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Labour market flows: Facts from the United Kingdom ☆

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ABSTRACT

This paper documents a number of facts about worker gross flows in the United Kingdom for the period between 1993 and 2010. Using Labour Force Survey data, I examine the size and cyclicality of the flows and transition probabilities between employment, unemployment and inactivity, from several angles. I examine aggregate conditional transition probabilities, job-to-job flows, employment separations by reason, flows between inactivity and the labour force and flows by education. I decompose contributions of job-finding and job-separation rates to fluctuations in the unemployment rate. Over the past cycle, the job-separation rate has been as relevant as the job-finding rate.

1. Introduction

The behaviour of flows between employment, unemployment and inactivity drives movements in aggregate indicators, such as the employment and unemployment rate. They are critical to our understanding of labour market dynamics and business cycle fluctuations. Furthermore, worker gross flows and transition rates lie at the heart of state-of-the-art models of unemployment, anchored in the Mortensen and Pissarides (1994) search and matching framework.

The objective of this paper is to establish a number of key facts about the properties of the UK labour market flows, by examining data from the Labour Force Survey over the past 18 years. In so doing, it extends the work by Bell and Smith (2002) and provides a systematic study of worker gross flows based on UK data, along the lines of the pioneer work of Blanchard and Diamond (1990) for the United States.[1]

One main contribution is to add to the debate revived by Shimer (2007) regarding the relative importance of job-finding and separation rates for fluctuations in unemployment. It provides evidence for the United Kingdom using different decomposition methods proposed in the literature. The additional interest, relative to Petrongolo and Pissarides (2008) is that the sample covers a complete business cycle: the expansion between 1993 and 2001, the economic slowdown, the late 2000s recession and its aftermath. I find that the job-separation rate is as important as the job-finding rate. The increase of the job-separation rate at the onset of the current recession gives strength to the point made by Davis et al. (2006) that changes in the job-separation rate explain most of the variation in unemployment during sharp recessions.

I then go on to analyse particular elements of the labour market that can be useful for economists in other areas of research. Given the size of the flows from and into inactivity I have explored in more detail their role over the business cycle. In particular, I have disaggregated the inactive into two subgroups: those that *want a job* (and therefore can be considered marginally close to the labour market) and those that *do not want a job* and evaluated the differences between them. In the last few years the United Kingdom experienced structural changes in the level of education of the labour force. Therefore, it seems important to examine the size and the behaviour of labour market flows by education. I have also provided evidence on job-to-job flows and on-the-job search, on the causes of employment separations and on aggregate conditional transition probabilities.

These stylised facts, summarised in the conclusion, are of interest to policymakers and macroeconomists alike. For policymakers they can help improve the monitoring of business cycles, the detection of turning points and the assessment of labour market tightness. For

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[1] There are some studies on the UK labour market flows, notably classical studies by Nickell (1982) and Pissarides (1986) or more recently Burgess and Turon (2005), but they only consider inflows and outflows of unemployment using claimant count data. Bell and Smith (2002), on the other hand, use Labour Force Survey data but their sample only runs until 2000 and they restrict their analysis to the size and cyclical properties of gross flows, job-to-job flows and job separations by reason.

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macroeconomists, this paper can be seen as a reference for the calibration of a number of parameters, and also provide a guideline of the empirical features that theoretical models should ideally have.

2. Preliminary concepts

2.1. Labour market dynamics

In order to analyse labour market dynamics I make use of some fundamental equations that describe the evolution of the stock of employed E and the stock of unemployed U. The pool of inactive is denoted as I. Adding the three pools gives us the working-age population W, while summing employment and unemployment corresponds to the labour force L. The unemployment rate is defined as $u=\frac{U}{L}$ and the participation rate as $p=\frac{L}{W}$.

Total employment evolves according to the following equation:

$$E_{t+1}=E_t+N_t^{UE}+N_t^{IE}-N_t^{EU}-N_t^{EI}, \tag{1}$$

where N is the gross flows between the pools indicated by the superscript. If we normalise this equation by the total working-age population, we get the following equation that focuses on the total gross flows as the determinant of changes in the employment rate.

$$\frac{E_{t+1}-E_t}{W_t}=\frac{N_t^{UE}}{W_t}+\frac{N_t^{IE}}{W_t}-\frac{N_t^{EU}}{W_t}-\frac{N_t^{EI}}{W_t}. \tag{2}$$

Alternatively, Eq. (2) may be written in terms of transition probabilities rates (λ^{ij})

$$\frac{E_{t+1}-E_t}{E_t}=\lambda_t^{UE}\frac{u_t}{1-u_t}+\lambda_t^{IE}\frac{(1-p_t)}{p_t(1-u_t)}-\lambda_t^{EU}-\lambda_t^{EI}. \tag{3}$$

We can perform a similar decomposition of the changes in unemployment

$$U_{t+1}=U_t-N_t^{UE}+N_t^{EU}-N_t^{UI}+N_t^{IU}, \tag{4}$$

either focusing on the gross flows or on the transition rates:

$$\frac{U_{t+1}-U_t}{W_t}=-\frac{N_t^{UE}}{W_t}+\frac{N_t^{EU}}{W_t}-\frac{N_t^{UI}}{W_t}+\frac{N_t^{IU}}{W_t}, \tag{5}$$

$$\frac{U_{t+1}-U_t}{U_t}=\lambda_t^{EU}\frac{1-u_t}{u_t}+\lambda_t^{IU}\frac{(1-p_t)}{p_t u_t}-\lambda_t^{UE}-\lambda_t^{UI}. \tag{6}$$

Some authors like Blanchard and Diamond (1990) or Davis (2006) focus on gross flows, while others, such as Shimer (2007) or Fujita and Ramey (2009) give more emphasis to transition rates. The two perspectives are complementary in the analysis of the labour market and the interest in one or the other depends ultimately on the theoretical model one has in mind. Thus I explore both of them.

2.2. Labour Force Survey

The data are constructed from the Labour Force Survey (LFS). The LFS is a quarterly survey of households living at private addresses in the United Kingdom. Its random sample design, is based on the Postcode Address File, a list prepared by the Post Office with all addresses which receive fewer than 25 articles of mail a day. The LFS panel samples around 60,000 households for five successive quarters. The households are interviewed face-to-face when first included on the survey, and by telephone thereafter. The respondents are asked about the household's characteristic, education, labour market status, economic activity, as well as other elements. The sample is split into five waves. Every quarter one wave of approximately 12,000 leaves the survey and a new wave enters. In this way, we can observe the changes in the labour market status of 80% of the households that took part in the survey and, therefore, obtain the gross labour market flows.[2]

Although the quarterly survey starts in 1992, the 5 waves only run since the first quarter of 1993, so the sample is restricted to the period between 1993:2 and 2010:4. There is a break in the survey in 1996 as before, it did not include Northern Ireland. As Northern Ireland represents less than 3% of the working-age population of the United Kingdom, the break does not affect the size of the gross flows as a percentage of the working-age population or in hazard rates. The constructed flow series are weighted using the Office for National Statistics (ONS) census population weights.

Estimating gross flows on the basis of survey data has two shortcomings: they suffer from non-response bias, and response-error bias. For the LFS, the non-contact rate is around 5% while the refusal rate ranges between 10% and 15%. The response error bias is a more serious problem because, in longitudinal data the errors are cumulative and lead to an overestimation of flows. There is no practical way to deal with response-error bias. We should bear in mind that the results might be biased upwards, particularly in the flows between unemployment and inactivity. Nevertheless there is no reason to believe that the response-error bias affects the cyclical properties of the gross flows.

