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Partnership, fertility, and employment trajectories of immigrants in the UK: A three-channel sequence analysis

Júlia Mikolai and Hill Kulu

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Júlia Mikolai, *University of St Andrews*

Hill Kulu, *University of St Andrews*

Abstract

This study investigates how partnership, fertility, and employment changes interact in the lives of migrants. While previous studies have analysed immigrants' employment and family, most studies have examined these life domains separately. We use data from the UK Household Longitudinal Study, which contains rich retrospective histories on individuals' fertility, partnership, and employment transitions. We apply multi-channel sequence analysis to establish the main types of joint trajectories of partnership, fertility, and employment among immigrants in the UK. We find three types of joint trajectories. Immigrants in the first group ('single, childless, students') arrive as and largely remain single and childless and are either in education, or part-time employment when they arrive. The second group ('partnered, childless, full-time employed') consists of immigrants who arrived as single and childless but later became partnered and parents. They are largely in full-time employment. Finally, the third group represents family migrants; individuals in this group arrived as married and half of them also already had at least one child at the time of arrival. Five years after migration, almost all of them are married and have become parents. Individuals in this group are either employed or inactive. However, our further analysis reveals significant differences in employment patterns between migrant men and women. While most men are in education or in full-time employment after arrival in the UK, a large share of women stay inactive, especially among marriage migrants.

Keywords

Partnerships, fertility, employment, immigrants, multi-channel sequence analysis, UK

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Introduction

A huge body of literature has focused on immigrants' labour market participation and outcomes as this is one of the most important dimensions of immigrant integration. These studies have shown that immigrants are in a worse position on the labour market than natives: they have lower labour market participation rates, are less likely to be employed, more likely to be self-employed, and have lower earnings than natives in the host countries. These differences remain even when adjusting for social, economic, and compositional differences between immigrants and natives. Differences between natives and immigrants are especially large in case of non-white and non-European immigrants (Adsera & Chiswick, 2007; Blackaby, Drinkwater, Leslie, & Murphy, 1997; Borjas, 1986; Chiswick, 1980; Dustmann, Fabbri, Preston, & Wadsworth, 2003; Kogan, 2007; Rendall, Tsang, Rubin, Rabinovich, & Janta, 2010; Wheatley Price, 2001).

Although it is well known that the transition to parenthood influences individuals' – especially women's – employment trajectories (e.g., Matysiak & Vignoli, 2008), literature on immigrants' employment and labour market outcomes tend not to incorporate childbearing as a key determinant. Only a handful of studies are available on the link between childbearing and the employment of immigrants (Kil, Neels, Wood, & de Valk, 2018; Vidal-Coso, 2019) showing that immigrants', especially women's employment is affected more by childbearing than that of the natives. Additionally, recent studies have highlighted that immigrants' childbearing trajectories are also closely related to their partnership trajectories. Some groups of immigrants almost exclusively have children within marriage, whereas others have children whilst unpartnered or within cohabiting relationships (Delaporte & Kulu, 2021; Liu & Kulu, 2021; Mikolai & Kulu, 2021).

This study analyses partnership, fertility, and employment trajectories among immigrants in the first five years following their arrival in the UK. We apply multi-channel sequence analysis to high-quality longitudinal data from the UK Household Longitudinal

Study, which contains retrospective and prospective information on partnership changes, childbearing, and employment. Although multi-channel sequence analysis as a data mining technique is increasingly used in the social sciences to study the joint evolution of individual trajectories in several interrelated life domains, its application in migration studies remains limited. We focus on the UK, a country with a long immigration history. Over the last two decades, the share of foreign-born individuals has grown from 8% in 2004 to 14% in 2019 (ONS 2019). The UK has experienced migration from different parts of the world including South Asia, the Caribbean region, Africa, and Europe. This makes the UK an interesting and relevant context for analysing immigrant's joint trajectories of partnership, childbearing, and employment.

Partnership and fertility of immigrants

Many previous studies have investigated the partnership and family formation of immigrants from different origin countries across Europe. Most studies have either focused on the partnership or fertility trajectories of immigrants. Regarding partnership patterns, studies have shown that immigrants from different origin countries have different partnership experiences. A comparative study across the UK, France, Spain, and Estonia found that immigrants from countries, which are culturally similar to the host countries, tend to have similar partnership behaviours to the natives (Hannemann et al., 2020). Research on individual countries has shown similar findings. For example, in the UK, immigrants from (continental) Europe and other industrialised regions have similar partnership patterns to UK natives (Hannemann & Kulu, 2015). However, there seems to be considerable heterogeneity within European immigrants in other host countries where the data allow for distinguishing between different groups of European migrants. For example, compared to Swedish natives, Southern European immigrants in Sweden had a lower risk of first marriage, divorce, and remarriage (Andersson,

Obućina, & Scott, 2015), whereas Eastern European immigrants had higher first marriage, divorce, and remarriage rates. Southern European immigrants in France, exhibited higher risks of first union formation than the natives, due to the formation of direct marriages rather than cohabitations (Pailhé, 2015). Once cohabiting, immigrant women from Southern Europe were also more likely to marry their partners than the French natives (Pailhé, 2015). Eastern European immigrants in Spain are also more likely to marry and to cohabit than Spanish natives (González-Ferrer, Hannemann, & Castro-Martín, 2016).

Patterns of union formation among immigrants from culturally distant groups are different to those of the natives (Hannemann et al., 2020). Immigrants from countries with conservative partnership formation patterns typically have higher marriage rates and lower cohabitation as well as separation rates compared to the natives (Kulu & Hannemann, 2016a). For example, immigrants from South Asia (i.e., India, Pakistan, and Bangladesh) in the UK tend to almost exclusively marry and often at younger ages; cohabitation and separation are rare among them. In Germany, a large share of Turkish immigrants are married and a small share cohabit or live alone unpartnered (Kuhnt & Krapf, 2020). Similarly, Turkish immigrants in Sweden have elevated risks of first marriage formation and low risks of divorce, although they have higher rates of remarriage than Swedish natives (Andersson et al., 2015). In France, immigrants from Southeast Asia are less likely, whereas those from Turkey are more likely to form a union compared to French natives. However, both groups tend to prefer direct marriages rather than cohabiting unions (Pailhé, 2015). The partnership formation patterns of immigrants from Africa and the Maghreb region are gendered: women are less likely, whereas men are more likely to form a union than the natives. However, both women and men from the Maghreb region were more likely to marry directly than to cohabit compared to the natives. Men from Africa were more likely than the natives to cohabit or marry directly, whereas women from Africa had lower risks of both of these transitions when compared to French natives (Pailhé,

2015). Once cohabiting, immigrants from Turkey and women from the Maghreb region were more likely than the natives to marry their partner.

There is more diversity in partnership formation and dissolution patterns among migrants from the Caribbean region, Sub-Saharan Africa, and Latin America (Kulu & Hannemann, 2016a). For example, Caribbean immigrants in the UK tend to marry at older ages, and exhibit higher rates of cohabitation, lower rates of marriage, and higher rates of union dissolution than UK natives (Berrington, 1994, 1996; Hannemann & Kulu, 2015). In Sweden, immigrants from Africa, the Middle East, and Iran, have elevated levels of first marriage levels, although they also have high rates of divorce and remarriage (Andersson et al., 2015). Immigrants from Latin America in Spain are more likely than the Spanish natives to choose cohabitation as a first union and also have higher union dissolution rates (González-Ferrer et al., 2016).

