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Research Article

Union dissolution and housing trajectories in Britain

Júlia Mikolai

Hill Kulu

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Union dissolution and housing trajectories in Britain

Júlia Mikolai¹

Hill Kulu²

Abstract

BACKGROUND

A growing body of literature shows that divorce and separation have negative consequences for individuals' residential mobility and housing conditions. Yet, no study to date has examined housing trajectories of separated individuals.

OBJECTIVE

We investigate housing trajectories of separated men and women using longitudinal data from Britain.

METHODS

We apply sequence analysis to data from 18 waves of the British Household Panel Survey (1991–2008). We use time since separation as the 'clock' in our analysis and examine the sensitivity of the results to attrition, the length of the observation window, and the choice of classification criteria.

RESULTS

We identify five types of housing trajectories among separated individuals: 'owner stayers,' 'owner movers,' 'social rent stayers,' 'social rent movers,' and 'private renters.' Men are more likely to stay in homeownership, whereas women are more likely to stay in social housing. There is an expected educational gradient: Highly educated individuals are likely to remain homeowners, whereas people with low educational level have a high propensity to stay in or to move to social housing. Overall, this study shows that some individuals can afford homeownership after separation, and that social housing offers a safety net for the most vulnerable population subgroups (low-educated women with children). However, a significant group of separated individuals is unable to afford homeownership in a country where homeownership is still the norm.

¹ University of St. Andrews, UK. Email: julia.mikolai@st-andrews.ac.uk.

² University of St. Andrews, UK.

CONTRIBUTION

This study shows that separation has long-term consequences for individuals' housing conditions and that post-separation housing trajectories are significantly shaped by individuals' socioeconomic characteristics.

1. Introduction

Since the 1960s, divorce rates have increased in all industrialized countries (Thomson 2014). In England and Wales the number of divorces increased from 24,000 in 1960 to 111,000 in 2014 (Office for National Statistics 2016). Additionally, because cohabiting unions are less stable than marriages, the rapid spread of nonmarital cohabitation has contributed to an increase in the number of union dissolutions (Beaujouan and Ní Bhrolcháin 2011; Ermisch and Francesconi 2000). Previous research has shown that divorce has a negative effect on individuals' physical, psychological, and economic well-being (Amato 2000, 2010). This study contributes to this line of research by focusing on the consequences of divorce and separation for individuals' housing conditions.

Upon separation,³ at least one of the partners has to move out of the joint home (Feijten 2005; Mulder and Wagner 2010). Such moves are usually urgent and financially restricted (Feijten and van Ham 2007). Therefore, ex-partners who move out of the joint home upon separation are likely to move to smaller, lower-quality dwellings (Feijten 2005; Gober 1992), and to move out of homeownership (Booth and Amato 1993; Dieleman and Schouw 1989; Dieleman, Clark, and Deurloo 1995; Feijten 2005; Feijten and van Ham 2007; Gober 1992; Helderma 2007; Lersch and Vidal 2014; Sullivan 1986). These moves, usually called 'downward' moves on the housing ladder, may have negative consequences for separated individuals' well-being, especially if separation has a long-term effect on individuals' housing situation (Feijten and van Ham 2007).

A growing body of literature investigates the interrelationship between separation and residential mobility (e.g., Feijten and van Ham 2007; Kulu et al. 2017; Lersch and Vidal 2014; Mikolai and Kulu 2018b, 2018a; Thomas and Mulder 2016; Thomas, Mulder, and Cooke 2017). Previous longitudinal studies have significantly improved our understanding of how the moving risks of separated individuals differ from the moving risks of those who are single or are in a relationship (Kulu et al. 2017; Mikolai

³ We use the term 'separation' and 'union dissolution' interchangeably throughout this paper, because even in the case of a divorce, usually the date of the separation (i.e., relationship breakdown) rather than the date of the legal divorce implies a move out of the joint home (Feijten 2005).

and Kulu 2018b, 2018a); how such risks are associated with individual characteristics (Mikolai and Kulu 2018b, 2018a; Thomas and Mulder 2016); and what type of housing separated individuals move to (Mikolai and Kulu 2018b, 2018a; Thomas and Mulder 2016). However, no study has focused on the housing trajectories of separated individuals.

This paper studies housing tenure trajectories of separated individuals. We extend previous research in the following ways. First, using sequence analysis, we investigate housing trajectories of separated women and men. Although a number of studies have investigated residential trajectories of various population subgroups using sequence analysis (Clark, Deurloo, and Dieleman 2003; Falkingham et al. 2016; Köppe 2017; Pollock 2007; Spallek, Haynes, and Jones 2014; Stovel and Bolan 2004), no study has examined the housing trajectories of separated individuals. Studying housing trajectories will significantly improve our understanding of how individuals' housing conditions evolve over time following separation and of the short- and long-term consequences of separation. Second, we use time since separation as the 'clock' to study housing trajectories of separated individuals. Previous studies have either used age or time since start of the panel as the timeline in sequence analysis (e.g., Köppe 2017; Pollock 2007; Spallek, Haynes, and Jones 2014). We argue that time since separation provides a natural 'clock' for the analysis of housing trajectories of separated individuals. Third, by focusing on separated individuals and their housing trajectories, we study, for the first time, the role of origin and destination housing tenure, as well as the role of the socioeconomic and demographic characteristics of separated individuals, in order to gain a better understanding of the mechanisms behind social and housing inequalities. Finally, we also discuss and show ways of addressing various issues related to the use of panel data in sequence analysis; for example, unbalanced data due to attrition. Panel studies have become increasingly common in social science research (compared to retrospective surveys, which dominated in the early stages of longitudinal research), and it is important to understand the opportunities they provide for research and the challenges researchers face when using them.

2. Background and previous research

2.1 Housing tenure after separation

Housing tenure and particularly access to homeownership is one of the main dimensions of social inequalities in contemporary Europe and North America (Dewilde 2008). Becoming a homeowner is a desirable goal that many individuals strive to achieve throughout their lives (Dewilde 2008). Homeownership is not only associated

with being a good parent and good caretaker (Dewilde 2008; Lauster 2010), but also means living in large, good-quality dwellings, and dwellings situated in desirable neighbourhoods (Dieleman, Clark, and Deurloo 1995; Feijten 2005). Additionally, buying a house is a financial investment as properties are likely to hold their value in the long run (Davies Withers 1998). Buying a home is subsidized in many countries, and being a homeowner offers protection against poverty (Dewilde 2008). This means that individuals who can afford to get on the property ladder will further benefit from being a homeowner, whereas those who cannot afford to become homeowners will be disadvantaged.

The desire to become a homeowner is strongly related to family life events. Union formation, marriage, and childbirth usually lead to ‘upward’ moves on the housing ladder, i.e., moves to large, good-quality dwellings located in desirable neighbourhoods (e.g., Clark and Huang 2003; Clark and Davies Withers 2009; Feijten and Mulder 2002; Helderman, Mulder, and van Ham 2004; Kulu 2008; Michielin and Mulder 2008; Mulder and Lauster 2010). Marriage and childbearing are also associated with an increased likelihood of moving to homeownership (Davies Withers 1998; Enström Öst 2012; Ermisch and Halpin 2004; Feijten and Mulder 2002; Kulu 2008; Michielin and Mulder 2008; Mulder and Wagner 1998, 2001).

