

Mobile no more? The innovative use of administrative data linked to a census-based longitudinal study to investigate migration within Scotland

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This paper builds upon existing scholarship on changing patterns and processes of internal migration, especially the surprising recently documented trend towards falling internal migration intensities since the late 20th Century in many developed countries. The analysis is based on new research opportunities presented by the recent linking of administrative health data into the census-based Scottish Longitudinal Study (SLS) and points to a modest recent decrease in aggregate rates of address changing within Scotland. This decline is partly driven by the population sub-groups that have been conventionally most mobile, especially over longer distances, becoming less migratory. This supports the notion of an evening out of some of the main socio-economic determinants of migration and validates calls for a greater emphasis on the drivers and consequences of population immobility within migration studies.

Keywords: administrative data, data linkage, internal migration, residential mobility, Scottish Longitudinal Study

Introduction

The drivers, experiences and outcomes of migration are issues that have long occupied the social sciences, dating back to Ravenstein's seminal works well over a century ago (1885; 1889). Within the diverse field that is migration studies, the relocation of people within the borders of nation states is a phenomenon that has been the subject of relatively little analytical scrutiny (Bell *et al*, 2015). At first glance this may seem counterintuitive, since internal migration is quantitatively much more prevalent than its international counterpart (Elmhirst, 2017) and paradigm shifts have led to growing recognition of the qualitative significance of relatively frequent and even mundane mobilities at finer spatial scales than between states (Adey, 2010). However the study of population movements within countries has long been hampered by significant data challenges. As such residential mobility and internal migration are widely acknowledged as predominant drivers of population composition and change at the local and regional scales, but also recognised as the hardest to measure and predict (Stillwell *et al*, 2011).

Recent years have however witnessed a burst of scholarship on patterns and processes of internal migration in high income countries (Champion *et al*, 2018a; Fielding, 2012; Champion and Shuttleworth, 2017a and 2017b; Cooke, 2011; Smith *et al*, 2015b). These timely contributions are to be welcomed for two important reasons. Firstly, they have exploited existing and new datasets and developed pioneering methodological approaches to shed new light on a key facet of population change. Secondly, they have potentially identified a fundamental shift in trends in, and thus understandings of, internal migration in developed countries. Focusing on rates of address changing in Scotland 2001-2015, the innovative methodological approach and original empirical findings discussed in this paper seek to contribute to this reinvigorated research agenda in migration studies. The research utilises recent developments in the census-based Scottish Longitudinal Study (SLS), which have permitted analysis of a sizeable cohort of moves and movers within Scotland, at detailed geographies and over a substantial period. Four important dimensions of internal migration are examined through the following research questions;

1. Is there evidence of a shift in the overall rate of address changing within Scotland?
2. To what extent is the prevalence of address changing altering across short, medium and long-distances?
3. Which population sub-groups are becoming relatively (im)mobile?
4. How are certain types of places experiencing changing population mobility trends?

The proceeding section briefly reviews the key literatures within which the study sits. This is followed by a discussion of the novel methodological approach employed by this investigation. The results are then presented, broadly focusing on: temporal patterns in internal migration and the social and spatial selectivity of these processes. The broader implications of these findings are then considered in the concluding section.

Literature review

Against the backdrop of widespread acceptance of the quantitative and qualitative significance of migration in contemporary society, recent research has identified an unexpected and potentially rather significant trend: the possibility of long-term declines in address changing within high-income countries. This apparent paradox, initially identified by Cooke (2011) with

regards to internal migration patterns in the USA, is of considerable significance as it challenges the longstanding wisdom that population mobility is an inevitable and positive consequence of economic and social development (Zelinsky, 1971). Indeed, as Champion and Shuttleworth (2017b) aptly point out, the widespread prevalence of parlance such as the Age of Migration (Castles *et al*, 2014) and the New Mobilities Paradigm (Sheller and Urry, 2006) in the social sciences and more widely reflect and reinforce the notion that mobility is a fundamental facet of modernity.

This assumed and often celebrated ‘hypermobility’ has been depicted within the ‘mobilities turn’ in the social sciences (Urry, 2007) as the outcome of modernisation unquestionably leading to an increasingly footloose society (Champion *et al*, 2018b). As such migration is widely represented as increasing in terms of volume, diversity, geographic scope and complexity (Czaika and de Haas, 2014). However empirical observations do not necessarily support these assumptions. For example even the proponents of the Age of Migration thesis, Castles *et al* (2014), note that international migration rates have actually been relatively stable over the past half century. Furthermore levels of internal migration are actually slowing in many high income countries, such as the USA, Australia and Japan (Champion *et al*, 2018b).

Shifting analytical scales somewhat, research within the mobilities paradigm has usefully emphasised the existence of a continuity of population mobilities, ranging from everyday movements to permanent international migration and even virtual mobilities (Pooley *et al*, 2005; Halfacree, 2018). Whilst mobility as a very liquid concept risks becoming meaningless if applied to almost all forms of physical movement, these perspectives are helpful in that they encourage recognition of migration as an ongoing, relational process, rather than a one off experiential event (Findlay *et al*, 2015).

The relevance of these points to the research discussed in this paper is that empirical observations regarding changes in migration need to be framed within a backdrop of normative expectations concerning the living of ‘mobile lives’, to the extent that to be immobile is considered undesirable, and even stigmatised as problematic and a marker of personal inadequacy (Halfacree, 2018). Why then, when physical mobility across space is seemingly

easier than ever (at least within countries), and widely regarded as a personal and public good, might rates of address changing be slowing in high income countries? As Green (2018) and Champion *et al* (2018b) expertly set out, a number of demographic, economic, technological and societal shifts are currently underway that could be acting to suppress rather than stimulate residential mobility and internal migration in developed countries. Of these, three factors are potentially particularly apposite to the empirical lens used in this analysis (rates of address changing in Scotland 2001-2015).

Firstly, in terms of economic change, the 2007-08 Great Recession and its ongoing aftermath is likely to have negatively impacted on the ability, desire and thus propensity of households to move. This is because the volume of new job opportunities which drive much of internal migration moves (especially over longer distances) are severely restricted in economic downturns, and individuals become much more risk averse during these periods (Green, 2018). The effects of these macro-economic factors on decreasing the gains from and increasing the risks of migration could potentially be quite significant. Research on this topic with regards to the most recent recession remains in its early phases. Indications from analysis in the USA suggest that as much as two-thirds of the decline in inter-county moves between 1999-2009 can be directly attributed to this event (Cooke, 2011), whilst Campos *et al* (2011) also report recession related declines in internal migration in England and Wales. The analysis presented in this paper seeks to contribute to emerging understandings of how the most momentous economic shock in decades and its repercussions have influenced the likelihood of households to relocate, and the social and spatial selectivity of these effects.

Secondly, aside from a potentially sustained period effect arising from behavioural changes associated with the Great Recession, deeper seated and sustained compositional shifts in the demographic profiles of high-income countries could well be conducive to less migration. Unless the long-established relationship between age, the life-course and migration changes drastically, the population ageing that is occurring in higher income countries could significantly reduce their future internal migration rates (Frey, 2018). Other important demographic developments that have been cited as potentially leading to less population mobility include the rise of dual career households and increased levels of home ownership in the post-war period (Green, 2018). Statistical techniques are used in this investigation to

explore how the migration propensities of population sub-groups (including age cohorts and those in different types of housing tenures) have shifted over time. The modelling also allows for investigation of whether observed changes in rates of address changing can simply be attributed to compositional effects (e.g. ageing of the study sample), or whether they reflect wider behavioural change across a range of population sub-groups.