Regarding immigrants' fertility patterns, a large body of literature has studied the timing and levels of fertility among immigrants from different origin countries across many European countries (for a comprehensive review, see e.g., Adsera & Ferrer, 2015; Kulu & González-Ferrer, 2014; Kulu & Milewski, 2007; Kulu, Milewski, Hannemann, & Mikolai, 2019). Generally, immigrants from non-Western countries have children at younger ages and have larger families than the natives in European host countries (Kulu et al., 2017). For example, immigrants from the Caribbean region, Pakistan, and Bangladesh in the UK (Kulu & Hannemann, 2016b), Turkish and Moroccan immigrants in the Netherlands (Garssen & Nicolaas, 2008), Albanian, Moroccan, and Romanian immigrants in Italy (Mussino & Strozza, 2012a, 2012b), and immigrant women from Turkey in Germany (Krapf & Wolf, 2015; Milewski, 2007, 2010) have higher firstbirth risks than the natives in those countries. In Switzerland (Rojas, Bernardi, & Schmid, 2018) and Spain (González-Ferrer, Castro-Martín, Kraus, & Eremenko, 2017), immigrants also have higher first-birth risks compared to the

natives but their second-birth risks are lower. The risk of a second and third birth is the highest among immigrant women from Pakistan and Bangladesh in the UK, from the Maghreb region and Turkey in France, and from Morocco and Turkey in Belgium (Kulu et al., 2017).

Some non-European migrant groups show specific patterns. For example, Caribbean immigrants in the UK have low second birth risks, but higher third-birth risks than British natives (Kulu & Hannemann, 2016b). Southeast Asian women in France have lower first birth transitions than the natives but the timing and the level of their second births is similar (Pailhé, 2017). There are fewer differences between the fertility levels of natives and immigrants from Western countries. For example, in Germany immigrants from Southern Europe had fertility levels similar to that of native Germans (Milewski, 2007, 2010). In the UK, European and other immigrants had lower first-birth risks than the natives (Kulu & Hannemann, 2016b).

Although partnership changes and fertility are intertwined, especially in the context of increasing family complexity (Thomson 2016), most previous studies have either focused on partnership transitions or fertility changes among immigrants. Some recent studies have analysed immigrants' partnership and fertility jointly to improve our understanding of the partnership context of childbearing and prevalence of different family configurations among immigrants. For example, Mikolai and Kulu (2021) used multi-state event history analysis on longitudinal data from the UK to jointly analyse repeated partnership and fertility transitions of female immigrants. They showed that similarly to UK natives, immigrants from Europe and Western countries tend to cohabit first followed by marriage or childbearing. By contrast, those from countries with conservative family behaviours (e.g., India, Pakistan, and Bangladesh) are more likely to marry first and have children within marriage. Finally, Caribbean immigrants show the weakest interrelationship between partnership and fertility: some have children outside unions, whereas others form a union first and then have children.

Delaporte and Kulu (2021) studied the two domains jointly using multi-channel sequence analysis on French data. Older immigrants (born in 1950s and 1960s) from North Africa, Turkey, South-East Asia, and Sub-Saharan Africa are more likely to marry early and have higher marital fertility than the French natives. Those from Southern Europe are also more likely to marry at a young age but they have lower marital fertility. Immigrants from South-East Asia and Sub-Saharan Africa are also more likely to be single and childless than the natives. Among younger birth cohorts (1970s and 1980s), all immigrant groups were less likely to cohabit than natives.

Finally, Liu and Kulu (2021) analysed cohabitation, marriage, and childbearing of unpartnered immigrants in Germany. Immigrants from Europe (Poland, and Southern Europe) have largely similar cohabitation and childbearing risks as West German natives. Immigrants from Russia/Kazakhstan and Turkey have higher marriage and lower cohabitation rates than West German natives. The risk of childbearing whilst being unpartnered is low among all immigrant groups.

Employment of immigrants

A large body of literature has studied the employment and labour market position of immigrants in European and other industrialised countries. Overall, these studies show that immigrants are in a worse position on the labour market than natives: they have lower labour market participation rates (Dustmann et al., 2003), are less likely to be employed (Blackaby et al., 1997; Dustmann & Fabbri, 2003; Wheatley Price, 2001), more likely to be self-employed (Borjas, 1986), and have lower earnings (Chiswick, 1980; Dustmann et al., 2003) than natives in the host countries. These findings are usually explained by differences in natives' and immigrants' human capital, level of education, socio-economic status, and demographic composition at the time of arrival (Borjas, 2013; Dustmann et al., 2003).

There are considerable differences in immigrants' labour market experiences by their country of origin even after adjusting for socio-economic differences between natives and immigrants. For example, in the UK, non-white immigrants (especially Black African, Pakistani and Bangladeshi) had much lower employment rates than UK-born white individuals, whereas white immigrants had similar rates to the UK-born after controlling for age, educational level, and region of residence (Blackaby et al., 1997; Dustmann & Fabbri, 2003; Dustmann et al., 2003). Regarding activity rates (i.e., either being employed or looking for employment), Black Africans and European men from outside the EU have the lowest participation rates and socio-economic characteristics did not explain these differences. However, among women, age and education are largely responsible for the lower activity rates (Dustmann et al., 2003). Regarding wages, non-white immigrants (especially from Bangladesh) earn less than UK natives and white immigrants even after accounting for individual characteristics and the region of origin (Dustmann et al., 2003). Some white migrant groups (e.g., those from the old Commonwealth countries) have higher wages than UK natives (Dustmann et al., 2003).

Over time since arrival in the host countries, some improvements are expected in immigrants' labour market position. Immigrants may accumulate additional skills, knowledge about the labour market, or change their skills sets so that they match better the needs of the host countries' labour market (Dustmann et al., 2003). Such improvements are observed mainly among white immigrants. For example, in the UK immigrants' initial disadvantage regarding their lower employment rates disappears over time but only for white immigrants (Wheatley Price, 2001). Similarly, the initial wage gap between natives and immigrants slowly decreases over time but it does not close, and it remains especially large for non-white immigrants (Bell, 1997; Chiswick, 1980; Denny, Harmon, & Roche, 1997; Dustmann & Fabbri, 2003). The

probability of being self-employed increases among all immigrant groups over time especially among non-white immigrants (Dustmann et al., 2003).

Most studies on immigrants' labour market participation, outcomes, and integration do not consider partnership or childbearing experiences as important determinants of their economic outcomes. However, it is well known that the transition to parenthood influences individuals' – especially women's – employment trajectories (e.g., for a review, see Matysiak & Vignoli, 2008). Women are more likely to work part-time or stay at home following childbirth in many European countries than men (Gutiérrez-Domènech, 2005; Shapiro & Mott, 1994). These changes lead to lower income, lower pension, and reduced economic independence among women. Although many studies have investigated the parenthood-employment link in majority populations, only a handful of studies have examined the intersection between parenthood and employment among migrant populations.

Using Belgian register data Kil et al. (2018) studied the motherhood-employment link among women from Southern Europe, Eastern Europe, Turkey, and Morocco. They investigated several indicators of labour market position: economic activity, employment versus unemployment, and full-time versus part-time employment. Following the transition to parenthood immigrants' activity and employment levels decreased more than those of native women and these differences cannot be explained by socio-demographic or pre-birth job characteristics. Similarly, unemployment levels increase more among immigrant mothers than among natives even after adjusting for these factors.

Vidal-Coso (2019) used the Swiss Labour Force Survey to analyse a change in native and migrant partnered women's employment patterns following childbirth. She compared EU and non-EU immigrants' working hours and employment levels to those of Swiss natives. Among childless women, she observed high levels of employment and high working hours, although immigrants from non-EU countries exhibited lower initial levels of employment and

working hours. Childbirth leads to a substantial reduction in employment levels as well as working hours among all groups. EU immigrants' employment levels are mainly reduced following the birth of a first child, whereas non-EU immigrants and native Swiss women also experience a decline after the birth of higher-order children. There are even larger differences in working hours among women from different origin groups. Swiss women tend to reduce their weekly working hours the most after the birth of their first child, whereas this decline is smaller for immigrant women. The birth of a second or third child also leads to substantial reductions in working hours only among non-EU migrants.