Once individuals achieve homeownership or their desired housing size and quality, they are unlikely to leave it unless unexpected circumstances intervene (Feijten 2005; Feijten and van Ham 2007). Union dissolution is an example of such circumstances. Separation implies that at least one of the partners has to move out of the joint home. Therefore, moves after separation are usually urgent and financially restricted (Feijten and van Ham 2007), implying that upon separation individuals may have to move to sub-optimal dwellings which are small, cheap, and/or of low quality (Feijten and Mulder 2010). Thus, separation leads to ‘downward’ moves on the housing ladder, is likely to disrupt individuals’ housing career, and might have long-lasting negative consequences for separated individuals’ housing conditions and well-being (Dewilde and Stier 2014; Feijten and van Ham 2007; Wind and Dewilde 2018).

The tenure type of the dwelling that individuals move to upon and following separation is a crucial indicator of separated individuals’ socioeconomic status and well-being. Upon separation, individuals may move to private renting, social renting, homeownership, or move in with family or friends. Moving to a privately rented property is a likely outcome for separated individuals, whether they were homeowners or private renters prior to separation (Dewilde 2008; Ermisch and Di Salvo 1996; Feijten 2005; Lersch and Vidal 2014). Those who were homeowners and could not stay in their pre-separation home are likely to move to privately rented dwellings, especially if they cannot afford to buy a new property following separation. Those who were already living in a privately rented dwelling at the time of separation may need to move

to another more affordable rental dwelling. These decisions may be linked to whether the ex-partner stays in the pre-separation home and/or whether individuals can afford to stay in the pre-separation home. Additionally, moving to a socially rented dwelling may be an option for those who cannot afford to buy a property or rent at market price. People who lived in privately or socially rented accommodation at the time of separation are more flexible than those who are tied to a dwelling via homeownership (Mikolai and Kulu 2018a). Depending on the urgency of the move and the financial circumstances surrounding separation, separated ex-partners may temporarily move in with family members or friends. Finally, separated individuals who have sufficient resources may become homeowners.

The housing situation of separated individuals shortly after separation is likely to be temporary, and it may take several adjustment moves to find appropriate accommodation (Feijten and van Ham 2007; Warner and Sharp 2016). Therefore, many separated individuals may have to move several times. Additionally, separated individuals who stay in the joint home after separation may have to move out later if they cannot maintain the home alone (Feijten and Mulder 2010) or if the ex-couple decides to sell their joint home (Feijten and Mulder 2005). Therefore, tenure type shortly after separation might not be crucial if this potentially sub-optimal situation is only short-lived and individuals recover their position on the housing ladder sometime following separation. However, residing in a temporary or sub-optimal dwelling and/or staying highly mobile for a long period is likely to have deleterious consequences for individuals' lives. Taken together, it is expected that separated individuals' post-separation housing trajectories will be characterised by several residential moves and tenure changes. However, it is unclear how many changes will occur in the housing trajectories of separated people.

Previous studies on post-separation tenure change have focused on moves out of homeownership and find that separation leads to a significant increase in the likelihood of moving from owner-occupied to rental dwellings (Dewilde 2008; Ermisch and Di Salvo 1996; Feijten 2005; Lersch and Vidal 2014). Additionally, some studies have shown that separated individuals are less likely to move to homeownership than those who are in a relationship (Feijten and van Ham 2010; Lersch and Vidal 2014; Thomas and Mulder 2016). Moreover, Lersch and Vidal (2014) find that separated individuals in Britain maintain relatively high levels of homeownership after separation, whereas ownership rates fall significantly in Germany, which the authors attribute to differences in housing markets. These studies only analyze those who are homeowners at the time of separation and most of them focus on the destination tenure following a first move. A recent study by Mikolai and Kulu (2018a) analyzes the destination of moves among separated individuals in England and Wales and finds that a move to private renting is the most common outcome after separation. Additionally, they show that the risk of a

residential move remains high among separated individuals even three or more years after separation. However, no study has examined the housing tenure trajectories of separated individuals.

2.2 The role of individual characteristics

Whether and where individuals move to at the time of separation is likely to be related to their socioeconomic and demographic characteristics, whether they have children, and the characteristics of the pre-separation relationship.

Upon separation, one or both ex-partners have to move out of their pre-separation home. The decision of who moves out is based on balancing and bargaining between the ex-partners (Mulder and Wagner 2010; Mulder and Malmberg 2011; Theunis, Eeckhaut, and van Bavel 2018). The ex-partner for whom the cost of moving is lower than the cost of staying will move out at the time of separation. If the cost of moving is higher than the cost of staying for both partners, then a negotiating process needs to take place, which is based on the ex-partners' relative resources (i.e., income and education), their personality traits, and, if the ex-couple has joint children, who has custody of the children. Those with greater relative resources, higher levels of self-determination, and who have custody of the child/children are more likely to stay in the joint home than their ex-partner. Those who have more resources are more likely to stay in the joint home because they can afford the costs alone. At the same time, those who initiated the separation and who separate because of starting a new relationship are more likely to move out upon separation (Fiori 2019; Mulder and Wagner 2010; Mulder and Malmberg 2011). Separated individuals' educational level (a proxy for their socioeconomic status) is not only important for their propensity to move at the time of separation but is also likely to be an important predictor of their post-separation housing tenure. Low-educated separated individuals are likely to have fewer socioeconomic resources than those who are highly educated. At the same time, buying a home requires more resources than moving to private renting, which, in turn, requires more resources than moving to social renting. Moving in with family and friends requires the smallest amount of resources.

Additionally, the residential and housing consequences of separation are likely to be different for men and women. Women's relative lack of economic independence (they are more likely to work part-time, not to work, or to have a lower-paid job) and the fact that dependent children often live with their mother after separation (Feijten and Mulder 2010) mean that the housing consequences of separation are likely to be more severe for women than for men. After divorce, women are often worse off financially than men (Manting and Bouman 2006; Poortman 2000). The gender

differences in economic well-being after separation from cohabitation are smaller than after separation from marriage (Manting and Bouman 2006). Nonetheless, women are likely to be disadvantaged compared to men regarding their post-separation residential and housing experiences. Indeed, Feijten (2005) shows that in the Netherlands women are more likely to move out of owner occupation than men. Dewilde (2008) observes relatively similar patterns across twelve European countries, although separated men and women who live in a country with strong extended family support and/or social housing policies are less likely to leave owner occupation than those who live in a country with limited family support and housing policies. A recent study by Mikolai and Kulu (2018a) finds that separated men and women in England and Wales are most likely to move to private renting, but women are also likely to move to social renting whereas men are also likely to move to homeownership. This indicates that there are gender differences in separated individuals' propensity to move to different housing tenure types upon and following separation.