Thirdly, of the dozen or so plausible candidates suggested as accounting for declines in internal migration (Champion *et al*, 2018b), perhaps the most intriguing is the possibility of a growing desire for rootedness on the part of residents of high income countries. Mainly based on research involving the traditionally relatively mobile USA, these understandings emanate from analyses which claim that socio-economic and demographic trends alone cannot account for observed declines in migration rates, since levels have fallen in a largely universal way across population sub-groups and the composition of the population has not shifted to an extent that is sufficient to drastically alter aggregate migration trends (Cooke, 2011; Molloy *et al*, 2011). Instead a desire for ‘moorings’, and thus choosing to be residentially rooted, may explain the apparent contradiction of falling internal migration rates in an era of mobilities (Halfacree, 2018). Indeed, recent research has emphasised the need to pay greater consideration to the role of social capital and place attachment in the dynamics of (im)mobilities (Clark and Lisowski, 2019; Thomas *et al*, 2016). Whilst difficult to quantify, these social forces could manifest themselves in the form of reduced rates of longer distance migration, and a possible subsequent growth in physical and virtual circular movements (Green, 2018). Indeed the ‘transition towards a more rooted society’ could be self-perpetuating, given that ‘migration is often a learned behaviour and the risk of (not) moving is greater for those who have (not) already moved’ (Cooke, 2018, 116 and 117). The research discussed in this paper can help to contribute to these understandings by shedding light on the extent to which changes in internal migration in Scotland: (a) can be accounted for by population composition effects or (b) are universal across population sub-groups and thus potentially indicative of ‘secular rootedness’ (Cooke, 2011).

Whilst the study of changing patterns and processes of internal migration in high income countries is an intriguing intellectual endeavour, not least because of its implications for how the nexus between migration and development is theorised, it is also an issue that has

significant practical implications. Internal migration is a key mechanism through which the demand and supply sides of the labour market are connected, acts as a catalyst for social mobility and sits at the heart of concerns regarding social mixing and residential inequalities (Champion *et al*, 2018b). As such it is vital that the research community engages with questions of whether, how and why patterns and processes of internal migration and residential mobilities are changing. As discussed earlier, recent years have seen an evidence base begin to develop with regards to changing aggregate trends over time. However gaps remain in terms of understanding which population sub-groups and types of places are implicated in these processes, especially post the great recession. The research discussed in this paper seeks to make two important contributions in this regard. Firstly, it sheds light on the characteristics of moves *and* those who make them in relation to a sizeable cohort of individuals, at detailed geographies and over a significant period of time. The second contribution, discussed below, illustrates how administrative data linked to a census-based longitudinal dataset can be used in innovative ways to advance migration studies.

Data and methods

Efforts to study internal migration and residential mobility have long been hampered by a paucity of suitable data available to researchers. In theory, these topics can be investigated through population censuses, registers and surveys; with each approach having specific benefits and limitations (Bell *et al*, 2015). In the UK the most widely used sources for research on internal migration have been the decennial census and the National Health Service Central Register (NHSCR), which is a health based administrative register based on GP registrations (Raymer *et al*, 2011; Stillwell *et al*, 1992). The latter is used by the official statistical agencies in the UK to generate internal migration estimates (ONS, 2016b). This source provides frequent and up to date information on moves. However it undercounts some forms of mobility (such as very short-distance moves and those made by young people, especially young males) and can only shed light on the origin and destination of moves and age and sex of movers (Raymer *et al*, 2011). The decennial national census on the other hand contains a wealth of demographic information about movers, but it is infrequent and only picks up individuals that have engaged in mobility sometime in the 12 months leading up to the day of the census (through the ‘address one year ago’ question).

Due to these restrictions, researchers seeking to study internal migration at the aggregate level have been faced with an unenviable choice between time rich but attribute poor administrative data, or attribute rich but time poor census data. Champion and Shuttleworth's enlightening recent studies of long-term trends in internal migration in England and Wales (2017a and 2017b) are a textbook illustration of these challenges. One of their studies uses the ONS LS (Office for National Statistics Longitudinal Study), the England and Wales sister study of the SLS (Scottish Longitudinal Study), to examine changes in addresses over the ten-year periods between censuses from 1971 (2017a). This provides a high level of detail on the characteristics of moves and movers, but has the limitation of only providing this type of information at decadal intervals. Their other study (2017b) uses health administrative data to generate estimates of between area moves from 1971. This approach has the benefit of annual as opposed to decennial information. However it contains much less data on the nature of moves and movers and omits within health board area (i.e. shorter distance) mobility.

The methodological perspective described in this paper (see Ernsten *et al*, 2018) seeks to overcome these limitations by allowing for elucidation of all moves (via postcode level Scottish NHS GP registration data) as well as the characteristics of movers (through the SLS). This is made possible by the recent linking of data on GP registration dates and associated postcode information into the census-based SLS. The SLS is a large-scale linkage study based on information from the Scottish Census from 1991 onwards. The study is based on 20 semi-random birthdates, meaning that anyone who was born on one of them is included in the study. About 5.3 percent of the Scottish population is covered in the sample, equating to over a quarter of a million members (Boyle *et al*, 2009). Data are collected on SLS members over time and their records are continuously updated through the linkage of vital events registration and NHSCR data (Hattersley and Boyle, 2007).

The SLS only recently (in 2016) received permission to incorporate NHSCR GP postcode historical data (starting from 1st January 2000) into its records. This recent development means research on internal migration in Scotland can now be carried out using health administrative data linked to census-based longitudinal studies that is akin to that conducted in England and Wales (Smallwood and Lynch, 2010) and Northern Ireland (Barr and Shuttleworth, 2012). However a critical additional advantage of the Scottish data is that it enables analysis of short-

distance moves. The way that health administrative data are incorporated into the census-based longitudinal studies of the other parts of the UK results in only moves that span health board boundaries or Super Output Areas being recorded (see ONS, 2017 for an illustration of UK statistical geographies). In Scotland, postcode level information from the Community Health Index (CHI) system is now fed into the NHSCR. Postcode level data cannot be directly accessed by researchers due to the risk of statistical disclosure, however SLS support staff can derive variables of moves (such as distance of move) for researchers to use which allows for analysis of short-distance moves without the risk of disclosure. As such the recent linking of this data into the SLS now enables analysis of moves at postcode level upwards, as opposed to merely the longer distance moves that cross health administrative boundaries. It should be noted that the analysis described in this article is based on a test version of NHSCR GP postcode data, which has subsequently been revised in order to include flags to describe data quality, checks around the times that postcodes were in use by Royal Mail, deal with split postcodes and areas that changed postcode over time. Whilst this affects only a small proportion of the data, the dataset that is now available to researchers is slightly different. This, and the specific sample definition and methodology used in this study, means that the results from future analyses may not exactly correspond with those described here.

Another issue to note is that, since this approach relies on administrative health data to detect moves, it suffers from a systematic underreporting of some forms of mobility. This is because young people (especially males) take a relatively long time to register with a new doctor, or do not register at all, after changing address (Raymer *et al*, 2011). In the analysis which follows, attempts were made to account for this bias through weighting procedures which involved using an inverse probability method to weight the study sample so that its age and sex profile matched that of Scotland's population more generally, as recorded in the 2011 census and accessed via the full SLS sample (see Ernsten *et al*, 2018 for full details). The mobility of people who move short distances but who do not change their GP is captured, provided they inform their GP of their new address.

The migration propensities and patterns of the burgeoning retiree populations of high-income countries is an area that remains ripe for future research, however since this analysis especially sought to capture the potential effect of the Great Recession on mobility trends, the study

