Immigration and Unemployment Dynamics

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Abstract
One striking feature of the latest downturn was that unemployment rates among immigrants varied much less than in previous downturns or relative to those of the native-born workforce. In what follows we examine the role that worker flows between labour market states play as determinants of this variation. Expanding on the existing dynamic flows modelling framework to allow for labour force growth due to population changes, we present decompositions of changes in the steady-state unemployment rate into parts accounted for by changes in rates of job loss, job finding and net labour force entry, distinguished by immigration status. Using individual micro data we show that recessionary ramp-ups can be accounted for by both rises in the unemployment inflow rate and falls in the outflow rate—with changes in job loss flows over the cycle accounting for around 25% of unemployment variation, employment inflows for 35%. The largest contribution (40%) however is accounted for by direct labour force entry into unemployment. These results hold, broadly, for both immigrants and native-born workers.

Key Words: labour market, unemployment, worker flows
JEL Classification: E24, J6
I. Introduction

Immigration to the United Kingdom has risen sharply over the last 15 years, from around 8% to 14% of the labour force, (see Figure 1). Such a large rise has prompted concerns over possible displacement of native workers, though the existing evidence (see for example Manacorda, Manning and Wadsworth (2011) does not appear to show much evidence of significantly adverse wage or employment effects for native-born workers. In previous downturns, immigrants were typically much more at risk of experiencing unemployment than native born workers, (see Figures 1 and 2), even within the same skill groupings, a fact that Dustmann Glitz and Vogel (2009) attribute to the idea that immigrants may not have been perfect substitutes for native-born labour. However over the latest downturn, two notable features regarding unemployment emerged. First aggregate unemployment rates rose much less than most people expected given the scale of the GDP fall. Second , the increase in immigrant unemployment rates relative to those of native born-workers has been much more muted than in previous downturns, (see again Figure 2).

In this paper, we delve into the origins of these observations using a dynamic approach. Based on an influential literature dating from the 1970s, (Eg Perry (1972), Marston (1976) ), it is now known that changes in the stock of unemployment are shaped by the flows of workers into and out of the unemployment pool from both employment and inactivity. Knowledge of the relative size of these flows has been used both to try to understand the main reasons underlying rises (and falls) in unemployment and to shape appropriate policy responses. Elsby, Smith and Wadsworth (2012) have used this approach to analyse changes in the aggregate UK unemployment arte over three downturns. They conclude that close to two-thirds of the volatility of unemployment in the UK can be traced to rises in rates of job loss that accompany recessions.¹

¹ Elsby, Michaels and Solon (2009) reach a similar conclusion using United States data.
However no-one has yet analysed the separate contributions that immigrant and native born workers make in these flow accounting frameworks. For example we do not know whether the observed differential changes in unemployment between immigrants and native born were due to differential job loss or job finding rates. Nor do we know if or how the contributions of job loss or job finding have changed over time. Nor do we know to what extent labour force entry, whether caused by immigration or college leavers or re-entry by previous workers, shapes unemployment rates. Yet all this seems to be important issues to consider, particularly in a period of rising immigration. In what follows we examine the role that worker flows between labour market states play as determinants of this variation. Expanding on the existing dynamic flows modelling framework to allow for labour force growth due to population changes, we present steady state decompositions of changes in the steady-state unemployment rate into parts accounted for by changes in rates of job loss, job finding and net labour force entry and the changing contribution of each of these components distinguished by immigration status.

Section 2 provides an analytical framework for decomposing steady-state unemployment rates into constituent flow components allowing for different contributions between natives and immigrants. Section 3 discusses the data used to document these flows and section 4 provides some results. Section 5 concludes.

2. A Two-State Decomposition of Steady-State Unemployment Changes with Labour Force Growth Due to Immigration

In order to outline the separate roles of immigrants and natives in determining the aggregate unemployment rate, the analysis proceeds in two steps. First, the mapping from changes in the aggregate unemployment rate to changes in the underlying native and immigrant unemployment rates is derived accounting for labour force growth. Second, changes in native
and migrant unemployment rates can in turn be decomposed into changes attributable to each underlying flow.\(^2\)

\textit{i Decomposition of aggregate unemployment rate}

Aggregate unemployment \(U\) is the sum of native unemployment \(U_n\) and migrant unemployment \(U_m\). Likewise, the aggregate labour force \(L\) is the sum of the native labour force \(L_n\) and the migrant labour force \(L_m\). A key aspect of the analysis, hitherto ignored in the literature, is that both may be growing over time:

\[
\frac{dL_n}{dt} = A_n, \text{ and } \frac{dL_m}{dt} = A_m
\]  