Furthermore, whether separated couples have joint children plays an important role in their post-separation situation. Having joint children may influence the distance of moves (Thomas, Mulder, and Cooke 2018) and for the residential parent it increases living costs relative to their household income (Manting and Bouman 2006). Indeed, studies have shown that the presence of children influences individuals' probability to move out of the joint home at the time of separation. For example, research in several countries has shown that ex-partners who do not have joint children are equally likely to move out of the joint home, whereas among those who have a child/children, fathers are more likely to move out than mothers (Feijten and Mulder 2010; Fiori 2019; Thomas, Mulder, and Cooke 2017). A recent French study finds that although sole custody of children is associated with fewer moves after separation, joint custody implies elevated residential mobility for mothers (Ferrari, Bonnet, and Solaz 2019). There are fewer studies regarding the role of children for post-separation housing tenure. Nonetheless, based on the above it is likely that the separated parent who keeps the children will stay in the pre-separation home, which, in the British context, is likely to be owned by the ex-couple.

The dissolution of a marriage may have a different impact on the ex-partners' post-separation housing than the dissolution of a cohabitation. Cohabiting couples are less likely than married couples to own a home together or to have invested in their housing (Feijten and van Ham 2010). This suggests that there is less to lose when cohabiters split up, compared to the impact of the dissolution of a marriage. Although only a handful of studies have compared the housing consequences of separation for married versus cohabiting individuals, they have shown that those who split up from cohabitation tend to move to privately rented and 'other' types of dwelling (e.g.,

sharing with family or friends), whereas those who separate from marriage are most likely to move to homeownership.

The role of these demographic and socioeconomic characteristics might be crucial not only immediately after separation but also later on for separated individuals' housing trajectories. However, previous studies have typically focused on one move following separation and/or on moving out of homeownership. They do not investigate how separated individuals' housing trajectories evolve and whether and how these trajectories vary by individuals' demographic and socioeconomic characteristics. It is likely that separated individuals who have more resources will move to better housing and will do so sooner than those who have fewer resources, who will be more likely to either remain in lower quality housing for longer or to never recover their position on the housing ladder. Therefore, it is expected that separated individuals with low levels of education, women, and those who are responsible for children will be more likely to experience housing trajectories that include spells of social renting. By contrast, those who have higher levels of education, men, and those who are not responsible for children will tend to have housing trajectories that are dominated by spells of homeownership and/or private renting. It is less clear whether separating from cohabitation versus marriage makes a difference to individuals' housing experiences in the long run.

3. The British context

Britain has experienced vast changes in partnerships in the past five to six decades, similarly to other industrialised countries. The proportion of first unions that start as cohabitation (as opposed to direct marriage) has increased considerably (Beaujouan and Ní Bhrolcháin 2011), likely contributing to an increase in the number of unions that end in separation (Feijten and van Ham 2010). Two-thirds of cohabiting couples marry and about a third end their relationship within ten years (Ermisch and Francesconi 2000; Hannemann and Kulu 2015). At the same time, the number of divorces increased from 24,000 to 110,000 between 1960 and 2014 in England and Wales (Office for National Statistics 2016), and from approximately 1,830 to 9,030 in Scotland (National Records of Scotland 2013; Scottish Government 2016a).

The British housing market belongs to the 'career homeownership regime' (Mulder and Billari 2010) with widespread and relatively easily accessible mortgages, which represent a major source of financing homeownership. In Britain, homeownership is a desirable goal, especially for families, whereas renting is an acceptable alternative mainly for singles and childless couples. Recent evidence shows that due to the difficulties associated with becoming a homeowner among younger

cohorts, private renting is becoming an acceptable setting for childbearing (Tocchioni et al. 2018). The British rental market is ‘dualist’ (Kemeny 2001), meaning that some of the rental dwellings are privately owned and some are publicly owned. Publicly owned accommodation, commonly referred to as social housing, is typically provided by local authorities or housing associations at a subsidized rate and is only available to those in need (Norris and Shiels 2017). Private renting is available for anyone at a market price, contracts are usually of short duration (6–12 months), and the sector is unregulated and unsupported by government (Norris and Shiels 2017; Thomas and Mulder 2016). Thus, in Britain, homeownership represents tenure security and housing quality (Thomas and Mulder 2016).

Owner-occupied dwellings dominate the British housing market. Between the 1980s and early 2000s homeownership rates gradually increased, followed by a small and gradual decline. In 2011 around 60% of the dwelling stock was owner-occupied (Office for National Statistics 2014; Scottish Government 2016b). Privately rented dwellings constituted approximately 10% of the dwelling stock throughout the 1980s and 1990s, followed by a sharp growth (e.g., due to the introduction of ‘assured shorthold’ tenancies and ‘buy-to-let’ mortgages). By 2011, 16% of the dwelling stock was privately rented in England and Wales (Office for National Statistics 2014) and 12% in Scotland (Scottish Government 2016b). The share of socially rented dwellings peaked in the early 1980s (31% in 1980 in England and Wales and over 50% in Scotland) and has declined significantly thereafter. This is primarily due to the introduction of the Right to Buy program, which enabled many tenants in social housing to purchase their homes at a discounted price (Department for Communities and Local Government 2015). Due to this scheme and low build rates, the stock of social housing continuously decreased between 1991 and 2011 (Department for Communities and Local Government 2015). Social housing has been increasingly provided by housing associations. In 2011 the proportion of socially rented dwellings was 17% (56% provided by housing associations) in England and Wales (Office for National Statistics 2014) and 24% (46% provided by housing associations) in Scotland (Scottish Government 2016b).

4. Data and methods

We used data from 18 waves (1991–2008) of the British Household Panel Survey (BHPS), a nationally representative survey of approximately 5,000 households (Institute for Social and Economic Research 2010). We used information on original sample members and two additional sub-samples (the European Community Household Panel and the Wales Extension Sample) from England, Wales, and Scotland. Our

sample consisted of individuals who experienced at least one separation after the start of the survey (601 men and 852 women). Although the BHPS includes retrospective information on individuals' partnership experiences, such data is not available on individuals' housing tenure prior to the survey. This means that we can only study the housing consequences of separations that took place after the start of the survey.

We applied sequence analysis to study individuals' housing careers following separation. Sequence analysis requires individuals to have complete information for the entire observation window (i.e., balanced data). Therefore, we decided to follow men and women for five years after separation. This observation window was chosen to maximise the number of individuals in our sample and to follow them for a sufficient length of time to understand how their housing trajectories evolved following separation. We carried out additional robustness checks (see section 8) to ensure that the analytical sample was not selective and that we could draw valid conclusions about the housing experiences of all separated individuals in Britain. After excluding individuals who had missing values on any of the covariates included in the analysis and those who did not have complete information on housing tenure for the five-year observation window, the analytical sample consisted of 224 men and 381 women (605 individuals in total).