3. Worker gross flows in the United Kingdom

3.1. Average gross flows

Fig. 1 summarises the average quarterly worker flows over the 1996–2010 period. It reports the total number of people that changed status in thousands (t), as a percentage of the working-age population (p) and as a transition probability or hazard rate (h).

Over the sample period there was an average 52,000 net increase in employment per quarter. Substantial quarterly gross flows hide, however, behind this value. An average of 877,000 people move out of employment every quarter, approximately 60% of whom go into inactivity. An average of 930,000 people move into employment, where the split is broadly similar between unemployment and inactivity. In addition to the 2.6% of the total working-age population that join the pool of employed, there is an additional 2.1% that change employer every quarter.

Demographic change represents a very small fraction of worker turnover, as shown in the two boxes within the chart. Only a minority of young people (less than 16 years of age) joining the working-age population enter the labour force directly. Similarly, more than half of the people that reach retirement age (65 plus for men, 60 plus for women) are already inactive. For this reason, I exclude from the analysis new entries and exits from the working-age population.

How do these numbers compare to those of the United States? Table 1 compares the quarterly figures of the United Kingdom with the monthly values of the United States taken from Bleakley et al. (1999). If we interpret the size of the gross flows between unemployment, employment and inactivity as a proxy for labour market flexibility, one could be tempted to say that the labour market in the United Kingdom is less flexible than in the United States. While 6.9% of the population change status every quarter in the United Kingdom, in the United States 6.5% change status every month. In my opinion, a comparison between these values can be misleading.

First, because there might exist multiple transitions within the quarter. Suppose someone is unemployed in the first month, then moves to employment in the second, and then back to unemployment. While a monthly survey would pick up all transitions, the quarterly survey would not detect any. It is possible to overcome the

[2] A comprehensive discussion of the survey's methodology can be found in Clarke and Tate (2000).

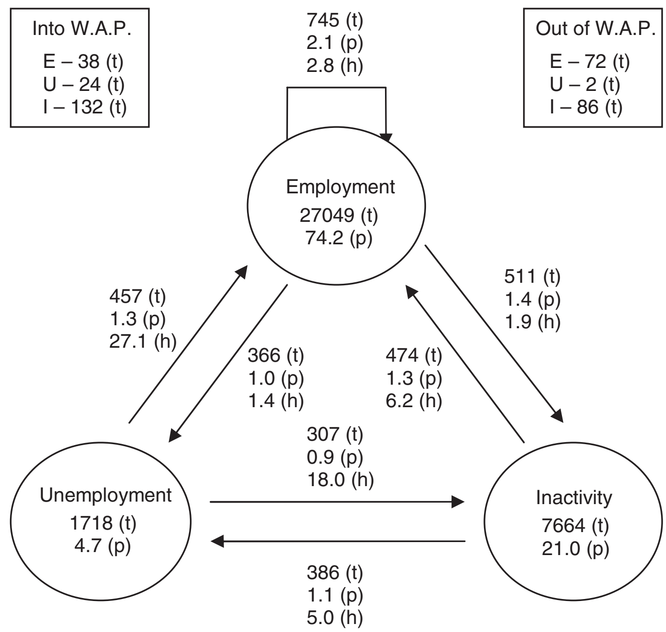

Fig. 1. Average quarterly worker flows, Labour Force Survey, 1996–2010. 2010.
Note: the worker flows are expressed as total number of people in thousands (t), as a percentage of the working-age population (p) and as a hazard rate (h). The two boxes show the movements in and out of the working-age population. The statistics are the average of the period starting in 1996:2, to include Northern Ireland, and ending in 2010:4.

problem of multiple transitions by calculating for the United States the quarterly probabilities implied by the monthly rates. The results are shown in the second column of Table 1.[3] After correcting for multiple transitions, the total implied quarterly flows in the United States are around 15% of the working-age population, twice the value for the United Kingdom. A big part of the flows, however, is accounted by the flows between inactivity and employment.

But for this comparison to be correct, we are implicitly assuming that: first, there is no history dependency and second, that there is no heterogeneity on the labour force in terms of transition probabilities. However, in reality these assumptions do not seem to be met. Ruhm (1991), for instance, finds that displaced workers face higher unemployment rates for at least 4 years. Also, Stevens (1997) shows that the effects of displacements in earnings are quite persistent, because of additional job losses in the years following the displacement. Shimer (2007) discusses in length the effect of heterogeneity on the evaluation of the relative importance of the job-finding rate. One way to test if these two assumptions hold is to look at the aggregate conditional transition probabilities. Both history dependence or heterogeneity would reflect on different aggregate conditional probabilities. I computed the average conditional probabilities in the LFS, based on three-period flows (N^{hij}):

$$\lambda^{ij}_{t|E_{t-2}} = \frac{N^{ij}_t|E_{t-2}}{N^{Ei}_{t-1}} = \frac{N^{Eij}_t}{N^{Ei}_{t-1}}, \lambda^{ij}_{t|U_{t-2}} = \frac{N^{ij}_t|U_{t-2}}{N^{Ui}_{t-1}} = \frac{N^{Uij}_t}{N^{Ui}_{t-1}}, \lambda^{ij}_{t|I_{t-2}} = \frac{N^{ij}_t|I_{t-2}}{N^{Ii}_{t-1}} = \frac{N^{Iij}_t}{N^{Ii}_{t-1}}.$$

We can see in Table 2 the substantial differences in conditional probabilities. The probability of separation from employment to unemployment is 1% if the person was previously employed, 11% if he was previously unemployed and 5% if he was inactive. The job-finding rate is 48% if two quarters earlier the person was employed, 24% if the person was inactive and 20% if it was unemployed. In addition, one inactive person is between 3 and 6 times more likely to return to the labour force, if it has only been inactive for one period.

Whatever the cause of the differences of the aggregate conditional probabilities is, their existence implies that the extrapolation of flows at a different frequency than the one for which the survey was carried, is biased. In order to show how possibly misleading this can be, I compute the annual transition probability for the LFS directly, by looking at the flows between the first and the fifth wave, and the annual rate extrapolated from the quarterly rates, by assuming equal conditional probabilities. We can see from the last column of Table 1 that the result is quite different. The annual transitions, calculated through the quarterly rates tend to overestimate the true values, particularly on the employment–inactivity transitions. The total gross flows, estimated using the quarterly transition probabilities, are 18.6% of working-age population as opposed to the consistently calculated value of 11.6%. When doing the reverse exercise – extrapolating the quarterly flows from the observed annual flows – we underestimate the true transitions by roughly one half.

This conclusion is in line with the results of Elsby et al. (2008). They estimate the job-finding and separation rates for OECD countries, based on publicly available data on unemployment by duration spell.

Table 1
Gross flows for the United States and the United Kingdom.

	United States		United Kingdom			
	Monthly	Quarterly	Quarterly		Annual	
	(o)	(ext-m)	(o)	(ext-a)	(o)	(ext-q)
Employment → unemployment	0.8	1.4*	1.0	0.6*	1.5	2.2*
Employment → inactivity	1.7	5.1*	1.4	0.8*	2.9	5.3*
Unemployment → employment	1.0	1.6*	1.3	0.7*	2.0	2.7*
Unemployment → inactivity	0.8	1.3*	0.9	0.4*	1.0	1.5*
Inactivity → employment	1.5	4.5*	1.3	0.8*	3.0	5.4*
Inactivity → unemployment	0.6	1.0*	1.1	0.5*	1.3	1.8*
Total	6.5	15.0*	6.9	3.6*	11.8	18.7*

Note: gross flows in percentage of the working-age population. The values from the United States are taken from Bleakley et al. (1999). The columns with (o) indicate the frequency of the original survey. The columns with an * are extrapolated from a different frequency denoted by: monthly (m), quarterly (q) or annual (a), by allowing for multiple transitions and assuming constant transition probabilities. Data for the United Kingdom are averages between 1996:3 and 2010:4.