Longitudinal studies have also investigated whether and how employment status influences the transition to first and subsequent births among immigrants. For example, Wood and Neels (2017) showed that the propensity of a first and second birth in Belgium are highest among those who are employed full-time but the likelihood of a third birth are largest among those who were unemployed or inactive. The negative effects of unemployment and inactivity on the propensity of a first birth were weaker for non-European immigrant women, whereas the patterns for Belgian natives and European immigrants were similar. Regarding the likelihood of a higher order birth, the positive effect of employment is somewhat stronger for European immigrants than for native women.

In Sweden, childbearing rates were highest among native and immigrant women who were established in the labour market (Andersson & Scott, 2005; Lundström & Andersson, 2012). However, receiving benefits reduced the probability of a first birth among immigrants but not among natives (Andersson & Scott, 2005). Among immigrant women, there were no differences in the propensity of a first birth by type of employment; those who had temporary or permanent employment had similar first birth rates (Lundström & Andersson, 2012). The lack of differences in first birth probabilities between natives and immigrants is explained by the equalising impact of Sweden's universal welfare regime.

The British context

The post-WWI economic recovery in the UK in the 1950s and 1960s attracted immigrants from the Caribbean region, India, Pakistan, and Bangladesh (Dale and Ahmed 2011; Dubuc 2012). After the introduction of restrictions on entry to Britain from the Asian subcontinent in 1962 family reunification became important (Coleman and Dubuc 2010; Dale and Ahmed 2011; Dubuc 2012). In the 1970s, immigration from Caribbean countries became less prominent, whereas immigration from Sub-Saharan Africa increased (Coleman and Dubuc 2010; Dubuc 2012). In the first two decades of this century, many migrants arrived from China and from the newly joined countries of the European Union, especially Poland (Dubuc 2012; Robards and Berrington 2016; Waller et al. 2014).

The share of ethnic minorities including both immigrants and their descendants has increased considerably over the time. In the 1991 Census, 7% of the population reported non-White ethnicity. The largest groups were those of Indian, Caribbean, Pakistani, Chinese, and Bangladeshi origin. By the 2011 Census, the share of ethnic minorities had increased to 20%. In 2020, most foreign-born individuals were from India, Poland, Pakistan, Romania, and the Republic of Ireland (ONS 2020).

Over the last five to six decades, partnership formation and dissolution patterns as well as fertility levels have changed remarkably in high-income countries including the UK. An increasing share of relationships start as cohabitation (Ermisch and Francesconi 2000), more children are born to cohabiting parents (Perelli-Harris et al. 2010), and divorce and repartnering have increased leading to multi-partner fertility and complex families (Thomson 2014; Thomson et al. 2012). Family behaviour in the origin countries of many immigrants differ from that in the UK (Hannemann and Kulu 2015). For example, characteristic to South Asian countries are high levels of marriage and low levels of extra-marital childbearing (Alexander

et al. 2006). By contrast, in the Caribbean region, low marriage and high repartnering rates are prevalent and childbearing often precedes union formation (Berrington 1994; Miner 2003).

Data and Sample

We use data from 9 waves (2009–2019) of the UK Household Longitudinal Study (UKHLS), also called Understanding Society (University of Essex, 2020b), an ongoing, nationally representative, household panel survey. It collects information on about 30,000 households corresponding to around 51,000 individuals. The UKHLS provides a unique opportunity to study the lives of immigrants from different origin countries in the UK in detail. Two boost samples ensure a sufficiently large sample size among immigrants and ethnic minorities. First, an ethnic minority boost sample (EMB) of 4,000 households was added in wave 1 with the aim to interview at least 1,000 respondents from each of the main ethnic groups (Indian, Pakistani, Bangladeshi, Caribbean, and African). Second, an immigrant and ethnic minority boost sample (IEMB) of 2,900 households was added in wave 6 (McFall, Nandi, & Platt, 2019).

The UKHLS contains rich and reliable retrospective histories on individuals' partnership, fertility, and employment transitions. Retrospective information is collected on the start and end dates (year and month) of up to 11 cohabitations and marriages, the year and month of childbirths, and the dates (year and month) of employment changes. Additionally, as all adult household members are interviewed annually, the panel waves provide prospective information on changes in partnership and employment status, and the birth of (additional) children (Nandi, Menon, & Smith, 2020). We use the Marital and Cohabitation Histories file (University of Essex, 2020a), which combines retrospective and prospective information on partnerships.

We study immigrants, who arrived in the UK aged 18 to 49 between 1956 and 2014 (7,890 individuals). We follow them for five years after immigration to the UK. As we are

interested in the joint evolution of partnership, fertility, and employment trajectories of immigrants after arrival in the UK, we restrict the analytical sample to immigrants who have information on all three life domains: partnership, fertility, and employment. This leads to a substantial reduction in the size of the analytical sample (from 7,890 to 3,301) because employment histories are only available for a subset of individuals. Employment histories were collected in wave 1 for respondents who were interviewed in the first 6 months of the 24-month data collection period and in wave 5 for the remaining respondents. This means that employment histories are missing for the wave 6 IEMB sample and for those who were not asked to provide employment histories in wave 1 and were not present in wave 5. For individuals who never left full-time education, we assume that their employment history consists of being in full-time education since age 16. After excluding an additional 816 individuals who do not have complete partnership, fertility, and employment histories for the 5-year follow-up period (a requirement for sequence analysis, see 'Methods' section), the analytical sample consists of 2,485 individuals. We conduct a series of additional analyses (see 'Robustness checks' section), which confirm that our results are robust to different sample sizes.

Methods

We use multi-channel sequence analysis (MCSA) to analyse the joint evolution of the partnership, fertility, and employment trajectories of immigrants during the first five years (60 months) after their arrival in the UK. MCSA is an extension of simple sequence analysis (SA), a data mining technique increasingly used in the social sciences to describe individuals' life course trajectories in a single life domain.

In SA, each individual's life course trajectory is represented as a sequence of states (Mikolai & Lyons-Amos, 2017). Individual sequences summarise information not only on the

states occupied over time but also the order and duration of these states. As there are many possible combinations of states, few individuals tend to experience the exact same sequence. Thus, to analyse individual sequences, first, the number of sequences in the data needs to be reduced. The most common method for this is Optimal Matching Analysis (OMA), which calculates how dissimilar pairs of sequences are. Similarity is defined in terms of the number, order, and duration of states within individual sequences. During OMA, dissimilarity between each pair of sequences is calculated as the minimum cost of operations (insertion, deletion, or substitution) needed to turn one sequence into the other (Abbott, 1995; Abbott & Tsay, 2000; Barban & Billari, 2012; Billari, 2001; Mikolai & Lyons-Amos, 2017). The results of these calculations are stored in a dissimilarity matrix. Then, to find patterns in the data, hierarchical cluster analysis is performed on the dissimilarity matrix. During cluster analysis, individual sequences are classified into a pre-defined number of groups such that the within-cluster distances are minimised, and between-cluster distances are maximised. Finally, the clusters are used as the categorical dependent variable in a multinomial logistic regression to understand how individual characteristics influence the probability of belonging to different clusters.

MCSA is an extension of SA for studying trajectories in multiple life domains. The steps of the analysis during MCSA are the same as in SA, but the OMA is extended to deal with multiple dimensions (for technical details, see Gauthier, Widmer, Bucher, and Notredame (2010)). In our analysis, each individual has a sequence for each of the analysed domains: partnership, fertility, and employment. The state spaces for the three dimensions are represented by partnership, fertility, and employment statuses. In each month following migration to the UK, individuals' partnership status can be single (i.e., never partnered), cohabiting, married, and separated or widowed (denoted as 'separated' on the Figures). Individuals who repartner following separation or widowhood are included in the cohabiting or married category depending on the type of their partnership. States in the fertility domain

are defined as childless, 1 child, 2 children, and 3 or more children. Employment status can be full-time employee, part-time employee, self-employed, in full-time education (including those who are on a government training scheme), inactive (retired, maternity/paternity leave, looking after family, long-term sick/disabled, or something else[1]), or unemployed.

