Received: 4 March 2020 | Revised: 17 March 2021 | Accepted: 18 March 2021

DOI: 10.1002/psp.2468

SPECIAL ISSUE PAPER

WILEY

Changing migration rates in England and Wales over a 40-year period: Is mobility declining?

Oliver Duke-Williams[1] | Rachel Stuchbury[2] | Jemima Stockton[2]

[1]Department of Information Studies, University College London, London, UK

[2]Department of Epidemiology and Public Health, University College London, London, UK

Correspondence
Oliver Duke-Williams, Department of Information Studies, University College London, London, UK.
Email: o.duke-williams@ucl.ac.uk

Funding information
Economic and Social Research Council, Grant/Award Number: ES/R00823X/1

Abstract

Research using data for the United States has pointed towards a long-term pattern of falling migration rates. Similar research in England and Wales has also found declining migration rates when observing all migrants. Using the Office for National Statistics Longitudinal Study (ONS LS), we study the patterns of migration observed over 10-year periods for persons in 10-year birth cohorts over each intercensal period from 1971–1981 through to 2001–2011.

When the sample population is considered as a whole, the results from the LS are consistent with earlier findings: There has been a decade-on-decade decline in the migration rate as observed in longitudinal data. When disaggregated by cohort, it is apparent that this decline is not always observed for young adults, but it is consistently observed for those in their 30s and older, for whom each successive cohort has a lower migration rate than the previous one and also for whom there is a steady within-cohort decline in the migration rate over time. This is observed at both short and longer distances of move. Alternative results from successive censuses looking at migration observed for single years do not appear to confirm this decline in migration, although data collection and processing issues may be part of the explanation for this finding, and it is also the case that these data may be more subject to cyclical effects.

KEYWORDS
census, England and Wales, longitudinal, migration

1 | INTRODUCTION

Assumptions that internal migration will tend to increase are long-standing. In the general conclusions to his second paper on The Laws of Migration, Ravenstein (1889, p. 288) posed the question 'Does migration increase?', answering himself 'I believe so!', and connected this to ideas of progress: 'Migration means life and progress: a sedentary population stagnation'. Building on Ravenstein, Lee (1966) stated that 'Unless severe checks are imposed, both the volume and rate of migration tend to increase with time' (p.53). Yet this pattern of continuous increase is not necessarily correct. Considerable attention has been paid to changes in migration propensity over several decades, with a specific focus on whether mobility has declined; this is placed in the context of an assumed trend of increasing mobility. References to an 'age of migration' (e.g. de Haas et al., 2020, p. 11), have been challenged by observations that migration is falling rather than rising.

Cooke (2013) identified a decline in inter-county mobility in the United States 'for at least twenty-five years' (p. 665), whereas Wolf and Longino (2005) stated that overall mobility (in the United States)

had 'generally declined since about 1950' (p. 5). Molloy et al. (2011) compared the decline in migration across different demographic and socio-economic groups and found that rates had fallen for nearly all subgroups. They also compared mobility in the United States to European countries, largely supporting the supposition that mobility was higher in the United States than in Europe and also pointing to decline in migration over the period 1999–2008 in Britain. International comparisons of migration remain difficult due to significant differences in data collected, and thus, comparisons often tend to be limited to specific countries and require extensive data husbandry prior to analysis (e.g. Stillwell et al., 2000, 2001); however, a review of internal migration in 66 countries was carried out by Bell et al. (2017), with temporal trends in migration intensity computed for interregional moves in over 40 of the countries. The term migration intensity follows the usage outlined by van Imhoff and Keilman (1991) in using intensity to refer either to transition probabilities (in data based on observation of migrants) or movement rates (in data based on observation of migrations—a distinction being that within an observation period, individual migrants may make more than one migration). Migration intensities reported by Bell et al. (2017) declined over the period 2000–2010 in most countries, although the exception to this was in Europe, where more countries were observed to have rising migration intensities than were observed to have falling intensities.

As regards England and Wales, Champion and Shuttleworth (2017a) found from analysing time-series administrative data that there had not been a substantial fall in overall longer distance migration rates since the 1970s, but, in a companion paper (Champion & Shuttleworth, 2017b) using the ONS Longitudinal Study (ONS LS), compared 10-year migration transitions across four intercensal periods from 1971–1981 to 2001–2011 and found a marked decline in migration rates, with the differences between these two findings hypothesised as being related to the distance of move, and variations in the extent to which the two data sources could capture short-distance moves. The present paper expands upon their work and in particular aims to explore whether or not reductions in mobility are observed for all age and sex groups across the period 1971–2011 and also whether this is true for both short and longer distance moves.

The paper starts by exploring the challenges posed by the data available for analysis and goes on to discuss patterns observed in successive sets of cross-sectional migration data for England and Wales. The bulk of the paper then discusses migration rates as observed in census longitudinal data for England and Wales using three overlapping samples: firstly, a set of sample members who were repeatedly mobile (i.e. they have moved in each intercensal decade, 1971–1981 through to 2001–2011); secondly, a set of sample members who were present at each census 1971–2011 (the repeatedly mobile being a subset of this group); and thirdly, a set of sample members who were present for at least two successive censuses 1971–2011 (the second group in turn being a subset of this group). The first of these groups are used to explore regional patterns of migration. The repeatedly mobile sample, whilst not directly informing the question of changes in migration rates over time, are useful in that they set the context of the spatial patterns of movement over a relatively long observation period. They demonstrate the utility of the data, showing that the sample size is sufficient to select a specific population and follow them across five censuses. The same population is observed throughout, and within that population, overall migration rates do not change: there is one net migration event in each decade. However, the data are disaggregated by region and therefore give some indication of variations in the length of migration over time for a broad cohort. The second and third groups are used to examine changes in migration rates over time for sets of period-cohort observations in order to determine whether Champion and Shuttleworth's findings hold true for cohorts. Period-cohort observations are those for a given birth cohort over a given time period, for example, the 1961–1971 birth cohort observed over the period 1981–1991. In the context of census longitudinal data, this is an observation of migration transition: we can observe the place of residence of each sample member at the start of the period and at the end of the period and can therefore determine whether there has been a change. The paper then goes on to subdivide the third group—those who had been present for at least two successive censuses—on the basis of distance moved in order to explore whether patterns observed for all migrants remain the same or differ when different migration lengths are taken into account.

2 | DATA AND METHODS

Two families of census data outputs are used in this paper—cross-sectional observations and longitudinal observations. We describe here the data and the methods applied to them.

2.1 | Cross-sectional observations

The cross-sectional observations are drawn from successive sets of Special Migration Statistics (SMS), together with denominator population counts drawn from the more widely used Area Statistics. The SMS have been produced as part of census outputs since the 1966 Census (Denham & Rhind, 1983), with varying specifications and design over time and those from 1981 onwards being available for analysis (Duke-Williams et al., 2018). They are derived from a question on the census form asking the respondent to indicate whether their usual residential address at the time of the census was the same as 1 year previously. Where individuals indicate that they had a different usual residence 1 year ago, they are considered to be a migrant.

The cross-sectional data are taken from the whole population and thus have allowed spatially detailed outputs to be published. Interpretation of results is complicated by a number of factors, the most obvious being variations in reporting geographies used in different censuses. Less obvious to the casual data user is the difference in approaches taken to migrants who did not (fully) specify a former address 1 year ago that is different to the address at the time of the census. In 2001, as part of the general imputation process, migrants who had not (fully) stated their origin had one imputed. The numbers

of migrants involved were not trivial: At the previous census in 1991, 6% of all migrants had 'origin unstated', with significant spatial variations (Champion et al., 1998). Further issues with consistency (from the perspective of comparison over time) were introduced in the 2001 Census with the One Number Census project (Brown et al., 1999).

Other changes in population coverage issues between the 2001 and 1991 (and earlier) censuses were identified by Rees et al. (2002), including the assumed usual residences of students and the definitional process used with infant migrants, whereas a separate class of problems was discussed by Stillwell and Duke-Williams (2007), namely, variant data biases introduced by different forms of statistical disclosure control used for successive censuses.