[3] A quarterly survey measures the probability that an individual in a given state, is in a different state after 3 months, so we cannot simply multiply the monthly transition rates by three. We need to compute the probabilities of multiple transitions. See Appendix for details on the calculations.

Table 2
Conditional transition probabilities, Labour Force Survey.

	Unconditional probabilities	Conditional on:		
		E_{t-2}	U_{t-2}	I_{t-2}
Employment → unemployment	1.4	1.0	11.0	4.9
Employment → inactivity	1.9	1.3	4.9	18.0
Unemployment → employment	27.1	47.5	20.0	24.1
Unemployment → inactivity	18.0	10.5	12.8	33.5
Inactivity → employment	6.2	23.1	12.0	3.8
Inactivity → unemployment	5.0	9.7	22.8	3.7

Note: averages between 1996:3 and 2010:4.

They build upon the methodology of Shimer (2007), using data on the number unemployed by different duration spells: less than 1, 3, 6 or 12 months. They find that, for the United Kingdom and the United States, the calculated job-finding rate is quite different depending on which unemployment length was used, which they interpreted as evidence of duration dependence.[4] Blanchard and Portugal (2001) also found an analogous result, but with job flows. They find that, at a quarterly frequency, job creation and job destruction in Portugal are substantially lower than in the United States, but at an annual frequency job creation and destruction are actually higher in Portugal.

Because a survey compares the state of an individual in two points in time, different frequencies alter the weights put on the different types of unemployed or histories. This might not be relevant when we want to evaluate the relative importance of the job-finding rate, as shown by Shimer (2007), but it is important when we want to compare the size of the gross flows between countries. Having the transition probabilities at a given frequency is not enough to characterise a labour market.

3.2. Evolution of labour market stocks and flows

The first row in Fig. 2 displays the evolution of the employment rate, unemployment rate and inactivity rate in the United Kingdom over the past 30 years. The vertical line signals the beginning of the flows sample. We can see that the sample covers one complete business cycle, with a slightly negative trend in the unemployment rate. It fell until 2001, it was relatively stable until 2005 and has increased since. It reached 8% by the end of the sample, still below the peak value in the two previous recessions. The inactivity rate has a small downward trend, but compared to historical standards it can be considered relatively flat.

The second and third rows in Fig. 2 show the flows between the three pools, as a percentage of the working-age population and as hazard rates. Most of the action has been driven by the flows into and out of unemployment. At the beginning of the sample, 1.6% of the working-age population moved from unemployment into employment every quarter, by 2000 it stabilized at 1.2% and it increased during the recession to just above 1.4% of the working-age population. Separations from employment to unemployment have also fallen, from 1.4% to 0.9% of the working-age population in 2007 but they picked up sharply during the recession. In 2009 around two million people have lost their jobs. By contrast, flows between employment and inactivity have remained broadly stable across the sample period, but have somewhat decline during the recession.

Although the picture of the gross flows and hazard rates is very similar for employment and inactivity, this is not the case for unemployment. While the actual number of people that moved out of unemployment fell between 1996 and 2005, shrinking the pool of unemployed, the probability of moving out of unemployment increased in the same period.

[4] For instance, for the United States, when using unemployed with a spell shorter than 1 month, the monthly job-finding rate is 60%, but when using the unemployed with a spell shorter than 12 months, the monthly job-finding was only 20%.

3.3. Cyclical properties of labour market flows

The literature on worker flows defines the cyclicality of flows as their correlation with the level of economic activity. I estimate it by running an ordinary least square regression of the log of each variable on season dummy variables, a linear trend and the unemployment rate. This follows Baker (1992), who undertakes a similar procedure to analyse the cyclical movements of unemployment duration. The results are shown in Table 3. One should be aware that the conclusions are based on only one economic cycle, which also presented a negative structural trend in the unemployment rate.

Inflows and outflows of all pools are countercyclical. In economic downturns, as the labour market gets looser, there are more movements between the three states. The action occurs mostly in the unemployment pool. More of the unemployed find a job or stop searching for one. Also, more of the inactive start looking for a job and more workers lose theirs.

The separation rate from employment to unemployment, and the transition probability from inactivity to unemployment are strongly countercyclical, while the job finding rate is strongly procyclical. In other words, recessions are periods when it is harder for an unemployed individual to find a job, an employed person is more likely to lose their job and an inactive person is more likely to start looking for one. Gross flows and hazard rate from inactivity to employment are slightly procyclical, whereas from employment to inactivity do not seem to have a cyclical component.

In terms of magnitude, job-separation rate fluctuates as much as the job-finding rate. Also quite responsive is the hazard rate between inactivity and unemployment. It seems that job-finding and separation rates are equally important determinants of unemployment fluctuations. Nevertheless, given the ongoing debate on the relative importance of each transition rate, I make a more careful analysis in the next section.

4. What drives unemployment in United Kingdom?

What dictates the cyclical behaviour of unemployment: hires or separations? The seminal work on labour market flows by Blanchard and Diamond (1990) and Davis and Haltiwanger (1992) set the 'conventional wisdom' that recessions are mainly driven by high job loss rates. Recently, Shimer (2007) and Hall (2006) have challenged this view by presenting evidence that cyclical unemployment dynamics are largely driven by a time-varying job-finding rate and that the separation rate is close to being acyclical. These two papers had a very strong impact on the field. On the one hand, many researchers have used this evidence to develop models that incorporate constant job destruction rates (for instance Blanchard and Gali (2010)). On the other hand,

Table 3
Cyclical variation of labour market flows and hazard rates.

	Gross flows	Hazard rates
$\rightarrow E$	0.007 (0.88)	−0.020* (−2.91)
$E\rightarrow$	0.023* (3.14)	0.033* (4.78)
$\rightarrow U$	0.075* (15.52)	0.084* (17.59)
$U\rightarrow$	0.065* (12.64)	−0.075* (−26.60)
$\rightarrow I$	0.022* (2.84)	0.021* (2.86)
$I\rightarrow$	0.013 (1.48)	0.016 (1.99)
$E\rightarrow U$	0.077* (10.36)	0.087* (12.34)
$E\rightarrow I$	−0.020 (−1.99)	−0.010 (−1.06)
$U\rightarrow E$	0.050* (6.25)	−0.090* (−16.10)
$U\rightarrow I$	0.087* (11.99)	−0.053* (−7.37)
$I\rightarrow E$	−0.038* (−3.70)	−0.035* (−3.64)
$I\rightarrow U$	0.071* (8.389)	0.075* (9.42)

Note: the cyclicality of the series is the coefficient on unemployment rate in a regression of the series in logs on season quarter dummies, time trend and unemployment rate. T-statistics are in brackets. The sample is between 1993:2 and 2010:4.
* Significant at 1%.