(1)

Now, consider how changes in the aggregate unemployment rate \(u \equiv U/L\) are related to changes in the native and migrant unemployment and labour force stocks. Note that

\[
d \ln u = d \ln (U_n + U_m) - d \ln (L_n + L_m)
\]

\[
= (1 - v) d \ln U_n + vd \ln U_m - (1 - \lambda)d \ln L_n - \lambda d \ln L_m,
\]  

(2)

Where \(v \equiv U_m/U\) is the unemployment share of migrant workers, and \(\lambda \equiv L_m/L\) is the labour force share of migrants.

Collecting terms to rewrite the right-hand side in terms of the constituent unemployment rates \(u_n \equiv U_n/L_n\) and \(u_m \equiv U_m/L_m\) (rather than stocks) yields

\[
d \ln u = (1 - v) d \ln u_n + vd \ln u_m + (v - \lambda)(d \ln L_m - d \ln L_n),
\]  

(3)

Now, note that the labour force growth terms can be linked to the assumptions on labour force growth above. Specifically,

\(^2\) It is important to note that these decompositions are the outcome of an \textit{accounting} exercise, and are not necessarily indicative of the degree to which these changes in flow rates \textit{cause} changes in unemployment. For example, it is quite possible to construct stories for why changes in the flows might be interrelated: If workers who lose their jobs in a recession experience a loss of skill, a rise in job loss could retard the job-finding rate. If that were true, one could argue that the real “causal” contribution of the job-loss rate would be larger. These possible inter-linkages between flows have been emphasised by Burgess and Turon (2005), who showed empirically that allowing for this endogeneity did indeed increase the role of the inflow rate.
\[
d \ln L_m = \frac{dL_m}{L_m} = \frac{A_m}{L_m} \, dt \equiv a_m dt, \quad \text{and} \quad d \ln L_n = \frac{dL_n}{L_n} = \frac{A_n}{L_n} \, dt \equiv a_n dt,
\]

(4)

where \(a_m \equiv A_m/L_m\) and \(a_n \equiv A_n/L_n\) denote labour force growth as a fraction of the respective labour force stocks. Since \(dt\) will correspond to one “period,” we can normalise it to one. Substitution then yields

\[
d \ln u = (1 - \nu) d \ln u_n + \nu d \ln u_m + (\nu - \lambda)(a_m - a_n).
\]

(5)

The intuition for the last term is that aggregate unemployment will rise if migrant labour force growth exceeds native growth, and the unemployment share of immigrants exceeds the corresponding labour force share. The latter of course means that immigrants are disproportionately unemployed relative to native workers, so that faster growth in their labour force implies higher aggregate unemployment.

ii Decomposition of constituent unemployment rates

The next task is to derive the flow contributions to (log) changes in native and migrant unemployment rates, \(u_n\) and \(u_m\). Note that, in a two-state world, we can describe the evolution of the unemployment stocks of each group as follows

\[
\frac{du_i}{dt} = s_i(L_i - U_i) + A_{ui} - f_i U_i,
\]

(6)

where \(i \in \{n, m\}\), \(s_i\) is the inflow rate, \(f_i\) the outflow rate, and \(A_{ui}\) the flow of new entrants into unemployment of group \(i\). Recall that the evolution of the labour force for group \(i\) is given by

\[
\frac{dL_i}{dt} = A_{ei} + A_{ei} \equiv A_i,
\]

(7)

where \(A_{ei}\) is the flow of new entrants into employment. It follows that the differential equation for the evolution of the unemployment rate for group \(i\) is given by

\[
\frac{du_i}{dt} = \frac{1}{L_i} \frac{du_i}{dt} - \frac{u_i}{L_i} \frac{dL_i}{dt} = s_i + a_{ui} - (s_i + f_i + a_i) u_i,
\]

(8)

where \(a_{ui} \equiv A_{ui}/L_i\) and \(a_i \equiv A_i/L_i\) as above.