In sequence analysis, each individual's life course is represented by a sequence of states. To define these states, we combined information on individuals' housing tenure (homeownership, social renting, and private renting), the order of move (no move and one or more moves),⁴ and whether individuals were household heads or not (in the case of homeownership). Respondents were asked at each interview whether they had experienced a change of residence since the previous interview, and if they had the year and month of this change was recorded. This means that if more than one move occurred between two waves, only the most recent was recorded. Although this may lead to an underestimation of mobility rates, the estimated rates in our data are comparable to what we know from previous studies (Champion and Shuttleworth 2017a, 2017b). Tenure type is recorded in the household questionnaire at each survey wave. However, respondents were not asked to report the year and month of a tenure change. Therefore, we assumed that a tenure change happened at the same time as a move if they both occurred between two interviews. If there was a tenure change but no residential move, we assumed that tenure change took place six months before the interview. In the BHPS, housing tenure is measured at the household level. This implies that individuals appear to become homeowners when they return to their parents' home or move to friends' place following separation, but in reality the parents/friends are the homeowners and not the respondent. Mikolai and Kulu (2018a) have shown that this

⁴ We experimented with different cut-off points for higher order moves and found that the result of the cluster analysis was very similar to that presented in the paper.

distinction is important. Therefore, in this paper we distinguish between homeowners who are head of the household and those who live in an owner-occupied dwelling where someone else is the household head. Note that we do not make this distinction for social renters and private renters. Thus, individuals can move between eight possible states.

Due to the large number of possible combinations of states, few individuals experience the exact same sequence of states, implying that many different sequences are present in the dataset. To reduce the number of sequences in the data we used Optimal Matching (OM). OM measures the distance between pairs of sequences by identifying how similar they are in terms of the number, order, and duration of states. The dissimilarity between two sequences is calculated by taking into account three possible operations: replacement (one state is replaced by another), insertion (an additional state is added to the sequence), and deletion (a state is deleted from the sequence). Furthermore, a certain cost is attached to each operation. The distance between two sequences is defined by the minimum cost of the operations (replacement, insertion, or deletion) that is required for two sequences to become identical (Abbott 1995; Abbott and Tsay 2000; Barban and Billari 2012; Billari 2001b; Mikolai and Lyons-Amos 2017). The distances are stored in a dissimilarity matrix. In our analyses we assigned the cost of 1 for substitutions and 1.5 for insertions and deletions.

To determine existing patterns in the data, we conducted hierarchical cluster analysis on the dissimilarity matrix. The aim of the cluster analysis is to minimize the within-cluster and maximize the between-cluster distances. We assessed the optimal number of clusters using two measures of average cluster linkage: the Calinski–Harabasz and the Duda–Hart indices (see Appendix Table A-1). These fit statistics determine the optimal number of clusters by comparing the ratio of the within-cluster distances to the between-cluster distances. In the case of the Calinski–Harabasz and Duda–Hart indices, higher values indicate more distinct groups, whereas for the related Duda–Hart Pseudo T-square measure, lower values are indicative of more distinct clusters.

Finally, we used the clusters as the categorical dependent variable in a multinomial logistic regression to understand how certain individual characteristics influence the probability of separated individuals to belong to the identified clusters. The sequence analysis, OM, and cluster analysis were performed using the SADI package in STATA (Halpin 2017), which relies on the SQ package (Brzinsky-Fay, Kohler, and Luniak 2006) to calculate the descriptive statistics and prepare graphs.

The choice of the distance measure and the definition of the costs attached to different operations can be arbitrary (Wu 2000). OM is the most commonly used data reduction technique in sequence analysis in the social sciences, but several other methods are available for calculating distances between sequences (Studer and

Ritschard 2016). Some of these methods place more emphasis on the duration of states, on the timing of different transitions, or on the length of sub-sequences. We decided to use OM because we do not have specific expectations about the relative importance of timing, sequencing, or duration of the studied states. Setting the costs of insertion, deletion, and substitution is also subject to the researcher's decision. This may have consequences for the results. Substitution operations conserve the timing of events but alter the events themselves, whereas insertion and deletion (indel) operations distort time but preserve events (Lesnard 2010). In our analysis we assigned the cost of 1 for substitutions and 1.5 for insertions and deletions, because in our application the timing and order of events are equally important. We assessed the sensitivity of our results to these decisions by replicating the analysis using different distance measures and cost regimes (see section 8). We found that the choice of the distance measure and cost regime does not influence the main findings and conclusions of this study.

5. Challenges of applying sequence analysis to panel data

Many applications of sequence analysis in demography use retrospective life histories with age as the duration variable. Although age may be seen as the natural 'clock' when studying most demographic processes, it may not always be the best choice. For some life events, e.g., divorce and separation, it may be more natural to use time since the event rather than an individual's age (unless full partnership histories are studied). Individuals experience separations at different ages. If the aim is to observe their life histories after the event of separation then the duration variable should be time since separation. Applications of sequence analysis using prospective panel data have used time since panel wave (Martin, Schoon, and Ross 2008; Pollock 2007; Spallek, Haynes, and Jones 2014). This approach provides reliable information on the state spaces and sequences experienced by the study population, particularly if other duration variables (age and time since event) are included as covariates later in the (multivariate) analysis. However, it suffers from shortcomings when describing and visualising patterns observed in the data. We thus propose using time since separation as the 'clock' for studying sequences of separated individuals. Time since separation has been used before as an important dimension in studies using event history analysis to understand whether and how the impact of separation on individuals' housing changes over time (e.g., Feijten 2005; Mikolai and Kulu 2018b, 2018a). However, to the best of our knowledge, this is the first study to use time since separation as a clock for studying housing trajectories of separated individuals using sequence analysis.

Sequence analysis requires balanced data, i.e., all individuals must have records for the entire observation window. Using retrospective data to study individuals' life

courses would be ideal because such data is immune to attrition (although the sample may be a select group of the initial population). Individuals would be followed during a certain age range (e.g., age 15 to age 40) and we would observe the transitions they experience as they become older. Previous studies have used sequence analysis on retrospective data to study, for example, the transition to adulthood, partnership transitions, and family formation (e.g., Aassve, Billari, and Piccarreta 2007; Billari 2001a; Billari and Piccarreta 2005; Bonetti, Piccarreta, and Salford 2013; Liefbroer and Elzinga 2012; McVicar and Anyadike-Danes 2002; Mikolai and Lyons-Amos 2017; Robette 2010; Widmer and Ritschard 2009).

There are a number of challenges related to applying sequence analysis to prospective panel studies: The length of individual life histories vary significantly, people enter and leave the study at different ages, and attrition is common. The issue of different entry ages can be easily overcome if time since event (e.g., separation) is used as the duration variable and only separations that occurred during a certain period (panel waves) are included. However, attrition remains an issue. If individuals who drop out of the study are different from those who stay, the sample will not be representative of the population. The sample of those who stay can be compared with those who leave the study to understand whether this is the case. Alternatively, the observation window can be shortened to reduce sample loss due to attrition, especially when this does not alter the substantive outcomes of the analysis and when there are few events at longer durations.

In this study we investigate the housing trajectories of separated individuals using time since separation as the ‘clock.’ We faced the problem of attrition (separated people dropped out of the study). To meet the requirement of balanced data, we dropped individuals who formed a new union⁵ or who were lost to follow up during the five-year observation window. However, we then conducted a series of analyses to investigate how sensitive the results are to different data specifications. We first compared those who left the study with those who stayed; we then conducted the analysis using different lengths of the observation window (five, three, and one year since separation). We also assessed whether or not using different distance measures and cost regimes in the sequence analysis influenced our findings. The results of these sensitivity analyses are shown in section 8.

⁵ Only 91 individuals were removed from the analysis because they experienced repartnering.

