Population Growth, Immigration and Labor Market Dynamics

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Abstract

This paper provides a first synthesis of population flows and labor market dynamics across immigrant and native-born populations. We devise a novel dynamic accounting methodology that integrates population flows from two sources—changes in birth cohort size and immigrant flows—with labor market dynamics. We illustrate the method using data for the United Kingdom, where population flows have been large, and cyclical, driven first by maturation of baby boom cohorts in the 1980s, and latterly by immigration in the 2000s. New measures of labor market flows by migrant status uncover the flow origins of disparities in the levels and cyclicality of immigrant and native labor market outcomes, and their more recent convergence. Application of our accounting framework reveals that population flows have played a nontrivial role in the volatility of labor markets among both the UK-born and, especially, immigrants.

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1. Introduction

Analysts have long realized that a better understanding of what drives changes in labor market states can be gleaned from an examination of the associated worker flows (Perry 1972; Marston 1976). The existing literature has, however, largely overlooked the role of population change in this process. Population change may stem from fluctuations in net immigration or from changes in net year of birth cohort size. Immigration is driving population growth in many OECD economies, while others are experiencing population decline from out-migration or falling birth rates (OECD 2022). As such, the influence of population change on unemployment, employment and nonparticipation is a potentially important unknown for any country experiencing a period of rapid change in immigration or birth rates. This paper is the first to accommodate the contribution of gross population flows, and their interaction with labor market flows, into a dynamic accounting framework, and to infer the individual contributions of subgroups, specifically immigrant and native-born workers, to variation in labor market states over time.

We begin in section 2 by devising an accounting methodology that integrates labor market dynamics with population flows. The mapping between worker flows, population flows, and the evolution of labor market stocks is summarized in the form of a Markov chain. Changes in the three principal labor market stocks of employment, unemployment, and nonparticipation are shaped by both labor market flows among the existing working-age population and, now additionally, by gross population flows into and out of each stock. We use this mapping to motivate a decomposition of variance that attributes variation in each of the stocks to contributions from labor market flows and, importantly, population flows, both separately by migrant status, and in the aggregate.[1]

We then apply this framework in section 3 to data from the United Kingdom. Several aspects of the UK experience lend themselves to the analysis. UK population growth since the 1970s has been considerable, averaging 0.5 percent a year, and dominated by two episodes: First, maturation of the baby boom cohorts, and a simultaneous decline in the number of retirees in the late 1970s

[1] A feature of our methodology is that it can be applied to study the effects of population and labor market flows for *any* subgroup—e.g., by sex, education, work experience, occupation, industry, region, distinguishing rural from urban areas, and interactions between these, in addition to migrants and natives—along with the implications for aggregate dynamics. One could also further differentiate migrants—e.g., by contexts of reception or immigration status Although data limitations preclude our ability to implement further disaggregation, we hope the flexibility of our methodology will motivate future research along these lines.

and early 1980s—legacies of the two world wars and their aftermath. Second, significant rises in immigration, especially from the 2000s onward. These two episodes provide fertile ground for studying the role population flows in shaping labor market stocks, and therefore are the focus of much of our empirical analysis.[2]

Crucial inputs into this dynamic analytic framework are measures of both labor market and population stocks and flows by migrant status. Such measures are not straightforward to compile: Few countries provide such data from a single source disaggregated by migrant status. One contribution of the paper is to show how such measures can be compiled.

We do so by combining microdata from the UK Labor Force Survey (LFS) with official data on population flows published by the UK Office for National Statistics (ONS). We believe a similar approach can be extended to several countries.[3] We first document their empirical properties and use them to illustrate the role of gross worker and population flows in the evolution of labor market stocks.

We identify three broad trends in the stocks. First, there are clear levels differences in the labor market experiences of immigrant and native-born individuals: Immigrants are more likely to be unemployed, much less likely to be employed, and much more likely to be out of the labor force. Second, immigrants historically have faced greater cyclicality in their labor market outcomes. These two results echo the earlier work for the UK by Bell (1997), and Dustmann et al. (2010). Third, and more novel, more recent data point to *convergence* in the labor market experiences of immigrant and native populations. Moreover, this convergence appears to have been pervasive, with both the levels and cyclicalities of immigrant stocks aligning more closely to those of the UK-born over time.

[2] Migration and birth rate variation contribute to population change in many industrialized countries. The US working-age population has grown by around 0.4 percent a year, largely due to immigration. Conversely, many eastern European countries have experienced working-age population declines of a similar order of magnitude, largely because of emigration to western Europe. Recessions also appear to affect immigrant flows elsewhere. Spain experienced a 0.5 percent yearly fall in its population in the years following its 2009-11 downturn, driven by the return migration of many immigrants. Allied to this, domestic birth rates across much of the OECD have been falling continuously over the last 40 years and this has begun to affect working age populations in the last decade. See OECD Population Statistics (2019).

[3] Our code will be posted to facilitate such analyses. For example, although not their focus, Frazis et al. (2005) note that Current Population Survey (CPS) microdata for the United States allow measurement of working-age population inflows due to those turning 16, as well as population outflows due to death, by labor market state (in addition to labor market flows). Since the CPS also records data on country of birth and date of entry into the US, the latter could further be disaggregated by migrant status.

An important contribution is that our analytical framework provides a sense of the flow origins of these outcomes. Our measures of labor market flows by migrant status reveal that immigrants historically have faced both higher rates of job loss, as well as lower rates of job finding—both from unemployment and from nonparticipation. Moreover, these differences have tended to be exacerbated in times of recession. Together, these features of the labor market flows provide an account for the flow origins of the differences in the levels and cyclicality of immigrant labor market stocks.

Important new insights also emerge from the population flows. First, we find that gross population flows by labor force state are substantial, of a similar magnitude to the unemployment stock. Second, gross population flows are cyclical. UK-born working-age population growth around the early 1980s recession led to large rises in population inflows to unemployment and, to a lesser extent, nonparticipation. The burst of immigration in the mid-2000s was followed by large declines in immigrant population inflows to employment, and rises in population inflows to unemployment, during the Great Recession. Third, the latter burst of immigration was accompanied by population churn—rises in both population inflows and outflows among the immigrant population—consistent with greater incidence of return migration among new EU migrants.

The upshot, then, is that there is a *prima facie* case for a significant role for population flows in accounting for UK labor market variation around these two episodes: that is, among the UK-born in the late 1970s and early 1980s, and among immigrants around the Great Recession. To study this quantitatively, we apply the accounting methodology developed in section 2 to these new measures of labor market and population flows.

The results reinforce the qualitative impression from the time series. Starting with the earlier episode, between 1978 and 1988, we find that population inflows that accompanied the maturation of the baby boom cohorts accounted for 8 percent of the large rise and fall in unemployment, and 16 percent of the variation in the nonparticipation rate, among the UK-born. Thus, part of the labor market volatility witnessed during the late 1970s and 1980s can be traced to an accident of history—the coincidence of the baby-boom cohorts' entry to the labor market with a period of recession.

More starkly, population flows also had a profound impact on the labor market outcomes of immigrants during the Great Recession and its aftermath. Cyclical declines in immigrant

population inflows to employment explain over one third of the cyclical path of employment, and over 40 percent of the variation in the nonparticipation rate among immigrants. Along with a cyclical rise in immigrant population inflows to unemployment, the combined contribution to immigrant unemployment was 14 percent. Population flows have thus played a key role in the labor market dynamics of immigrant populations in the United Kingdom.

In the remainder of the paper, we investigate two further outcomes. First, we juxtapose the role of labor market flows between native-born and immigrant populations in the United Kingdom. This reveals that although, like the native-born, job loss is the main contributor to immigrant unemployment variation, rates of job finding contribute relatively little to explaining unemployment among immigrants. The participation margin between unemployment and nonparticipation looms larger for immigrants, accounting for more than 20 percent of the variation in unemployment, consistent with labor market attachment tending to be weaker among immigrants.

Finally, we measure the contributions of flows by migrant status to each *aggregate* labor market stock over time. This reveals that immigrant contributions have become increasingly under-represented in the contribution of job-finding flows, a corollary of job-finding rates among immigrants falling less during the Great Recession, and rising more in the subsequent recovery, itself a contributory factor to the convergence in the levels of immigrant and native job-finding rates observed in the time series.

We conclude by offering thoughts on how our results motivate and inform future scientific and policy work. We have provided a first synthesis of population and labor market flows in a dynamic accounting framework. Our initial application of this framework in turn provides a first sense of the importance of understanding population flows to better understand labor market outcomes. Our results can be used to motivate and discipline future work on the processes of migration, labor supply, and job search among potential migrants. They also identify margins most worthy of further study—like the elasticity of population inflows to the business cycle and the role of immigrant composition in the convergence of labor market outcomes. Alongside monitoring of year of birth cohort sizes as they age, these can inform immigration policies that seek to balance labor demand and supply. More generally, our framework can be used to generate future scientific progress by applying it to other episodes of population change to study (e.g., the labor market implications of immigration flows by source country, or of *out*-migration on the source countries

themselves). It could also be used to delve into the reasons for any difference in flows over time or between groups due to heterogeneity of flows by subgroup (e.g., sex, education, experience, occupation, industry, region etc., and the interactions thereof), analyses accommodated by our accounting framework, but precluded by current data limitations. This, in turn, underscores the value of developing better integrated measures of labor market and population flows. We hope our findings stimulate future work along these lines.