First, we use MCSA to describe and visualise how the partnership, fertility, and employment trajectories of immigrants evolve jointly over time since arrival in the UK. We use OMA to calculate the distances between pairs of sequences using substitution costs based on transition rates between different states observed in the data, and a cost of 1 for insertions and deletions. Second, we apply agglomerative nested cluster analysis to these individual trajectories to establish the main types of joint trajectories. Finally, we estimate a multinomial logistic regression model to predict immigrants' probability of belonging to each joint trajectory type by key socio-demographic variables. As we are particularly interested in gender differences in the evolution of immigrants' joint trajectories of partnership, fertility, and employment, we also conduct MCSA separately for women and men. We report unweighted results but also present the results of weighted analyses (see 'Robustness checks' section).

SA has been criticised (e.g., Wu, 2000) because researchers need to make *a priori* decisions about the costs attached to substitutions, insertions and deletions, the method used to calculate distances between pairs of sequences, and the method of cluster analysis (see Studer and Ritschard (2016) on the choice of distance measures, and Lesnard (2010) on the choice of the cost regime). In many applications, these choices may impact the results significantly (Brzinsky-Fay & Kohler, 2010). To ensure that our results are robust to the choice of the cost regime, distance measure, and clustering method used, we conducted additional analyses (see 'Robustness checks' section).

[1] We conducted additional analysis (not shown) to assess how to best classify individuals whose employment status is 'something else'. Dropping these individuals from the analysis leads to the same groupings although some full-time employed individuals are grouped into the first rather than second group.

Another challenge of SA is the requirement that individuals need to have complete information for the entire observation period. We chose to follow individuals for five years after migration to maximise the number of individuals in the sample and, at the same time, follow them for a sufficient length of time to understand how their partnership, fertility, and employment trajectories have evolved following migration to the UK. We conducted robustness checks to ensure that the length of the observation window does not alter the results and the conclusions of this study (see 'Robustness checks' section). The MCSA is conducted in R using the TraMineR (Gabadinho, Ritschard, Müller, & Studer, 2011), TraMineRextras (Ritschard et al., 2021), WeightedCluster (Studer, 2013), and seqhandbook (Robette, 2020) packages. The multinomial logistic regression and calculation of average marginal effects is conducted in Stata.

Variables

Table 1 describes the analytical sample by the covariates used in the multinomial logistic regression. The first key variable of interest is migrant origin. We distinguish between immigrants from EU countries, the rest of Europe and other Western countries, India, Pakistan, Bangladesh, the Caribbean region, African countries, and other countries (Latin American, other Asian and other countries). The largest share of immigrants in our sample come from South Asia (29%), followed by African countries (24%), the EU (18%), other countries (17%), the rest of Europe and the West (7%), and Caribbean countries (5%).

Table 1. Analytical sample by covariates

	N	%
Migrant origin		
EU	453	18.2
Rest of Europe & West	183	7.4
India	345	13.9
Pakistan	210	8.5

Bangladesh	159	6.4
Caribbean	115	4.6
Africa	597	24.0
Other	423	17.0
Migration cohort		
1956-1989	657	26.4
1990-2004	1295	52.1
2005-2014	533	21.5
Age at arrival		
18-24	1096	44.1
25-29	693	27.9
30+	696	28.0
Education		
Low	892	35.9
Medium	907	36.5
High	686	27.6
Sex		
Male	1045	42.1
Female	1440	57.9
Total	2485	100

Source: Authors' calculations using UKHLS data.

Another key variable is migration cohort, i.e., the year of arrival in the UK, grouped as those who arrived before 1990 (1956-1989), between 1990 and the mid-2000s (1990-2004), and recent migrants following EU accession (2005-2014). Most (52%) immigrants in the analytical sample arrived in the UK between 1990 and 2004 whereas around a quarter of them arrived in each of the two other periods. Additionally, we control for age at arrival (18-24, 25-29, and 30+), level of education at the time of arrival (low, medium, and high), and sex (male vs. female).

Results

Evolution of partnership, fertility, and employment trajectories after arrival

Figure 1 displays the chronograms for the partnership, fertility, and employment domains of immigrants in the UK by migration cohort. These chronograms show the proportion of individuals in each state over time (in months) since arrival in the UK. Overall, around 60% of

immigrants arrived in the UK as single and around 35% were married (see 'Total' column in Figure 1). As time since migration increases, individuals tend to form partnerships (mainly marriages). Five years after migration, most individuals are married but around 20% remain never partnered.

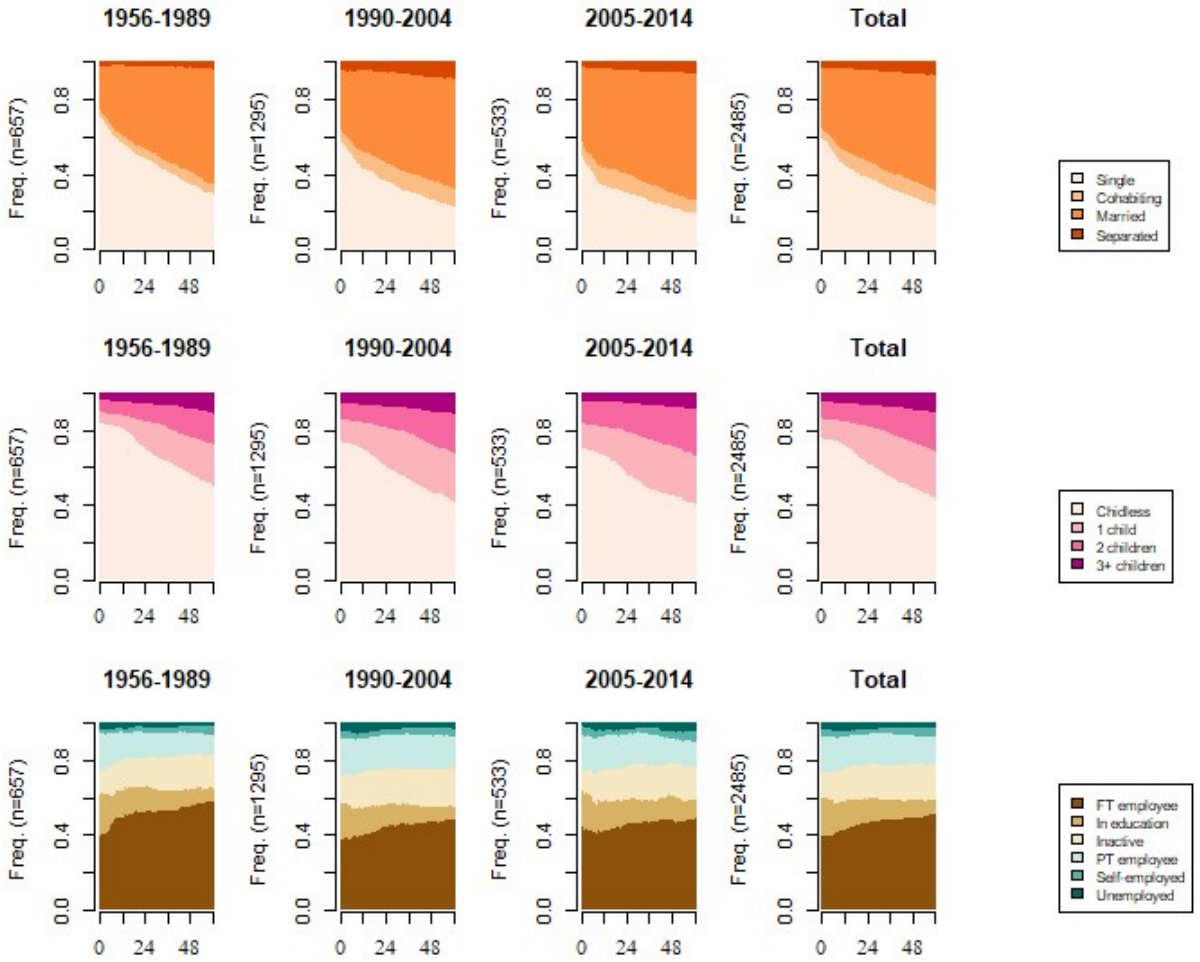
We observe some changes across migration cohorts. The share of those who arrived as never partnered has declined, whereas the proportion of those who arrived as married has increased. Additionally, the proportion of those who remained never partnered after 5 years following migration has declined across migration cohorts, and, accordingly, the share of married individuals has increased. These patterns likely reflect changes in immigration streams, e.g. an increased importance of arrivals through the Tier 2 Skilled Migrant route, which allows entrants to bring dependants. Although most people arrived as single or married, around 5% of individuals were cohabiting, separated, or widowed upon arrival. Additionally, the share of individuals who form a cohabitation or separate during the first 5 years after arriving to the UK has increased across migration cohorts. These findings suggest that the partnership experiences of immigrants in the UK reflect the broader changes in partnership patterns (i.e., an increase in non-marital unions and separation) that took place in the origin countries and in the UK.