6. Variables

We included a number of independent variables in the multinomial logistic regression to understand how individual characteristics predict cluster membership of separated individuals. It is not possible to include time-varying covariates in sequence analysis (Mikolai and Lyons-Amos 2017); therefore, all covariates were measured at the time of separation.

Table 1: Descriptive statistics by sex

	Men	Women	Total
Education			
Low	118	245	363
Medium	58	76	134
High	48	60	108
Age at separation			
16–24	32	59	91
25–34	114	182	296
35+	78	140	218
Union type			
Marriage	116	196	312
Cohabitation	108	185	293
Children			
No children	103	131	234
At least one child	121	250	371
Total	224	384	605

Source: Authors' calculations based on data from the British Household Panel Survey, 1991–2008.

Educational level was measured as low (O level, CSE, none), medium (A level), and high (university degree or teaching qualification). Age at separation was grouped as 16–24, 25–34, and 35+. We also included information on the type of union at separation (cohabitation or marriage) and whether an individual had a child/children at the time of separation. Lastly, we included sex (men and women) in the regression.⁶ Table 1 describes the analytical sample by the categories of the independent variables.

⁶ We also tested whether the year of separation and the type of area where people lived at the time of separation influenced the probability to belong to the different clusters. However, as these factors did not have a significant influence on the outcome variable, we removed them from the analysis in the interest of parsimony. The inclusion of these variables only slightly alters the effect sizes and significance of some of the other independent variables included in the model.

7. Results

7.1 Examining the sequences

Figures 1a and 1b show, respectively, sequence index plots and chronograms of separated individuals' housing tenure over time since separation. As explained earlier, we combined information on individuals' housing tenure, whether they had moved since separation, and, in the case of homeowners, whether or not they were household heads. In sequence index plots, each line represents the sequence of states an individual occupies over time since separation. Chronograms (also called transversal state distribution) show the distribution of states over time. Different colors depict different states. For example, homeownership where a separated individual is the household head (HH) is marked by dark navy blue for those separated individuals who have not (yet) experienced a move and by lighter navy blue for those who have experienced at least one move. We apply the same logic for those who live in an owner-occupied dwelling but are not household heads (NHH) themselves (dark and light blue), and who live in social housing (dark and light green) or private rentals (dark and light orange).

First, we found some stability in the residential experiences of separated individuals. During the observation window, around 42% of separated women and men remained in the same tenure or moved to a new dwelling of the same tenure type as the previous dwelling. Additionally, five years following separation, about 31% of separated individuals (26% of men and 34% of women) had not experienced a move or a tenure change. Around 25% of separated individuals who moved at least once moved within the same tenure type.

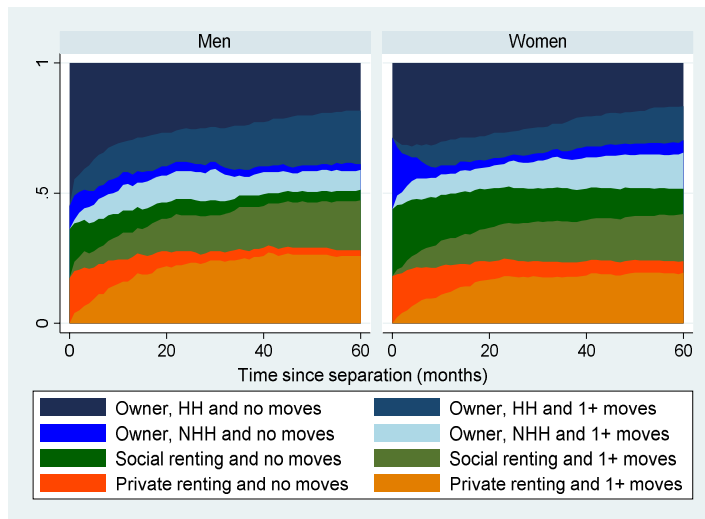
The chronogram in Figure 1b shows that five years following separation, about 40% of separated men were homeowners, 10% lived in a dwelling owned by someone else (e.g., friends or family), about 30% lived in a privately rented dwelling, and the remaining 15% lived in a socially rented dwelling. The proportion of separated women who were homeowners five years after separation is smaller (around 30%) compared to men, whereas a larger share (20%) of separated women lived in dwellings where someone else was head of household. Additionally, more separated women than men remained in and moved to social renting, and a smaller proportion of women than men lived in privately rented accommodation. Men tended to experience moves and tenure changes sooner after separation than women, whereas women either remained in the joint home or moved later. This pattern is in line with the idea that men are more likely to move out of the joint home and women are more likely to stay, especially if they have children (Thomas, Mulder, and Cooke 2017).

Figure 1a: Sequence index plots of tenure type over time since separation, by sex



Source: Authors' calculations based on data from the British Household Panel Survey, 1991–2008.
 Note: HH—head of household, NHH—not head of household.

Figure 1b: Chronograms of tenure type over time since separation, by sex



Source: Authors' calculations based on data from the British Household Panel Survey, 1991–2008.
 Note: HH—head of household, NHH—not head of household.

7.2 Grouping the tenure sequences

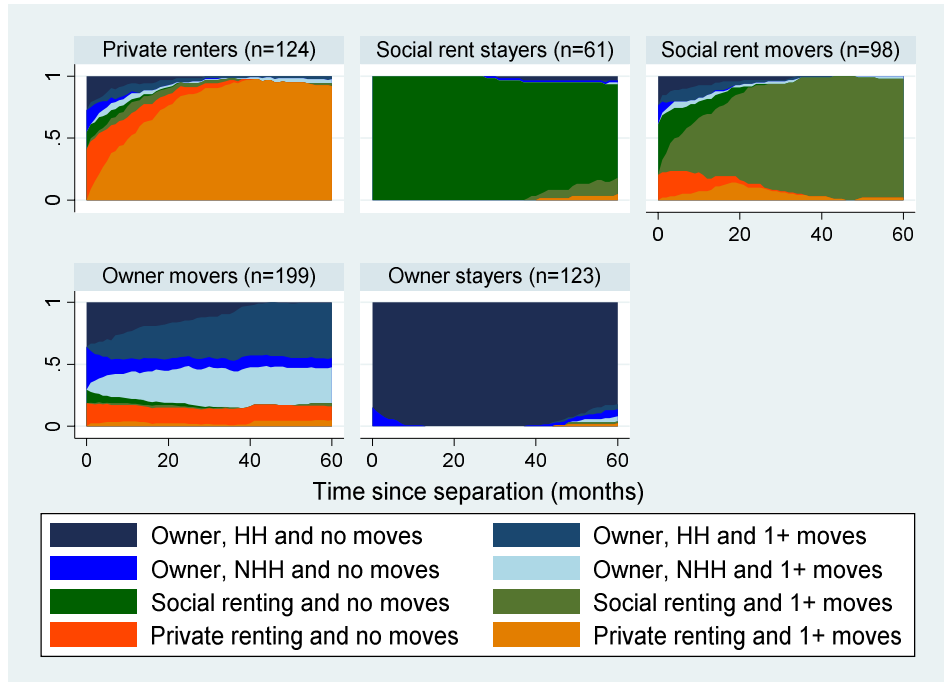
Next, we conducted cluster analysis to understand whether there are distinct groups of separated men and women with respect to their housing tenure trajectories. Figure 2 shows a five-cluster solution for separated individuals' housing tenure trajectories. The Duda–Hart indices suggest that a four-cluster solution is optimal, whereas the Calinski–Harabasz pseudo T-square suggests a three-cluster solution (see Appendix Table A-1). However, the four-cluster solution includes a cluster that is heterogeneous and hard to interpret from a substantive point of view. Therefore, we decided to choose a five-cluster solution because this was much more straightforward to interpret.⁷ We present the result of cluster analysis for the entire sample (i.e., men and women together) to increase the sample size and to study gender differences in the probability of experiencing different types of housing tenure trajectories following separation. Additional analysis (not shown) showed that the emerging clusters are very similar for men and women.