2. Methodology

We begin by devising a labor market accounting framework that can accommodate population dynamics. We use a set of accounting identities for the evolution over time of labor market stocks, and the flows that underlie them.[4] Labor market stocks change as current members of the working-age population transition across states and as individuals enter and exit the working-age population to and from each state—either through changes in "native" cohort size, or through migration.

Denoting the measured stocks of the employed, unemployed and nonparticipants respectively by E, U and N, and indexing "migrant" and "native" status respectively by a subscript $k \in \{m, n\}$, we can formalize the change in labor market stocks for group k at time t with the following Markov chain,

$$\begin{bmatrix} E \\ U \\ N \end{bmatrix}_{kt} = \begin{bmatrix} 1 - p_{EU} - p_{EN} & p_{UE} & p_{NE} \\ p_{EU} & 1 - p_{UE} - p_{UN} & p_{NU} \\ p_{EN} & p_{UN} & 1 - p_{NE} - p_{NU} \end{bmatrix}_{kt} \begin{bmatrix} E \\ U \\ N \end{bmatrix}_{kt-1} + \begin{bmatrix} Q_E \\ Q_U \\ Q_N \end{bmatrix}_{kt}. \quad (1)$$

Here, p_{ijkt} denotes the probability that a working-age individual of migrant status k in labor market state i moves to state j from year $t-1$ to year t. Thus, the transition probabilities p_{ijkt} summarize labor market dynamics among current members of the working-age population. We then augment these transitions with net flows into the working-age population: The Q_{ikt} in (1) denote the *net* population inflow into labor market state i between year $t-1$ and year t by migrant status k. These net inflows can in turn be disaggregated into gross inflows and outflows. It is in this way that population flows alter labor market dynamics.

Sustained growth in the working-age population will imply that the labor market stocks will

[4] The framework therefore treats the transition probabilities as exogenous throughout.

tend to inherit any such trend. To focus on shorter-run variation, we normalize the dynamic system in (1) by the working-age population, so that the focus is now on the share of each stock in the working-age population. Using lower-case letters to denote shares, $x \equiv X/Pop$ for all $X \in \{E, U, N, Q\}$, we can write

$$\underbrace{\begin{bmatrix} e \\ u \\ n \end{bmatrix}_{kt}}_{\mathbf{s}_{kt}} = \underbrace{\frac{1}{1+q_{kt}} \begin{bmatrix} 1-p_{EU}-p_{EN} & p_{UE} & p_{NE} \\ p_{EU} & 1-p_{UE}-p_{UN} & p_{NU} \\ p_{EN} & p_{UN} & 1-p_{NE}-p_{NU} \end{bmatrix}_{kt}}_{\mathbf{P}_{kt}} \underbrace{\begin{bmatrix} e \\ u \\ n \end{bmatrix}_{kt-1}}_{\mathbf{s}_{kt-1}} + \underbrace{\begin{bmatrix} q_E \\ q_U \\ q_N \end{bmatrix}_{kt}}_{\mathbf{q}_{kt}} \quad (2)$$

where $q_{kt} \equiv q_{Ekt} + q_{Ukt} + q_{Nkt}$ is the total net rate of growth of the working-age population of group k.

The direct effects of net population inflows on employment, unemployment and nonparticipation rates are captured by the final term in (2) which shows that each state share is boosted by any direct net inflows. The scalar $1/(1+q_{kt})$ reflects a dampening effect of total population growth q_{kt} on labor market dynamics. Intuitively, using the example of employment, any population flows into unemployment and nonparticipation increase the working-age population without raising employment, and so tend to reduce (growth in) employment as a share of the working-age population. We express (2) in matrix notation as

$$\mathbf{s}_{kt} = \mathbf{P}_{kt}\mathbf{s}_{kt-1} + \mathbf{q}_{kt} \quad (3)$$

To summarize, changes over time t in the vector of labor market states $\mathbf{s}$ by migrant status k, $\mathbf{s}_{kt}$, are shaped by transition rates across labor market states among the existing working-age population, given by the probability matrix $\mathbf{P}_{kt}$, *and* net inflows due to population growth into each state, summarized by the vector $\mathbf{q}_{kt}$.[5]

2.1 Accounting framework

The normalized Markov chain in (3) allows a quantitative estimate of the role of population flows in shaping labor market stocks. Specifically, we now augment the stock-flow variance decomposition developed in Elsby et al. (2015) to accommodate population flows, and analyze outcomes by migrant status, and their aggregate analogues.

[5] One difference between immigration-driven population changes and birth cohort changes is that the former occurs along the age distribution at a point in time, rather than rippling through the age distribution over time (see Appendix D), with different consequences for the contributions of labor market transition rates.

Decomposition by migrant status. The Markov chain (3) converges to a flow steady state,

$$\bar{\mathbf{s}}_{kt} = (\mathbf{I} - \mathbf{P}_{kt})^{-1}\mathbf{q}_{kt}. \tag{4}$$

Dynamic convergence to this flow steady state can in turn be expressed as a partial adjustment mechanism,

$$\Delta\mathbf{s}_{kt} = \mathbf{A}_{kt}\Delta\bar{\mathbf{s}}_{kt} + \mathbf{B}_{kt}\Delta\mathbf{s}_{kt-1}, \tag{5}$$

where $\mathbf{A}_{kt} \equiv (\mathbf{I} - \mathbf{P}_{kt})$ and $\mathbf{B}_{kt} \equiv (\mathbf{I} - \mathbf{P}_{kt})\mathbf{P}_{kt-1}(\mathbf{I} - \mathbf{P}_{kt-1})^{-1}$. The first term on the right-hand side of (5) reflects contemporaneous changes in discrete-time transition probabilities—the elements p_{ijkt} of the transition matrix $\mathbf{P}_{kt}$—which shift the flow steady state $\bar{\mathbf{s}}_{kt}$. The second term gives the impact of past changes in transition probabilities on the current labor market state.

To understand how the contribution of transition probabilities to labor market dynamics can be estimated, it is helpful to reformulate (5) as a distributed lag of growth in steady-state labor market stocks. By repeated substitution, (5) becomes

$$\Delta\mathbf{s}_{kt} = \sum_{\ell=0}^{t-1} \mathbf{C}_{k\ell t}\Delta\bar{\mathbf{s}}_{kt-\ell} + \mathbf{D}_{kt}\Delta\mathbf{s}_{k0}, \tag{6}$$

where $\mathbf{C}_{k\ell t} \equiv \left(\prod_{n=0}^{\ell-1}\mathbf{B}_{kt-n}\right)\mathbf{A}_{kt-\ell}$, $\mathbf{D}_{kt} \equiv \prod_{\ell=0}^{t-1}\mathbf{B}_{kt-\ell}$ and $\Delta\mathbf{s}_{k0}$ is the change in labor market stocks in the first period of available data.

The flow steady states in this distributed lag adjust immediately to any change in the transition probabilities p_{ijkt} and the population flows q_{ikt}. The $\mathbf{C}_{k\ell t}$ coefficients then embody the effect of all the histories of transition probabilities. The influence of changes in each flow on labor market dynamics can then be approximated by taking a first-order expansion to the change in the flow steady state labor market stocks, [6]

$$\Delta\bar{\mathbf{s}}_{kt} \approx \sum_{i\neq j} \frac{\partial\bar{\mathbf{s}}_{kt}}{\partial p_{ijkt}}\Delta p_{ijkt} + \sum_{i} \frac{\partial\bar{\mathbf{s}}_{kt}}{\partial q_{ikt}}\Delta q_{ikt}. \tag{7}$$

The derivatives $\partial\bar{\mathbf{s}}_{kt}/\partial p_{ijkt}$ and $\partial\bar{\mathbf{s}}_{kt}/\partial q_{ijkt}$ can be calculated analytically using (4) and standard rules for matrix derivatives. Inserting the approximation (7) into the distributed lag (6) gives changes in labor market stocks as a sum of the changes in the flows, and thereby allows a

[6] Note that the steady-state stocks, unlike the actual stocks, are functions solely of the current transition rates. This fact lends itself to the decomposition above.

decomposition of the variance over time in the stocks into contributions accounted by each flow p_{ijkt} and q_{ikt}.[7]

Aggregate decomposition. Our framework can be extended to assess how each subgroup flow contributes to variation in *aggregate* labor market stocks. The latter are shaped by aggregate labor market and population flows which, in turn, are weighted sums of subgroup flows.

The aggregate decomposition is useful for two reasons. First, it quantifies how immigrant flows percolate to the aggregate, and how changes in both the extent of immigration, and its composition across labor force states, can amplify, or moderate, the contributions of immigrant flows relative to their base shares of labor force stocks. Second, the method we develop can be applied to study the role of composition across any given set of subgroups, beyond our focus on migrant status—for example, by age, gender, ethnicity, skill, or region—a feature we hope will be useful for future work to study these further dimensions of heterogeneity as the requisite data become available.

