rise in unemployment in the 1990-93 recession is driven mainly by a rise in separations, especially in the first four quarters of the recession. The patterns observed in the more recent recession parallel the ones observed in US recessions, as documented by Fujita and Ramey (2007).

A possible explanation for the relative importance of the job finding rate in the long recovery since 1993 is that the economy had features of a steady state during this period. Even in markets where it is easy to lay off labor, when the adjustments in the labor force required are small and labor turnover is high, it is easier for firms to implement adjustments

[5] In the index of employment protection legislation constructed by Gayle Allard (2005) Britain is given 1.3 for the period 1985-1998, 1.4 before and after it, and higher values before 1979, on a scale from 0 to 5. The United States, for comparison, has index value 0.1 before 1989 and 0.6 after it. It is doubtful, however, that the small changes in the British time series can explain the large differences between subperiods in Table 1.

Table 2: Contributions from four transition rates

Transition	UK	US
employment-unemployment	0.352	0.325
inactivity-unemployment	0.133	0.053
unemployment-employment	0.364	0.588
unemployment-inactivity	0.151	0.035

The column headed UK is from the UK Labor Force Survey, 1993Q3-2003Q3. The US data are due to Robert Shimer. See http://robert.shimer.googlepages.com/flows and they are for 1967-2006.

through changes in their job creation rate.

B. LFS unemployment

A rotating five-quarter panel for 1992-2005 can be extracted from the LFS files. Following the methodology outlined in section I, we first compute the contribution of unemployment inflows and outflows to volatility under the assumption of two states only. The result is that for the long recovery of 1993Q2-2005Q3 the outflow rate contributes $\beta_f = 0.521$. The claimant count gives 0.750 for the contribution of outflows over the same period, which is substantially higher. We do not exactly know the source of this difference. But given that the LFS includes workers who transit via unemployment without benefit entitlement, this suggests that the volatility in non-compensated unemployment (young workers, new entrants and re-entrants) is due much more to the entry into unemployment than is the volatility of benefit claimants. Since benefit claimants are likely to be older and more established workers, this makes sense. They are the ones more likely to be protected by employment legislation, union agreements or seniority benefits on the job.

More interestingly, with LFS data we can use the decomposition in (12) and (13) to take into account the contribution of the transitions between activity and inactivity. The contributions of each of the four rates are shown in Table 2. The comparisons between these numbers and the one in the two-state case should be with the contribution of the outflow calculated without time aggregation correction. This figure is 0.454.[6] In Table 2

[6] Instead of the one we reported above, 0.521. As emphasized by a number of authors, time aggregation tends to reduce the contribution of the inflow rate. See for example Elsby, Michaels and Solon (2007) for more discussion.

the total contribution of the outflow from unemployment is $0.364 + 0.151 = 0.515$, so the approximate 50:50 split still holds. The transitions between activity and inactivity contribute less than the transitions between employment and unemployment but they still contribute a significant amount. Roughly two thirds of the volatility in unemployment is due to the two-state transitions, evenly split, and the other third to the transitions between activity and inactivity, also evenly split between employment and unemployment.

There are no comparable calculations for the United States to compare with our numbers so we calculated the β values of the four transition rates using Shimer's (2007) data from 1967 to 2006. The results are shown in Table 2. Perhaps surprisingly, the transitions between activity and inactivity contribute much less to unemployment volatility in the United States than in the United Kingdom. The contribution of the job exit rate is about the same in the two countries with the slack left over by the lower inactivity contributions in the US taken up by the job finding rate.

III. Continental Europe

A. France

For France we use claimant data, which are available monthly since 1991. The average unemployment rate obtained with claimants data is only 0.3 percentage points lower than the official one, based on the ILO definition, and the coefficient of correlation between the two is 0.941. The continuous time transition rates are obtained from (2) and (3), and deliver an equilibrium unemployment rate that is also very closely correlated with the actual one (0.964).