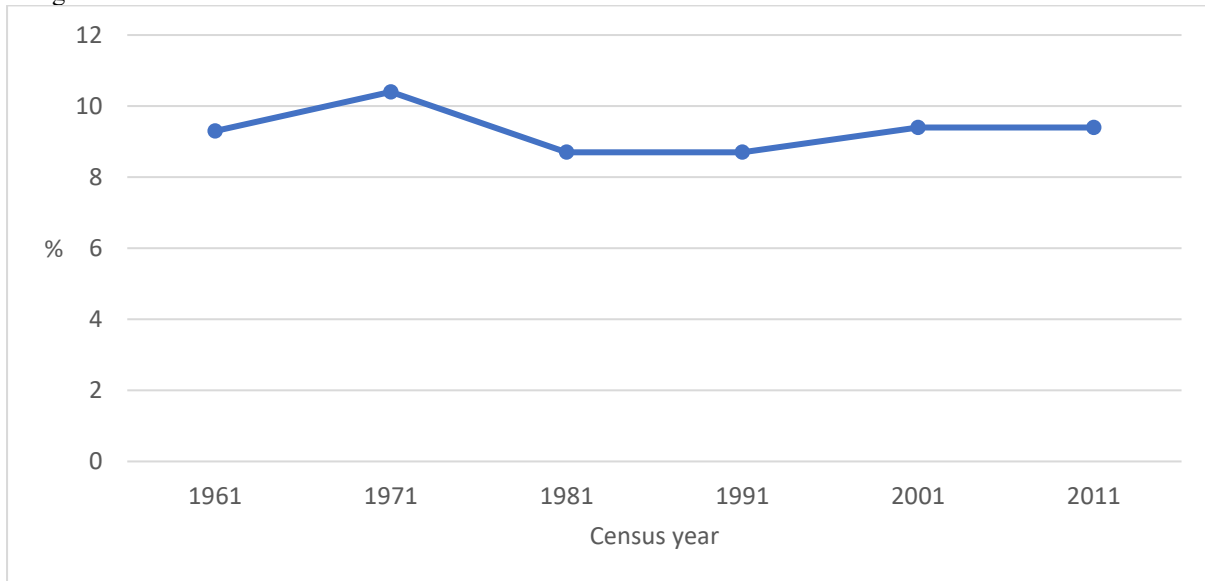
sample was restricted to those of working age (16-64) at the 2011 census (although this will still include people who have retired before reaching the state pension age). As such, the sample in this study is SLS members aged 16-64 at the 2011 census whose records were traced by NHSCR and whose location according to the census and administrative health data matched on census day or within six months of it. This equates to 151,592 individuals in 2011, with fewer before and after this date (126,755 in 2001; 138,089 in 2015) as people enter and leave the study through birth, deaths and migration to/from Scotland. The migration rate of this sample is measured annually across 2001-2015 and is defined as the number of address changes in a given year divided by the study sample population of that year. The analysis involved producing various migration rate time-series: overall and for short, medium and long-distance moves, for population sub-groups and area types. In a development from many existing approaches, statistical (logistic) modelling techniques are used to examine the drivers of these trends.

Results

Census data: attribute rich but time poor

Figure 1 below shows rates of internal migration within Scotland, as calculated from the ‘usual address one year ago’ census question, first asked in 1961. These figures tentatively suggest that, on average just under one in ten people in Scotland change address annually, and that this rate has been largely consistent over time. As well as providing a time-series trend, census data has been used to analyse the characteristics of movers, via anonymised census micro data (Fielding, 2012) and census-based longitudinal studies (Champion and Shuttleworth, 2017a). However whilst providing a useful long-term perspective on address changing, this approach has the considerable limitation of only generating specific once-a-decade crude snapshots of migration.

Figure 1: Share of population that changed address within Scotland in the year preceding census day, 1961-2011, all ages



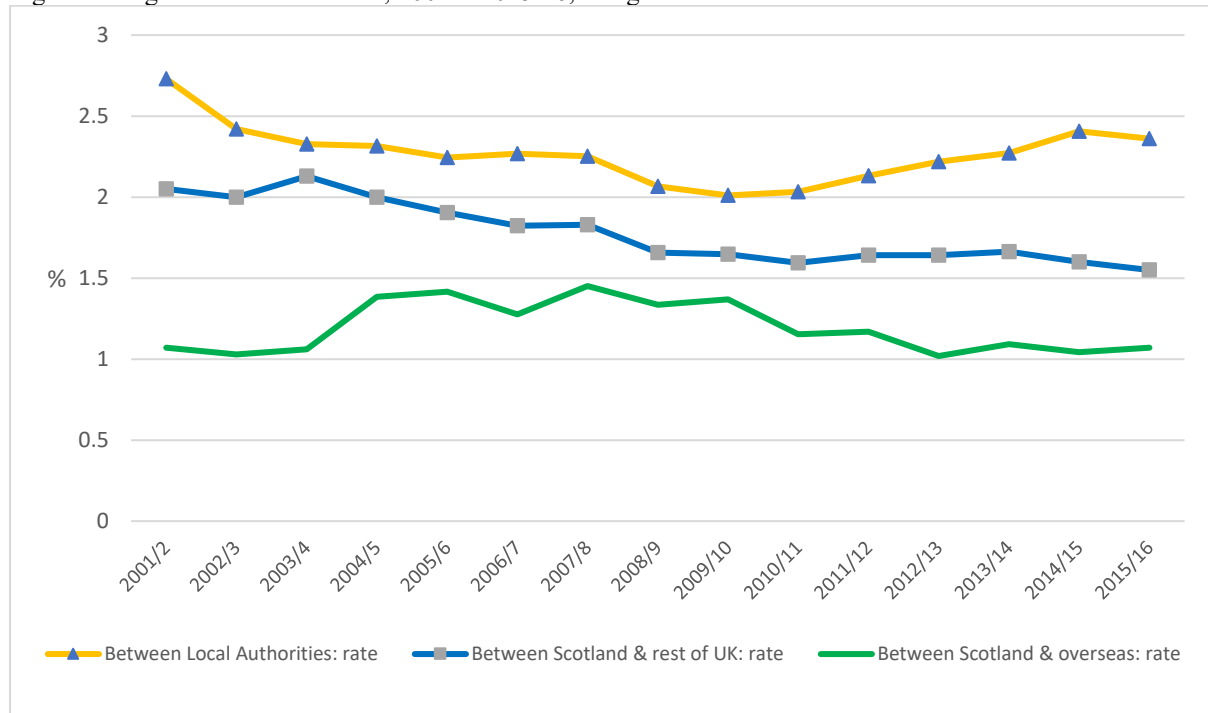
Source: Scottish census data supplied by National Records of Scotland (NRS).

*Thanks to Sandy Taylor, from Demographic Statistics at NRS for sourcing some of this data.

Administrative health data: time rich but attribute poor

Health administrative data, unlike censuses, provides a time rich source of information on rates of address changing. However, as illustrated in Figure 2, the data normally only provide information on mobility at and above the level of local authority (LA) moves, which are much less prevalent than shorter distance residential mobility (about two-thirds of moves are at sub-local authority scale, see Lomax and Stillwell, 2018). As with Figure 1, these trends seem to suggest little change in internal migration trends over time, with just over two per cent of the population moving between Scotland's 32 local authorities annually.

Figure 2: Migration rates. Scotland, 2001/2-2015/16, all ages.



Source: Author calculations based on NRS publications of NHSCR data, available from: <https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/migration/migration-statistics>

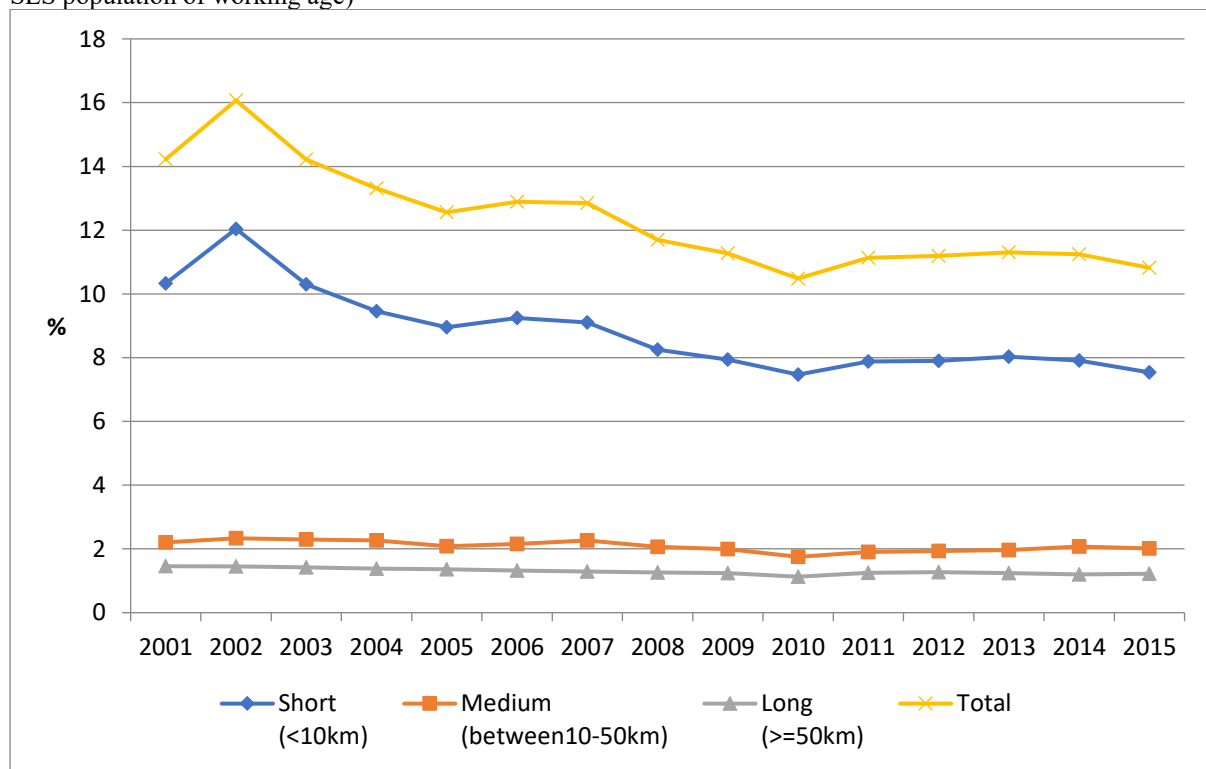
Administrative health data linked to the census-based SLS: time *and* attribute rich