The individual contributions of the subgroup transitions reflect both the (time-varying) relative share of immigrants in the aggregate, as well as the differing importance of each transition path across the subgroups. E.g., the aggregate job loss probability p_{EU} can be rewritten as the weighted sum of migrant and native job loss probabilities,

$$p_{EUt} = \varepsilon_t p_{EUmt} + (1 - \varepsilon_t) p_{EUnt}, \tag{8}$$

where $\varepsilon_t \equiv E_{mt-1}/E_{t-1}$ is the share of immigrants in employment at time $t-1$. Analogous expressions hold for each of the remaining gross labor market and population flows.

If each subgroup's transition probabilities were identical, (8) and its analogues would be degenerate, and each subgroup's contribution to the aggregate would be proportional to their share in the respective labor market stocks. If not, (8) and its analogues provide a mechanism for gauging the extent to which the contributions of subgroup flows deviate from their shares in the stocks.

The law of motion for the aggregate stock of employment, for example, can be expanded as follows (noting that $p_{EEkt} = 1 - p_{EUkt} - p_{ENkt}$),

$$\begin{aligned} E_t = {} & [\varepsilon_t p_{EEmt} + (1 - \varepsilon_t) p_{EEnt}] E_{t-1} + [\upsilon_t p_{UEmt} + (1 - \upsilon_t) p_{UEnt}] U_{t-1} \\ & + [\eta_t p_{NEmt} + (1 - \eta_t) p_{NEnt}] N_{t-1} + [\omega_t q_{Emt} + (1 - \omega_t) q_{Ent}] Pop_{t-1}, \end{aligned} \tag{9}$$

[7] The decomposition is a straightforward extension of that suggested by Fujita and Ramey (2009).

where, mirroring the definition of ε_t above, $\upsilon_t \equiv U_{mt-1}/U_{t-1}$, $\eta_t \equiv N_{mt-1}/N_{t-1}$, and $\omega_t \equiv Pop_{mt-1}/Pop_{t-1}$ are the shares of migrants in the respective stocks of employment, unemployment, nonparticipation, and the working-age population.[8]

Since the aggregate equivalent of (4) is

$$\bar{\mathbf{s}}_t = (\mathbf{I} - \mathbf{P}_t)^{-1}\mathbf{q}_t, \tag{10}$$

all terms in $\mathbf{P}_t$ and $\mathbf{q}_t$ can be similarly expressed as weighted averages of subgroup probabilities and flow transition rates. This allows the total differential of the steady state stocks $\bar{\mathbf{s}}_t$ with respect to a given transition probability p_{ijt} to be disaggregated as

$$\sum_{i \neq j} \frac{\partial \bar{\mathbf{s}}_t}{\partial p_{ijt}} \Delta p_{ijt} = \sum_{i \neq j} \frac{\partial \bar{\mathbf{s}}_t}{\partial p_{ijmt}} \Delta p_{ijmt} + \sum_{i \neq j} \frac{\partial \bar{\mathbf{s}}_t}{\partial p_{ijnt}} \Delta p_{ijnt}. \tag{11}$$

The transition rate contributions of the subgroups thus sum to the total contribution of each transition rate. Analytical expressions for subgroup derivatives with respect to the overall steady state $\partial \bar{\mathbf{s}}_t / \partial p_{ijkt}$ based on (7) and (11) can be obtained, and hence their contribution to overall labor market dynamics calculated.[9]

3. Application to the United Kingdom

To undertake this analysis, it is necessary to have access to microdata on labor market flows, allied to aggregate data on emigration, immigration, births, and deaths. The United Kingdom is a particularly good exemplar since, over the last 40 years, it has experienced net working-age population growth, driven first by baby boom cohorts reaching maturity and latterly by rising immigration. Furthermore, individual-level data on labor market flows are available going back to 1975, together with some aggregate administrative data concerning emigration, immigration, births, and deaths.

We begin by documenting the evolution of the UK working-age population, and the underlying flows that shaped its path. We then delve into their origins by labor force and migrant status, providing novel measures of joint labor force and population flows, and documenting their empirical behavior. Finally, we quantify the role of population flows in labor market dynamics by

[8] Since the shares are measured at time $t-1$, they are predetermined in the decomposition calculations.

[9] See Appendix C for detailed derivations.

applying the decompositions devised in the preceding section.

3.1 Aggregate population dynamics

We define the working-age population as men aged 16-64 and women aged 16-59.[10] Changes in this stock are driven by population flows, which can be disaggregated into immigrants plus 16-year-old entrants (together, population inflows), less emigrants, 60/65-year-old exits from the working-age population, and deaths (population outflows).

Aggregate measures of these population flows can be derived for the years 1975 to 2016 using data from the LFS,[11] combined with official data from the ONS on population and deaths by age, and immigration and emigration for the entire UK population.[12] The resulting time series are illustrated in the two panels of Figure 1.

Figure 1A presents the working-age population by migrant status. Over the sample period, the UK working-age population grew at an average annual growth rate close to 0.5 percent. Most of this growth can be traced to two broad eras of accelerated population advance. The first contains the maturation of the UK baby boom cohorts in the late 1970s and 1980s. By contrast, the second era has its origins in rising immigration, especially since the mid-1990s, associated in part with the accession of the A10 countries to the European Union in 2004. As a result, the immigrant share in the working-age population grew from around 8 percent to more than 18 percent over the sample period.

Figure 1B plots the underlying gross population flows, expressed as shares of working-age population. The role of the baby boom cohorts in population growth is underscored by the large spike in the inflow of 16-year-olds early in the sample. The large rise in the immigrant population is reflected in growing net migration later in the sample.

Figure 1B also provides an initial perspective on the flow origins of population growth. Gross population flows are large. UK-born entrant and exit flows together are equivalent to 4 to 5 percent of the working-age population. For migrants, these flows are equal to 50 percent of the working-

[10] For most of the sample period these upper age bounds defined state pensionable age in the UK.

[11] Our sample period ends in 2016 for two reasons. First, it aligns with a full cycle of unemployment; second, Brexit and the pandemic have had a major adverse effect on sampling and population weights in the LFS and on official UK estimates of aggregate immigration and unemployment. This induces much greater uncertainty in estimates of the immigrant and UK-born populations after 2016.

[12] See the ONS datasets: *Population Estimates for UK, England and Wales, Scotland, and Northern Ireland*; *Deaths by single year of age tables – UK*; and *Migration Statistics Quarterly Report*.

age immigrant population by the end of the sample. Aggregate gross population flows are therefore comparable in size to the total stock of unemployed workers. We will see later that these population flows are consequently nontrivial relative to the gross flows across labor market states.

A lot of churn underlies net population growth. A prominent example is the rise in net immigration which, Figure 1B shows, was accompanied by large rises in both immigration *and* emigration flows. This suggests the growth of the immigrant population increasingly was driven by rises in short-term (return) migration spells.

Population flows are also correlated with the business cycle, in a way that offers a potential explanation for cyclical movements in labor market outcomes. While it has long been known that birth rates fall in recessions (Yule 1906), it does not follow that the arrival of 16-year-olds into the working-age population should also coincide with a cyclical shock. Yet, as Figure 1B shows, this misfortune befell the large baby-boom birth cohorts that turned 16 during the downturn in the early 1980s. This was accompanied by a near-contemporaneous fall in the number of 60/65-year-olds leaving the working-age population, due to the low birth rates during the First World War, and increased deaths among the same birth cohorts who were then of fighting age in the Second World War.[13]

Migration flows also exhibit cyclical variation. This is especially apparent in the latter part of the sample, as the scale of immigration grows. Both immigration and emigration flows rose with the economic expansion of the early 2000s, subsided with the onset of the Great Recession, and then recovered in its wake. Among the population flows, only deaths are acyclical, exhibiting instead a secular decline over the 40 years covered by our data.

3.2 Measurement

Key ingredients to our accounting framework are *disaggregated* measures of labor market and population flows by migrant status—see (2). This is not straightforward, since neither labor market nor population flows are published officially at the required levels of disaggregation. We use individual microdata underlying the UK LFS, combined with official sources, to infer the

[13] Lower World War II birth rates help explain the fall in 65-year-olds from 2010 to 2012 in Figure 1.

components of (2). Mirroring the frequency of the LFS, the resulting estimates are available biannually from 1975 to 1983, and annually thereafter.[14]

Labor market flows. Our starting point is to infer labor market transition rates by migrant status—the p_{ijkt} in (2). The LFS asks all individuals interviewed in the second quarter of each year about their labor force status one year prior to the interview date. This information on *recalled* status is combined with the individual's reported *current* status to infer measures of annual worker flows, and thereby the transition rates.[15] A key advantage of this approach is that it provides measures of transition rates over a long sample period covering three economic cycles, 1977-1987, 1988-1995 and 2007-2016. No other UK data source allows measurement of worker flows over such a long period.

The use of recalled data does raise issues about the accuracy of remembered status. Studies investigating recall accuracy indicate that over short periods—up to about three years—recall bias is not severe (Paull 2002; Elias 1996). 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, while Bell and Smith (2002) find recalled stocks accurate, and transitions between employment and unemployment correctly recalled, short spells between unemployment and nonparticipation tally less well with contemporaneous reports. This may reflect a tendency to remember personally salient events. Moves between the two nonemployment states are unlikely to be as psychologically "painful" or "enjoyable" as losing or gaining a job (Akerlof and Yellen 1985).