Next, we examine individuals' fertility trajectories (middle row, Figure 1). Overall, most individuals (around 80%) were childless when they moved to the UK. Five years after migration, 60% of immigrants had at least one child (see 'Total' column). The share of migrants who arrived as childless has declined slightly across migration cohorts and the proportion of those who had at least one child within five years following arrival has increased slightly. This implies that a somewhat larger share of immigrants has children within five years of arrival to the UK among later migration cohorts compared to earlier cohorts. These changes in childbearing trajectories correspond to the observed partnership changes.

Last, we describe immigrants' employment trajectories (bottom row, Figure 1). More than half (around 60%) of the immigrants arriving to the UK were employed (full-, or part-time, or self-employment) upon arrival. Around 20% arrived in the UK as students; the remaining share was either economically inactive (10%) or unemployed (5%). Over time since migration, the share of employed individuals increases, whilst the proportion of full-time students declines suggesting that some migrants came to the UK to study first but later entered the UK labour market.

We observe some changes across migration cohorts; the share of full-time employed individuals has declined slightly across migration cohorts and, in line with this, the share of part-time employed individuals has increased. Furthermore, five years after migration, the share of students in full-time education remained larger in the youngest migration cohort compared to earlier cohorts. The share of unemployed, inactive, and self-employed has remained very similar across migration cohorts.

Figure 1. Chronograms of partnership, fertility, and employment trajectories of immigrants over time since arrival (in months) in the UK by migration cohort



Source: Authors' calculations using UKHLS data.
Notes: The 'Separated' category includes separated as well as widowed individuals.

Grouping the sequences

Classifying immigrants' partnership, fertility, and employment trajectories allows us to investigate the heterogeneity within the migrant population and also to determine the factors that have shaped migrant life course trajectories in the UK. Based on their partnership, fertility, and employment trajectories we classify immigrants into three groups (Figure 2).

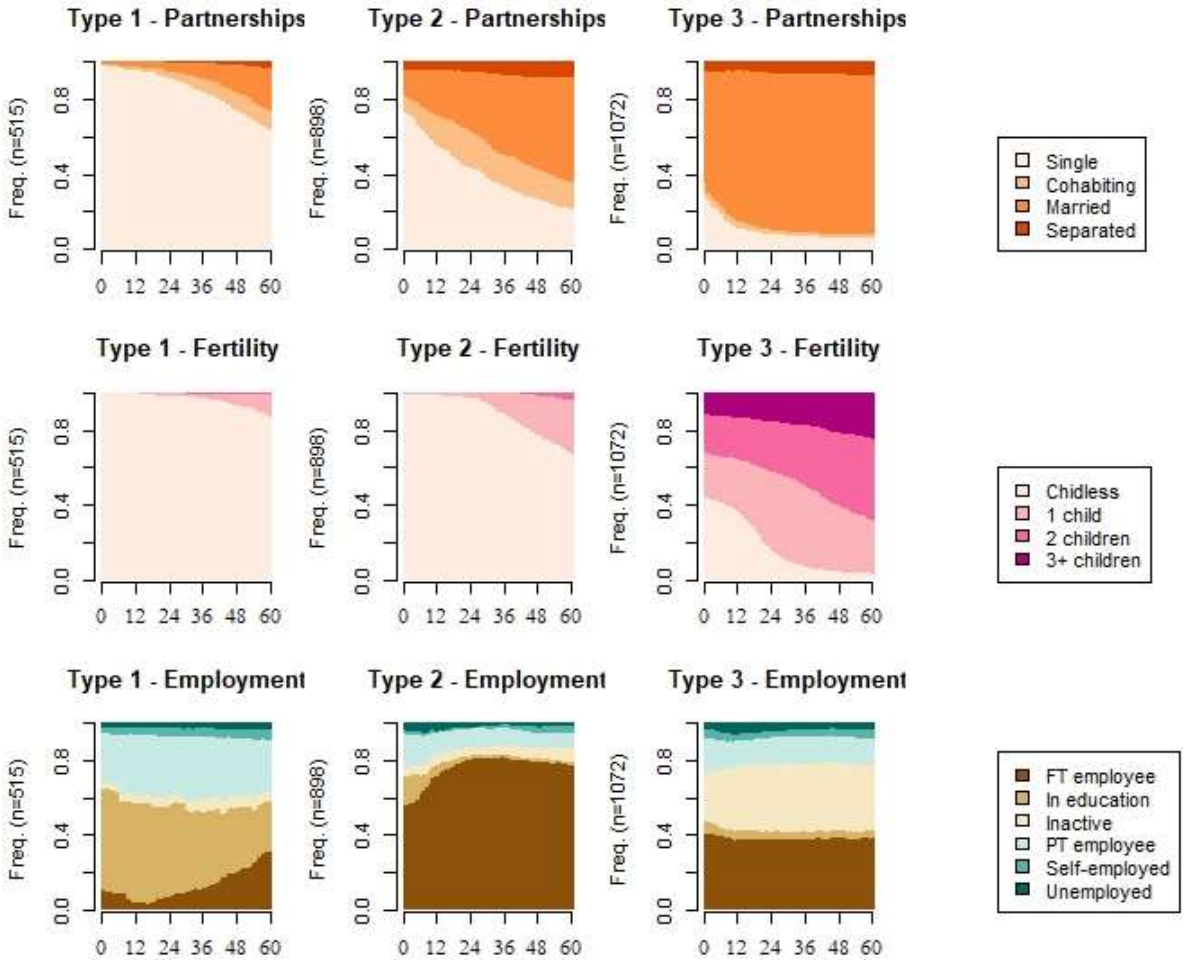
The first group (Type 1, first column on Figure 2) consists of individuals who arrived in the UK as and largely remained single and childless in the first five years after migration. The majority (around 60%) of these individuals were in full-time education at the time of

migration and later on about half of them became full-time employed. The remaining 40% of individuals in this cluster were largely part-time employed upon arrival and remained in the same employment status during the observation period. Around 21% of individuals in the sample belong to this group, who we refer to as 'Single, childless, students'.

The second group (Type 2, second column on Figure 2) includes immigrants who were either single or partnered when they arrived in the UK, but experienced significant partnership changes during the first five years following migration. Most unpartnered individuals in this group formed a union during the observation period, although around 20% remained single. Many formed cohabiting unions, some of which later became marriages and some dissolved. Immigrants in this group arrived as childless and most of them remained childless for the first two to three years after migration. Five years after migration, around 40% of individuals in this group were parents to one child. Regarding their employment trajectories, 60% of migrants in this group were employed full-time at the time of arrival in the UK; two years after migration this proportion has increased to 80%. We label this group 'Partnered, childless, full-time employed'; 36% of individuals in the analytical sample belong to this group.