Having illustrated the limitations of the two main conventional approaches to researching internal migration, the remainder of the paper focuses on the outcomes of the new opportunity presented by the recent linking of administrative health data linked into the census-based SLS. The approach developed here has the significant advantage over the approaches illustrated in Figures 1 and 2 of being able to provide year-on-year information on all address changes (via CHI information fed into the NHSCR) and of containing information about the characteristics of these movers (through their 2011 census returns, available via the SLS). An inevitable limitation of this is that time varying attributes (e.g. housing tenure, socio-economic class) are only captured at a single point in time (2011). It is important to remember this when interpreting Figures 4-7, as many of individual level characteristics could well change before and after 2011 census day. As such they provide a general rather than specific view of the changing relationship between mobility and factors such as area deprivation, socio-economic class and education level over time.

Address changing, aggregate trends

Figure 3 displays a time-series perspective of rates of address change for the working-age population within Scotland over the period 2001-2015. This graph implies a gradual decline in aggregate levels over the first decade of the millennium, followed by a levelling off in migration rates from around 2010 onwards. A decrease in short-distance moves ostensibly accounts for much of this trend.

Figure 3: Share of population making changing postcode, by distance moved, 2001-2015 (based on 2011 census SLS population of working age)



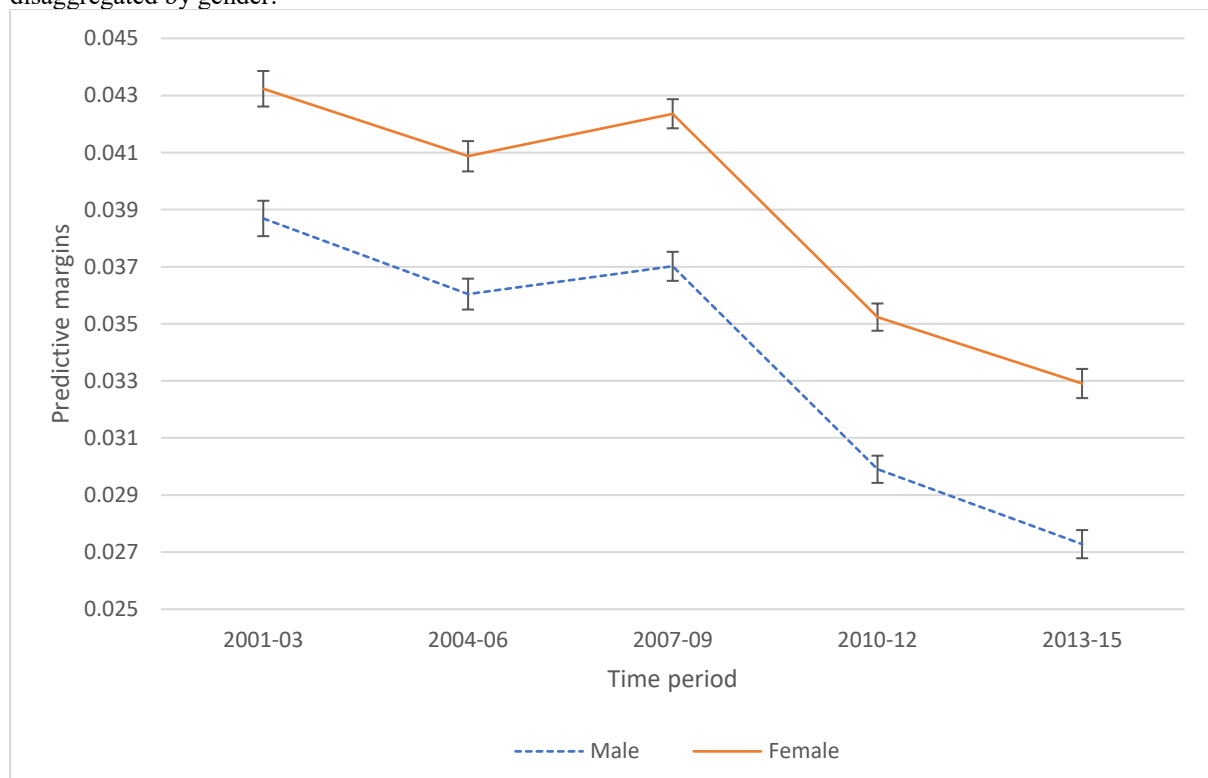
Source: Authors analysis of SLS data

Caution is required when interpreting these trends, as drawing inferences about changing migration patterns from simple visualisations of time-series data is a fraught endeavour, not least because of the interplay between migration and age on one hand, and the complex relationship between migration propensities and demographic and economic factors on the other (Pandit, 1997). For example the trends in Figure 3 could simply be a consequence of the sample ageing over the study period, as opposed to a more fundamental shift in mobility behaviour. Thus, to address the issue of whether and how the prevalence of address changing is actually shifting in Scotland, (a) binomial logistic modelling was used to examine the statistical probability of sample members making any move in a given year over the study

period, and (b) multinomial logistic models were employed to test for changes over time according to distance moved. All tests included discrete time period – age interaction effects to specifically test for temporal shifts in migration propensities, and included a series of individual and area level characteristics to identify the determinants of the propensity to move.

Figure 4 displays the probability (predictive margins) of sample members making any move, disaggregated by discrete time periods and gender. Binomial logistic regression analysis (not displayed here), including interaction effects for time-period and age, point to address changing being significantly less likely for both men and women ($p < 0.01$), in the 2010-2012 and 2013-2015 periods compared to the 2001-2003 reference period. Thus, in contrast to the trend in Figure 3, the decrease in the propensity of working age residents of Scotland to change address seems to have occurred in the second, not first, half of the study period. This is a more logical conclusion, as it fits with the expectation of suppressed population mobility in periods of economic uncertainty.

Figure 4: Predictive margins and (95%) confidence intervals, likelihood of making any move 2001-2015, disaggregated by gender.



Source: Authors analysis of SLS

The investigation was also sensitive to the extent to which aggregate rates of address changing was influenced by the distance that individuals move. This was motivated by Cooke (2011) and Champion and Shuttleworth's (2017a) interest in how migration over various spatial scales has varied over time in the USA and England and Wales respectively (this investigation uses the same distance categories as the latter to aid comparison of findings). The outcomes of the three multinomial models pertaining to this analysis are displayed in Table 1. As with the overall trend, these results point to fewer short-distance moves in the 2010-2012 and 2013-2015 periods relative to 2001-2003 (but only approaching significance $0.05 < p < 0.1$). There is a clearer reduction in longer distance moves over time: in the 2007-2009 period ($0.05 < p < 0.1$) and from 2010 onwards ($p < 0.05$). Similar to the USA experience (Cooke, 2011), but in contrast to England and Wales (Champion and Shuttleworth 2017a and 2017b), these trends are noteworthy in that they identify reductions in long-distance moves as a central driver of declining internal migration rates. Regrettably, given that the decline in short and long-distance moves is most marked between 2010 and the end of the study period in 2015, it is difficult to ascertain whether this decrease represents part of a longer term sustained downward trajectory in rates of address changing, or merely a shorter-term business cycle associated fluctuation. Conceivably it could be a combination of both, as the Great Recession and its ramifications could have inflicted an enduring 'scar' on young people's migration prospects (Green and Shuttleworth, 2015).