Population flows. We augment these LFS measures of labor market transitions with yearly measures of net population flows by labor market state and migrant status—the q_{ikt} in (2), and their disaggregation into gross population inflows and outflows. Denoting the out-of-population state by A ("abroad"), we can write

$$q_{ikt} = (A \text{ to } i)_{kt} - (i \text{ to } A)_{kt}, \quad \text{for all} \quad i \in \{E, U, N\}. \tag{12}$$

We derive these flows partly from LFS data, and partly from official ONS sources.

UK official migration numbers during our sample window were based on survey data rather

[14] More detail of these calculations and data sources are provided in Appendix A.

[15] LFS data on recalled status also have the benefit of being asked of all individuals, not just those who remain at the same address, unlike in the matched quarterly LFS longitudinal flows, which are available only from 1992.

than administrative sources.[16] While the ONS publishes aggregate immigration and emigration estimates for the entire UK population, it does not measure flows for the working-age population, emigration by country of birth, or migrant flows into and out of labor market states. For these reasons, we use additional information from the LFS microdata.

The LFS elicits the month and year of entry into the UK for foreign-born individuals. We define a new immigrant entrant as a foreign-born individual of working age who reports having been in the UK for less than one year at the date of interview. We then split these new immigrants into entrants into employment, unemployment, or nonparticipation, according to their reported current labor market status.[17]

By contrast, the LFS offers no simple way of estimating emigration outflows. We proceed by taking official ONS measures of emigration outflows for the *entire* population and use them to impute their counterpart for the *working-age* population. For each year of data, we assume that the ratio of emigrant outflows to immigrant inflows in the working-age population mirrors its analogue for the total population in the official ONS figures. We apply this ratio to our estimated working-age immigrant inflow to compute the analogous working-age emigrant outflow. We then apportion these total working-age emigrant outflows from the three labor market states by immigrant status according to the shares of each of these six groups in the working-age population.[18]

To estimate the gross population flows associated with 16-year-old entrants into the working-age population and 60/65-year-old exits from the working-age population, we first obtain measures of these two age sizes from each year of the LFS microdata grossed up using the population weights supplied in each LFS. These flows can then be split into employment, unemployment, and nonparticipation inflows and outflows by immigrant status according to the reported current labor market states of 16-year-olds and the reported retrospective labor market state of 65-year-olds.

Finally, we estimate gross population outflows due to deaths. Official statistics for age-

[16] Before the pandemic, official UK migrant flow data were based on the International Passenger Survey, a survey of arrivals and departures at multiple UK ports of entry and exit. Since 2020 the ONS has sought to collate migration flows from administrative sources regarding visas issued, visa recipient arrivals, border exit checks, and Bayesian modelling of recent trends. The results are still officially classed as "experimental".

[17] The LFS-derived inflow series and ONS inflows derived from the International Passenger Survey are broadly in line until 2017, a year after our sample ends. The series then begin to diverge (Wadsworth 2019).

[18] The assumption, then, is that emigration is random with respect to labor force and immigrant status. There is sporadic evidence to suggest that this may not hold. In Appendix B, we show that reasonable perturbations to this assumption do not alter our results significantly.

specific death rates by year are published by the ONS. However, no data are published on labor market status at time of death or country of birth. The literature on mortality by migrant and labor market status is sparse, so we augment the ONS age-specific death rates using the results of Dunlavy et al. (2018), who provide such estimates, albeit for Sweden.[19] Estimated working-age deaths are much lower than the immigration or birth cohort population flows and so are unlikely to influence greatly the results we present.[20]

3.3 Stocks and flows by migrant status

With these measures, it is then possible to document the joint dynamics of labor market and population flows.

Labor market stocks. Figure 2 contrasts the performance of labor market stocks among immigrant and UK-born populations. This reveals three broad messages.

First, there are clear levels differences between labor market outcomes of immigrant and native populations. Averaged over the full sample, immigrants are more likely to be unemployed, much less likely to be employed, and much more likely to be nonparticipants.

Second, immigrants historically have faced much more variation in their labor market outcomes, both at cyclical and medium-run frequencies. Their unemployment rates have risen more in recessions, mirrored by larger cyclical declines in employment, as first noted by Dustmann et al. (2010). Over the medium-run, immigrant nonparticipation rates rose in the first half of the sample and have fallen considerably in the latter half. These trends can in turn be seen in mirror image in the rising immigrant employment rate series.

Third, the recent data show *convergence* between migrant and native populations. Remarkably, this can be seen across the board: unemployment, employment, and nonparticipation have converged, and the amplitudes of the cycles of immigrant and native unemployment rates were comparable in the Great Recession.

Labor market and population flows. Figures 3 and 4 track the transition rates that underlie these

[19] The authors find an approximate 50 percent excess mortality rate for the unemployed in the population of 25- to 64-year-olds, that appears to be offset by foreign-born status. Immigrants in employment have significantly lower mortality rates than Swedish-born employed.

[20] Annual working-age deaths average around 80,000; emigrant flows around 300,000; and 65/60-year-old outflows around 700,000. Appendix B reports the sensitivity of the results to variants in these assumptions.

changes in labor market stocks by migrant status. Figure 3 plots the labor market flows and Figure 4 plots the evolution of population flows by labor force state. The interaction between the labor market dynamics in Figure 3, and the population dynamics in Figure 4, is rich and complex and is the subject of formal analysis in the ensuing section. For now, we document the qualitative features of this interaction.

Labor market flows. Figure 3 indicates the flow origins of the differences in labor market stocks depicted in Figure 2, in *levels*; in *cyclicalities*; and in the recent *convergence* of their labor market stocks. The qualitative account turns out to be a relatively simple one.

Consider first the *levels* differences. Figure 3 identifies two clear sources for the higher rate of unemployment among immigrants: they typically face both higher rates of job loss to unemployment (E-to-U), and, for much of the sample, lower rates of job finding from unemployment (U-to-E). Both differences also help to explain why employment rates are so much lower among immigrants, an outcome reinforced by immigrants having been much less likely to transition from nonparticipation to employment (N-to-E). In turn, the latter helps to explain why nonparticipation rates are so much higher among immigrants.

A similar logic elucidates the origins of historical differences in the *cyclicality* of labor market stocks between these groups. All the differences in flows are exacerbated in recessions. Among immigrants, rates of job loss have risen more, and rates of job finding fallen more in recession, especially in the early 1980s and 1990s. This differential cyclicality in job loss and job finding is apparent both in flows between unemployment and employment, as well between nonparticipation and employment.

These forces in turn account for the recent *convergence* of labor market outcomes. Since the turn of the century, there has been a broad-based convergence of labor market flows between the two groups. Although some differences remain—e.g., immigrants still face higher rates of entry into unemployment—many have narrowed or, indeed, reversed. Strikingly, job finding rates are now *higher* for immigrants, not only for the unemployed, but also for those out of the labor force, among whom rates of job finding have exhibited a remarkable upward surge since the early 2000s. These trends have led to convergence in both the levels and cyclicality of labor market outcomes among the two groups.

Population flows. Figure 4 provides a first snapshot of a key contribution of this paper, plotting the time series of the gross population flows by migrant status over the sample period.[21] This yields new insights into the *levels* of gross population flows, their *cyclicalities* (and co-movement with the labor market dynamics documented above), and the recent emergence of increased population *churn* among immigrants.

A first message is that the *levels* of gross population flows are large. Averaged over the sample period, combined annual rates of population entry and exit correspond to 8 percent of the working-age population among immigrants, and 4 percent of the working-age population among the UK-born.[22] These are large in relation to both labor market stocks and flows. Importantly, population inflows generally are larger than population outflows over the sample period, especially among immigrants, reflecting the net population growth highlighted earlier. We will see that population inflows tend to loom larger in the labor market dynamic decompositions.

There is also considerable time variation in population flows - they exhibit a degree of *cyclicality*. This is most apparent in the cycles surrounding the 1980s recession and the Great Recession. Both episodes suggest a narrative whereby the evolution of population flows contributed to the cyclicality of labor market stocks of both UK-born and immigrant populations.

The most prominent feature of the 1980s recession in Figure 4 is a large spike in population inflows into unemployment, particularly among the UK-born. For them, maturation of the large baby-boom cohorts coincided with a deep recession, frustrating the job-finding prospects of school leavers. Similar trends are apparent among immigrants, who also experienced a spike in inflows to unemployment. Also apparent is a gradual fall in immigrant inflows into employment. These features provide a first glimpse of the interaction between population flows and the cyclicalities of labor market stocks: We will see that population flows contributed to the rises in unemployment, and falls in employment, among both groups during the 1980s recession.

The Great Recession was not accompanied by large shifts in population flows among the UK-born. Instead, the large growth in immigration in this period was accompanied by cyclical gross population flows among immigrants. The UK was one of only three EU member states to grant immediate access to the 10 EU accession countries in 2004. Along with continued in-migration from non-EU citizens with work visas or retained rights of entry, immigration to the UK rose

[21] The shading in the Figure corresponds to the two subperiods subject to the formal decomposition in the next section.