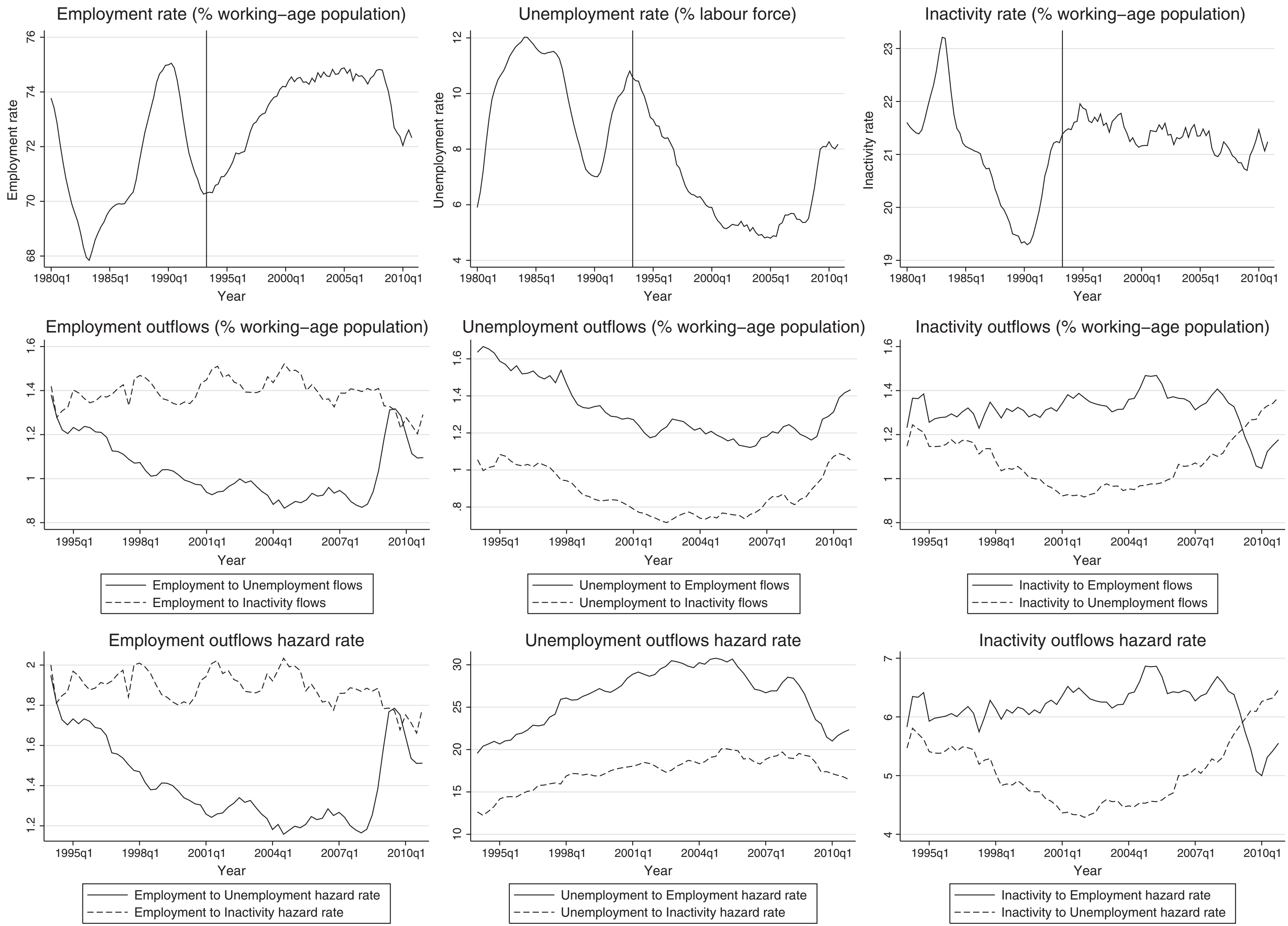

Fig. 2. Labour market stocks, gross flows and hazard rates. Note: the flows series are a four-quarter moving average to remove seasonality and high frequency movements. The stock series are the ONS official rates.

Table 4
Unemployment decompositions.

	LFS (1993:2–2010:4)			Claimant count (1989:1–2010:4)	
	Three States	Two States			
	Shimer	Shimer	F & R	Shimer	F & R
Employment → unemployment	0.25	0.56	0.58	0.46	0.42
Employment → inactivity	0.01				
Unemployment → employment	0.44	0.37	0.39	0.44	0.44
Unemployment → inactivity	0.07				
Inactivity → employment	0.07				
Inactivity → unemployment	0.06				

Note: the gross flows series are previously seasonally adjusted using the X12 Census programme and the transition probabilities are corrected for time aggregation bias using the methodology applied by Shimer (2007). In Shimer's decomposition, the value is the ratio between the covariance between u_t^{ss} and u_t^{ij} and the variance of u_t^{ss} (the series are previously linearly detrended). For Fujita and Ramey, the value correspond to ratio between the covariance between du_t^{ss} and du_t^{s} and the variance of du_t^{ss}.

other researchers put forward more evidence that opposes their claims. Davis et al. (2006) provide new empirical evidence in support of the view that a recession starts out with a wave of separations. Fujita and Ramey (2009) and Elsby et al. (2009) argue that both job-separation and job-finding rates play a significant role in unemployment fluctuations in the United States.

The UK evidence is also controversial. Pissarides (1986) finds that, for the period between 1967 and 1983, almost all changes in unemployment can be accounted for by changes in the job-finding rate. In contrast, Burgess and Turon (2005) claim that between 1967 and 1998 the unemployment dynamics arise mostly from shocks to inflows. Petrongolo and Pissarides (2008) find that the job-separation rate accounts for one third of unemployment volatility.

The ongoing debate gives emphasis to the use of different methodological approaches and data sources across researchers. To evaluate the contribution of job-finding and job-separation rates in the United Kingdom I use two decompositions of unemployment that have been proposed in the recent literature: Shimer (2007) and Fujita and Ramey (2009). I also correct the data for time aggregation bias, by applying the continuous correction method proposed by Shimer (2007).

4.1. Unemployment decompositions

The starting point for all unemployment decompositions is the equation of the steady-state unemployment u_t^{ss}. With three states, the equilibrium unemployment is a function of all six transition probabilities[5]:

$$u_t^{ss} = f\left(\lambda_t^{EU}, \lambda_t^{EI}, \lambda_t^{UE}, \lambda_t^{UI}, \lambda_t^{IE}, \lambda_t^{IU}\right). \tag{7}$$

Shimer (2007) isolates the effect of the each transition rate by constructing a counterfactual unemployment rate if all other transition probabilities were always to be at their sample average ($\bar{\lambda}^{ij}$). For instance, if we focus of the transition probability between employment and unemployment, the counterfactual unemployment would be:

$$u_t^{EU} = f\left(\lambda_t^{EU}, \bar{\lambda}^{EI}, \bar{\lambda}^{UE}, \bar{\lambda}^{UI}, \bar{\lambda}^{IE}, \bar{\lambda}^{IU}\right). \tag{8}$$

If we ignore the flows in and out of inactivity, and focus only on two states, the equilibrium unemployment is given by[6]:

$$u_t^{ss} = \frac{\lambda_t^{EU}}{\lambda_t^{EU} + \lambda_t^{UE}}, \tag{9}$$

and the two counterfactual unemployment rates are:

$$u_t^{EU} = \frac{\lambda_t^{EU}}{\lambda_t^{EU} + \bar{\lambda}^{UE}}, u_t^{UE} = \frac{\bar{\lambda}^{EU}}{\bar{\lambda}^{EU} + \lambda_t^{UE}}. \tag{10}$$