Table 1: Multinomial model: predictors of changing address in the previous 12 months, by distance moved. Odds ratios and significance levels

Base, no move	<10km	10-50km	>50km
Gender (ref male)			
female	0.170***	0.093***	0.146***
Age (ref 56-64)			
16-25	1.350***	1.452***	1.634***
26-35	1.346***	1.501***	0.900***
36-45	0.810***	0.810***	0.207
46-55	0.277**	0.294	-0.327
Time period (ref 2001/03)			
2004/06	-0.156	0.005	-0.423
2007/09	0.047	0.007	-0.501*
2010/12	-0.246*	-0.226	-0.706**
2013-15	-0.214*	-0.085	-0.608**
Housing tenure (ref owns)			
social rent	0.492***	0.354***	0.054
private rent	1.041***	0.953***	1.025***
rent free	0.393***	0.479***	0.730***
Occupational status (ONS NSSEC, ref: managerial & professional)			
intermediate	-0.033***	-0.136***	-0.188***
routine & semi routine	0.008	-0.147***	-0.133***
Qualifications (ref no degree)			
degree or higher	-0.009	0.211***	0.458***
Household type (ref single no children)			
couple-no children	0.135***	0.246***	-0.011
single & children	-0.044***	-0.182***	-0.073**
couple & children	0.117***	-0.103***	-0.359***
Ethnic group (ref white Scottish & British)			
not white Scottish & British	0.079***	-0.022	-0.158**
Scottish Government 6-fold Urban Rural Classification (ref large urban areas)			
other urban areas	-0.135***	0.514***	-0.415***
accessible small towns	-0.274***	0.806***	-0.394***
remote small towns	-0.194***	0.738***	0.366***
accessible rural	-0.498***	1.087***	-0.028
remote rural	-0.650***	0.922***	0.686***
Area deprivation quintile (SIMD, ref 5: least deprived)			
1, most deprived	0.042***	-0.303***	-0.798***
2	0.019*	-0.266***	-0.464***
3	0.020*	-0.141***	-0.092***
4	0.044***	-0.041*	-0.092***

Source: Authors analysis of SLS

***, **, * denote statistical significance at 1%, 5%, and 10% level, respectively

Whilst this investigation does have the limitation of uncertainty regarding post-recession long-term migration trajectories, it does have the advantage of allowing for detailed analysis of social and spatial aspects of migration patterns. A number of highlights can be drawn from

Table 1 in this respect. Although the effect is modest, women are significantly more mobile across all three distance categories than men. This matches existing evidence of a minor gender difference in internal migration propensities in favour of women in most developed countries (ONS, 2016a; Rees and Kupiszewski, 1999). The findings also confirm the well-established age selectivity of migration (Champion and Shuttleworth, 2017b; Lomax and Stillwell, 2018), with young people being relatively mobile, especially over longer distances (although the 56-64 cohort is slightly more mobile than those aged 46-55 over shorter distances). Renters and those who live rent free are more mobile than homeowners across all distances, with the exception of social renters being relatively immobile over long-distances. These findings tie in with Green's (2018) observations regarding the administrative barriers that restrict inter-local authority moves amongst social renters, the relative ease of address changing for those in the private rented sector and the sensitivity of homeowner's mobility to macro-economic factors.

The figures in Table 1 also indicate that those in higher ranking occupations are relatively mobile over medium and long-distances. A similar pattern exists in terms of qualifications, with holding a degree having a large positive impact on one's probability of moving over long-distances. These mechanisms relate to the well-established tendency for migrants to be positively selected: those with the most human capital are relatively mobile over long-distances (Faggian *et al*, 2017). In terms of household type, having children (whether single or couple households) is associated with few moves of 10-50km or 50km+. This underlines the utility of the linked lives approach to spatial mobility, since it emphasises how the potential for disruption to children (in terms of their schooling and friendship networks) can act as a significant deterrent to relocation for parents (Bailey *et al*, 2004).

Substantial ethnic differences in mobility patterns exist in that minority groups fitted the expectation of being more mobile than the main 'white' groups (Finney *et al*, 2015). As can be observed in Table 1, this is due to ethnic minorities in Scotland, as elsewhere, having relatively high levels of residential mobility (<10km), potentially due to complex immigrant integration processes and issues surrounding racial discrimination (Finney and Catney, 2016). A more novel finding is that, despite being more mobile overall, ethnic minorities displayed a much lower probability of moving over long-distances. Recent work by Darlington-Pollock *et al* (2019) has shed light on the distinctive mobility trends of specific ethnic groups over shorter

and longer distances. However the causes and consequences of these dynamics merit more attention than they have received to date. For example, since longer distance moves are more usually associated with social mobility (Gordon *et al*, 2015), the inability or disinclination of ethnic minorities to engage in this form of spatial mobility may represent a specific form of disadvantage. Disaggregation of mobility trends by ethnic categories (discussed in more depth later in this paper) points to the White Polish and African/African Scottish ethnic groups being exceptionally mobile, compared to not only the white Scottish/British cohorts but also other ethnic minority groups.

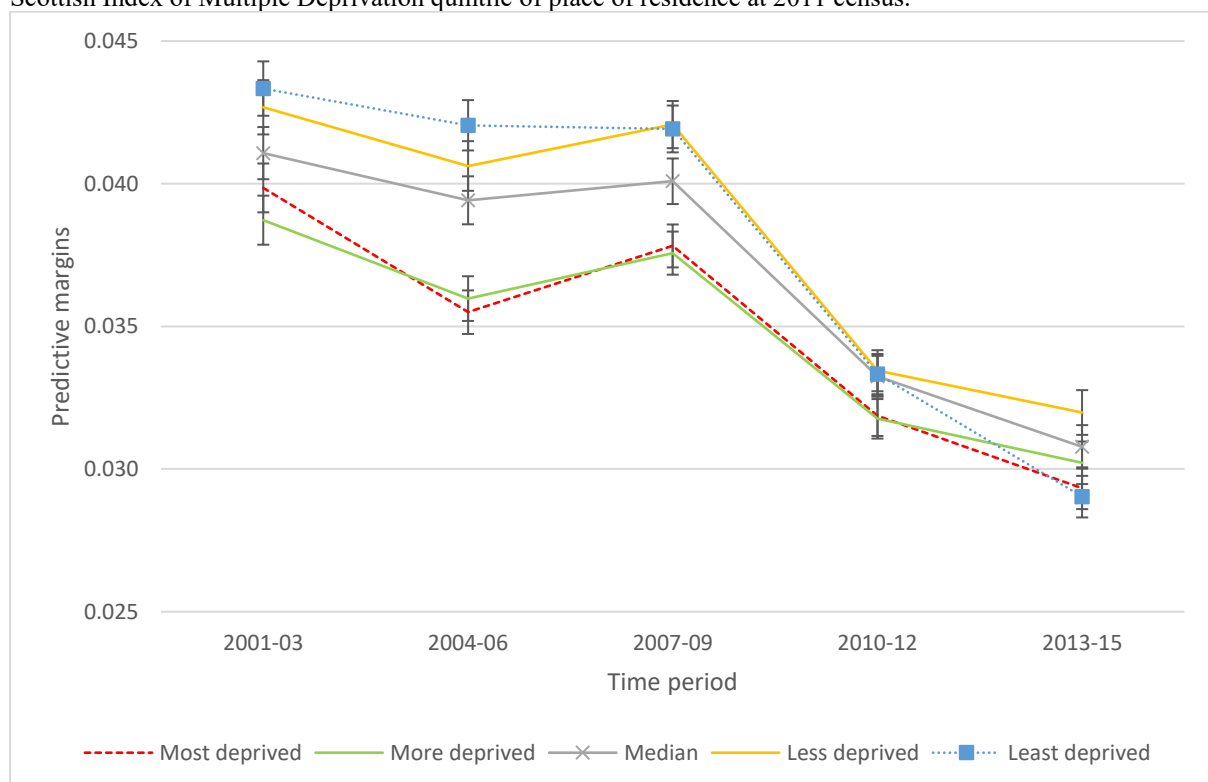
Residents of large urban areas were most mobile over short-distances whilst remote rural dwellers displayed the greatest propensity to move over long-distances. Also in terms of geographies, a wealth effect was evident in that individuals residing in less deprived areas were much more mobile over medium and especially long-distances than those living in more deprived ones. This effect was less evident in terms of short-distance residential mobility, where residents of the most deprived areas are relatively mobile. These trends can be related to the existence of a U-shaped relationship between area deprivation and population mobility, whereby relatively privileged groups are more mobile over longer distances and *vice versa* (Bailey and Livingston, 2007; Champion and Shuttleworth, 2017a). This finding acts as a timely reminder that scholarship must not shy away from wider social justice concerns, given that internal migration produces and is produced by entrenched unequal power relationships in contemporary society (Smith *et al*, 2015a).