[22] 13 percent and 5 percent at their respective maxima in 2006 and 1981.

sharply over this period. Figure 4 suggests two cyclical features of this episode. Most prominent is a large decline in population inflows into employment among immigrants. In addition, immigrant population inflows into unemployment rose after the onset of the Great Recession in 2007. Both forces contribute to decline in employment, and rise in unemployment, among immigrants during the Great Recession, a point we will confirm formally later.

Figure 4 also shows that recent immigration was accompanied by increased *churn* of immigrant populations. Immigrant population flows reached their peak in the aftermath of the 2004 accession of the A10 countries to the European Union. A distinctive characteristic of this wave of immigration, however, was its association with elevated rates of *both* population inflows and population outflows - greater churn - consistent with a larger incidence of return migration among these new EU migrants.

These new measures of labor market and population flows by migrant status suggest a role for gross population flows in the evolution of labor market stocks in two large recessions. We now establish this point more formally by applying the methodology developed in section 2 to these two episodes of demographic and cyclical change.

3.4 Decomposition results

We implement our decomposition of the evolution of labor market stocks using data for the periods 1978-88 and 2007-16,[23] both by immigrant status, and in the aggregate. Results for immigrants are reported in Table 1; analogous results for the UK-born are in Table 2; and the aggregate results are in Table 3. These summarize the percentage contribution of each gross flow, based on (7), in accounting for the change in each of the three labor market states over the two episodes. Variance contributions of labor market flows are grouped in the upper panels, and those of population flows are in the lower panels. The labor market flows are grouped into those capturing job loss (E-to-U and E-to-N; panel a), job finding (U-to-E and N-to-E; panel b), and moves into and out of the labor force (U-to-N and N-to-U; panel c).

Population flows. We begin by summarizing the contributions of gross population flows. As we foreshadowed, these loom especially large in the labor market dynamics of immigrants, and so we describe the population flows results for immigrants first.

[23] These episodes also correspond to full cycles of the unemployment rate, from trough to trough.

Immigrant population flows. Table 1 delivers a central contribution of the analysis. It reveals that gross population flows play a substantial role in explaining variation in all three immigrant labor market states, and more so in periods of accelerated immigration.

The contribution of gross population flows to immigrant labor market volatility is dominated by the variation in population *inflows*—primarily to employment, but also to unemployment (panel d). This provides quantitative support to the qualitative impression of Figure 4 that A-to-E and A-to-U flows are both larger in magnitude, and exhibit more considerable time variation, during these episodes.

Table 1 also confirms that population inflows contributed significantly to the substantial variation in immigrant labor market stocks in the 1980s seen in Figure 2. 10 percent of the large fall and rise in the immigrant employment rate, and 20 percent of the countercyclical movement in the immigrant nonparticipation rate, can be traced to the variation in population inflows during this early episode (panel d).

A key message of Table 1 is that population flows played an even more dominant role in immigrant labor market dynamics in the later 2007-2016 period. Population inflows again account for most of this contribution. Over 14 percent of the rise and subsequent fall in immigrant unemployment in the 2007-2016 cycle can be traced to population inflows (panel d). Most notably, they account for over *one third* of the variation in immigrant employment rates, and over *40 percent* of the variation in immigrant nonparticipation rates in the Great Recession and its wake.

The upshot is that population flows play a key role in the labor market dynamics of immigrants in the United Kingdom. Moreover, these flows *exacerbate* the considerable labor market volatility faced by migrants, amplifying the cyclical responses of immigrant unemployment, employment and nonparticipation. An integrated study of labor market and population flows thus adds considerable insight into the labor market outcomes experienced by UK immigrants.

UK-born population flows. The population flows contributions for the UK-born are reported in the lower panels of Table 2. These flows are dominated by changes in working-age entrants and exits over time, rather than changes in net migration patterns of the UK-born. The decomposition again confirms the qualitative picture conveyed in Figure 4.

The effects of population flows among the UK-born are concentrated in the earlier 1978-1988 economic cycle, when the downturn coincided with the entry of large baby boom cohorts into the

working-age population. This mostly affected the paths of unemployment and nonparticipation among the UK-born.

As with immigrants, the contributions of population flows among the UK-born are dominated by variation in inflows. Population inflows account for 8 percent of the large rise and fall of UK unemployment in the 1980s, driven entirely by the large spike in population inflows to unemployment (A-to-U) during that period apparent in Figure 4. An echo can be seen in the evolution of nonparticipation: Population inflows, in particular A-to-N flows, account for 16 percent of the variation in the nonparticipation rate (panel d), which rose and then fell by around 3 percentage points between 1978 and 1988.

The baby boomers thus entered a labor market at the onset of a large recession. Rather than find work, many were channeled into unemployment and nonparticipation. The rise in nonparticipation was mitigated in part by a rise in participation outflows among the cohorts of older workers reaching retirement age in this same period.

There is a much smaller role for population flows in the latter period. Fluctuations in UK-born birth cohorts were not significant. Nor did they coincide with the timing of the Great Recession. Indeed, population outflows dampened the volatility in all three labor market states during this period (panel e).

Labor market flows. A further contribution of Tables 1 and 2 is to provide additional perspective on the labor market flows of immigrant and UK-born populations.

Since the UK-born account for the bulk of UK working-age population, the labor market flow contributions in Table 2 largely confirm the results of earlier flow studies of the aggregate UK labor market.[24] Table 2 shows that the bulk of variation in labor market stocks can be traced to variation in rates of job loss and job finding (panels a and b). And, as in earlier studies, of these, job loss is the larger (and growing) contributor to unemployment variation among the UK-born.

[24] Elsby, Smith and Wadsworth (2011) estimate that 70 percent of the variation in aggregate *steady-state* unemployment is accounted for by job loss in the 1975-2010 period. Smith (2012) reports similar estimates for the job loss contribution to variation in aggregate *actual* unemployment over the period 1992 to 2007. In Petrongolo and Pissarides (2008), the relative contributions of job loss in explaining aggregate steady-state unemployment variation vary from 30 to 50 percent, depending on the period studied.

The participation margin is a smaller contributor, at around 8 to 13 percent (panel c). This, too, is consistent with aggregate UK results reported in Elsby, Smith and Wadsworth (2011).[25]

The novel contribution of Tables 1 and 2 to our understanding of labor market flows lies in the *juxtaposition* of their behavior among immigrants and the UK-born. This reveals that the labor market experience of immigrants has a distinctive character.

First, as for the UK-born, job loss is the main contributor to immigrant unemployment variation, particularly via E-to-U flows, accounting for nearly 60 percent of the variation in the Great Recession episode (Table 1, panel a). In contrast to the UK-born, however, rates of job finding contribute relatively little to explaining unemployment among immigrants, and less so over time, falling to as little as 3 percent in the 2007-16 period (Table 1, panel b). This confirms the impression of Figure 3 that job finding rates for immigrants did not change much during the Great Recession, and so do not explain much of the rise in immigrant unemployment.

Second, it is apparent that the participation margin between unemployment and nonparticipation looms larger for immigrants, accounting for more than 20 percent of the variation in unemployment (Table 1c). Immigrants are more fluid across the participation margin, and in a cyclical fashion. The suggestion, then, is that labor market attachment among immigrants tends to be weaker, and the participation margin binds more.

Aggregate decomposition. In our final set of results, we implement the aggregate decomposition derived in section 2. This indicates the extent to which subgroups—here, immigrants and the UK-born—play a disproportionate role in the variation in aggregate labor market stocks. If flows were homogeneous across groups, their aggregate contributions would be in proportion to their shares in each stock. The average immigrant shares among the unemployed, employed and nonparticipants were, respectively, 7 percent, 8 percent, and 9 percent from 1977 to 1988, and 14 percent, 18 percent, and 17 percent from 2007 to 2016. Immigrant contributions to aggregate labor market variation will deviate from these shares if their flows display more, or less, cyclicality.

Table 3 reports the percentage contribution of each aggregate labor market flow to the variation in each aggregate labor market state, and the percentage share of that contribution

[25] The participation margin appears to be more prominent in the United States: Elsby, Hobijn and Sahin (2015) report US variance contributions around twice those reported here for the United Kingdom.

accounted for by immigrant flows.[26] This reaffirms the importance of variation in job finding and job loss flows in shaping aggregate unemployment. Job loss (panel a), rather than job finding (panel b), dominates the changes over the 2007-16 cycle. Immigrant contributions in job loss are broadly proportional to their labor force shares. But immigrants are under-represented in the contribution of job-finding flows. Panel b shows that immigrants account for under 3 percent of the total contribution of job finding flows in explaining unemployment variation (column 1) over the 2007-16 cycle. This suggests that part of the reason for the recent convergence in unemployment rates of immigrants and UK-born workers is that job-finding rates among immigrants fell less during the Great Recession and rose more in the subsequent recovery.

On the variation in aggregate employment and nonparticipation, Table 3 indicates that immigrants are under-represented in the contribution of U-to-E flows, and contribute disproportionately to job finding flows from N-to-E (panel b). The direct N-to-E flows are more important in explaining aggregate variation in employment, and particularly nonparticipation, than explaining variation in unemployment (panel b). Variation in migrant flows from N-to-E over time contributes disproportionately to the aggregate N-to-E contribution (panel b).