Some of these concerns can be partially addressed by adjustments to the reported data. For instance, Boyle and Feng (2002) developed a methodology that could be used to remodel migration flows reported with one geographic system and estimate equivalent flows for another and used this to transfer migration data from the 1981 and 1991 censuses to the 2001 reporting geographies, with results produced with and without pro rata allocation of migrants with unstated origins.

In order to compare overall levels of mobility over time, we calculated the proportion of the population that were migrants according to the census definition (a change in usual residence in the year prior to the census), by sex, using the versions of the SMS prepared by Boyle and Feng (2002). These versions allow for variations in the reporting geography and reallocate flows with no stated origin.

The mean distance moved was calculated for all migrants. Distances were determined as the Euclidean distance between local authority centroids; for moves within a local authority, the distance was assumed to be half of the radius of a circle of the same area as the local authority. Similar calculations were made for the 2011 census data, although substantial changes in the local authority geography mean that these are not directly comparable with the earlier results.

Comparisons of mobility between cross-sectional observations are also complicated here by variations in the universe over which moves are observed: Some data are available for the whole of the United Kingdom, whereas other data omit Northern Ireland. The cross-sectional measures were calculated for moves within England and Wales only in order not only to create a comparable time series but also to provide appropriate context for the analysis of data from the LS.

2.2 | Longitudinal observations

The original sample for the ONS LS was drawn in 1974 from individuals recorded in the 1971 Census (Office for Population Censuses and Surveys, 1973). The sample was drawn by selecting four (undisclosed) birth dates, giving a sampling fraction of 4/365.25 (as observed across a leap-year cycle), or around 1.1% of the population of England and Wales. The 1971 sample consisted of around 500,000 people, with slightly larger numbers of persons (given overall population growth) being sampled at each subsequent census. Sample members are included in all censuses for which they are present and enumerated. More than 200,000 people have been enumerated in the five successive censuses from 1971 to 2011 (Lynch et al., 2015). As well as census data, the ONS LS contains linked data on birth and death registrations of sample members, on live births to sample mothers (and, for some time points, on fatherhood), on immigration and emigration (as observed via National Health Service registration), on cancer registration and on widow(er)hood (death of a sample member's spouse). The study is more fully described by Shelton et al. (2019).

The ONS LS offers considerable advantages over repeated cross-sectional observations for the comparison of migration propensity over time. A number of the concerns relating to the cross-sectional counts do not apply with this, although other ambiguities are introduced. Migrant status is not directly affected by changes in reporting geographies. The 10-year migration transitions in the ONS LS are determined by comparison of usual residence in two successive censuses and thus give an indication of an individual's net migration over this period. In order to be identified as a 10-year migrant, the individual would need to be present in England and Wales at the start and end of each period. No distinction is made between a person who has moved once and a person who has moved multiple times. A person who had moved (whether within England and Wales or to elsewhere) and had then returned to their original place of usual residence would not be identified as a 10-year migrant.

For each census from 1981 onwards, an administrative comparison has been made of the person's address at the census in question and the address at the time of the previous census, and this has been used to create derived 10-year movement indicators. The exact process for doing this has varied between censuses, from a clerical comparison in 1981 (Creeser, 1991) to comparison of grid references in later censuses. The accuracy of these references have improved over time, with enumeration district centroids being used in 1991 and household locations thereafter. In order to avoid false positives arising from these methods, some apparent very short-distance moves were not flagged as 10-year moves in the derived LS variables. Using the 2001 SMS, based on respondent identification of a different usual address, it can be observed that 198,550 (3.6%) of 1-year moves in England and Wales in 2000–2001 were within an Output Area. The distribution of move distances is not known, but it is assumed that some of these moves were of a very short distance, and therefore, that some short-distance moves excluded from the LS were not in fact false positives. However, it is assumed that the total number of these is small enough not to affect analysis elsewhere.

Thus, it is possible to look at the 10-year migration observations for each intercensal period in the LS, but it should be remembered that there is still some noise within the results, due to differential measurements of migration. Unlike the cross-sectional data, the LS does not have fully imputed records, nor does it have imputed usual residences, from which the migration event is inferred. The imputation of 'migrant origins' is only relevant to cross-sectional data, for it is an

imputation of unknown data (a response that has been omitted or not fully completed on the census form), whereas in the case of the longitudinal data, the 'origin' is a known item: the place of residence at the time of the census, which by definition cannot be missing if the sample member has been included in the dataset for that census.

A further point to note is that the date of each census in the period 1971–2011 has not been the same, meaning that the observation period over which a migration might have occurred is not identical. Most censuses have taken place in late April, but two have varied from this pattern, with the 1981 Census being in early April and the 2011 Census in late March. However, over the course of 10 years, this makes little difference: The longest intercensal period between 1971 and 2011 was less than 1.5% longer than the shortest intercensal period. Other factors—errors in linkage and in item imputation—may have a larger impact on analysis of migrants' characteristics than variations in the exposure period during which it would be possible for a person to migrate.

Three groups of migrants were identified within the LS for analysis. Firstly, we selected persons who were present in at least two successive censuses and thus could potentially be observed to have made at least one 10-year migration. This would include persons born after 1971, persons who had died before 2011 and persons who had either entered or left the sample due to migration to or from the rest of the United Kingdom or overseas countries. The second group was more strictly defined, as those present at every census from 1971 to 2011, whereas the third group was restricted to those who had been present and who had migrated between each of the five censuses. This final sample was further constrained by requiring that persons were aged less than 20 at the time of the 1971 Census, such that they would potentially follow a broadly similar narrative, starting out mostly co-resident with their parents in 1971 and then moving through early adulthood and progression through working life. Up to 1991, students will have been recorded at their parental address, and thus, this cohort is unlikely to have a migration narrative in the LS that includes a student term-time address. In each case, we aggregated the total number of persons in a sequence of 10-year age groups who had migrated in each 10-year period and constructed a migration intensity or rate for each group, using the population (of movers and non-movers) who were present at the beginning of the 10-year period and were still alive and present at the end of the period. We have assumed these to equate to corresponding 10-year birth cohorts, running on the census calendar: Thus, what we refer to as a 1961–1971 cohort contains persons born in the 10 years up to the date of the 1971 Census (based on age at the time of the census). Given that the census does not take place on the same date in each round (see above), the actual cohort inclusion will contain a small amount of error. Although the ONS LS contains the single-year ages of all sample members, it is clear that at upper ages, the numbers of sample members can be too small to permit further disaggregation: Exploratory analysis was done in order to determine an effective upper age group that could be reliably reported without the absolute numbers falling below the publication threshold.

3 | RESULTS

3.1 | Cross-sectional context

We turn first to the cross-sectional observations of internal migration, which allow comparison of levels of migration propensity at intervals throughout the time period examined using the longitudinal data. These provide some context for the longitudinal results, but do not necessarily have the same characteristics. They exhibit more volatility through cyclical effects. However, cross-sectional observations are easier to obtain than longitudinal ones, and thus, it is useful to explore whether or not the two approaches suggest similar results.

Table 1 presents cross-sectional results from the 1981, 1991 and 2001 Censuses using versions of the data from the '1-year' migration question that are closest to being comparable, together with additional results from 2011, albeit with a variant geography. The data for 1981–2001 were modelled to use a common base geography, and the data for 1981 and 1991 had prorate reallocation of migrants with unstated origins, allowing some comparison to be made of these observations. Comparison of 2011 results with the earlier results is less direct. The count of residents at the time of the census was used as the population at risk, and this was modified to remove persons

TABLE 1 Cross-sectional observations of migration within Great Britain, 1981–2011

	All flows					
	Male			Female		
Census	Number of migrants	% of male population	Mean distance migrated (km)	Number of migrants	% of female population	Mean distance migrated (km)
1981	2,130,630	9.0%	34.8	2,162,743	8.7%	32.3
1991	2,207,414	9.4%	36.1	2,273,075	9.1%	33.6
2001	2,701,534	10.7%	37.9	2,789,236	10.4%	35.8
2011[a]	3,082,954	11.2%	35.4	3,013,131	10.6%	33.6

Sources: OPCS Census Special Migration Statistics (1981, 1991); ONS Census Special Migration Statistics (2001, 2011); OPCS/GRO Scotland Census aggregate data (1981, 1991); ONS/NRS Census aggregate data (2001, 2011).