Shimer's decomposition has faced some criticism because the steady-state approximation is non-linear in the hazard rates. In this sense, if we chose different values for $\bar{\lambda}^{ij}$ instead of the sample average we could get different answers. I access the robustness of the method by applying the two-state decomposition of Fujita and Ramey (2009). By linearising the steady-state unemployment around the previous period steady-state u_{t-1}^{ss}, we get the following expression:

$$\frac{u_t^{ss} - u_{t-1}^{ss}}{u_{t-1}^{ss}} = \left(1 - u_{t-1}^{ss}\right)\frac{\lambda_t^{EU} - \lambda_{t-1}^{EU}}{\lambda_{t-1}^{EU}} - \left(1 - u_{t-1}^{ss}\right)\frac{\lambda_t^{UE} - \lambda_{t-1}^{UE}}{\lambda_{t-1}^{UE}}, \tag{11}$$

which is simply breaking down the percentage change of the steady-state unemployment rate into percentage changes of both job-finding and job-separation rates. We can restate this expression as $du_t^{ss} = du_t^f + du_t^s$, where

$$du_t^{ss} \equiv \frac{u_t^{ss} - u_{t-1}^{ss}}{u_{t-1}^{ss}}, du_t^f \equiv -\left(1 - u_{t-1}^{ss}\right)\frac{\lambda_t^{UE} - \lambda_{t-1}^{UE}}{\lambda_{t-1}^{UE}}, du_t^s \equiv \left(1 - u_{t-1}^{ss}\right)\frac{\lambda_t^{EU} - \lambda_{t-1}^{EU}}{\lambda_{t-1}^{EU}}. \tag{12}$$

Another way to assess the robustness of the results is to repeat the exercise using data generated at a monthly frequency. I use data on the claimant count unemployment outflows and inflows to calculate a proxy for job-finding and job-separation rates. This data, provided by ONS, covers the unemployed that are claiming unemployment benefits. It is a proxy for two reasons. First, people registered in the claimant count are only a subset of the unemployed. Second, despite constituting the large majority, claimant account flows include not only flows between unemployment and employment but also include flows between unemployment and inactivity. With this data we can go back to 1989, which allows us to also capture the early 1990s recession. The correlations between the LFS and the claimant count series are quite high: 0.99 between the unemployment rates, 0.90 between the job-separation rates and 0.91 between the job-finding rates.

Table 4 displays the importance of each transition probability using the LFS and claimant count data. When we use the three-state decomposition, we find that slightly more than 20% of the fluctuations in unemployment can be attributed to flows between inactivity and the labour force. From the remaining, job-finding rate is more important than the job-separation rate (60–40 split). When we do a two-state decomposition, the job-separation rate is somewhat more important, accounting for more than 50% of the volatility of unemployment, both using the LFS (40–60 split) and claimant count data (50–50 split). There are little differences between Shimer's and Fujita and Ramey decompositions. These values are in line with the ones reported by Petrongolo and Pissarides (2008). Using an

[5] See Appendix for the exact formula.

[6] While the three-states equilibrium unemployment tracks the actual unemployment rate very well, the two-states equilibrium unemployment is one percentage point below actual unemployment. However, the correlation between equilibrium and actual unemployment is around 0.93 for both methods.

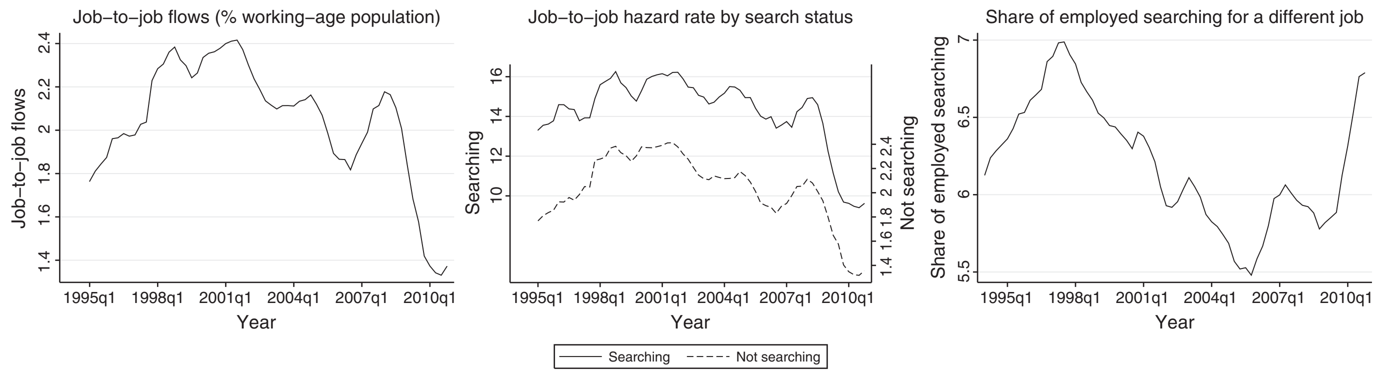

Fig. 3. Job-to-job flows. Note: the series are a four-quarter moving average to remove seasonality and high frequency movements.

alternative decomposition, they find that job-separation rate has the same contribution to unemployment volatility as the job-finding rate with the LFS data, while for the claimant count since 1967, the contribution of job-separation rate has varied between 25 and 45%.[7]

5. Other perspectives on the UK labour market

5.1. Job-to-job flows

Many economists think that on-the-job search and job-to-job flows are important elements of business cycles. For instance, Krause and Lubik (2007), building on the Pissarides (1994) on-the-job search model, concluded that on-the-job search and job-to-job transitions greatly amplify shocks to the economy.

One advantage of the LFS, relative to the US surveys, is that it allows us to calculate job-to-job flows. It asks the respondent what year and month it started the current job, making it possible to compute the length of the current job tenure. I count as job-to-job transitions the cases where an individual is employed in the first quarter and employed in the second quarter but with a job tenure of less than 3 months. We should bear in mind that this measure of job-to-job flows includes people that changed job directly as well as individuals that had non-measured spells of unemployment or inactivity. In other words, it includes individuals that moved out of employment and back into employment within the quarter.

The first graph of Fig. 3 plots the job-to-job flows as a percentage of the working population. Job-to-job flows increased from 1996 to 2001, but have fallen since, particularly during the recession. As one expects, there are substantial differences in the transition probabilities among employees engaged in on-the-job search and the ones that are not searching. If a worker is searching for a job, the probability of changing job in any given quarter is, on average, 14%. If he is not searching, the probability is only 2%. Each quarter, on average, 6.2% of workers are searching for a different job. This is higher than the value of 5.2% found by Pissarides and Wadsworth (1994). All in all, roughly one third of all the job changers were previously searching for a job.

Evidence from the United States by Fallick and Fleischman (2004) suggests that job-to-job flows are procyclical. We observe the same pattern in the United Kingdom as we can see in Table 5. Job-to-job transition probabilities are strongly procyclical as well as actual job-to-job flows.

Some on-the-job search theories have different predictions for the cyclicality of the number of employees searching for a different job. For instance, the stylised model presented in Pissarides (2000) predicts that increasing productivity leads to more people searching for jobs. Conversely, Nagypál (2008) argues that workers undertake less on-the-job search when they face lower unemployment risk, as is the case of expansions. In the United Kingdom, the second effect seems to dominate as number of employed searching for a job is slightly countercyclical.[8]

Table 5
Cyclical variation of job-to-job flows.