Finally, Table 3 indicates that the contributions of population flows to changes in aggregate stocks echo the analysis of the UK-born in Table 2. This is not surprising given that the UK-born comprise the vast majority of labor market stocks over the sample. However, for the later 2007-16 cycle, Table 3 reveals prominent contributions of population inflows into employment (A-to-E) and nonparticipation (A-to-N) to aggregate variation in the nonparticipation rate and, to a lesser extent, the employment rate (panel d). Consistent with the shifting influences of population change over the sample window, these later contributions are dominated by immigrants.

4. Summary and discussion

This paper provides a first synthesis of labor market and population flows among immigrant and native-born populations. We devise an analytical accounting framework that can accommodate the interaction between population flows from two sources—changes in birth cohort size and immigrant flows—with labor market dynamics. This facilitates and enhances understanding of the

[26] Equation (11) shows that the total contribution of any flow (e.g., E-to-U) is the sum of the contributions from immigrants and the UK-born. Rather than report each subgroup contribution, Table 3 shows the percentage share of the immigrant contribution for each flow underneath the total contribution of that flow.

forces that underlie changes in immigrant and native-born labor market stocks over time and, thereby, changes in aggregate labor market outcomes. The framework can be applied to any country with microdata on labor market flows, allied to aggregate data on emigration, immigration, births, and deaths.

We have applied this framework to the United Kingdom, a country that has experienced rapid population growth over the past 50 years and which has data to carry out the methodology. Doing so uncovers novel stylized facts on population flows, driven both by changes in birth rates among population cohorts and by immigration, alongside new evidence on the patterns of labor market flows by migrant status over time. Our results indicate that the impact of population change on the labor market was particularly important at two points in recent history: In the early 1980s, when large UK-born cohorts entered the labor force during a steep downturn; and in the late 2000s, when immigration rose steeply. The former helps to explain the rise in native-born unemployment in the 1980s. The latter helps to explain variation in immigrant employment, and particularly nonparticipation, through the Great Recession. Both channels would be obscured by an analysis that ignored population flows.

In addition to these contributions, our results also motivate and inform future scientific and policy work that seeks to understand and respond to these findings.

Our results reveal the importance of understanding population flows as a means to understanding labor market outcomes, especially during episodes of accelerated population change, and especially among immigrants. On the latter, we have shown not only that immigrant labor market flows behave differently to those of the native-born, but also, crucially, that their population flows are central to the evolution of immigrant labor market stocks. This motivates future work that seeks to understand jointly the processes of migration, labor supply, and job search among potential migrants, work that can be informed and disciplined by our findings.

Our results also shed light on which margins should be a priority for such work. We find important roles for population inflows, as well as migrant composition, in shaping immigrant labor market dynamics. Our evidence suggests that population inflows are particularly elastic over the business cycle, and that immigrant inflows associated with the accession of the A10 countries to the EU coincided with a convergence of immigrant and native-born labor market dynamics in the UK. These findings direct future work to focus on these key margins.

Relatedly, policy decisions regarding immigration and the balancing of labor demand and

supply also can be informed by our results. Alongside a need to monitor year of birth cohort sizes to anticipate possible cohort size effects on labor markets over the cycle, our finding that immigrant population inflows are cyclical suggests that policymakers devising visa requirements to address labor shortages should be cognizant that their ability to resolve these shortages this way will vary over the cycle.

More generally, our framework can be used to generate future scientific progress by applying it to other episodes of population change in other contexts. We have devised one way of piecing together joint labor market and population flows using Labor Force Survey microdata and aggregate population data. Due to the prevalence of such data across countries, we believe our framework can facilitate future work on a range of questions. For example, one could study the interaction of immigration by source country with labor market dynamics; or, symmetrically, one could study the implications of *out*-migration for the labor markets of source countries. These, and related, outcomes have been thrown into sharper relief as OECD immigration rates have reached record highs, both in terms of permanent migration, and refugees fleeing conflict (OECD 2023).

Finally, although we have proposed one way to compile the requisite data on gross labor market and population flows, our analysis also underscores the importance of developing even better integrated measures of joint labor market and population flows. Most notably, facilitating the measurement of these outcomes among subgroups known to experience different labor market performance and rates of population change over time (e.g., by sex, education, experience, occupation, industry, region), including distinctions across contexts of reception or types of migration (e.g., economic, familial, humanitarian), in addition to emigration outflows by labor market status, would be of particular value. We hope the present paper will stimulate further data developments along these lines.

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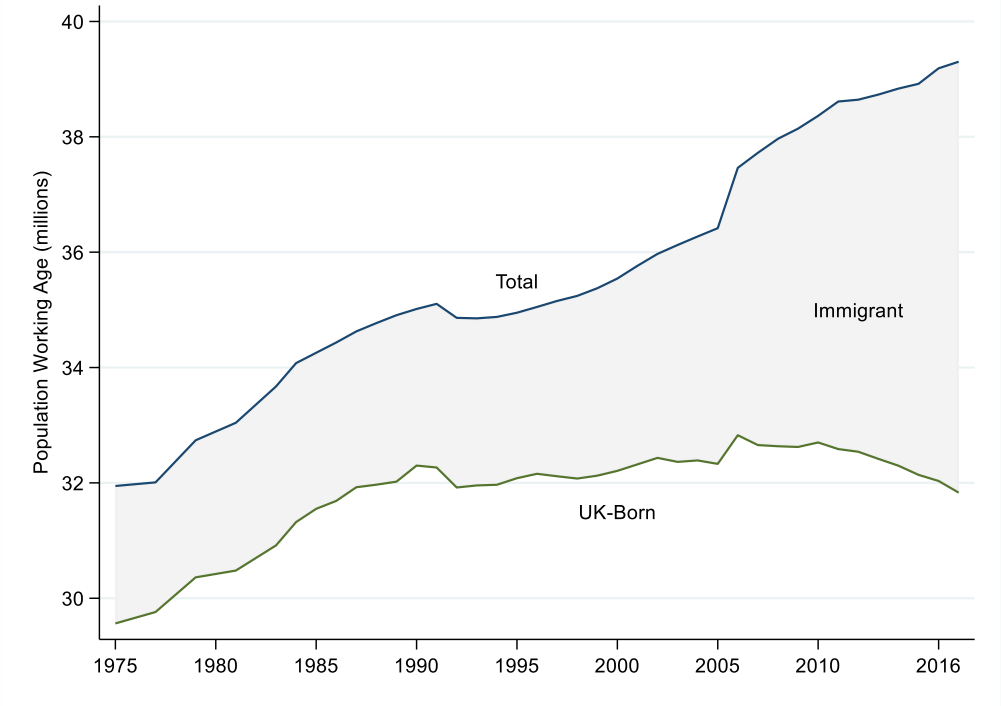
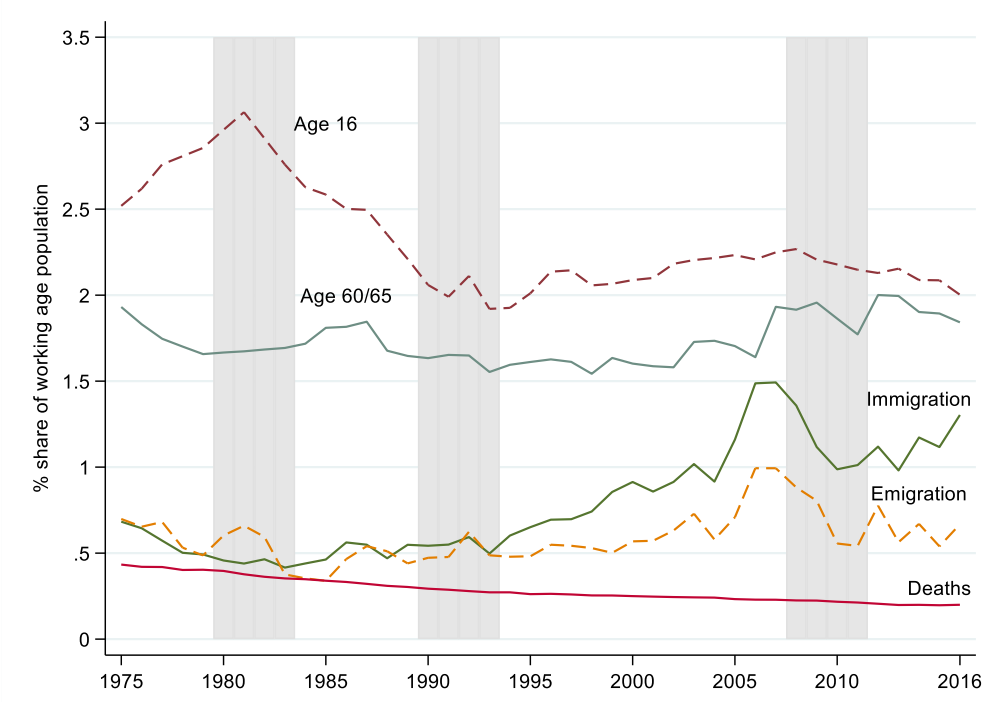
Figure 1. Working-age population dynamics, 1975 to 2016