[a]Local authority geography in 2011 has significant differences to the geography used for 1981–2001 results.

aged under 1 at the time of the census (and thus not capable of having had a usual residence 1 year previously). Though the 2001 and 2011 SMS presented results for the whole of the United Kingdom, and the 1981 and 1991 equivalents for Great Britain, the analysis here was restricted to England and Wales, for more direct comparability with the results in the ONS LS. The reporting geography used for the 1981–2001 results was a time-consistent set of 369 districts.

For the 'all moves' case, Table 1 shows a consistent trend between 1981 and 2001: The number of moves increased (expressed as absolute and migrants as a proportion of all persons), and the mean distance travelled by migrants increased between all censuses, and this was the case for both genders. The percentage of the population who were migrants increased from 9.0% to 10.7% for men and from 8.7% to 10.4% for women, and the mean distance migrated rose from 34.8 to 37.9 km for men and from 32.3 to 35.8 km for women. Similar persistent increases in the absolute number and proportion of people migrating and mean length of move were observed for both men and women for flows between (but not within) local authorities. Inclusion of equivalent data from the 2011 Census is hampered by significant changes to the underlying geography, which merged a number of the component districts used for the earlier results. Whereas the number of 'all flows' migrants is comparable, the number of intra-district migrants is not, and neither are the reported distances of move.

These cross-sectional data do not therefore fit the pattern seen elsewhere of falling migration propensities. However, caution should be attached to these results, due to the cyclical factors noted elsewhere and the aforementioned variations in disclosure control, imputation approach and population coverage: the full effect of those is unknown but may be larger than the changes in migration propensity and distance seen in these results. In particular, different approaches to the processing of migrants with an unstated origin (the number of which can be large) make it difficult to approach these cross-sectional results with total confidence.

Cyclical economic effects that may affect labour demand are more likely to be 'evened out' in the decadal periods between the longitudinal observations than they are should they coincide with the 1-year period of the cross-sectional observations. Another important qualifier is that it is necessary to consider the growth in the numbers of students since 1971 and at the same time changes in the recording of students' usual residence from 2001 onwards.

3.2 | Regional patterns of repeatedly mobile persons

The selection criteria for the LS analysis of movements at regional level required that sample members had moved in each intercensal period observed and had been aged less than 20 in 1971. There were a total of 13,983 persons in the LS who satisfied these selection criteria. As the LS is a 1.1% sample, this suggests a total of around 1.3 million persons in the total population of England and Wales would satisfy these criteria. The denominator population (those who might have moved in every period and were aged under 20 in 1971 and still present in 2011) can be roughly estimated using census area statistics as the population of England and Wales aged under 60 in 2011, less those persons who had entered the United Kingdom more recently than 1971. This gives a total of around 37.2 million persons, although this would include some persons unable to potentially meet the inclusion criteria and exclude some others and should therefore be considered cautiously.

For each intercensal period, a 10×10 area matrix using standard government office regions (GORs) of England, and Wales, was constructed, with an aggregate set of net moves for all persons. The GOR geography typically used for reporting from 1998 onwards was employed, and data from earlier censuses were aggregated on that basis in order to establish a common spatial framework. Each move was determined using a comparison of address at the start and end census points, although the precise algorithm has varied slightly from census to census, as described above in the data section. All comparisons share the characteristic that only a 10-year net move is considered: Someone who lived at a given address at the start point, moved away and then moved back to the same address at the end point would not be considered to have moved using this indicator, and someone making a sequence of moves within or between multiple regions would only be recorded as making a single move between the usual residence locations at the start and end of the intercensal period.

The ONS LS data usage agreements require that small numbers should not be published. The region-level matrices for the most part produce numbers above the publication thresholds, although this is not the case for every region-to-region flow—a small number of the lower volume flows were below the publication threshold. Given that *some* of the results cannot be disclosed, the complete set of matrices were transformed so as to split the flows into deciles (based on absolute value) and then to report which decile each matrix cell fell into. Figure 1 shows the four matrices representing the four intercensal periods with deciles represented by different degrees of shading, with the decile containing the largest flows being shown as black and the lowest decile shown as white. They are arranged in a 'staircase' formation, such that the migration observations flow through the figure from top to bottom. The typical arrangement of a migration matrix is thus not always used in this figure. In the upper left matrix, flows are shown in a traditional form with origins (in 1971) forming rows and destinations (in 1981) forming columns. The general patterns for this and other intercensal periods are as expected: The largest flows occur within regions, with significant flows also occurring to and from London and the South East regions. The columns in the top left matrix then transfer down to the matrix directly below: The columns of the second matrix thus represent origins, with the rows indicating destinations in 1991. In turn, these rows are read across to the third matrix. In each case, it is the same group of sample members that are observed in each matrix, and thus, changing migration behaviour associated with age might be seen. In the first matrix (1971–1981), the sample members are aged 0–20 at the start of the transition period and 10–30 at the end of the period. By the fourth matrix (2001–2011), they are aged 30–50 at the start and 40–60 by the end of the

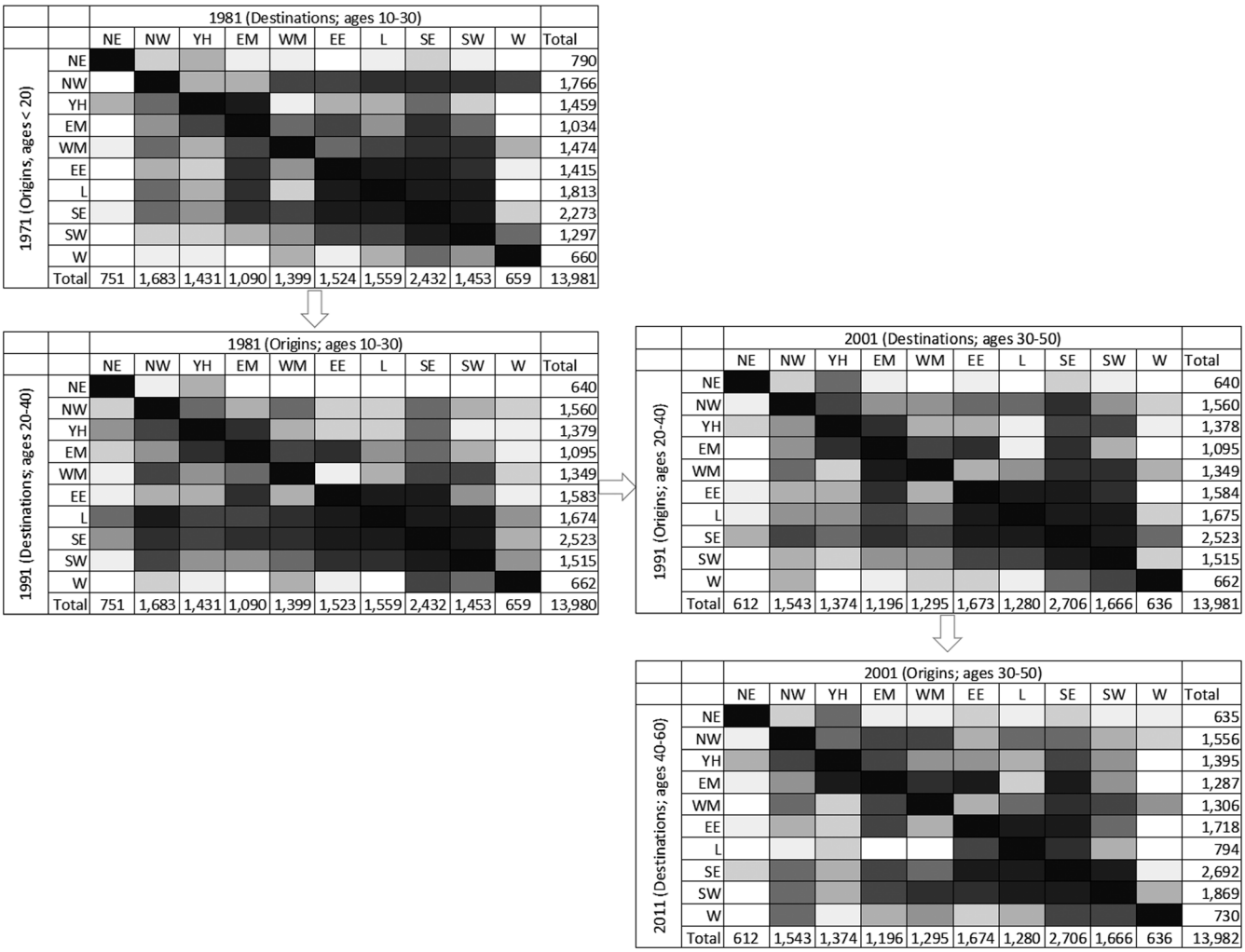

FIGURE 1 Interregional migration 'staircase'—ONS LS sample members, England and Wales, 1971–1981. Absolute flows by decile. Source: ONS Longitudinal Study. NE, North East; NW, North West; YH, Yorkshire and the Humber; EM, East Midlands; WM, West Midlands; EE, East of England; L, London; SE, South East; SW, South West; W, Wales. Black indicates highest decile; white indicates lowest decile

period. The South East region is a major destination throughout the sequence, with London most significant as a destination in the period 1981–1991, as this group of sample members aged from 10 to 30 at the start to 20–40 at the end of the decade, many presumably moving to London for career purposes as young adults.