Population mobility: social and spatial dynamics of change over time

The analysis now turns to the most original aspect of the research findings: elucidation of how the mobility trends of the population sub-groups discussed above have changed over time. Investigation of the dynamics of temporal change is valuable as it can aid understanding of the effects of the business cycle, demographic changes and changing societal norms on patterns and processes of migration. Perhaps one of the most intriguing aspects of the results in this respect is evidence of a convergence of long-distance moving rates across the social scale (a trend also identified by Champion and Shuttleworth (2017a) in England and Wales). As highlighted in the previous section, relatively high rates of mobility are conventionally associated with comparatively privileged population sub-groups and locales (e.g. graduates,

those in higher socio-economic status occupations, less deprived areas). However analysis of the probability of the study sample making any move, disaggregated by discrete time periods and various demographic and geographic indicators points to these differences becoming much less pronounced. Figure 5 displays the likelihood of sample members changing address according to the deprivation level of the data zone that they are resident in at the time of the 2011 census. This is measured using the Scottish Index of Multiple Deprivation (SIMD), which is a comprehensive relative measure of deprivation across 6,976 small areas in Scotland (Scottish Government, 2016). The results follow the expected trend of wealthier areas being associated with higher rates of mobility for much of the study period (2001-2009). However the pattern changes markedly over 2010-2015, with the wealth effect becoming much less prominent as the least deprived groups become much less mobile.

Figure 5: Predictive margins and (95%) confidence intervals, likelihood of moving 2001-2015, disaggregated by Scottish Index of Multiple Deprivation quintile of place of residence at 2011 census.

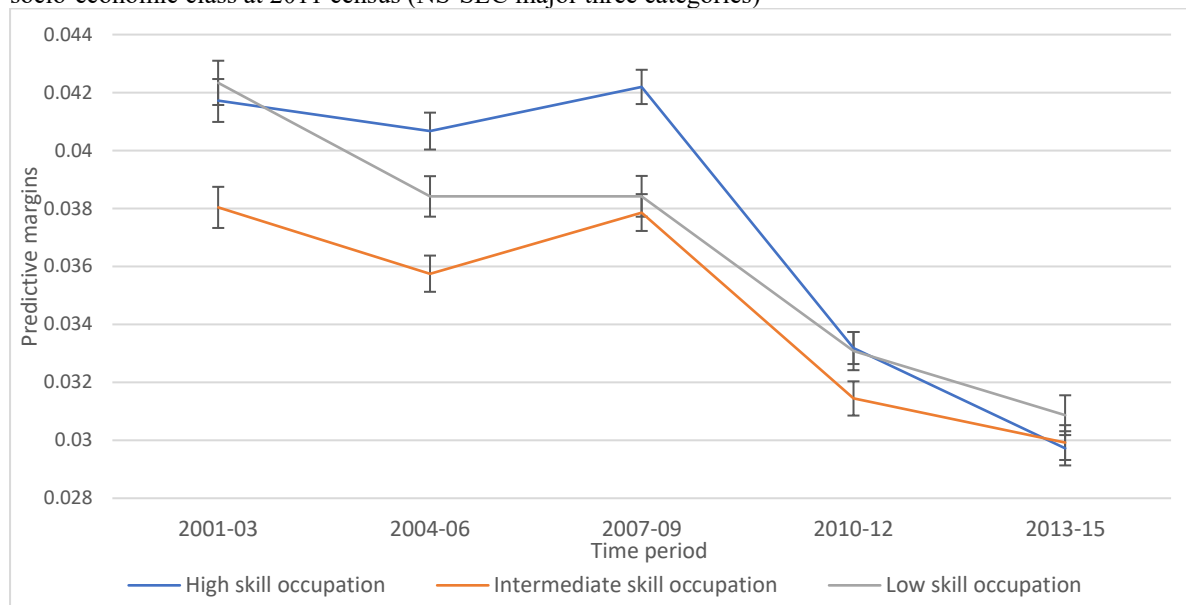


Source: Authors analysis of SLS

A similar pattern is apparent in terms of the evolution of the relationship between socio-economic status (as defined by occupation) and spatial mobility over the study period (Figure 6). The trend here mirrors the deprivation-migration trajectory in that the relative excess

mobility of those in high socio-economic status occupations is modest and fades drastically from 2010 onwards. This chimes with Champion and Shuttleworth’s (2017a) identification of a surprising long-term decline in rates of long-distance mobility amongst higher skilled workers, meaning that occupational status is not as powerful a predictor of this form of mobility as it was traditionally.

Figure 6: Predictive margins and (95%) confidence intervals, likelihood of moving 2001-2015, disaggregated by socio-economic class at 2011 census (NS-SEC major three categories)

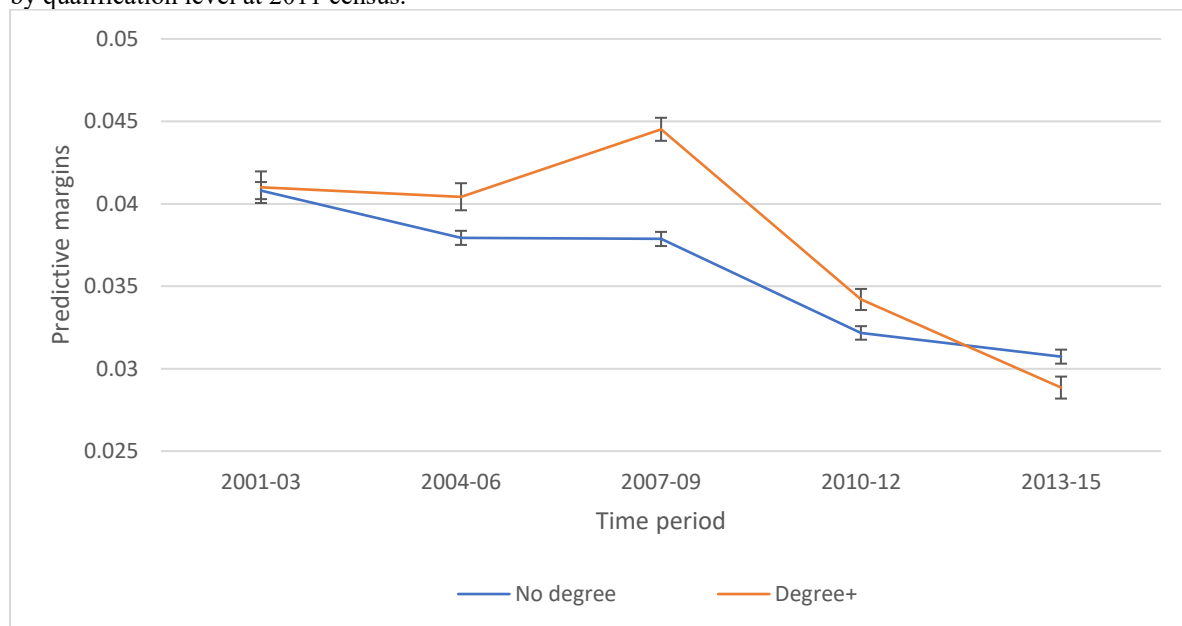


Source: Authors analysis of SLS

High-skilled occupation: NS-SEC 1 & 2. Intermediate-skilled occupation: NS-SEC 3 & 5. Low-skilled occupation: NS-SEC 6 & 7. NS-SEC group 4 (self-employed) is excluded as this covers a variety of skill levels.

Finally, although less pronounced, the skill gap in migration propensities also seems to have lessened in recent times (Figure 7), as the mobility of those with degrees increases prior to the recession but then dips dramatically from 2009.

Figure 7: Predictive margins and (95%) confidence intervals, likelihood of moving 2001-2015, disaggregated by qualification level at 2011 census.