Note that the steady-state unemployment rate implied by this law of motion is given by
\[ \bar{u}_t = \frac{s_{it} + a_{ul}}{(s_{it} + a_{ul}) + (f_{it} + a_{ei})} \]  

and thus the law of motion may be rewritten as

\[ \frac{d\bar{u}_t}{dt} = -(s_i + f_i + a_i)(u_t - \bar{u}_t). \]  

A number of observations arise from this. First, one can think of the steady-state unemployment rate being shaped by two objects that are analogous to the inflow and outflow rates in a two-state model without immigration flows or labour force growth. It is as if the effective inflow rate were \((s_i + a_{ul})\), and the effective outflow rate \((f_i + a_{ei})\). Second, the dynamics suggest that the presence of immigration flows or labour force growth raises the effective rate of convergence of the group unemployment rate to steady state to \((s_i + f_i + a_i)\).

Focusing on the steady state for now, note that application of previous results on unemployment flows provides a simple decomposition of group unemployment rates. Specifically,

\[ d \ln \bar{u}_t = (1 - \bar{u}_t)[d \ln(s_i + a_{ul}) - d \ln(f_i + a_{ei})]. \]  

The right-hand side in turn can be decomposed into components associated with movements in the flow rates \(s_i\) and \(f_i\), and the labour force flows \(a_{ul}\) and \(a_{ei}\),

\[ d \ln \bar{u}_t = (1 - \bar{u}_t)[(1 - \tau_i)d \ln s_i + \tau_i d \ln a_{ul} - (1 - \omega_i)d \ln f_i - \omega_i d \ln a_{ei}], \]  

where

\[ \tau_i \equiv a_{ul}/(s_i + a_{ul}) \] is the inflow share of labour force flows into unemployment, and

\[ \omega_i \equiv a_{ei}/(f_i + a_{ei}) \] is the outflow share of labour force flows into employment.

**iv Decomposition of labour force flows**

The labour force growth terms \(a_{hi}\) for \(h \in \{e, u\}\) and \(i \in \{n, m\}\) can in turn be decomposed into the flow of new entrants into the labour force less the flow of exits from the labour force

\[ a_{hi} = b_{hi} - d_{hi}. \]  

(Think “births” minus “deaths.”) It follows that we can write
\[ d \ln a_{hi} = \alpha_{hi} d \ln b_{hi} + (1 - \alpha_{hi})d \ln d_{hi}, \tag{14} \]

where

\[ \alpha_{hi} \equiv b_{hi}/a_{hi} > 1 \] is flow of new entrants as a fraction of the net labour force flow.

Note that \( \alpha_{hi} > 1 \) and so \( 1 - \alpha_{hi} < 0 \).

v. Piecing it all together

All of the above components can be used to motivate a decomposition of variance for the aggregate unemployment rate, and for each of the constituent group unemployment rates.

Consider first the aggregate unemployment rate. Substitution of the above components implies that the log change in the steady-state aggregate unemployment rate, \( d \ln \bar{u} \), is equal to the sum of the following contributions:

A. Native inflow rate: \((1 - \nu)(1 - \bar{u})(1 - t_n)d \ln s_n\).

B. Native outflow rate: \(- (1 - \nu)(1 - \bar{u})(1 - \omega_n)d \ln f_n\).

C. Migrant inflow rate: \(\nu (1 - \bar{u}_m)(1 - t_m)d \ln s_m\).

D. Migrant outflow rate: \(- \nu (1 - \bar{u}_m)(1 - \omega_m)d \ln f_m\).

E. Native births into unemployment: \((1 - \nu)(1 - \bar{u}_n)t_n \alpha_{un}d \ln b_{un} - (\nu - \lambda)b_{un}\).

F. Native deaths from unemployment: \((1 - \nu)(1 - \bar{u}_n)t_n (1 - \alpha_{un})d \ln d_{un} + (\nu - \lambda)d_{un}\).

G. Native births into employment: \(- (1 - \nu)(1 - \bar{u}_n)\omega_n \alpha_{en}d \ln b_{en} - (\nu - \lambda)b_{en}\).

H. Native deaths from employment: \(- (1 - \nu)(1 - \bar{u}_n)\omega_n (1 - \alpha_{en})d \ln d_{en} + (\nu - \lambda)d_{en}\).