The unemployment rate in France starts off high, between 10% and 12% in the early 1990s, then it falls to just below 8% between 1997 and 2001, and finally it fluctuates around 8% in the last six years. There is thus one important expansion in the French economy, linking two periods of roughly constant unemployment. Table 3 shows the relative contribution of the outflow rate to the evolution of equilibrium unemployment. The reported values of β_f indicate that the outflow is responsible for virtually all the unemployment volatility when

Table 3: Contributions from the outflow rate to unemployment volatility, French Claimant Count

period	feature	β_f
1991Q2-1996Q4	whole sample	0.799
1991Q2-1996Q4	untrended u	0.947
1997Q1-2001Q2	falling u	0.551
2001Q3-2007Q3	untrended u	0.912

unemployment is roughly untrended. In contrast, in the strong expansion of the late 1990s inflows and outflows contribute about the same to unemployment volatility. Values of β_f^* are not reported as there were no observations with a large discrepancy between the actual and predicted change in unemployment.

France has strict employment protection legislation, having Allard (2005) index value 3 during our sample period. So it is not surprising that the employment-unemployment transition contributes less to cyclical volatility. In the expansion period of 1997-2001 it contributes more, but it is falling, so employment protection is not binding. This contrasts with Britain, where in the low regulation period post-1985 the contribution of the inflow rate is about the same in both expansions and contractions.

B. Spain

Available claimants data for Spain are not suitable for our purposes so we use individual record files from the Spanish LFS, which is available as a six-quarter panel since 1987. We recover continuous-time transition rates solving (4) and (5), and the resulting equilibrium unemployment has a correlation coefficient with actual unemployment of 0.974.

Spain has had until very recently the highest (by far) unemployment rate in Europe. In 1987 Spanish unemployment was about 20%, and after a mild fall it rose to reach a record 24% in 1994. Then it started a very long, steady fall, and is currently below both French and German unemployment. A feature of the Spanish employment expansion is that after the mid 1980s, the majority of new matches were on the basis of fixed-term contracts, with maximum duration of four years. This policy was introduced to counteract the strict employment protection characterizing Spanish labor markets (with an Allard index of 3.2

Table 4: Contributions from the outflow rate to unemployment volatility, Spanish LFS

period	feature	β_f	β_f^*
1987Q4-2006Q4	whole sample	0.567	0.462
1990Q4-1994Q1	rising u	0.373	0.356
1994Q2-2006Q4	steady fall	0.608	0.539

Table 5: Contributions from four transition rates, Spanish LFS

Transition	Whole sample	1990Q4-1994Q1	1994Q2-2006Q4
employment-unemployment	0.299	0.402	0.230
inactivity-unemployment	0.133	0.218	0.092
unemployment-employment	0.348	0.223	0.337
unemployment-inactivity	0.220	0.157	0.341

declining to 2.3 during the sample period). By the early 1990s, as much as 90% of new job creation and 30% of employment was with fixed-term contracts. Although the use of fixed-term contracts started to be regulated in 1994 and more so after 1997, it did not seem to affect their incidence in the Spanish labor market.

The contribution of the outflow rate that we calculated for Spain on the assumption of two states only is shown in Table 4. Over the whole sample period inflows and outflows contribute in nearly equal parts to unemployment volatility (whether or not one drops observations with inconsistent changes in actual and predicted unemployment). But during the strong rise in unemployment between 1990 and 1994 the inflow accounts for almost two thirds of unemployment volatility. Virtually all job separations during this period were due to expiring fixed-term contracts. The outflow accounts for almost two thirds of the following twelve-year long expansion.

Table 5 reports results of the decomposition in (12) and (13), when inactivity is explicitly taken into account. Over the whole period the contribution of inactivity transitions in Spain is about the same as in Britain, with the unemployment-inactivity transition playing a slightly bigger role. But there are differences in the two sub-periods of our sample, with the transition from inactivity to unemployment becoming more important in the recession of the first sub-period and the unemployment-inactivity transition becoming more important in the recovery of the second period.

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