Job-to-job flows	−0.094*	(−11.50)
Job-to-job hazard rate if searching	−0.088*	(−11.33)
Job-to-job hazard rate if not searching	−0.098*	(−11.54)
Employees searching	0.016*	(3.16)

Note: the cyclicality of the series is the coefficient on unemployment rate in a regression of the series in logs on season quarter dummies, time trend and unemployment rate. T-statistics are in brackets. The sample is between 1993:2 and 2010:4.
* Significant at 1%.

5.2. Outflows from employment by reason

Are separations from employment driven by firms or workers? The LFS allows us to split the cause of employment separations into three categories: *involuntary separations*, *resignations*, or *other reasons*. The first category includes dismissals, termination of temporary employment contracts or redundancies, which are involuntary from the worker's point of view. *Resignations* include cases where the worker resigned, and also where they took voluntary redundancy. Finally, *other reasons* encompasses giving up work for health, family or personal reasons or taking early retirement. Roughly half of total separations from employment are due to *other reasons* and the other half is due to *resignations* and *involuntary separations* in equal shares.

The graphs in Fig. 4 plot, for the three types of job separations, the share caused by each reason. The flows from employment to unemployment are dominated by *involuntary separations*. On average, they account around 45% of total employment to unemployment flows, but at the peak of the recession they accounted for 60% of the flows. In the beginning of the sample *resignations* only accounted for 20% of total employment to unemployment flows, in 2007 that value was close to 30% but it has fallen since. As expected, *other reasons* accounts for 70% of the employment to inactivity flows, with the remaining being split equally between *involuntary separations* and *resignations*. Finally, only a minority of the job-to-job flows are caused by *involuntary separations*. Around 45% of job-to-job flows are due to *other reasons* and 35% are due to *resignations*.

Table 6 shows that, as expected, *involuntary separations* are strongly countercyclical, while *resignations* are very procyclical. In economic slowdowns less people quit, which partially counterbalances the fact

[7] One difference relative to Petrongolo and Pissarides (2008) is that while they compute the transition probabilities for all people above 15, I exclude people out of retirement age (60 plus for women and 65 plus for men). Because they include them, their transition probabilities are lower than mine, particularly out of inactivity. The cyclical properties do not seem to be affected.

[8] See Fujita (2010) for a more in-depth analysis of LFS job-to-job flows.

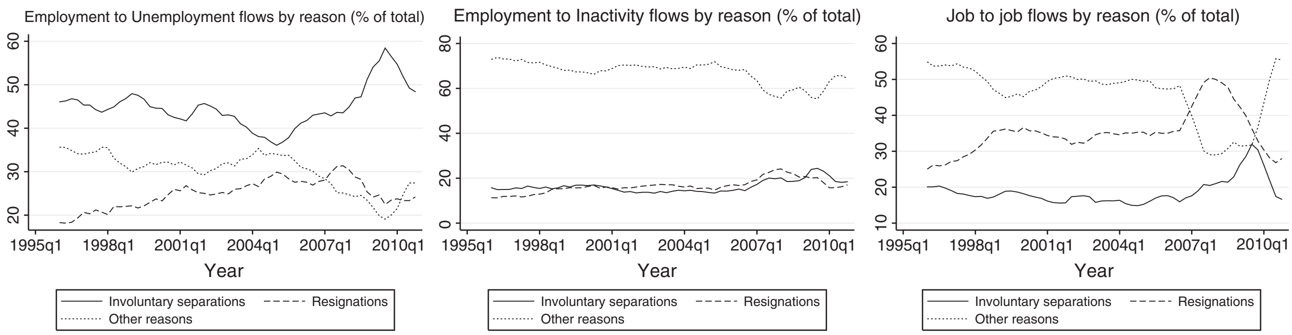

Fig. 4. Employment outflows by reason. Note: the series are a four-quarter moving average to remove seasonality and high frequency movements.

the more people lose their jobs. Separations by *other reasons* are acyclical which is consistent with the incidence of personal reasons having a weaker relationship with the business cycle.

When we disaggregate the separations even more, we see that the counter-cyclicality of the *involuntary separations* is mainly driven by the employment–unemployment flows while the procyclicality of resignations is much stronger in the job-to-job transitions.

5.3. Disaggregating inactivity

Given the magnitude of the flows in and out of inactivity, researchers have asked if some of the inactive should be considered as unemployed. Flinn and Heckman (1983) analysed conditional and unconditional transition probabilities between the two states and concluded that they are essentially different. In the United Kingdom, however, Joyce et al. (2003) found that many subgroups of the inactive have the same transition probability to employment as the unemployed. Blanchard and Diamond (1990) disaggregate the pool of inactive into two sub-groups: those that *want a job* and those that *do not want a job*. The inactive that *want a job* can be considered marginally close to the labour market, and consequently more likely to go into the labour force. The LFS also allows for this distinction.

The first graph in Fig. 5 shows the two series as a percentage of the working-age population. On average a quarter of all the inactive *want a job*. The relative size of the two groups has changed over the sample. While the pool of inactive that *want a job* had a similar trend as the unemployment rate, the pool of inactive that *do not want a job* has fluctuated but without a clear trend.

Table 7 reports the transition probabilities between the four groups. The inactive that *want a job* are twice as likely to join the labour force, and almost four times more likely to join the pool of unemployed than the inactive that *do not want a job*. Additionally, every quarter, 11% of the unemployed move into inactivity but still *want a job* while only 6% move to inactivity and *do not want a job*. There are also relatively high transition probabilities between the two groups of inactive. Around 21% of the inactive that *want a job* abandon their intentions by the following quarter. It seems that this state is a limbo between inactivity and the labour force.

Table 8 exhibits the cyclical properties of the gross flows and hazard rates between the two groups of the inactive and the labour force. The flows between the inactive (out) and the labour force are not related to the cycle, while all the flows between the inactive (want) and the labour force are countercyclical. In recessions, more people leave the labour force but still want a job. Taking the evidence as a whole, there seems to exist a closer link between the pool of the inactive that *want a job* and the labour force, particularly unemployment.

5.4. Flows by education

Previous studies on labour market flows have paid relatively little attention to differences by levels of education. To explore such differences, I divide the working-age population into three groups depending on the level of education: higher education (*Education 1*), A-levels and GCSE or equivalent (*Education 2*) and below GCSE (*Education 3*). There has been a significant change in the UK economy over the past decade, with the share of working-age population with higher education increasing from 20% in 1997 to above 35% in 2010. Over the same period, the share of the working-age population in the lowest education category fell from around 30% to 15%.

There are striking differences across the three education groups with respect to employment, unemployment and inactivity rates, as one can see in the first row of Fig. 6. The average employment rate among the most educated is 87%, as opposed to 55% for individuals in the lowest education category. Both the unemployment rate and the inactivity rate are monotonically decreasing in the level of education. Individuals in the lowest education category face an average unemployment rate of 12%, almost four times higher than the average unemployment rate of those with higher education. The average inactivity rates are, in increasing order of level of education, 38%, 19% and 11%.

The difference between education categories extends to transition probabilities, as shown in the remaining figures of Fig. 6. For example, the average separation rates from employment to unemployment are 0.9%, 1.5% and 1.9% as we go down the education ranking. The job-finding rate also presents significant differences. Individuals in the highest education category are twice as likely to find a job than individuals in the lowest education group.

Table 9 presents the coefficient of the regression of each transition probability with the unemployment rate. The cyclical

Table 6
Cyclical variation of employment outflows hazard rates by reason.