Putting together data for the whole period 1971–2011 permitted the analysis of variant migration trajectories (i.e. the sequence of migration events over an extended period). Given a 10×10 matrix of possible moves and four time periods, and the constraint that all persons move in each time period, there are $(10 \times 10)^4$ possible combinations of moves. We explored the trajectories of those who had moved in each decade and were in the same region in 2011 as they had been in 1971. Overall, 59% of the 13,983 persons in the sample who had moved in each intercensal period were in the same region in 2011 as they had been in 1971, and of this subset, 89% (approximately 49% of the overall repeatedly mobile group, or 6846 persons) appeared to have stayed within the same region for the whole period. There was regional variation in the likelihood of repeatedly moving within the same region; Table 2 shows the regional breakdown. Yorkshire & Humberside was the region in which the repeatedly mobile were most likely to end up (in 2011) in the same region as they had been in 1971 and also the region with the highest percentage of those repeatedly moving within the same region. The most striking feature however is that the proportion of repeatedly mobile persons staying within London (24%) for the whole period (1971–2011) was much lower than in all other regions. This is consistent with the description by Fielding (1992) and Champion (2012) of the South East (in this case with London as a focus) as an escalator region that people move to and then away from at a later career stage.

Demographic variations were also observed in the population who had been repeatedly mobile but had always stayed within the same region. Repeated migration within the same region was slightly more common for women than men (50% of repeatedly mobile women had stayed in the same region, compared with 47% of repeatedly mobile men) and was more common for people with a dependent child (observed in either 1991 or 2001) than for those without a

TABLE 2 Percentage by region of migrants moving in each intercensal period 1971–1981 to 2001–2011 being in the same region in 2011 as they had been in 1971 and having stayed within the same region 1971–2011

Region in 1971	Same region in 2011	Same region between 1971 and 2011
North East	67%	57%
North West	68%	59%
Yorkshire & Humberside	70%	60%
East Midlands	63%	52%
West Midlands	62%	54%
East of England	61%	48%
London	24%	17%
South East	61%	47%
South West	68%	55%
Wales	68%	57%

Source: ONS Longitudinal Study.

dependent child (52% of repeatedly mobile people with a dependent child had stayed in the same region, compared with 42% of repeatedly mobile people without a dependent child). Variations by social class are given in Table 3 and show considerable differences. Of those repeatedly mobile persons who were classified (in 2011) as 'professional', 27% had stayed within the same region over the whole period, with the rest having changed region at least once. This was the lowest observed level: that is, of all repeatedly mobile persons, professionals were most likely to have changed region at least once. Those classified in 2011 as 'managerial/technical' also exhibited the characteristic that the majority of persons have moved region at least once. In contrast, the majority of the repeatedly mobile who were classified (in 2011) as anything other than professional or managerial/technical had stayed in the same region throughout (although this is only marginally true for the 'non-manual skilled' group). This would therefore support assumptions of a relationship between social class (and perhaps social mobility) and geographical mobility and may be associated with the South East as an escalator region. It should be noted that here we simply divide the repeatedly mobile into two groups: those who have stayed within their original region throughout and those who have made an interregional move at least once. The latter group is diverse and includes those with a single interregional move and those with repeated such moves.

TABLE 3 Sample members who had moved in each intercensal period 1971–2011 and had stayed in the same region throughout, by social class in 2011

Social class (2011)	% of repeatedly mobile staying in same region	Total number of repeatedly mobile sample members
Professional	27%	843
Managerial/ technical	42%	5374
Non-manual skilled	51%	2878
Manual skilled	60%	2055
Partly skilled	57%	1786
Unskilled	65%	494

Source: ONS Longitudinal Study.

3.3 | Period-cohort observations

In order to study period-cohort patterns, two (overlapping) samples were constructed: the first — as for regional patterns — of sample members who had been present at every census, and for whom there was a valid value in all of the 10-year migration indicators (whether positive or not), and the second being a less restrictive sample comprising all persons who were present at any stage for two or more consecutive censuses, and for whom there was therefore at least one valid 10-year migration indicator.

In each case, we aggregated the total number of persons in a sequence of 10-year age groups who had migrated in each 10-year period and constructed a migration intensity or rate for each group. We have assumed these to equate to corresponding 10-year birth cohorts, running on the census calendar; as discussed above, the census does not take place on the same date in each round, so the actual cohort inclusion will contain a small amount of error.

In order to calculate migration intensities, it is necessary to determine the populations at risk of migration. Bell et al. (1999) describe a comparison framework for age-period-cohort migration data and discuss requirements for populations at risk in analysis of such data. We follow the terminology there and identify within the LS data a sequence of period-cohort migration transitions.

In order to be at risk of migration in any intercensal period (assessed through observation at the end of the period), it is necessary for the individual to be present at both the start and the end of the period. That population can therefore be calculated as all persons present at both time points (regardless of mover status). However, the subpopulation of interest in the first sample in this analysis is subject to more constraints: They must have been present in each period. Thus, we define the population at risk for any period-cohort cell in the first sample as being the total cohort population. The 10-year migration indicator variables in the data require that the individual was alive in order to be classified as a mover or non-mover. We do not include observations for persons aged under 10 as they cannot have been enumerated at a previous census, even though it is clearly possible that they may have migrated during that part of the intercensal decade in which they were alive. Subject to possible error described above in cohort inclusion, we assume our observations to be of period-cohort movement: We know age at the end of the period and thus determine the birth cohort. However, although we know (for movers) that (at least one) migration event has occurred, we do not know at what age it took place. For the second sample, we simply

require the population at risk to be that population present at both the start and end of the 10-year period, in each relevant age group. Separate calculations were done for male and female populations in both cases.

Figure 2 shows results for the sample of LS members present at each census from 1971 to 2011, in the form of a Lexis diagram (Vandeschrick, 2001). The left-hand image shows results for males, and the right-hand image shows the results for females. Each quadrilateral shape shows the migration intensity for a given 10-year birth cohort in a given 10-year period, with the exception of the final group, which is an open-ended cohort.