The first cluster ('private renters') is dominated by separated individuals who lived in a privately rented dwelling five years after separation. Most of them were private renters at the time of separation, some of whom stayed in the jointly rented home, while most of them moved to another privately rented dwelling. Additionally, about 50% of individuals in this group were homeowners or social renters at the time of separation. The second cluster ('social rent stayers') consists of separated people who lived in a socially rented dwelling at the time of separation, most of whom remained in this dwelling over the observation period. After about three years some individuals moved to another socially rented dwelling, while a smaller proportion moved to homeownership or private renting. The third cluster ('social rent movers') is characterised by separated people who moved to social renting. Most people in this group lived in a socially rented dwelling at the time of separation, but about 20% of them were private renters or homeowners. Separated individuals in the fourth cluster ('owner movers') moved to homeownership following separation. Around 50% of them became homeowners themselves, while the other half lived in a household where someone else was the homeowner. Note that for some individuals in this cluster, homeownership was reached via several moves. Last, the fifth cluster ('owner stayers') is dominated by separated people who were homeowners at the time of separation and who remained homeowners during the entire observation period. This group also

⁷ The four-cluster solution included the following clusters: private rent movers (n = 124); a heterogeneous cluster including social rent stayers, owner movers, and some other groups (n = 260); private rent movers (n = 98); and owner stayers (n = 123). In the five-cluster solution the heterogeneous cluster splits into social rent stayers and owner movers, which are substantively different and relevant groups.

includes individuals who moved to a new owned dwelling, to someone else's household, or to private renting (in total about 20% of individuals).

Figure 2: Results of cluster analysis of tenure type over time since separation



Source: Authors' calculations based on data from the British Household Panel Survey, 1991–2008.
 Note: HH—head of household, NHH—not head of household.

7.3 Determinants of group membership

To understand how individual characteristics influence cluster membership we used the outcome of the cluster analysis as the categorical dependent variable in a multinomial logistic regression. Table 2 shows the odds ratios of separated individuals to belong to the clusters of 'private renters,' 'social rent stayers,' 'social rent movers,' or 'owner movers,' compared to the 'owner stayers' cluster. Separated individuals in the 'private renters' cluster were generally younger and more likely separated from cohabitation than the 'owner stayers.' Women were more likely than men to be 'social rent stayers'

and medium- and highly educated separated individuals were less likely to belong to this cluster than to the ‘owner stayers’ cluster compared to low-educated separated individuals. Additionally, those who separated from cohabitation (compared to marriage) and those who had at least one child at the time of separation were also more likely to belong to the ‘social rent stayers’ group than to the ‘owner stayers’ cluster. Low-educated separated individuals and those who were younger at the time of separation were more likely to belong to the ‘social rent movers’ cluster than those who were medium educated and older. Additionally, this cluster is characterised by individuals who were cohabiting at the time of separation. We find no significant differences between ‘owner stayers’ and ‘owner movers’ by sex, education, or age at separation, but individuals who had at least one child at the time of separation were more likely to be ‘owner stayers’ than to move to an owner-occupied dwelling.

Table 2: Results of multinomial logistic regression, odds ratios. Base outcome: owner stayers (N = 605)

	Private renters	Social rent stayers	Social rent movers	Owner movers
Constant	3.41	0.27	2.69	4.15
Sex				
Women (ref)	1	1	1	1
Men	1.29	0.45 *	1.26	0.90
Education				
Low (ref)	1	1	1	1
Medium	0.78	0.39 *	0.48 *	0.98
High	1.25	0.27 *	0.53	0.83
Age at separation				
16–24 (ref)	1	1	1	1
25–34	0.22 **	0.77	0.19 **	0.51
35+	0.12 **	0.64	0.07 ***	0.36
Union type				
Marriage (ref)	1	1	1	1
Cohabitation	2.33 **	4.42 ***	2.81 **	2.05 *
Children				
No children (ref)	1	1	1	1
At least one child	0.93	3.22 *	1.68	0.57

LR $\chi^2(28) = 140.01$
 Prob > $\chi^2 = 0.0000$
 Pseudo $R^2 = 0.08$
 Log likelihood = -862.09

Source: Authors' calculations based on data from the British Household Panel Survey, 1991–2008.

Note: * $p < .05$; ** $p < .01$; *** $p < .001$.

8. Sensitivity analyses

We conducted sensitivity analyses to assess the robustness of our findings. First, we studied whether and how the decision to drop individuals from the analysis to meet the requirement of balanced data influenced the results. Second, we conducted the analyses varying the length of the observation window (five, three, and one year). Lastly, we tested whether using different distance measures and cost specifications influenced the main findings.

8.1 Attrition and repartnering

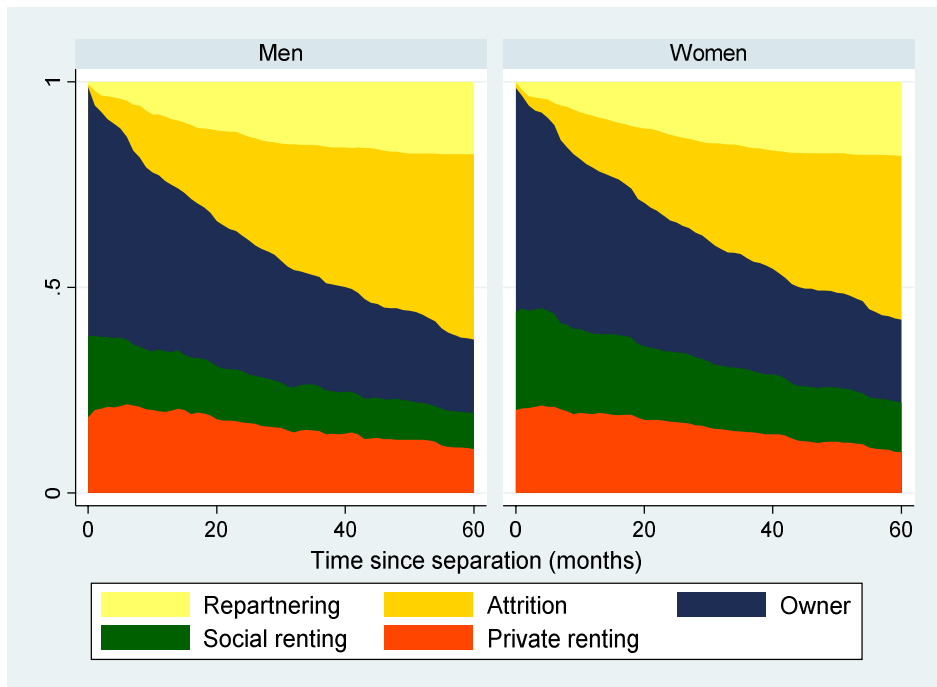
We investigated how the decision to drop individuals who repartnered during the five-year observation window and those who did not have information for the entire observation window influenced the composition of our analytical sample. Selecting separated individuals who had information for the entire five-year observation window resulted in a reduced sample size (from 852 to 381 for women and from 601 to 224 for men). Figure 3 shows the proportion of separated men and women who were in one of the following states over time since separation: homeownership (including both household heads and those who were not household heads), private renting, social renting, repartnering, and attrition. Most separated individuals who were removed from the analytical sample were deleted because of attrition and considerably fewer were deleted because they experienced repartnering during the five-year observation window.