I. Migrant births into unemployment: \(\nu (1 - \bar{u}_m)t_m \alpha_{um}d \ln b_{um} + (\nu - \lambda)b_{um}\).

J. Migrant deaths from unemployment: \(\nu (1 - \bar{u}_m)t_m (1 - \alpha_{um})d \ln d_{um} - (\nu - \lambda)d_{um}\).
K. Migrant births into employment: 
\[ -\nu(1 - \bar{u}_m)\omega_m \alpha_{em} d \ln b_{em} + (\nu - \lambda)b_{em}. \]

L. Migrant deaths from employment: 
\[ -\nu(1 - \bar{u}_m)\omega_m (1 - \alpha_{em})d \ln d_{em} - (\nu - \lambda)d_{em}. \]

Since \( d \ln \bar{u} \) is additive in these components, the implied decomposition of variance is straightforward, as suggested by Fujita and Ramey (2009). To pick a random example, imagine one were interested in the fraction of the variance in the change in the aggregate steady-state unemployment rate that is accounted for by migrant births into unemployment. This can be computed as

\[ \beta_{\text{um}} = \frac{\text{cov}(\Delta \ln u_t, \nu_t(1-\bar{u}_m))\Delta \ln b_{umt} + (\nu_t - \lambda_t)b_{umt}}{\text{var}(\Delta \ln u_t)}. \]  

(15)

Note that I have emphasized that all of the variables defined above are time-varying, and have used the approximations that changes in unemployment are close to steady-state changes (the replacement of \( \bar{u} \) with \( u \)) and that infinitesimal changes are close to the discrete change across periods (the replacement of the \( d \) with a \( \Delta \)).

It is useful also to note the nested nature of the decomposition. For example, imagine one did not wish to distinguish between births and deaths in the previous example, but only the contribution of overall migrant labour force growth into unemployment \( \alpha_{um} \). By summing terms I and J in the above, it follows one could compute

\[ \beta_{\text{um}} = \frac{\text{cov}(\Delta \ln u_t, \nu_t(1-\bar{u}_m))\Delta \ln a_{umt} + (\nu_t - \lambda_t)a_{umt}}{\text{var}(\Delta \ln u_t)}. \]  

(16)

In addition, if one wished to compute the contribution of migrant labour force growth \( \alpha_{um} \) on the migrant unemployment rate \( u_m \), as opposed to the aggregate unemployment rate \( u \), then one could calculate

\[ \beta_{\text{um}} = \frac{\text{cov}(\Delta \ln u_m, (1-\bar{u}_m))\Delta \ln a_{umt}}{\text{var}(\Delta \ln u_m)}. \]  

(17)
3. Data

Labour force flow estimates in the UK are not published officially, and so must be computed using the microdata that underlie the Labour Force Survey (LFS). The frequency of the estimates that we study in what follows mirrors the frequency of the available data.

We use two variants of flow estimates, one based on annual observations, the other on quarterly data. The base for the yearly flows are the microdata files are available for every other year from 1975 to 1983, and on an annual basis thereafter. The base for the quarterly flows are the matched samples across successive quarters of the LFS available from 1992 to the present.

The LFS asks individuals about their labour force status a year prior to the interview date. This information on recalled status may be combined with the individual’s reported current status to infer measures of annual worker flows, and thereby the accompanying transition rates. The information in the LFS on recalled status has the invaluable benefit of being asked of all individuals, not just those who remain at the same address, unlike the quarterly LFS longitudinal data available from 1992. It is also straightforward to calculate flows, since the current and recalled status of a particular individual are simple to match. The use of recalled data does raise issues about the accuracy of remembered status, however. Studies investigating recall accuracy indicate that over short periods—up to about three years—recall bias is not severe (Paull, 2002; Elias, 1996). If individuals are asked to remember over longer periods, unemployment tends to be underreported; this does not appear to be simply short spells being forgotten, but is rather a general tendency to underreport. The one-year recall required of respondents in this paper falls well within the horizon where results should not be adversely affected by recall bias. However, Bell and Smith (2002) find recalled stocks accurate, and transitions between employment and unemployment correctly recalled, but where spells are short, transitions between unemployment and non-participation
estimated from recalled data tally less well with contemporaneous reports. As Akerlof and Yellen (1985) suggest, this might be because individuals tend to remember better the most personally-important or salient events. Moves between the two non-employment states are unlikely to be as psychologically ‘painful’ or ‘enjoyable’ as losing or gaining a job.\(^3\) In what follows we provide estimates derived both from recall and matching and compare the results wherever possible.