	Total separations	Employment to unemployment	Employment to inactivity	Job-to-job
Involuntary separations	0.070* (7.72)	0.150* (10.50)	0.044* (3.68)	−0.029* (−2.76)
Resignations	−0.109* (−11.99)	0.015 (1.39)	−0.076* (−5.63)	−0.184* (−13.96)
Other reasons	−0.034 (−1.67)	0.056* (3.65)	−0.029 (−1.53)	−0.081* (−2.68)

Note: the cyclicality of the series is the coefficient on unemployment rate in a regression of the series in logs on season quarter dummies, time trend and unemployment rate. T-statistics are in brackets. The sample is between 1993:2 and 2010:4.
* Significant at 1%.

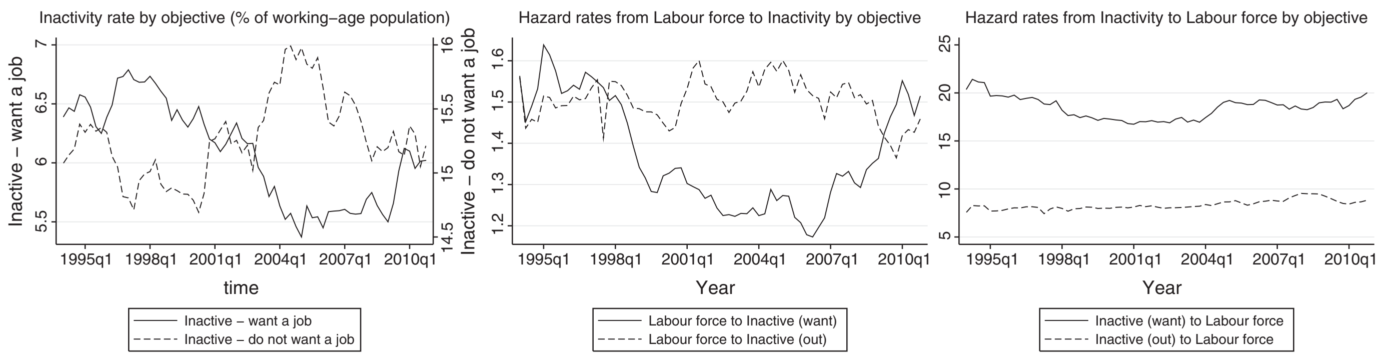

Fig. 5. Inactivity by sub-groups. Note: the series are a four-quarter moving average to remove seasonality and high frequency movements.

properties of most transition probabilities are quite robust across levels of education. The job-finding rate is highly procyclical and the separation rate from employment to unemployment is countercyclical. The probability of moving from inactivity to unemployment is countercyclical at all levels of education. From the magnitude of the coefficients we can see that individuals with higher education face less cyclical fluctuations in transition probabilities, than the individuals with lower education, with the exception of the transition from employment to unemployment.

6. Conclusion

The objective of this paper was to describe the main developments in, and establish a number of key facts about, the recent history of the UK worker gross flows. It provided a picture of a wide range of information about worker gross flows from different angles, which is essential to understand the UK labour market.

The findings of this paper can be summarised as follows:

- In each quarter, 7% of the working-age population change status between inactivity, employment and unemployment and 2.1% of the working-age population change their employer.
- Gross flows in and out of the three pools are countercyclical. In expansions, as the labour market becomes tighter there are fewer movements between the three states.
- Employment to unemployment flows are countercyclical, as well as the job-separation rate. Unemployment to employment flows are countercyclical too, but the job-finding rate is procyclical.
- There are differences in aggregate conditional transition probabilities. For example, the job-separation probability is 1% if the person was previously employed, 5% if inactive and 11% if unemployed. The job-finding rate is 20% if the person has been unemployed for two periods, but it is 48% if the person was previously employed. This suggests the presence of heterogeneity or history dependence.
- The job-finding rate and job-separation rate are equally important determinants of unemployment fluctuations.
- Every quarter, 6% of all employees are searching for a different job. They are seven times more likely to change jobs than the ones not searching. Job-to-job transition probability is strongly procyclical, but the number of employees searching for a different job is countercyclical.
- *Resignations* are strongly procyclical while *involuntary separations* (layoffs) are countercyclical. *Involuntary separations* dominate the employment to unemployment flows while 70% of all employment to inactivity flows occur because of *other reasons*. Only 15% of the job-to-job flows are driven by *involuntary separations*.
- The inactive that *want a job* are twice as likely to move into the labour force and four times more likely to move into unemployment than the inactive that *do not want a job*.
- There are substantial differences in the employment, unemployment and inactivity rates of different education categories, as well as in transition probabilities. Individuals in the lowest education category face a three times higher unemployment and inactivity rate, twice as high separation rate and half the job-finding rate, than individuals in the highest education category.

In addition to these findings, it is also relevant to mention that, either due to the presence of heterogeneity or history dependence, estimating annual gross flows or transition probabilities based on the quarterly transition probabilities overestimates the actual ones. This suggests that one should be cautious when comparing results from surveys carried out at different frequencies, which often happens between the United States, United Kingdom and other European economies.

Appendix A. Multiple transitions and different frequencies

Suppose that we have nine transition probabilities, calculated at a given frequency i: λ^i_{EE}, λ^i_{EU}, λ^i_{EI}, λ^i_{UE}, λ^i_{UU}, λ^i_{UI}, λ^i_{IE}, λ^i_{IU} and λ^i_{II}. If we consider that the transition probabilities of each individual are constant across time, we can compute the implied transition probabilities at any frequency (yearly, quarterly or monthly), using one of the following systems of equations:

$$\lambda^y_{ij} = \sum_k \sum_l \sum_n \lambda^q_{ik}\lambda^q_{kl}\lambda^q_{ln}\lambda^q_{nj}, i, j, k, l, n = \{E, U, I\}; \tag{13}$$

Table 7
Transition matrix, Labour Force Survey (% per quarter).

From: / To:	Employment	Unemployment	Inactive (want)	Inactive (out)
Employment	96.7	26.2	8.1	5.4
Unemployment	1.4	56.3	10.4	3.0
Inactive (want)	0.7	11.3	60.5	11.1
Inactive (out)	1.2	6.1	20.9	80.6

Note: averages between 1993:2 to 2010:4.

Table 8
Cyclical variation of flows in and out of inactivity.

	Gross flows	Hazard rates
Labour force → inactive (want)	0.072* (10.80)	0.054* (7.54)
Labour force → inactive (out)	−0.016 (−1.75)	−0.017 (−1.819)
Inactive (want) → labour force	0.043* (5.25)	0.023* (2.82)
Inactive (out) → labour force	−0.013 (−1.26)	−0.003 (−0.32)
Inactive (want) → inactive (out)	0.020* (2.96)	0.000 (0.00)
Inactive (out) → inactive (want)	0.037* (4.93)	0.047* (6.13)

Note: the cyclicality of the series is the coefficient on unemployment rate in a regression of the series in logs on season quarter dummies, time trend and unemployment rate. T-statistics are in brackets. The sample is between 1993:2 and 2010:4.
* Significant at 1%.