Deleting individuals from the sample due to attrition assumes that attrition is random. To check this assumption we estimated a regression model (not shown) to predict the likelihood of dropping out of the sample during the five-year follow-up period. We found no significant differences between those who dropped out of the sample and those who remained, based on their age, level of education, and area type. During the five-year follow-up, those who separated between 1991 and 1994 were more likely to drop out of the sample than those who separated later. Nonetheless, we conclude that there are only small differences by observed characteristics between separated individuals who were deleted from the sample and who remained in the survey during the first five years following separation.

Additionally, we estimated a multinomial logistic regression model (not shown) to predict the likelihood of dropping out of the sample because of repartnering or due to attrition, compared to remaining in the sample for the entire five-year observation window. Again, we did not find large differences, but those who were 35 years old or more at the time of separation and who separated after 2000 were less likely to be

deleted due to repartnering than due to attrition, compared to those who were 16–24 years old and who separated between 1991 and 1994. To summarize, we conclude that using a limited sample to conduct sequence analysis of tenure change among separated men and women in Britain is unlikely to lead to serious bias in the results.

Figure 3: Chronograms including repartnering and attrition, by sex

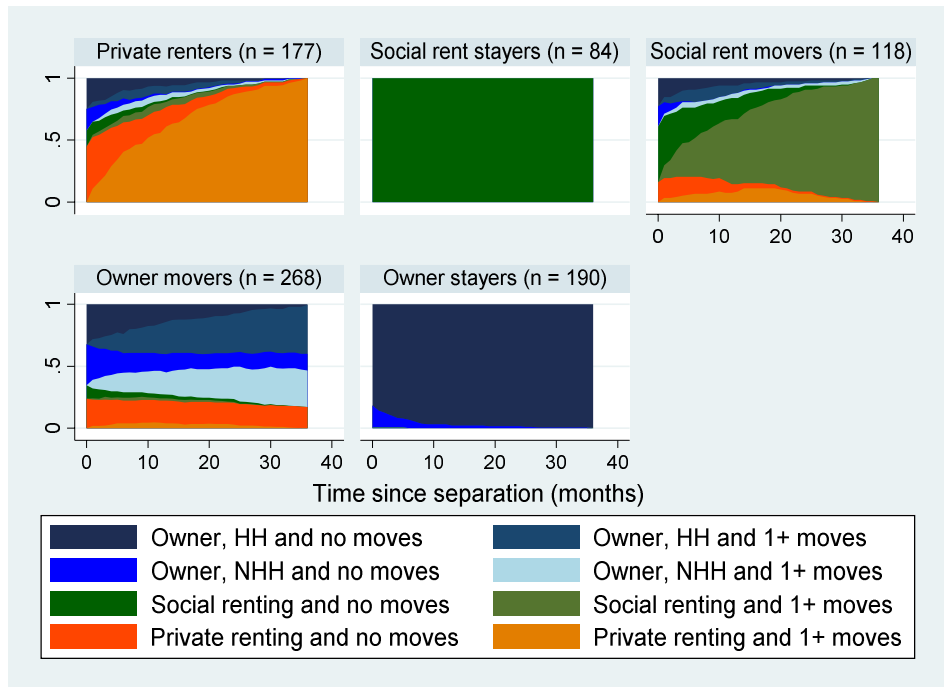


Source: Authors' calculations based on data from the British Household Panel Survey, 1991–2008.

8.2 Length of observation window

We carried out additional robustness checks to assess whether and how using a five-year observation window influenced the results. To do so, we experimented with using three-year and one-year observation windows. Table A-2 in the Appendix shows the number of individuals included in the analysis by length of observation window (five, three, and one year). We see that the shorter the observation window, the more individuals remained in the sample, which is not surprising.

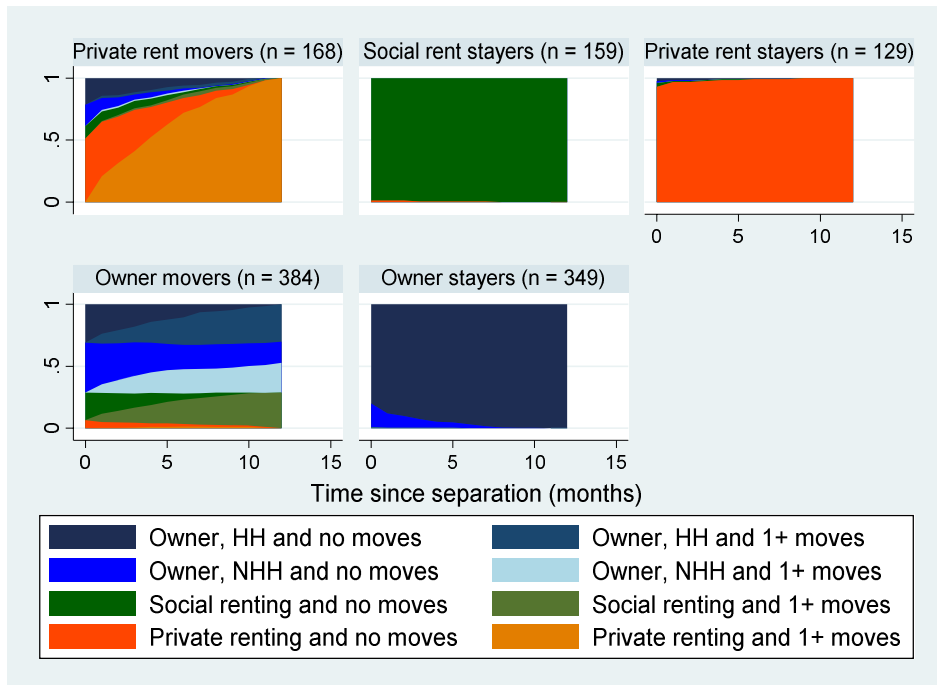
Figure 4: Results of cluster analysis using a three-year observation window following separation



Source: Authors' calculations based on data from the British Household Panel Survey, 1991–2008.
 Note: HH–head of household, NHH–not head of household.