4. Results

We begin with an outline of changes in the key constituent components of our decomposition. Figure 3 shows that the growth in the Labour force has indeed been larger among immigrants than native-born over the sample period. The rate of labour force growth for immigrants averaged 3% a year among immigrants, with a notable peak in 2006 following the A8 accession, and 1% a year for natives, (Figure 3). Figure 4 traces the actual and steady-state predicted unemployment arte based on equation (9) that allows for labour force entry. Over the period the steady-state and actual rates are quite close, allowing for seasonal variation in the quarterly flows.

Figure 5 tracks changes in the job loss (EU) transition probabilities and shows that while job loss rates are typically higher among immigrants, the two series have tended to get closer together over time. Similarly job finding rates, (Figure 6), are also lower for immigrants, but again the gap has narrowed over time.

Putting these and the other components together, the results are summarised in Table 1 which decomposes the change in the aggregate log steady state unemployment rate between 1992 and 2012. The Table shows that job loss accounts for around a quarter of the change and job finding around 30% with much of the rest being accounted for by direct entry into

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\(^3\) It is also worth noting that recalled status is subjective, and does not necessarily accord with ILO definitions.
unemployment from outside the labour force, presumably driven by cohorts of college leavers unable to find work. The separate contributions of immigrants and native born-workers are given in the next two columns. The relative contributions are similar for the two groups, though job finding share is somewhat lower among immigrants (25% compared to 35%) and labour force exit plays a much larger role in shaping changes in immigrant unemployment rates, (16% against 4%).

5. Conclusion

The UK unemployment rate has recently stabilised following the end of the third recession experienced over the last thirty years. Economists have long realised that a better understanding of what drives changes in the unemployment rate—and hence an appropriate policy response—can be gleaned from an examination of the numbers of workers moving into unemployment relative to the numbers moving out of unemployment. In a downturn many individuals lose their jobs and others fail to find work immediately after job loss. Yet, equally, some people are able to find work even in the depths of a recession.

This analysis has, for the first time, used a flow accounting framework that both explicitly allows for labour force growth and distinguishes between the separate contribution of immigrant and native-born worker flows in explaining changes in the steady-state unemployment rate. Using individual micro data we show that recessionary ramp-ups can be accounted for by both rises in the unemployment inflow rate and falls in the outflow rate—with changes in job loss flows over the cycle accounting for around 25% of unemployment variation, employment outflows for 35%. The largest share (40%) is accounted for by changes in direct labour force entry rates into unemployment. These result holds, broadly, for both immigrants and native-born workers.
References


Figure 1. Immigrant shares of the Labour Force and Unemployment

Figure 2. Unemployment by Immigrant Status 1975-2012

Note: Source: Quarterly LFS, 1992q2-2012q3, SA using X12, 4qMA.

Source: LFS. Authors’ calculations
Figure 3. Net labour force growth rates by Immigrant Status

Note: Source: Quarterly LFS, 1992q2-2012q3, SA using X12, 4qMA.
Figure 4a. Steady state and actual unemployment rates: Natives

Fraction of labour force

1995 2000 2005 2010

Steady state
Actual

1995 2000 2005 2010

Steady state
Actual

Note: Source: Quarterly LFS, 1992q2-2012q3, SA using X12.

Figure 4b. Steady state and actual unemployment rates: Immigrants

Fraction of labour force

1995 2000 2005 2010

Steady state
Actual

1995 2000 2005 2010

Steady state
Actual

Note: Source: Quarterly LFS, 1992q2-2012q3, SA using X12.
Figure 5. EU flow rates

Quarterly job loss probability (fraction)

Note: Log scale. Source: Quarterly LFS, 1992q2-2012q3, SA using X12, 4qMA.

Figure 6. UE flow rates

Quarterly job finding probability (fraction)

Note: Source: Quarterly LFS, 1992q2-2012q3, SA using X12, 4qMA.
<table>
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<th>Total</th>
<th>Of which</th>
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<tr>
<td></td>
<td></td>
<td>Immigrant</td>
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<tr>
<td>Job Losses</td>
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</tr>
<tr>
<td>Job finding</td>
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<td>3</td>
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<td>Births into unemployment (b_u) (NU)</td>
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<td>6</td>
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<td>Lab. Force outflows from unemployment (UN)</td>
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<tr>
<td>Births into unemployment (b_u) (NU)</td>
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<td>Lab. Force outflows from employment (EN)</td>
<td>-2%</td>
<td>0</td>
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*Source: Authors’ calculations*
Figure A1. Survivor Rates Across Immigrant Arrival Cohorts

Note: 4-quarter moving averages. Base (100) is average immigrant stock during year after arrival.