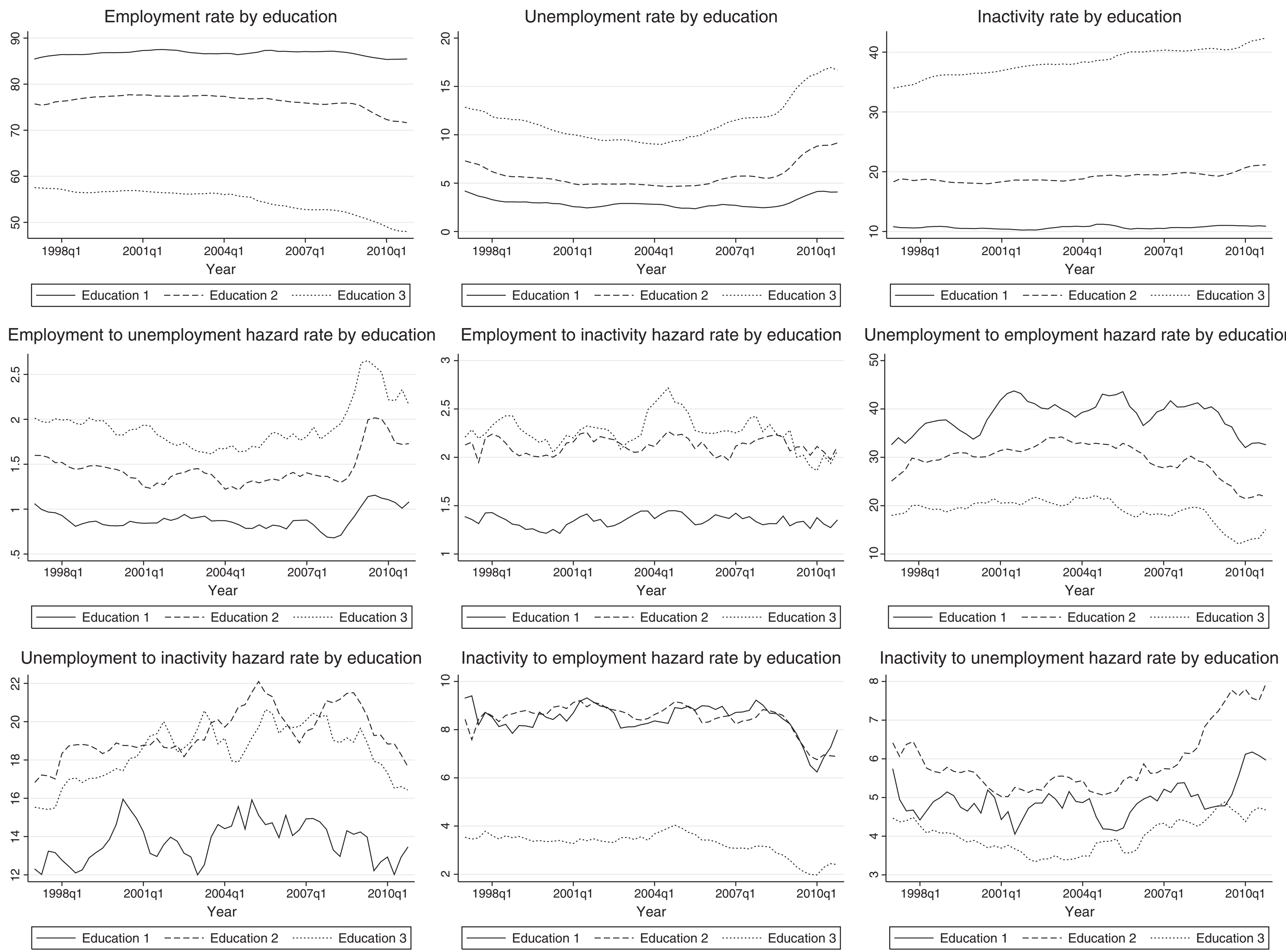

Fig. 6. Labour market stocks and hazard rates by education. Note: the series are a four-quarter moving average to remove seasonality and high frequency movements.

Table 9
Cyclical variation of labour market hazard rates by education.

	Education 1	Education 2	Education 3
Employment → unemployment	0.094* (5.86)	0.101* (9.62)	0.075* (5.41)
Employment → inactivity	−0.002 (−0.12)	−0.006 (−0.66)	−0.042* (−3.26)
Unemployment → employment	−0.077* (−7.50)	−0.106* (−12.76)	−0.097* (−7.43)
Unemployment → inactivity	−0.036** (−2.07)	−0.041* (−4.44)	−0.056* (−5.20)
Inactivity → employment	−0.036** (−2.40)	−0.056* (−4.88)	−0.089* (−5.28)
Inactivity → unemployment	0.068* (3.94)	0.101* (7.78)	0.074* (5.77)

Note: the cyclicality of the series is the coefficient on unemployment rate in a regression of the series in logs on season quarter dummies, time trend and the unemployment rate of the respective category. T-statistics are in brackets. The sample is between 1993:2 and 2010:4.
* Significant at 1%.
** Significant at 5%.

$$\lambda_{ij}^{q} = \sum_{k}\sum_{l} \lambda_{ik}^{m}\lambda_{kl}^{m}\lambda_{lj}^{m}, i,j,k,l = \{E,U,I\}. \tag{14}$$

When we use LFS data we have data on quarterly flows between the three states: employment, unemployment and inactivity. To solve for the annual rates we can compute the value directly from Eq. (13). To compute the monthly transition probabilities we need to solve the non-linear system of Eq. (14). To calculate the gross flows, we just multiply the transition probabilities by the stocks of employment, unemployment or inactivity.

For instance, with only two states, if we want to calculate the probability than an employed individual would be unemployed in the next quarter, we would have to add the probabilities of all possible combinations of monthly changes that start from employment and end up in unemployment:

$$\lambda_{EU}^{q} = \lambda_{EU}^{m}\lambda_{UU}^{m}\lambda_{UU}^{m} + \lambda_{EE}^{m}\lambda_{EU}^{m}\lambda_{UU}^{m} + \lambda_{EE}^{m}\lambda_{EE}^{m}\lambda_{EU}^{m} + \lambda_{EU}^{m}\lambda_{UE}^{m}\lambda_{EU}^{m}. \tag{15}$$

Appendix B. Equilibrium unemployment with three-states transitions

The explicit function of equilibrium unemployment rate with three-states transitions is given by:

$$u_t^{ss} = \frac{\lambda_t^{EI}\lambda_t^{IU} + \lambda_t^{IE}\lambda_t^{EU} + \lambda_t^{IU}\lambda_t^{EU}}{\left(\lambda_t^{EI}\lambda_t^{IU} + \lambda_t^{IE}\lambda_t^{EU} + \lambda_t^{IU}\lambda_t^{EU}\right) + \left(\lambda_t^{UI}\lambda_t^{IE} + \lambda_t^{IU}\lambda_t^{UE} + \lambda_t^{IE}\lambda_t^{UE}\right)}. \tag{16}$$

If, for example, we focus on the transition probability between employment and unemployment, the counterfactual unemployment would be:

$$u_t^{EU} = \frac{\bar{\lambda}^{EI}\bar{\lambda}^{IU} + \bar{\lambda}^{IE}\lambda_t^{EU} + \bar{\lambda}^{IU}\lambda_t^{EU}}{\left(\bar{\lambda}^{EI}\bar{\lambda}^{IU} + \bar{\lambda}^{IE}\lambda_t^{EU} + \bar{\lambda}^{IU}\lambda_t^{EU}\right) + \left(\bar{\lambda}^{UI}\bar{\lambda}^{IE} + \lambda_t^{IU}\bar{\lambda}^{UE} + \bar{\lambda}^{IE}\bar{\lambda}^{UE}\right)}. \tag{17}$$

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