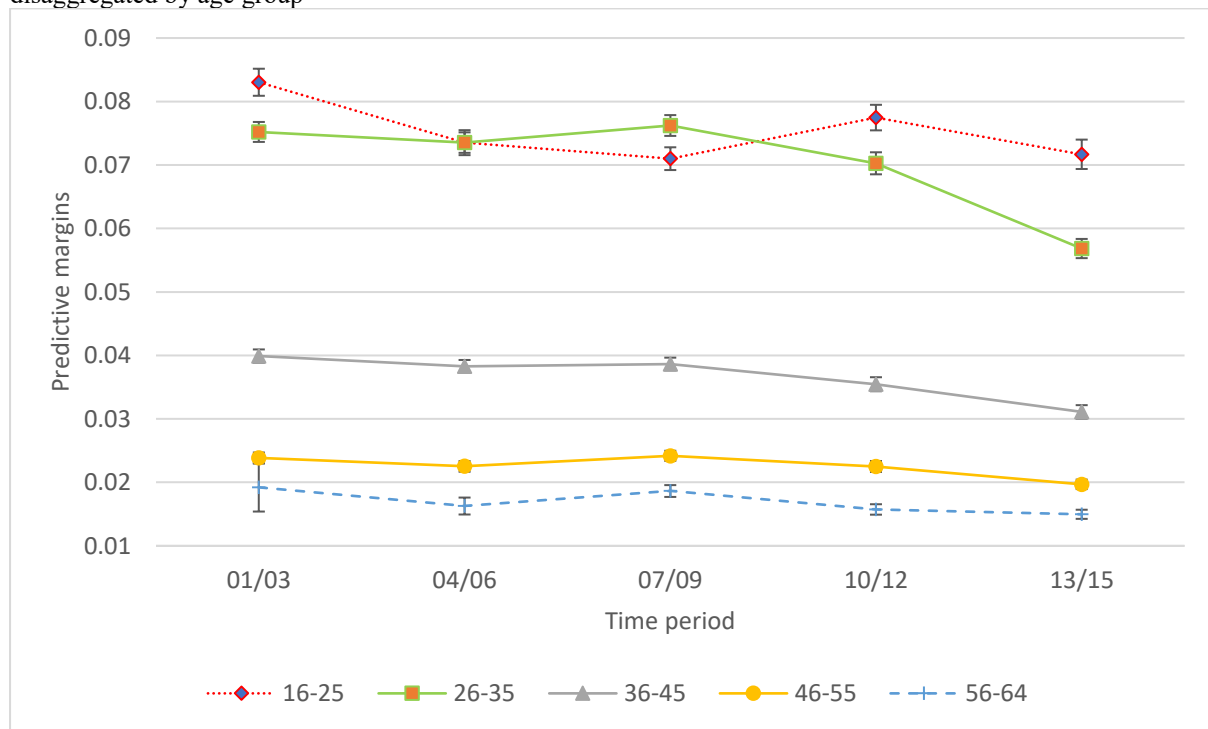
Source: Authors analysis of SLS

Statistical modelling of the trends in Figures 5-7 according to distances moved points to this convergence of migration trends being a consequence of a reduced inclination of the socio-economic groups who are conventionally most mobile to engage in longer distance (50km+) moves. Socio-economic differences in migration propensities at smaller scales (less than 10km) have been relatively stable over time, whereas constrained employment opportunities and enhanced risk aversion following the recession (Green, 2018) may have eroded the desire, ability and thus incidence of longer distance migration.

Other findings from the investigation support the thesis of the recession having suppressed longer distance migration amongst conventionally relatively mobile population sub-groups. All groups within the 26-55 age range became significantly less likely to change address from 2010 onwards (Figure 8). This decline in mobility was particularly marked for the age group whose mobility is most likely to be influenced by aggregate economic factors, the 26-35 age group, and is largely accounted for by a significant decline in the propensity of individuals within it to engage in longer distance moves. Mobility patterns amongst the most mobile age group, 16-25 year olds, are however more fluid, with the likelihood of address changing peaking in the 2001-2003 and 2010-2012 periods. As such, unlike other groups of working age, there is no evidence of this age group becoming less mobile over time. This echoes Lomax and Stillwell's

(2018) analysis of UK inter-district migration rates for all ages between 2001 and 2013, where 15-19 and 20-24 year olds experienced the least change in migration propensities over the study period. The distinctiveness of this age group most likely reflects the greater role of non-economic factors, especially education, in their mobility behaviours (Champion, 2016) and the corresponding steady growth in university admissions over the study period.

Figure 8: Predictive margins and (95%) confidence intervals, likelihood of making any move 2001-2015, disaggregated by age group



Source: Authors analysis of SLS

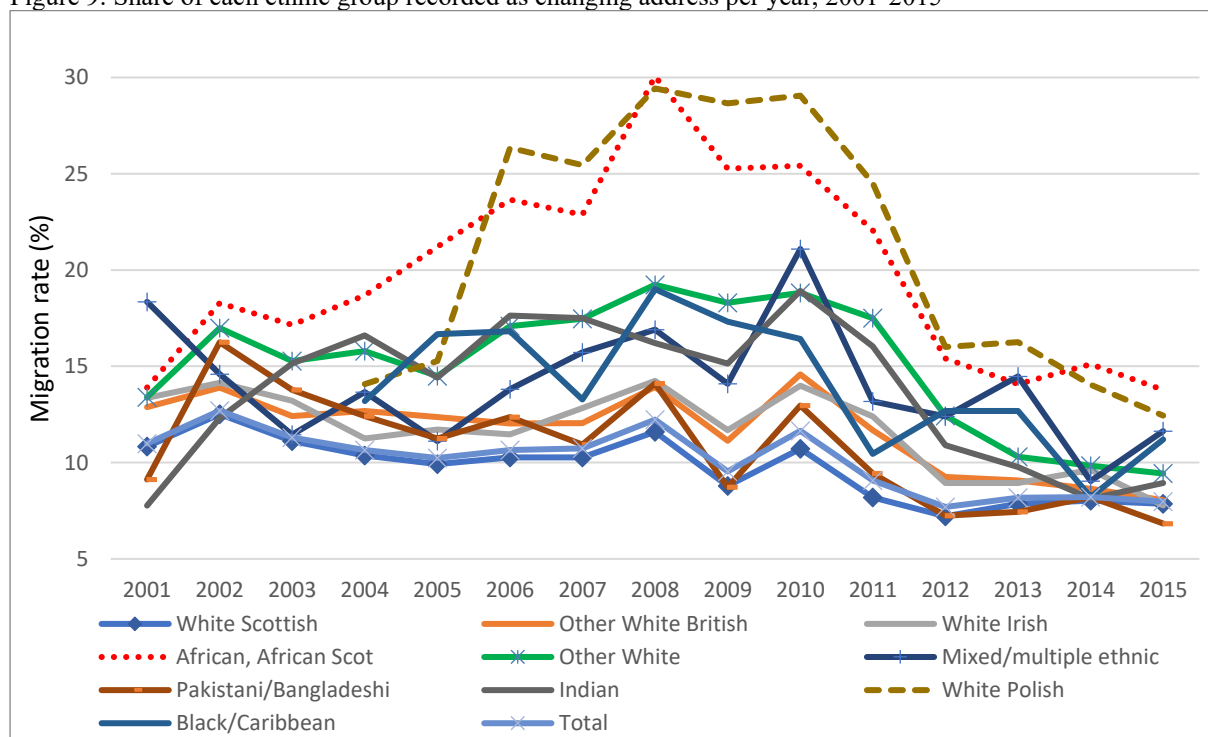
*To control for period effects, age does not refer to age at 2011 census, but rather age at each of the five discrete time periods shown above.

The trends discussed thus far have specific dynamics according to household type and housing tenure. As has been discussed, most population sub-groups and types of places have experienced declining rates of address changing in the period following the recession. However this decrease has been particularly abrupt for households composed of couples with dependent children, whose levels of address changing have dropped dramatically since 2010, in contrast with the more gradual decline experienced by other household types. Falling rates of moving amongst families can be attributed to fewer short-distance moves, associated with residential mobility, and a reduction in the longer distance moves frequently related to labour market drivers. Connected to this, rates of address changing amongst owner occupiers decreased

significantly from 2007, whereas moving amongst private renters increased over the period 2007-2012. These trends point to housing markets playing an increasingly prominent role in patterns and processes of migration (Lomax and Stillwell, 2018), especially given the increased costs and risks associated with buying and selling property (Halfacree, 2018), meaning that those in the private rented sector have bucked the general shift towards declining migration rates and residents of the least deprived (and thus most expensive) areas have become less mobile (Champion and Shuttleworth, 2017a). The housing market may thus have replaced labour market adjustments as the main mechanism through which business cycles shape internal migration.