Finally, the third group (Type 3, third column on Figure 2) consists of migrants who were already married and around 60% of them also had at least one child when they arrived in the UK. Most of them had (a)nother child within 2 to 5 years after migration. Regarding their employment domain, individuals in this group are either employed (full- or part-time) or inactive and we do not see many changes in their employment status during the 5-year observation period after arrival in the UK. We refer to this group as 'Family migrants'. This is the largest group; 43% of the analytical sample belongs to this group.

Figure 2. Results of cluster analysis: three types of joint trajectories of partnership, fertility, and employment among immigrants in the UK



Source: Authors' calculations using UKHLS data, waves 1–9 (2009–2019).
Notes: The 'Separated' category includes separated as well as widowed individuals.

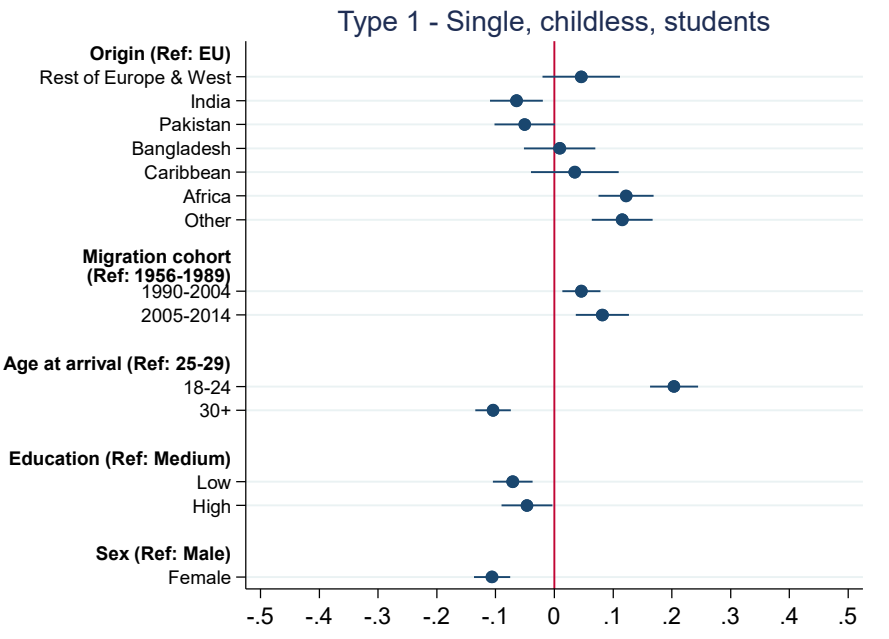
Determinants of group membership

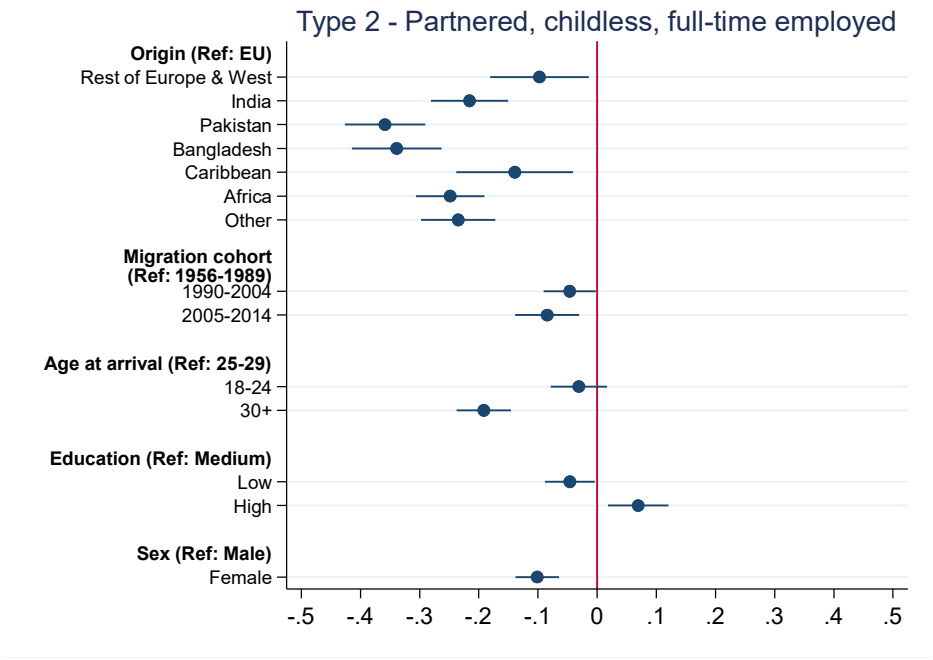
Next, we study whether and how individual characteristics predict cluster membership. We estimate a multinomial logistic regression model with the type of cluster being the dependent variable. We report average marginal effects (Figure 3), which show the average difference in the probability of a group to belong to a certain cluster compared to the probability of the reference group. Relative risk ratios and fit statistics are reported in Table A1.

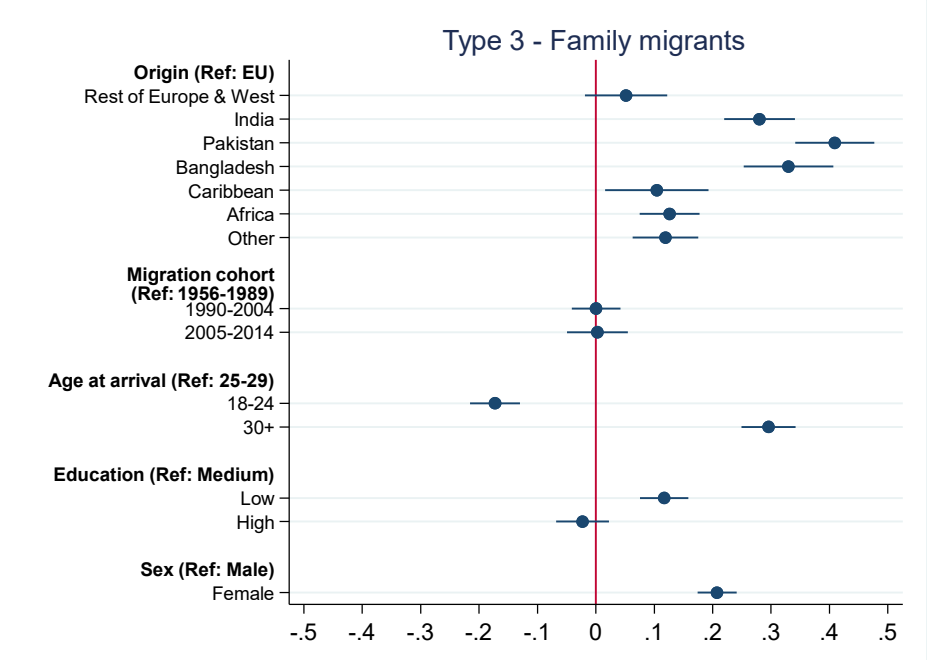
First, we focus on the probability of belonging to the 'single, childless, students' cluster (type 1). Compared to EU migrants, immigrants from India are less likely whereas those from

African and other countries are more likely to belong to this cluster. Immigrants from the remaining countries are as likely as EU migrants to belong to this group. More recent migrants are more likely to belong to this group. This is not surprising given both an increase in postponed partnership formation and childbearing as well as opportunities to study abroad. This is also confirmed if we look at educational differences in group membership; lower educated individuals are less likely than their more educated counterparts to belong to this cluster. There is a clear negative age gradient: the older immigrants are the less likely they are to be in this group. Finally, we also find significant gender differences: women are less likely than men to belong to this group.