The 'stripe' starting at the bottom left is the 1961–1971 cohort, the next stripe above the 1951–1961 cohort and so on. The uppermost stripe on the figure is for a pre-1921 group, with no lower birth-year bound; for this group, the age axis shows the lower age bound for the group at the start of each intercensal period. In each case, the period-cohort block is shaded using a contrast ramp across the range of values with darker cells showing higher intensities and the lighter cells showing lower intensities. The migration rate is also shown as a numeric value. The number of movers and the denominators (total of movers and non-movers for each cohort who survived the whole period) are shown in Table 4. Similarly,

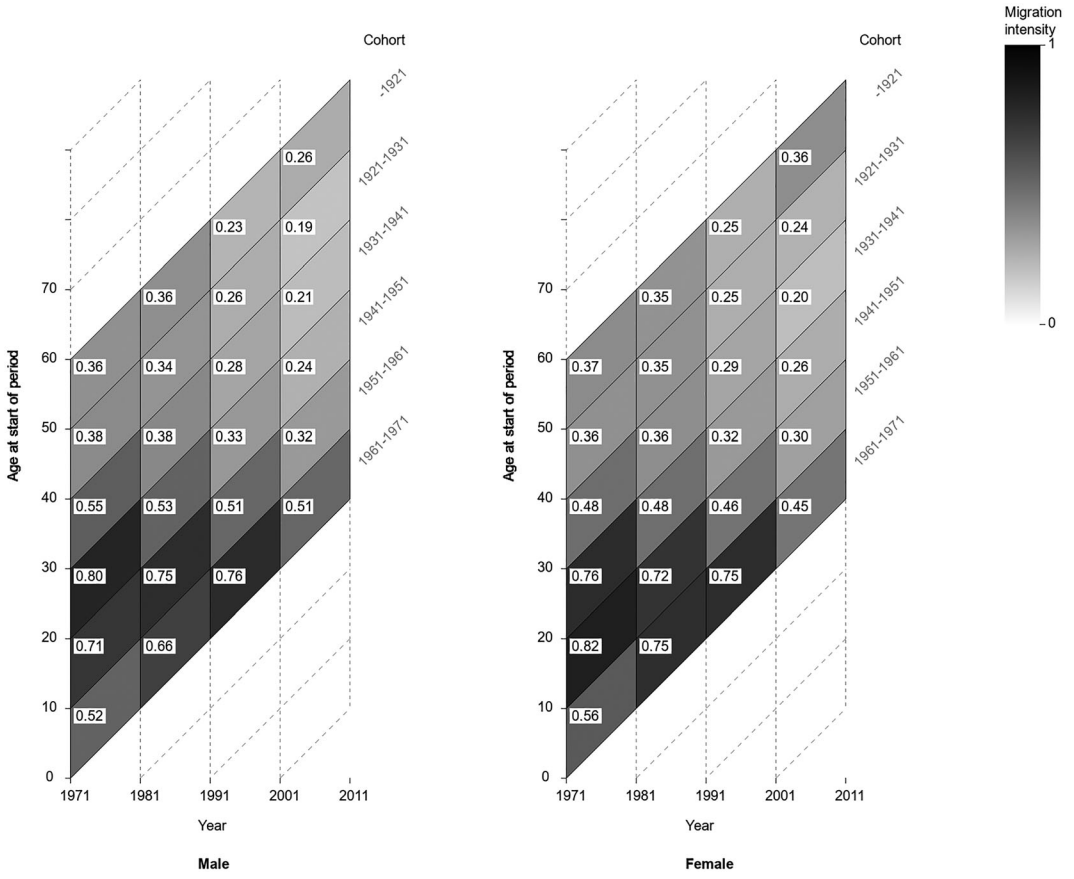

FIGURE 2 Period-cohort observations of migration intensity, 1971–2011, male and female sample members present in all censuses 1971–2011. Source: ONS Longitudinal Study

TABLE 4 Period-cohort moves, 1971–2011

	Moved in period 1971–1981		Moved in period 1981–1991		Moved in period 1991–2001		Moved in period 2001–2011		Movers and non-movers total	
Cohort	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
1961–1971	11,508	14,364	14,626	19,275	16,840	19,439	11,204	11,656	22,039	25,768
1951–1961	15,734	20,042	16,614	17,575	11,195	11,240	7,143	7,327	22,056	24,295
1941–1951	17,486	18,296	11,524	11,507	7,176	7,793	5,365	6,214	21,937	24,096
1931–1941	8205	8298	5780	6275	4256	4932	3120	3486	15,054	17,252
1921–1931	2662	3802	2432	3755	1808	2698	1326	2564	7088	10,662
To 1921	348	900	350	849	228	606	255	882	978	2438

Source: ONS Longitudinal Study.

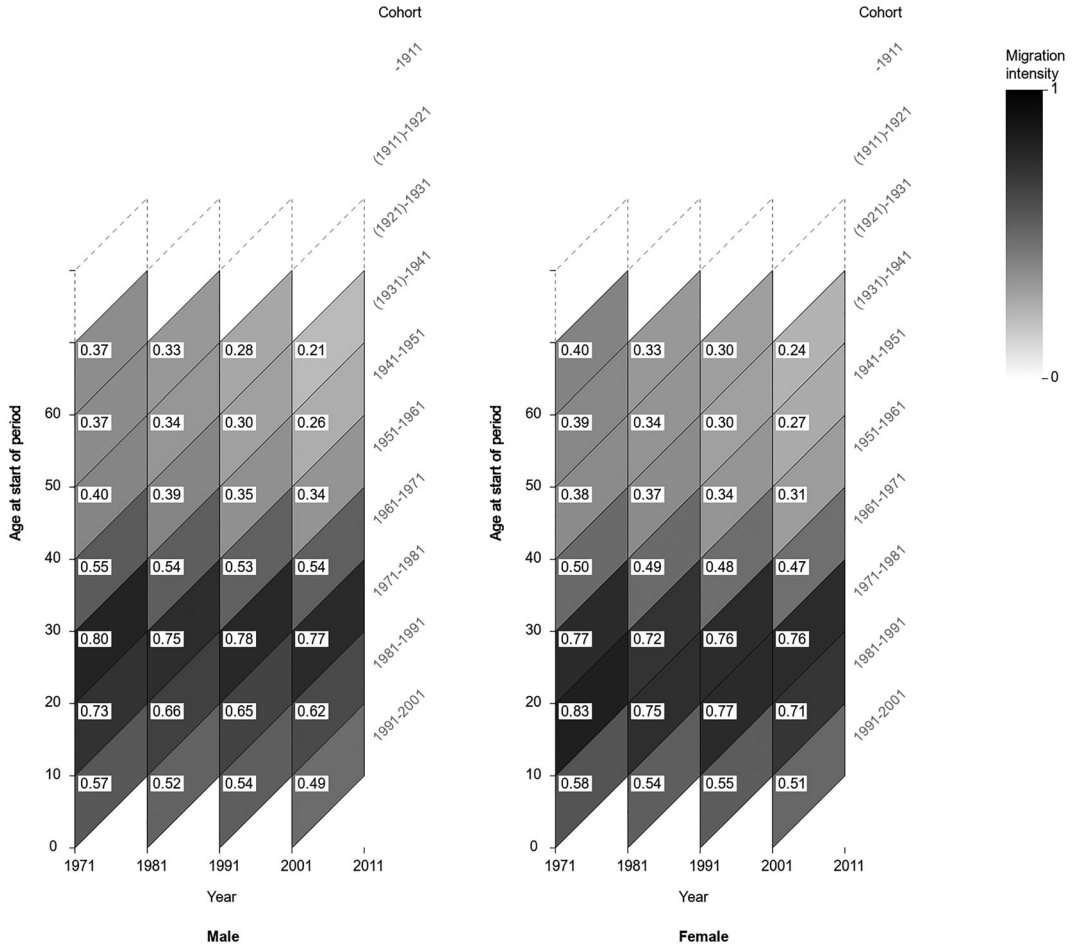

FIGURE 3 Period-cohort observations of migration rates, 1971–2011, male and female sample members present in at least two successive censuses 1971–2011. Source: ONS Longitudinal Study

Figure 3 shows the migration rates for the second of the two samples in this section: those who were present in at least two successive censuses and had at least one valid 10-year migration indicator. In this case, the total numbers were larger (as the selection criteria were more broad), permitting more recent cohorts to be followed and also permitting the earliest born cohorts to be observed at older ages. In each case in Figure 3, the oldest cohort in each intercensal period is open-ended: For the intercensal period 1971–1981, it is the pre-1911 cohort; for the period 1981–1991 it is the pre-1921 cohort; and so on. The labels for these cohorts are shown with parentheses around the starting year; in each case, the cohort is open only for the oldest age observation.