The distinctiveness of internal migration trends amongst immigrants and ethnic minorities is an emerging field of research in Europe and further afield (Finney and Catney, 2012). As noted earlier (Table 1), overall ethnic minorities are significantly more mobile than the ‘majority’ white Scottish/British ethnic groups over short-distances, but the inverse is the case over long-distances.

Figure 9: Share of each ethnic group recorded as changing address per year, 2001-2015



Source: Authors analysis of SLS

The analysis of temporal change displayed in Figure 9 above suggests that rates of residential mobility have begun to converge in recent years, with ethnic minorities no longer displaying such an excess propensity to experience short-distance moves by 2013-2015. This could be read as a positive development as it could reflect reductions in residential insecurity amongst ethnic minorities. An opposing trend is apparent however with regards to longer distance moves. Over the period 2001-2009 there is no statistically significant difference in migration rates over long-distances, but over 2010-2015 ethnic minorities become less likely to engage in this type of mobility than white Scottish/British ethnic groups. This could be interpreted negatively from an equalities perspective, since longer distance internal migration often acts as a catalyst for social mobility (Gordon *et al*, 2015). It is important to note a caveat regarding the reliability of post-2011 migration trends by ethnicity. Migrants may have left Scotland between the 2011 census and the end of the study period in 2015, but unless they informed their GP of their intention to leave Scotland they will incorrectly have been recorded as residentially immobile over this period. This could potentially account for the apparent decline in rates of residential mobility amongst ethnic minorities towards the end of the study period.

Further investigation involving detailed categories reveals some significant differences in migration propensities between ethnic groups. Whilst ethnic minorities are on the whole relatively mobile, in line with existing research in the UK, Pakistani and Bangladeshi groups are an exception (Finney *et al*, 2015). Their propensity to migrate is very similar to the white Scottish, British and Irish ethnic groups. This relative immobility persists after controlling for other personal characteristics such as age. Again, after controlling for compositional effects, the Chinese, Indian, Black/Caribbean and mixed groups were found to be relatively mobile. Furthermore two ethnic groups in particular were identified as being exceptionally mobile over the study period: the White Polish and African/African Scottish ethnic groups. Some of these trends can be accounted for by assessing the role of migrant status as many, but by no means all, ethnic minorities are immigrants. Controlling for time spent in the UK erodes some of the ethnic differences discussed above, since migrants generally become more residentially rooted with time spent in their host country (Finney *et al*, 2015). However the White Polish group appears to be distinctive in their mobility patterns, in that even relatively established migrants are comparatively mobile. Existing research has pointed to ‘Accession 8’ East-Central Europeans also having labour market profiles that are distinct not just from non-migrants but

also other migrant groups (McCullum and Findlay, 2015). Whilst not the core focus of this paper, the exceptional nature of this group merits more attention.

This analysis has identified a number of significant shifts in migration propensities amongst particular socio-economic, age and ethnic groups and area, household and tenure types (as defined, by necessity, in 2011). As noted earlier it is unfortunate that the data covers a timescale that does not allow for elucidation of whether these trends are merely a consequence of business cycle effects, or are part of a deeper shift in migration behaviour. The almost universal decrease in rates of address changing (private renters and 16-25 year olds being notable exceptions, perhaps driven by growth in university admissions) would support the latter, whereas the fact that declines are most dramatic amongst groups most sensitive to economic factors backs the former. The final section offers some reflections on the wider lessons that can be drawn from this analysis.

Discussion and conclusions

As was noted at the outset, the relative neglect of internal migration within migration studies can be at least partially attributed to practical challenges associated with investigating it. The two main sources of information on internal migration, administrative and census data, each contain well documented distinct strengths and weaknesses in this respect. The research presented here is innovative in that it has combined these data sources to shed new light on patterns and processes of internal migration in Scotland (Ernsten *et al*, 2018). This is not the first time such an approach has been employed in the UK context (Smallwood and Lynch, 2010; Barr and Shuttleworth, 2012), however its novelty lies in its ability to detect short-distance moves, which are by far the most prevalent form of migration (Lomax and Stillwell, 2018). This analysis is therefore of value as it enables investigation of not just temporal changes in overall rates of address changing, but also shifts in the frequency of short, medium and long-distance moves and elucidation of the population-sub groups and types of places that are implicated in these processes.

In addition to representing a novel methodological approach, a number of substantial conclusions can be drawn from this investigation. Fitting the notion of the paradox of reduced

migration in an increasingly mobile society, Scotland, as is the case in many other high-income countries (Champion *et al*, 2018b), appears to be experiencing a decline in rates of address change. Controlling for population composition effects, there has been a decrease in residential mobility since 2010, which was preceded by a more significant drop in the propensity of individuals to make long-distance moves (2007+). Perhaps one of the most significant findings is the revelation that these aggregate trends have been driven by an evening out of some of the main socio-economic determinants of migration. Like England and Wales, Scotland appears to be experiencing a convergence of long-distance moving rates across the social scale (Champion and Shuttleworth, 2017a). This is due to recent declines in address changing amongst the groups that have conventionally been the most mobile over longer distances (Figures 5-7). The timing of the observed drops in rates of address changing (2007+, long-distance and 2010+, short-distance) imply that the Great Recession and its aftermath are likely culprits for these changes. As noted by Green (2018), economic downturns suppress the quantity and quality of new employment opportunities, and heighten risk aversion. These processes plausibly explain reduced rates of long-distance migration, as it is determined by aggregate economic factors to a much greater degree than residential mobility. Given that similar shifts towards rootedness have been identified in other spatial contexts, this finding validates calls for a greater emphasis on the drivers and consequences of population immobility within migration studies (Cooke, 2011).

Whilst significant in a statistical sense, it is worth noting that some of the trends discussed above have been rather modest, and may not necessarily constitute the more fundamental societal shifts towards rootedness that have been mooted in some other relatively high-income countries (Bell *et al*, 2018). This acknowledgement relates to a key limitation of this study. Though 2001-2015 represents a respectable time frame over which migration trends can be assessed, the timing of the recession and (the conceivably related) declines in rates of address changing in the second half of the analysis period means that it is difficult to ascertain whether the observed trends are merely a business cycle effect, or are indeed the modest beginnings of a longer term more fundamental shift towards rootedness on the part of the working age population of Scotland. Since the labour and housing market effects of the recession are still ongoing it may be some time before future research can fully address this question. Similarly, analysis of changing socio-economic determinants of mobility is hampered by the need to rely

on characteristics at a single time point (2011) to assess time varying factors such as area deprivation and education.

Finally, while this research has contributed to the impressive recent body of literature on trends in internal migration, a drawback shared by this canon of research is that whilst it can document in detail changes in mobility behaviours and set out plausible frameworks to understand them, it is less enlightening when it comes to decisively explaining them. This has potentially significant implications for migration theory, as emerging evidence of slowdowns in migration in Scotland and elsewhere undermine the longstanding wisdom that population mobility is an inevitable and positive consequence of economic and social development (Zelinsky, 1971). The extent to which these developments reflect choice or constraint on the part of households is an important aspect of these dynamics. Now that research has broken new ground in terms of documenting these trends, the research agenda in this field needs to evolve towards approaches that enable explanation. This will not be a straightforward task given the data challenges that make it difficult for researchers to identify and conceptualise the numerous interacting factors that shape migration. However a potential way forward in this respect could involve innovative mixed methods approaches that combine the census-based and administrative data sources discussed above with secondary datasets that contain information on mobility preferences (e.g. Understanding Society, which has already been used to examine moving motives (Thomas *et al*, 2019)). This approach could also usefully inform the sampling frame for primary data collection that sheds light on how (potential) migrants engage with issues such as risk and uncertainty, and critically the social and spatial nuances of these processes. As highlighted by this investigation, professionals (becoming less migratory) and East-Central Europeans (hypermobile relative to other migrant groups) are just two examples of population sub-groups whose intriguing mobilities are particularly amenable to in-depth qualitative study. Such focused approaches may prove more feasible than efforts to formulate an all-encompassing general theory of internal migration decline in high-income countries.

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