Figure 3. Average marginal effects of belonging to the three different clusters by covariates







Source: Authors' calculations using UKHLS data, waves 1–9 (2009–2019).

Next, we describe the characteristic of immigrants who belong to the 'partnered, childless, full-time employed' cluster (type 2). Immigrants from South Asian countries (India, Pakistan, and Bangladesh), African countries, and other countries are significantly less likely than EU migrants to be classified into this group. Immigrants who arrived after 2005 and who were older at the time of arrival are less likely to belong to this group. Further, individuals with

higher levels of education and men are more likely to belong to this cluster than those with lower education and women.

Finally, we focus on the predictors of belonging to the 'family migrants' cluster (type 3). Immigrants from South Asian, African, and other countries are significantly more likely to be family migrants than those who come from EU countries. Individuals arriving in the UK in different years are equally likely to be in this group. Additionally, this cluster is characterised by older and less educated individuals, and women have a higher propensity to belong to this group than men.

Gender differences

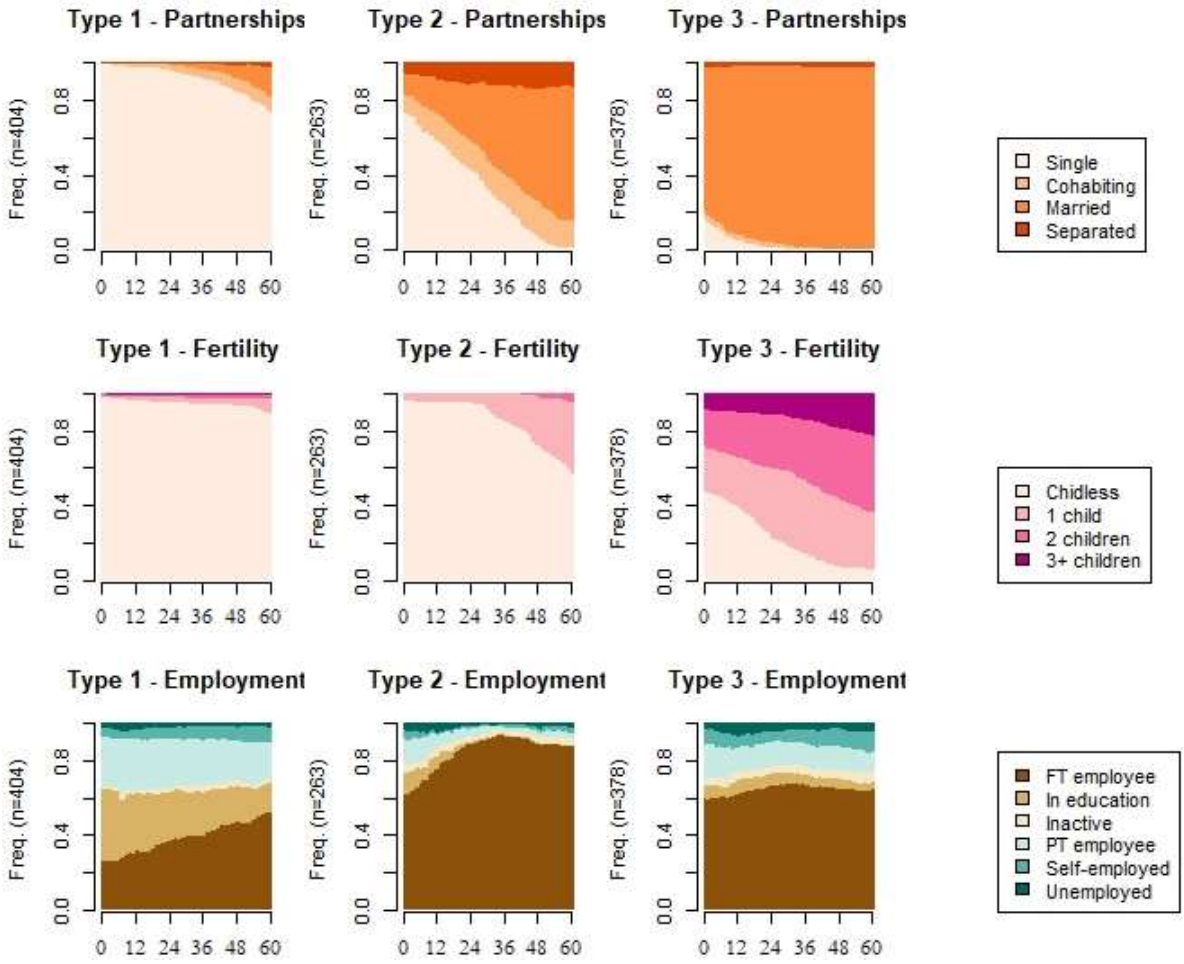
Previous studies have shown marked differences in the labour market attachment of women and men, particularly following childbearing. Therefore, we are interested in exploring gender differences in immigrants' partnership, fertility, and employment trajectories. We found significant gender differences in the probability to belong to each of the three clusters. To further explore these gender differences, we conduct the MCSA and cluster analysis separately for men and women. Although we find three very similar clusters among both women and men, we also observe some interesting differences between the trajectories of immigrant men and women.

First, when comparing men's trajectories (Figure 4) to the overall patterns shown on Figure 2, we see the most striking differences in men's employment trajectories. In the first group (single, childless, students), full-time employment and full-time education are equally prevalent at the time of arrival in the UK and many students later become full-time employed. The second group (partnered, childless, full-time employed) is almost exclusively categorised by full-time employment; two years after migration around 90% of men in this group are full-time employed. An even more striking difference is seen when we compare the employment

trajectories of men in the family migration group to the overall patterns. 60% of men in this group are full-time employed and the share of those who are in education or inactive is less than 10%. Immigrant men's partnership and fertility trajectories in three clusters are almost exactly the same as what we have shown for the full analytical sample.

Second, the classification of women's trajectories differs somewhat more from the overall patterns not only in terms of their employment trajectories but also their partnership and fertility sequences (Figure 5). Among women, there is no 'single, childless, students' cluster; instead, their first cluster is comparable to the second cluster in the full sample (i.e., partnered, childless, full-time employed). These women tend to arrive unpartnered and childless. Although many (around 60%) form a relationship during the first five years following migration, only around 20% becomes mothers during this time. They are either employed (full- or part-time) or students. Women in the second cluster arrive as and remain married and many already have large families (3+ children) at the time of arrival. Five years after arrival, all women in this group have at least three children. Around half of women in this group are inactive (with some returning to full-time employment towards the end of the five-year observation period), whereas the other half are employed. Finally, women's trajectories in the third cluster are similar to those in the second cluster. The most striking differences are that many women in this group arrived as single and childless and most have experienced a partnership transition soon after arrival. Similarly, almost all women in this group had at least one child during the five-year observation period. Their employment trajectories are very similar to those of women in the second group, i.e. a half of women are inactive.