Taken as a whole, the results show a decline in mobility over time. For the first group, who had been present at every census, mobility declined in each intercensal period, for both men and women. For men, it fell from a 63% intercensal rate (across all observed cohorts) in 1971–1981 to a 32% rate in 2001–2011; for women, the decline was very similar from 63% to 31%. These observations are for a fixed set of cohorts, whose members aged over the observation period. A decline was also observed for the second group—those who had been present for at least two successive censuses. For this group, total mobility (across all ages from 10 to 19 at the end of the period) within a 10-year period fell for both men and women from 56% in 1971–1981 to 45% in 2001–2011. These findings would therefore support arguments of an overall decline in mobility, both for fixed cohorts followed over time and for successive cohorts with equivalent age structures. However, closer inspection of the data shows that although this was true for aggregate populations, it was not universally true for at all ages. For those who were present at each census, a continuous decline (in which the migration rate fell in each successive intercensal period) was observed for men for the 1921–1931, 1931–1941 and 1941–1951 birth cohorts. The other cohorts had lower migration rates in the period 2001–2011 than they had in the first period, 1971–1981, but the decline had not been continuous. A similar pattern was observed for women, although with the difference that migration rates also fell continuously for the 1951–1961 cohort across the whole observation period. It is also possible to compare the migration rates for observations for period-cohort groups of equivalent ages, for example, to compare the 1951–1961 cohort in the period 1971–81, with the 1961–1971 cohort in the period 1981–1991; thus, both members of both cohorts were aged 10–19 at the start of the observation period. Using this comparison, we observe that there was a decline in the migration rate for equivalent aged

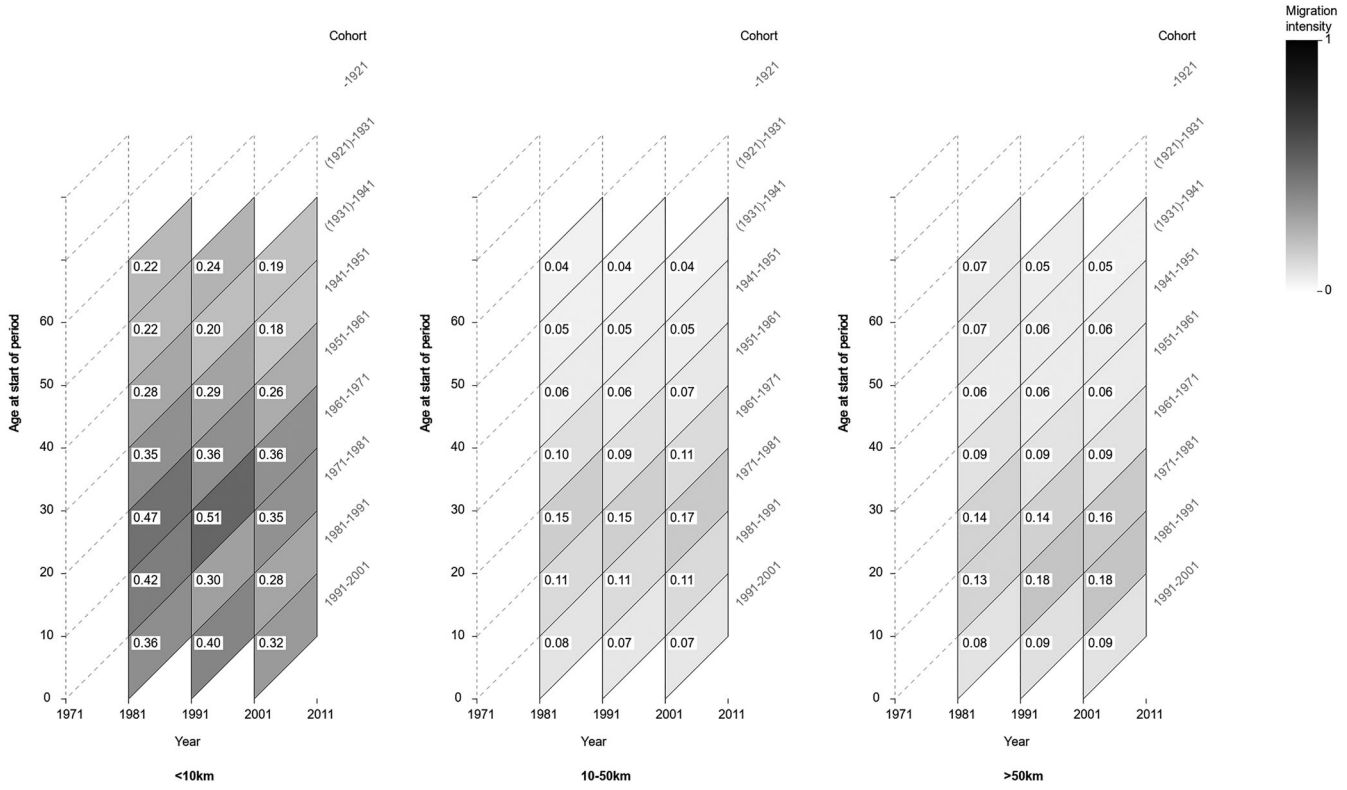

FIGURE 4 Period-cohort observations of migration rate, 1981–2011, for male sample members present in at least two successive censuses and moving <10 (left), 10–50 (centre) and >50 km (right). Source: ONS Longitudinal Study

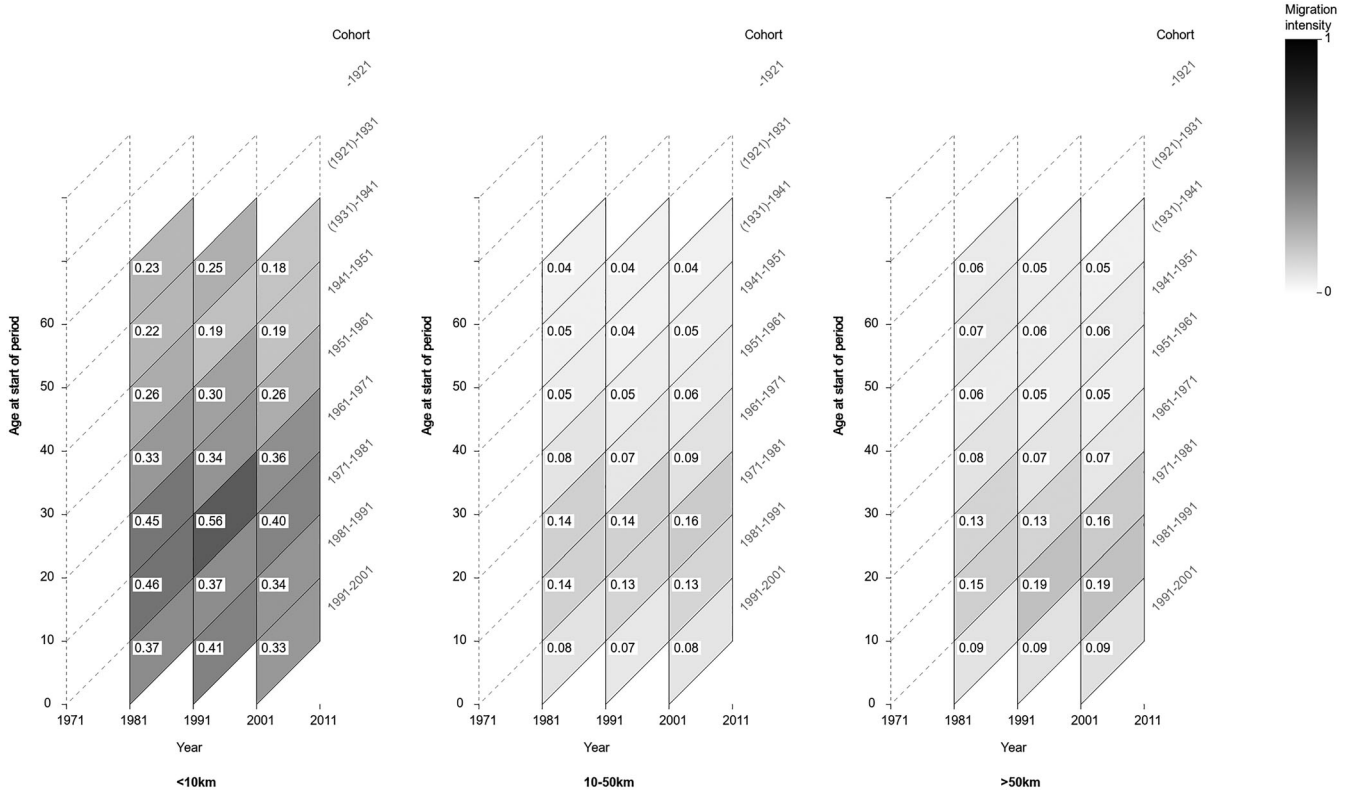

FIGURE 5 Period-cohort observations of migration rate, 1981–2011, for female sample members present in at least two successive censuses and moving <10 (left), 10–50 (centre) and >50 km (right). Source: ONS Longitudinal Study

groups between successive periods for both men and women and for all cohorts, apart from the groups aged 20–29 at the start of each successive observation period. Again, this supports the hypothesis of falling migration rates in England and Wales.