A. Working-age population by immigrant status



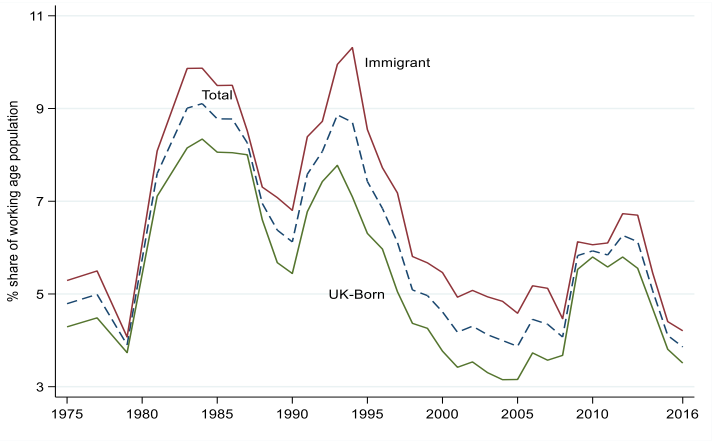
B. Annual population flows as a share of working-age population



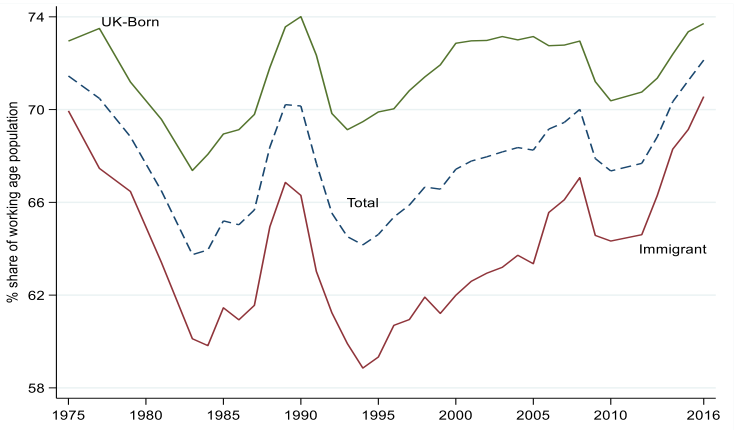
Source: LFS and ONS. Authors' calculations

Figure 2. Labor market stocks by immigrant status

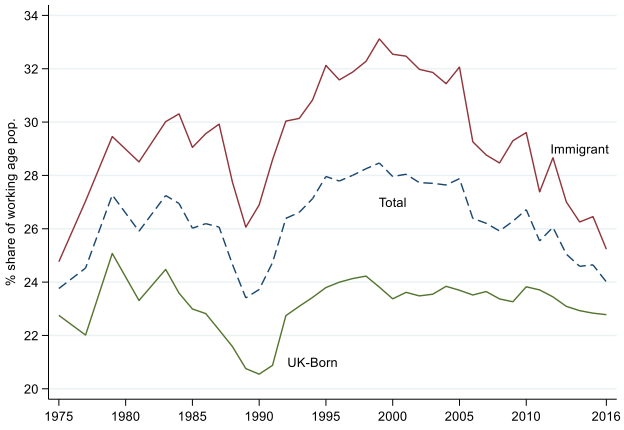
A. Unemployment-population ratio



B. Employment-population ratio



C. Nonparticipation-population ratio

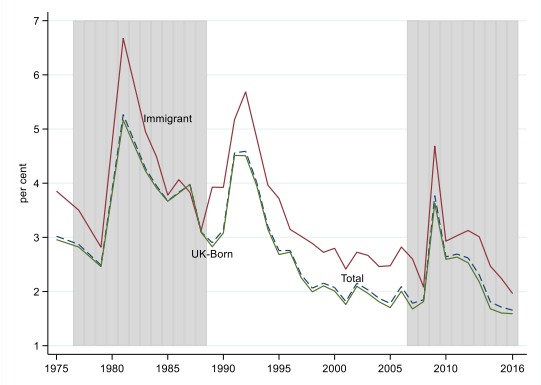


Source: LFS. Authors' calculations

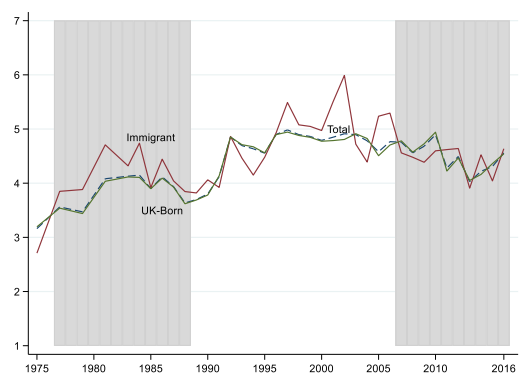
Figure 3. Labor market transition probabilities by immigrant status, 1975 to 2016

(i) Job loss

Employment to Unemployment

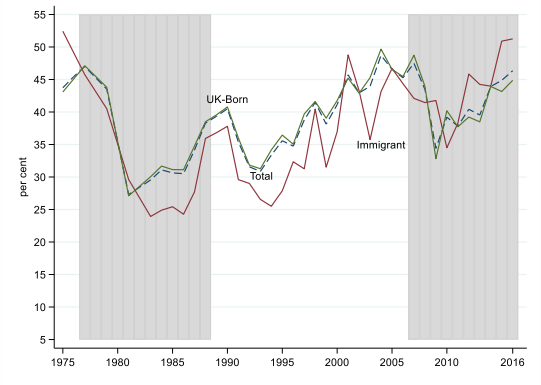


Employment to Nonparticipation

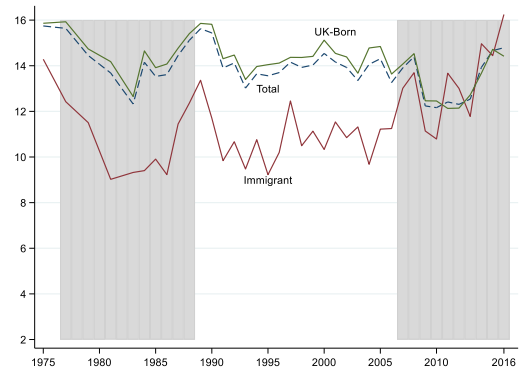


(ii) Job finding

Unemployment to Employment

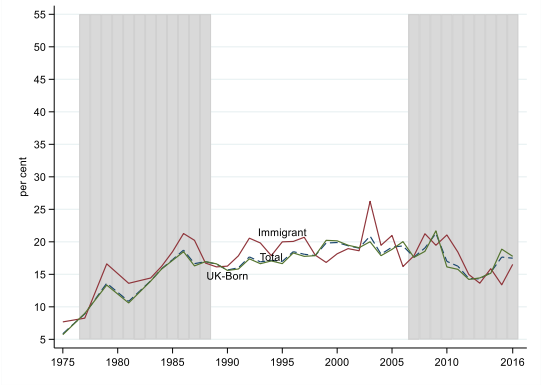


Nonparticipation to Employment

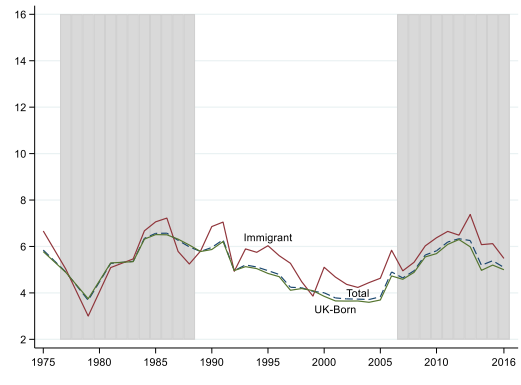


(iii) Participation margin

Unemployment to Nonparticipation



Nonparticipation to Unemployment

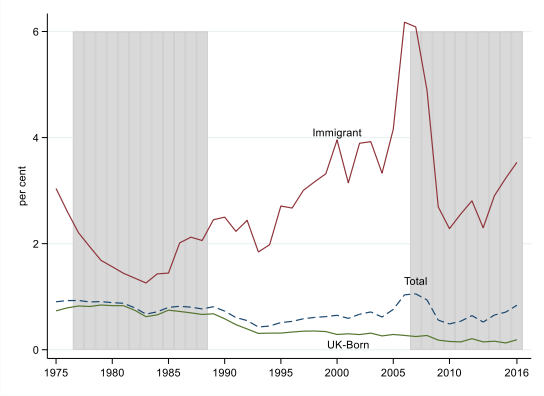


Source: LFS. Note: Transition rates are reported as a fraction of the respective origin stock of each group.