We also conducted cluster analyses using the samples that follow individuals up to three years and one year after separation (Figures 4 and 5, respectively). Although shorter observation windows lead to larger cluster sizes, the results of the cluster analyses are very similar to the results of the cluster analyses using a five-year observation window (cf. Figure 2). The main difference is that when using a one-year observation window, the ‘owner movers’ cluster also includes those who are classified as ‘social rent movers’ when we use a three- or five-year observation window. Additionally, a separate cluster emerges for those who stay in private renting. This is because many individuals who remained in private renting up to one year after separation experienced a move later, which is not captured when observing people for such a short duration.

Figure 5: Results of cluster analysis using a one-year observation window following separation



Source: Authors' calculations based on data from the British Household Panel Survey, 1991–2008.

Note: HH—head of household, NHH—not head of household.

8.3 Using different distance measures and insertion/deletion costs

We assessed the sensitivity of our results to the decision to use OM to calculate pairwise distances between sequences. We replicated the analyses using several other distance measures, including time-warp edit distance, Hollister's localized optimal matching, Hamming distance, and dynamic Hamming distance. For a detailed description of these methods, see Halpin (2012, 2014, 2017). Using these distance measures led to almost identical clusters to those presented in the paper and the conclusions from the Calinski–Harabasz and Duda–Hart indices remained consistent with those shown in the paper.

We also tested the sensitivity of the results to our choice of substitution, insertion, and deletion costs. We used a number of combinations of substitution and indel costs.

For substitution costs we used 1, a data-driven substitution matrix,⁸ and a theoretically defined substitution matrix.⁹ For insertion/deletion costs we specified 1, 1.5, and 2. These analyses came up with almost identical cluster solutions to those presented in the paper, except for when we used a theoretically defined and a data-driven substitution matrix. In these cases, the main difference was that the ‘social rent stayers’ were included in the same cluster as ‘owner stayers’, and those who moved to homeownership where someone else was the household head emerged as a separate cluster. However, these clusters were small, heterogeneous, and more difficult to interpret than the clusters we present in the results section. Although many more combinations could be experimented with, based on these additional analyses we conclude that our clusters are largely stable and robust to different specifications.

9. Conclusion and discussion

This study investigated the housing consequences of separation and divorce in Britain. We extended previous research in the following ways. First, we studied housing trajectories (rather than simply housing transitions) of separated individuals. Second, we used time since separation (rather than an individual’s age or panel wave) as the ‘clock’ to study separated individuals’ housing trajectories. Third, we investigated the socioeconomic gradient in post-separation housing trajectories. Finally, we showed how to address important issues related to the application of sequence analysis to panel data (e.g., unbalanced data).

We expected that separated individuals’ post-separation housing trajectories would be characterised by several residential moves and tenure changes. Although many separated individuals experienced several residential moves, our analysis showed remarkable continuity in housing tenure among separated individuals: Many individuals stayed in the same dwelling or moved to a new dwelling with the same tenure type as before separation. However, homeownership levels still declined substantially after separation, and remained low. Five years after separation about 40% of men and 30% of women were homeowners. Furthermore, even five years after separation a substantial proportion of separated individuals (10% of men and 20% of women) were staying with friends or relatives.

⁸ The data-driven substitution matrix is based on the transition probabilities between the states as observed in the data.

⁹ The theoretically defined substitution matrix was based on the idea of ranking the desirability of each tenure type (homeownership HH, private renting, social renting, homeownership NHH) and how many steps they were away from each other according to this ranking. The more steps it takes to get from one housing tenure type to another, the higher the cost in the substitution matrix for that specific transition.

The results of the cluster analysis revealed five distinct housing tenure trajectories among separated individuals: homeowner stayers, homeowner movers, social rent stayers, social rent movers, and private renters. Our analyses revealed that individuals' socioeconomic and demographic characteristics play a key role in their post-separation housing trajectories. We expected that less-educated separated individuals, women, and those who live with their children would be more likely to experience housing trajectories that include spells of social renting, whereas the housing trajectories of the highly educated, men, and those not responsible for children would be dominated by spells of homeownership and/or private renting. The analysis revealed a clear educational gradient: Highly educated separated individuals were more likely to remain homeowners, whereas the less educated were more likely to stay in or move to social housing. Furthermore, we found that separated men were more likely to remain homeowners and women were more likely to remain social renters. However, we found no gender differences in the propensity to belong to the clusters of 'owner movers,' 'social rent movers,' or 'private renters'. Additionally, we found that those who lived with their children following separation were more likely to remain homeowners or move to social renting than those who did not live with their children. However, we found no difference between those who were and who were not responsible for children regarding their propensity to move to private renting. Finally, those who cohabited prior to separation were more likely to belong to any other cluster than the 'owner stayer' cluster. This indicates that those who separated from marriage were the most likely to remain homeowners following separation.

This study shows that separation has long-term consequences for individuals' housing trajectories. Although some separated individuals, especially highly educated men, were able to remain homeowners or move (back) to homeownership after separation, many moved to social housing, especially low-educated women and those with children. Social housing thus offers a shelter to the most disadvantaged population subgroups. Remarkably, even five years after separation a group of separated people were neither homeowners nor renters but lived with relatives or had other living arrangements. Our study thus indicates some polarisation among separated individuals. Some separated individuals remain homeowners, and social housing offers a safety net for others (e.g., women with children). However, some have no permanent living arrangements or stability. This is an issue that requires the attention of policymakers.

Future research should focus on the most vulnerable separated individuals and extend the analysis to further investigate patterns and trends across population subgroups (e.g., by ethnicity) and in different residential contexts (e.g., big cities versus small towns and rural areas). Comparing separated and repartnered individuals would provide further insight into the interaction between partnership and housing changes in individuals' lives. Sequence analysis combined with optimal matching and cluster

analysis is an appropriate tool to study individuals' housing trajectories following separation. However, this method has some limitations (Barban and Billari 2012; Mikolai and Lyons-Amos 2017; Wu 2000), most of which have been discussed and addressed in this paper. We conducted a range of sensitivity analyses, which showed that our results are robust to the possible shortcomings of the applied methodology.

Most importantly, this study shows that separation has long-term consequences for individuals' residential trajectories and housing conditions. In Britain, social housing traditionally offers a safety net to the most vulnerable population subgroups (e.g., low-educated women with children). However, this study also highlights that there is a group of separated individuals who are unable to afford homeownership in a country where homeownership is still the norm.

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Appendix

Table A-1: Calinski–Harabasz and Duda–Hart indices for k cluster specifications using OM

Number of clusters (k)	Calinski–Harabasz Pseudo-F	Duda–Hart index	Duda–Hart Pseudo T-square
2	370.18	0.67	231.98
3	412.99	0.79	92.81
4	366.84	0.88	36.13
5	310.53	0.64	109.73
6	345.48	0.50	92.13
7	354.41	0.86	15.76

Source: Authors' calculations based on data from the British Household Panel Survey, 1991–2008.

Note: Numbers in boldface indicate the best fit for the given index.

Table A-2: Number of individuals in the analytical sample by varying lengths of observation window, by sex

	Five years	Three years	One year
Men	224	318	469
Women	381	519	731
Total	605	837	1200

Source: Authors' calculations based on data from the British Household Panel Survey, 1991–2008.