Using the second longitudinal sample we constructed—those present for at least two censuses—similar analyses were carried out. Similar patterns were observed: continuous declines in the migration rates of men in the 1941–1951 and earlier cohorts and of women in the 1951–1961 and earlier cohorts. Given the overall age profile of migrants, it was not surprising that more recent cohorts demonstrated a rise in the migration rate between childhood and early adulthood. Comparing across age groups, there was a continuous decline between successive time periods for men in cohorts aged 40–49 and older at the start of each time period and for women in cohorts aged 30–39 and older at the start of each time period. Younger age groups did not exhibit such a continuous decline in the migration rate.

A separate analysis was done of the same two groups—those present at every census 1971 to 2011 and those present for at least two successive censuses, with distance of move considered at the same time. In addition to the 10-year movement indicator, variables exist with the ONS LS indicating the distance of move between censuses. As with the general movement indicators, it should be recalled that this is a net observation; it is the distance between residential location in one census and residential location at the subsequent census. If a person had moved between multiple locations in the intervening 10 years, this would not be reflected in the distance of move variables. The distance of move is not directly available for the 1971–1981 intercensal period, and therefore, analyses were done for three time periods rather than four. Figures 4 and 5, respectively, show migration rates by distance for men and for women, divided into three distance bands: From left to right, the figures show rates for those moving less than 10 km, those moving 10–50 km and those moving more than 50 km. The results are broadly consistent with each other and with the overall results shown in Figure 3. Again, it can be observed that there is a decline in migration rate for both men and for women within cohort and between successive cohorts for fixed age groups for older cohorts and for older age groups, but that this is not the case for the younger age groups. As before, the reduction in migration rates can be observed in women at a lower age level than is the case for men.

4 | DISCUSSION AND CONCLUSION

The two families of data used in the paper appear to show inconsistent patterns: The cross-sectional data show an increase in migration propensity, whereas the longitudinal data show a decrease over the same time period. Why do the cross-sectional data seem to show an increase in migration rates, whereas the longitudinal data seem to show declining rates? Both sets of data ought to include all internal migrants (rather than some administrative sources that exclude shorter distance moves), subject to the time constraints over which they are collected: a 1-year period for the cross-sectional data and a 10-year period for the longitudinal data. On the other hand, it should be noted that the two sets of observations do not have the same geographic scope. The ONS LS is a sample of persons residing in England and Wales and therefore is limited to that framework. The SMS have been produced at Great Britain and latterly UK scale, but the observations reported here are for England and Wales only. It may be the case that migration within and between both Scotland and Northern Ireland and between them and the rest of the United Kingdom is different in structure to the extent that it would affect overall patterns, but given the large difference in population sizes, this seems unlikely. A part of the explanation for the apparent increase in migration rates in successive cross-sectional data may lie in the changing manner in which missing migrant origins and missing records have been imputed. The One Number Census process set out with the aim of restoring missing data, and some of the missing records were those of migrants; meanwhile, changes to item-level imputation could move reporting of migrants from having an 'unstated origin' to having a stated origin. It is easy to exclude the former from analysis, especially if one is simultaneously concerned with migration distances, and therefore need to place all migrants within a spatial framework. The number of migrants involved is not trivial. Thus, an argument might be made that the cross-sectional results do not show a history of increasing migration propensity, but rather a history of successively fewer migrants being ignored in analysis. The level of item non-response to the '1-year' migration question has varied: In 2001, it was 4.5% (ONS, 2005), whereas in 2011 it was 3.8% (ONS, 2012). In contrast, the 10-year migration data from the LS are not subject to item non-response (or to difficulties introduced through recall error) as that information must necessarily be captured for inclusion in the sample. Different classes of error exist for the LS, however, in the form of tracing and linking problems.

As well as variations in geographic scope, there is also clearly a difference in temporal scope. The longitudinal observations are taken over a much longer period that the cross-sectional observations (10 years versus a 1-year period) and as such might be assumed to be less influenced by short-term triggers. For all census years considered, the effects of changes in the robustness of the UK economy might be pertinent: The 1980–1981 and 1990–1991 cross-sectional periods coincided with recessionary periods, whereas the 1981–1991 longitudinal observation, covering almost the same range of years, clearly includes not only these periods but also the 1980s economic boom. So, if migration is fuelled by economic growth, then one would expect to see this reflected over the course of the decade, but the validity comparisons of the start and end points would be attenuated by the comparative depths of each recession. Similarly, it may be unwise to consider migration in the period 2010–2011 (even if we ignore differences in data capture) in isolation from the decade it terminates; it was a period of recovery after a very deep recession.

An obvious potential explanatory factor for changing migration rates of young adults is the growth in higher education (HE) participation rates over the period that the LS covers, although the changes in 10-year migration rates are much smaller in scale than the changes in HE participation. The fastest growth in HE

participation occurred in the 1990s, and although the longitudinal data do show an increase in migration rates for young adults compared with the previous decade, it would seem fairer to observe that the outlier decade in this is the 1980s rather than the 1990s, with migration rates both men and women aged under 30 (at the start of the decade) having a pronounced decline in the 1980s compared with the rates observed in the 1970s, followed by a partial recovery in the 1990s. This pattern would not seem to be explained by HE participation alone. Again, it is instructive to consider changes in the way that data have been captured in the decennial censuses. In the 2001 Census, the assumed usual residence of students changed from being their 'vacation' or 'parental' address to being their term-time address. This change in definition would have led to a greater number of students being recorded as migrants if the observation period (the year prior to the census) coincided with a move from a parental address to a (different) term-time one. The apparent growth (Table 1) in cross-sectional migration rates in 2000–2001 compared with the two preceding decades is likely to be influenced by this change in definition.

Looking at the effect of distance of migration supports earlier observations that the decline in migration rates is largely about a decline in short-distance migration and about the balance of different migration lengths. The overall decline in migration hides an increase in the 1990s and onwards of longer distance migration amongst young adults, and it is this element that is perhaps most likely to be associated with changes in HE participation rate. The rapid expansion in HE in the 1990s has plateaued, and it will be instructive to see the effect on migration rates over a longer time period. The new hypothesis that migration rates are falling would suggest that we should see declining rates over the period 2011–2021 following linkage of data from the 2021 Census.

The study of repeatedly mobile persons (those who had moved at least once in each intercensal decade) does not directly add to the exploration of changes in migration propensity, as it is for a fixed group of persons over a long period. Variations in the actual number of migration events from decade to decade for this cohort would be expected as with any other cohort. The patterns illustrated in Figure 1 do demonstrate the importance of London as a destination in early adulthood, and the South East in mid-career ages, supporting the escalator region hypothesis. The analysis of longitudinal data in this paper offers partial support to the views expressed elsewhere that migration in England and Wales has declined over several decades. Although it is true that this is the case for the four decades from 1971–1981 through to 2001–2011 when observed for all persons in the LS sample, it was not universally true when considered for separate age groups. A steady decline in migration rates was observed for the middle aged and older, but this was not the case at younger ages. The study design allows both cohorts and age groups to be compared. We can see, for example, that those aged 10–19 in 1971 had higher migration rates over the period 1971–1981 that did those aged 10–19 in 1981 over the period 1981–1991. However, following those two cohorts forward, we see that the latter group had higher migration rates in the following decade than had been the case for the former group and that this was true for both men and women. Though the longitudinal observations show overall declines in mobility, there remain variations that may be driven either by cohort effects or by age/life-stage specific effects of wider economic conditions.