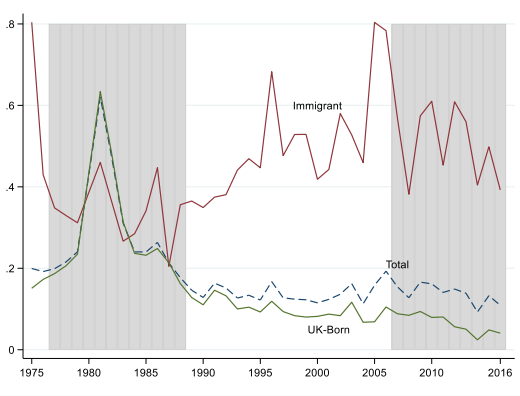
Figure 4. Gross population flows by immigrant status, 1975 to 2016

(i) Population inflows

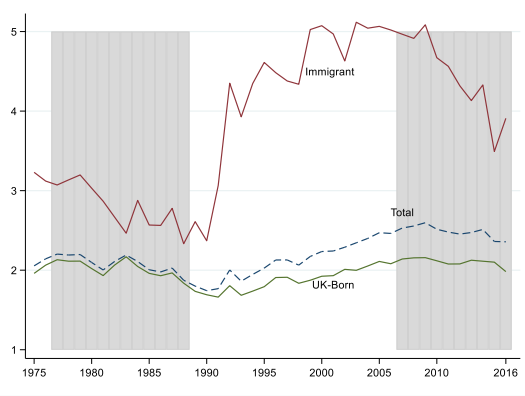
Inflow to employment (A to E)



Inflow to unemployment (A to U)

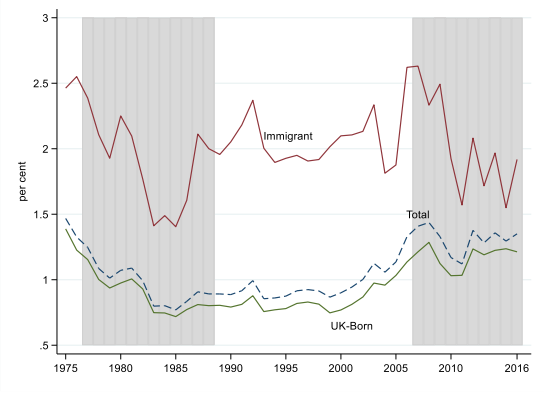


Inflow to nonparticipation (A to N)

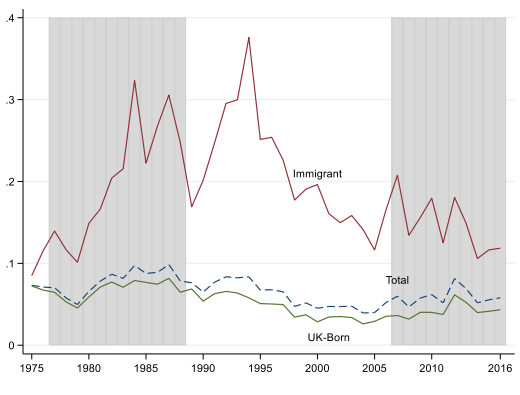


(ii) Population outflows

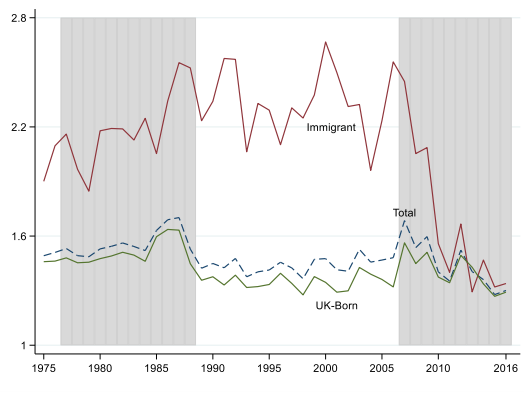
Outflow from employment (E to A)



Outflow from unemployment (U to A)



Outflow from nonparticipation (N to A)



Source: LFS. Note: Population flows by migrant status are reported as fractions of the respective working-age populations of each group.

Table 1. Flow variance contributions (percent) for two eras: Immigrants

	Unemployment		Employment		Nonparticipation	
	1978-88	2007-16	1978-88	2007-16	1978-88	2007-16
a) Job loss						
E to U	45.8	58.8	31.7	26.0	3.6	4.6
E to N	0.5	-0.1	14.4	-0.2	28.8	7.8
Total	46.3	58.7	46.1	25.8	32.4	14.4
b) Job finding						
U to E	25.4	4.6	18.3	7.6	-4.5	1.2
N to E	0.5	-1.4	19.7	26.1	32.8	41.1
Total	25.9	3.2	38.0	33.7	28.3	42.3
c) Participation						
U to N	8.4	7.2	0.2	2.3	1.6	5.2
N to U	14.3	17.8	6.4	0.3	13.9	-14.4
Total	22.7	25.0	6.6	2.6	15.5	-9.2
d) Pop. inflows						
A to E	2.5	5.7	7.4	26.0	11.7	37.5
A to U	3.0	8.5	1.1	3.1	1.0	-2.6
A to N	0.9	0.1	1.5	6.9	7.7	8.7
Total	6.4	14.3	10.0	36.0	20.4	43.6
e) Pop. outflows						
E to A	-0.8	0.9	-1.7	0.3	-3.5	-2.4
U to A	-0.9	-1.3	-0.3	0.2	0.3	0.2
N to A	0.6	-0.1	1.3	1.6	6.6	8.7
Total	-1.1	-0.5	-0.7	2.1	3.4	6.5
Pop. flows total	5.3	13.8	9.3	38.1	23.8	50.1

Notes. Author calculations using LFS. E=Employment, U=Unemployment, N=Nonparticipation, A=Abroad (out of population).

Table 2. Flow variance contributions (percent) for two eras: UK-born

	Unemployment		Employment		Nonparticipation	
	1978-88	2007-16	1978-88	2007-16	1978-88	2007-16
a) Job loss						
E to U	41.1	54.5	36.6	42.6	5.8	13.8
E to N	0.1	0.7	10.9	6.5	26.3	33.2
Total	41.2	55.2	47.7	49.1	32.1	47.0
b) Job finding						
U to E	37.5	36.1	35.2	26.7	3.3	8.7
N to E	0.3	-0.4	9.7	24.1	37.3	65.4
Total	37.8	35.7	46.9	50.8	40.6	74.1
c) Participation						
U to N	8.3	-6.2	-0.1	2.2	9.2	4.5
N to U	5.0	14.5	3.2	-0.7	5.8	-23.2
Total	13.3	8.3	3.1	1.5	14.0	-18.7
d) Pop. inflows						
A to E	-0.1	0.3	-0.2	0.9	0.9	2.4
A to U	8.0	0.6	5.1	0.2	1.3	-0.4
A to N	0.2	1.2	0.7	1.9	14.0	1.4
Total	8.1	1.2	5.6	3.0	16.2	3.4
e) Pop. outflows						
E to A	-0.1	-0.3	-0.3	-1.3	-3.6	-5.8
U to A	-0.5	-0.5	-0.4	-0.3	0.1	0.2
N to A	0.2	0.1	-0.4	-2.9	-0.3	-0.3
Total	-0.4	-0.7	-1.1	-4.4	-3.8	-5.9
Pop. flows total	7.7	0.5	4.5	-1.4	12.4	-2.5

Notes. Author calculations using LFS. E=Employment, U=Unemployment, N=Nonparticipation, A=Abroad (out of population).

Table 3. Aggregate variance contributions (percent) for two eras

	Unemployment		Employment		Nonparticipation	
	1978-88	2007-16	1978-88	2007-16	1978-88	2007-16
a) Job loss						
E to U	41.8	56.0	36.4	40.5	5.8	12.1
Immigrant % share	*9.8*	*16.6*	*9.9*	*15.8*	*15.5*	*14.0*
E to N	0.2	0.6	11.1	4.3	27.7	22.3
Immigrant % share	*50.0*	*16.6*	*11.7*	*-4.2*	*11.9*	*9.4*
b) Job finding						
U to E	36.6	31.8	33.7	23.1	2.3	7.0
Immigrant % share	*5.7*	*2.8*	*6.5*	*7.4*	*-8.0*	*7.1*
N to E	0.4	-0.5	10.7	25.3	38.1	64.9
Immigrant % share	*25.0*	*40.0*	*17.8*	*20.6*	*12.9*	*22.0*
c) Participation						
U to N	8.3	-4.7	-0.1	2.5	7.2	3.5
Immigrant % share	*8.4*	*10.2*	*50.0*	*32.0*	*2.8*	*65.7*
N to U	5.6	14.9	3.5	-0.6	7.0	-21.9
Immigrant % share	*14.3*	*18.1*	*14.3*	*20.0*	*-1.4*	*-16.9*
d) Pop. Inflows						
A to E	0.1	1.1	0.3	4.5	1.9	11.1
Immigrant % share	*200.0*	*45.5*	*71.4*	*75.0*	*73.7*	*82.0*
A to U	7.6	1.7	4.7	1.0	0.8	-0.7
Immigrant % share	*2.6*	*58.8*	*2.1*	*60.0*	*12.5*	*114.3*
A to N	0.3	-0.3	0.8	3.3	12.5	5.1
Immigrant % share	*33.3*	*133.3*	*12.5*	*54.5*	*0.1*	*76.4*
e) Pop. Outflows						
E to A	-0.1	-0.2	-0.4	-1.7	-4.1	-4.4
Immigrant % share	*100.0*	*100.0*	*25.0*	*23.5*	*-22.0*	*2.2*
U to A	-0.6	-0.5	-0.2	-0.3	0.2	0.2
Immigrant % share	*16.6*	*20.0*	*50.0*	*33.3*	*50.0*	*50.0*
N to A	0.3	-0.1	-0.2	-2.5	0.9	0.8
Immigrant % share	*33.3*	*100.0*	*50.0*	*4.0*	*122.2*	*175.0*