ACKNOWLEDGEMENT

The authors gratefully acknowledge the support of the Economic and Social Research Council (ESRC) for the CeLSIUS grant, reference ES/R00823X/1.

The permission of the Office for National Statistics to use the Longitudinal Study is gratefully acknowledged, as is the help provided by staff of the Centre for Longitudinal Study Information & User Support (CeLSIUS). CeLSIUS is supported by the ESRC Census of Population Programme (Award Ref: ES/K000365/1). The authors alone are responsible for the interpretation of the data.

This work contains statistical data from ONS, which is Crown Copyright. The use of the ONS statistical data in this work does not imply the endorsement of the ONS in relation to the interpretation or analysis of the statistical data. This work uses research datasets that may not exactly reproduce National Statistics aggregates.

DATA AVAILABILITY STATEMENT

Access to the LS data are permitted via Controlled Access SRS Service within the Office for National Statistics. Data are only made available to bona fide authorised researchers working on approved projects that demonstrate a public benefit to society. Researchers working within the Controlled Access SRS Service are bound by the Statistics and Registration Service Act 2007. Data access for Accredited Researchers can be requested at: https://www.ucl.ac.uk/epidemiology-health-care/research/epidemiology-and-public-health/research/health-and-social-surveys-research-group/studies-10 with the permission of the Office for National Statistics.

ORCID

Oliver Duke-Williams https://orcid.org/0000-0001-8050-1881
Rachel Stuchbury https://orcid.org/0000-0002-8500-1277
Jemima Stockton https://orcid.org/0000-0003-2509-2848

REFERENCES

Bell, M., Charles-Edwards, E., Bernard, A., & Ueffing, P. (2017). Global trends in internal migration. In T. Champion, T. Cooke, & I. Shuttleworth (Eds.), *Internal migration in the developed world: Are we becoming less mobile?* Routledge.

Bell, M., Rees, P., Blake, M., & Duke-Williams, O. (1999). An age-period-cohort database of inter-regional migration in Australia and Britain, 1976–96 [monograph]. http://www.geog.leeds.ac.uk/wpapers/

Boyle, P., & Feng, Z. (2002). A method for integrating the 1981 and 1991 British census interaction data. *Computers, Environment and Urban Systems*, *26*(2), 241–256. https://doi.org/10.1016/S0198-9715(01)00043-6

Brown, J., Diamond, I., Chambers, R., Buckner, L., & Teague, A. (1999). A methodological strategy for a one-number census in the UK. *Journal of the Royal Statistical Society: Series a (Statistics in Society)*, *162*(2), 247–267. https://doi.org/10.1111/1467-985X.00133

Champion, T. (2012). Testing the return migration element of the 'escalator region' model: An analysis of migration into and out of south-East

England, 1966-2001. *Cambridge Journal of Regions, Economy and Society*, *5*(2), 255–270. https://doi.org/10.1093/cjres/rsr045

Champion, T., Department of the Environment, Transport and the Regions, University of Newcastle upon Tyne, & University of Leeds. (1998). The determinants of migration flows in England: A review of existing data and evidence: A report prepared for the Department of the Environment, transport and the regions. Newcastle upon Tyne Department of Geography: University of Newcastle upon Tyne.

Champion, T., & Shuttleworth, I. (2017a). Are people changing address less? An analysis of migration within England and Wales, 1971–2011, by distance of move. *Population, Space and Place*, *23*(3), e2026. https://doi.org/10.1002/psp.2026

Champion, T., & Shuttleworth, I. (2017b). Is longer-distance migration slowing? An analysis of the annual record for England and Wales since the 1970s. *Population, Space and Place*, *23*(3), e2024. https://doi.org/10.1002/psp.2024

Cooke, T. J. (2013). Internal migration in decline. *The Professional Geographer*, *65*(4), 664–675. https://doi.org/10.1080/00330124.2012.724343

Creeser, R. (1991). *An introduction to the area based variables in the LS*. Social Statistics Research Unit, City University.

de Haas, H., Castles, S., Miller, M. J., & Castles, S. (2020). *The age of migration: International population movements in the modern world* (6th ed.). Macmillan Education.

Denham, C., & Rhind, D. (1983). The 1981 census and its results. In D. Rhind (Ed.), *A census user's handbook* (pp. 17–88). Methuen.

Duke-Williams, O., Routsis, V., & Stillwell, J. (2018). Census interaction data and the means of access. In J. Stillwell (Ed.), *The Routledge handbook of census resources, methods and applications* (p. 25). Routledge.

Fielding, A. J. (1992). Migration and social mobility: South East England as an escalator region. *Regional Studies*, *26*(1), 1–15. https://doi.org/10.1080/00343409212331346741

Lee, E. (1966). A theory of migration. *Demography*, *3*(1), 47. https://doi.org/10.2307/2060063

Lynch K, Leib S, Warren J, Rogers N, Buxton J. (2015) Longitudinal Study 2001–2011 Completeness of Census Linkage. Series LS No. 11. https://www.ons.gov.uk/file?uri=/aboutus/whatwedo/paidservices/longitudinalstudyls/longitudinalstudy20012011completenessofcensuslinkage.pdf

Molloy, R., Smith, C. L., & Wozniak, A. (2011). Internal migration in the United States. *Journal of Economic Perspectives*, *25*(3), 173–196. https://doi.org/10.1257/jep.25.3.173

Office for National Statistics. (2005). Census 2001: Quality report for England and Wales: Laid before parliament pursuant to section 4 (1) census act 1920. Houndmills, Basingstoke, Hampshire; New York: Palgrave Macmillan.

Office for National Statistics. (2012). 2011 Census: Methods and quality report: Item non-response, item deterministic editing and item imputation.

Office for Population Censuses and Surveys. (1973) Cohort studies: New developments, OPCS Studies on Medical and Population Subjects no. 25, London: HMSO

Ravenstein, E. G. (1889). The laws of migration. *Journal of the Royal Statistical Society*, *52*(2), 241–305. https://doi.org/10.2307/2979333

Rees, P., Thomas, F., & Duke-Williams, O. (2002). Migration data from the census. In P. Rees, D. Martin, & P. Williamson (Eds.), *The census data system*. Wiley.

Shelton, N., Marshall, C. E., Stuchbury, R., Grundy, E., Dennett, A., Tomlinson, J., & Xun, W. (2019). Cohort profile: The office for national statistics longitudinal study (the LS). *International Journal of Epidemiology*, *48*(2), 383–384g. https://doi.org/10.1093/ije/dyy243

Stillwell, J., Bell, M., Blake, M., Duke-Williams, O., & Rees, P. (2000). Net migration and migration effectiveness: A comparison between Australia and the United Kingdom, 1976–96 part 1: Total migration patterns. *Journal of Population Research*, *17*(1), 17–38. https://doi.org/10.1007/BF03029446

Stillwell, J., Bell, M., Blake, M., Duke-Williams, O., & Rees, P. (2001). Net migration and migration effectiveness: A comparison between Australia and the United Kingdom, 1976–96: Part 2: Age-related migration patterns. *Journal of Population Research*, *18*(1), 19–39. https://doi.org/10.1007/BF03031953

Stillwell, J., & Duke-Williams, O. (2007). Understanding the 2001 UK census migration and commuting data: The effect of small cell adjustment and problems of comparison with 1991. *Journal of the Royal Statistical Society: Series a (Statistics in Society)*, *170*(2), 425–445. https://doi.org/10.1111/j.1467-985X.2006.00458.x

van Imhoff, E., & Keilman, N. (1991). *LIPRO 2.0: An application of a dynamic demographic projection model to household structure in the Netherlands*. Swets & Zeitlinger.

Vandeschrick, C. (2001). The Lexis diagram, a misnomer. *Demographic Research*, *4*, 97–124. https://doi.org/10.4054/DemRes.2001.4.3

Wolf, D. A., & Longino, C. F. (2005). Our "increasingly mobile society"? The curious persistence of a false belief. *The Gerontologist*, *45*(1), 5–11. https://doi.org/10.1093/geront/45.1.5

How to cite this article: Duke-Williams O, Stuchbury R, Stockton J. Changing migration rates in England and Wales over a 40-year period: Is mobility declining? *Popul Space Place*. 2021;e2468. https://doi.org/10.1002/psp.2468