Figure 4. Results of cluster analysis for men (n = 1,045)

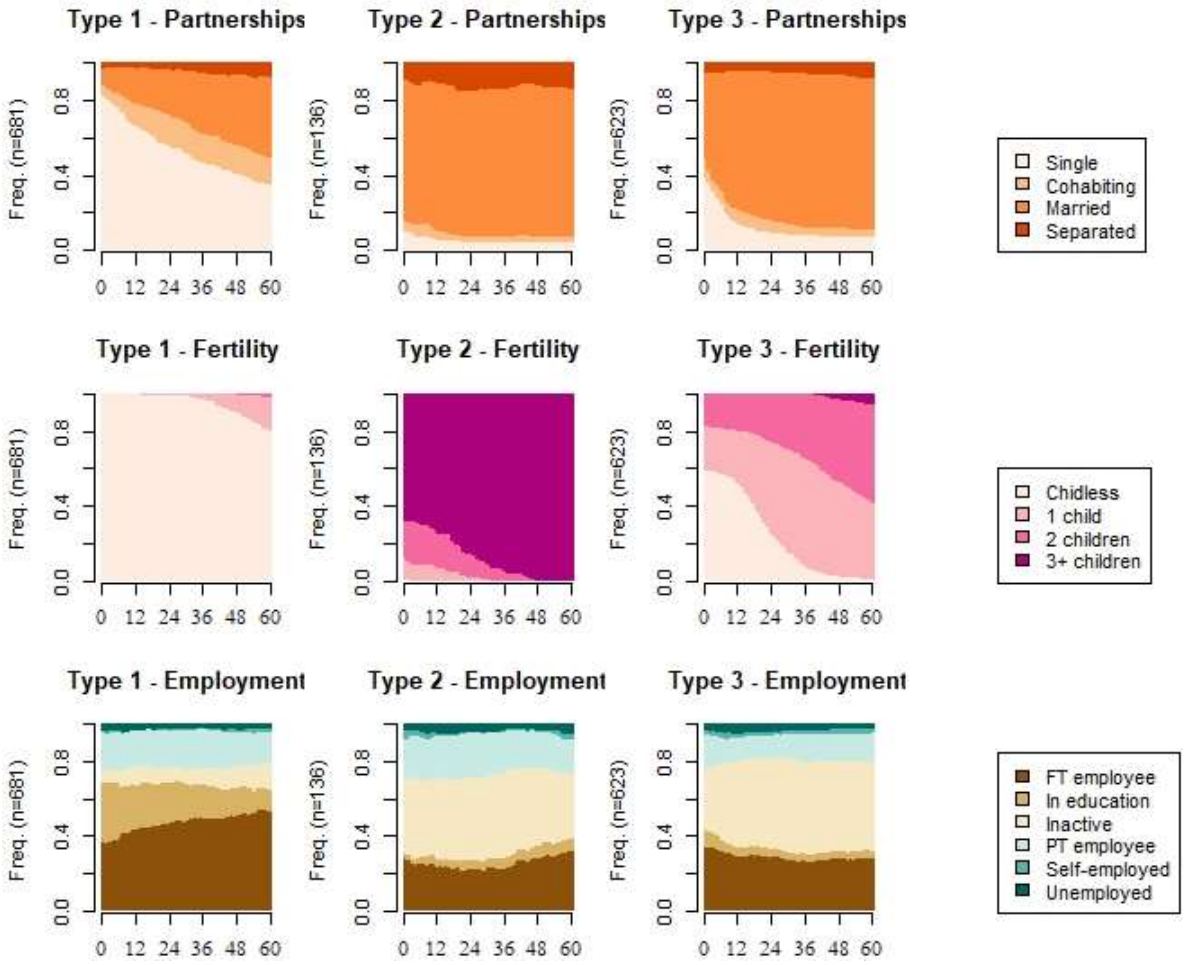


Source: Authors' calculations using UKHLS data, waves 1–9 (2009–2019).
Notes: The 'Separated' category includes separated as well as widowed individuals.

When comparing women's and men's trajectories, the question arises whether these are statistically different from each other. Liao and Fasang (2021) proposed to use an adaptation of the Bayesian information criterion (BIC) and the likelihood ration test (LRT) to compare trajectories of different groups. Although this measure is not yet available for MCSA, we have calculated it separately for partnership, fertility, and employment trajectories (Table A2). The differences in BIC values are low and the LRT is not significant when comparing men's and women's partnership or fertility trajectories indicating that immigrant women's and men's partnership and fertility trajectories during the first five years following their arrival to the UK are very similar. However, BIC differences are large, and the LRT is significant when comparing immigrant women's and men's employment trajectories. This suggests that

immigrant women's and men's employment trajectories are significantly different from each other justifying our decision to explore immigrants' joint trajectories of partnership, fertility, and employment by gender.

Figure 5. Results of cluster analysis for women (n = 1,440)



Source: Authors' calculations using UKHLS data, waves 1–9 (2009–2019).
Notes: The 'Separated' category includes separated as well as widowed individuals.

Robustness checks

We have conducted a range of robustness checks to test the sensitivity of our results to: a) sample size limitations, b) the length of the observation window, c) the choice of cost regimes, distance measures, and clustering methods, and d) the number of selected clusters. We also discuss the validity of the MCSA approach and the sensitivity of our results to using weights

during cluster analysis. We briefly discuss the results of these additional analyses below; the corresponding Figures are shown in the Appendix.

Sample size

Our analytical sample has reduced from 7,890 to 3,301 because employment histories were only collected for a subset of individuals in the UKHLS. This large reduction in sample size raises potential issues of selectivity. To check the robustness of our results to this sample size limitation, we have conducted a two-channel sequence analysis using information only on immigrants' partnership and fertility histories (Figure A1). The sample size for this analysis is considerably larger, 6,437 individuals (we had to drop 1,453 individuals who did not have complete partnership and fertility histories for the five-year observation period).

There are some small differences between how individuals are classified into groups based on their partnership and fertility sequences in the three- and two-channel classifications. For example, in the two-channel analysis, a somewhat larger share of individuals with children are classified into the first and second group than in the three-channel analysis. Additionally, in the two-channel analysis, all individuals in the second and third clusters form a relationship 1-3 years after migration, whereas in the three-channel analysis some individuals remain never partnered in these groups. These small differences notwithstanding, in the two-channel analysis we find three partnership and fertility clusters, which correspond to those presented in the results section: 1) single and childless, 2) partnered and childless, and 3) family migration. These results indicate that the partnership and fertility groupings that emerge in the three-channel analysis are reliable, and our results are unlikely to be biased because of the limited size of the analytical sample.

Length of the observation window

We follow the evolution of immigrants' trajectories of partnership, fertility, and employment for five years after their arrival in the UK. Sequence analysis requires that all individuals have complete information for the duration of the analysis. This implies that individuals who are observed for less than five years after migration have to be excluded from the analysis. For our analysis this meant that a further 816 individuals had to be dropped. Choosing a shorter observation window would result in a larger analytical sample; the disadvantage is that not many individuals may experience partnership, fertility, or employment transitions soon after arriving in the UK.

To test the sensitivity of our results to the length of the observation window, we have replicated the MCSA and cluster analysis using a one- (Figure A2) and three-year (Figure A3) observation window following Mikolai and Kulu (2019). Broadly speaking, we observe similar clusters regardless of the length of the observation window. However, only observing immigrants for one or three years after migration means that we do not yet observe many partnership, fertility, and employment transitions and thus, the clusters are mainly formed using information on immigrants' partnership and employment status as well as parity at the time of their arrival in the UK. This is reflected in the size of the first cluster (single, childless, students), which is the largest in both cases. As expected, we observe somewhat more transitions when we follow individuals for three years rather than only for one year. We draw two main conclusions from this set of robustness checks. First, although observing individuals for a longer period results in a smaller analytical sample, many transitions only occur later justifying our choice to follow individuals for five years after migration. Second, regardless of the length of the observation window, we find similar groups in the data. This indicates that individuals who are dropped due to incomplete information for the entire five-year observation window are likely to have similar experiences to those who are retained for analysis.

Choice of the cost regime, distance measure, and clustering method

When applying sequence analysis, researchers need to make several *a priori* decisions, such as the choice of the cost regime (i.e., setting substitution, insertion, and deletion costs), the method to calculate the dissimilarity between pairs of sequences, and the method of cluster analysis. The results can be highly sensitive to these decisions (Brzinsky-Fay & Kohler, 2010). Therefore, we have tested the robustness of our results to a range of different specifications.

First, we experiment with using different cost regimes. We have kept the same substitution matrix as in the main analysis and varied the indel costs to be 1.5 and 2. Then, we have used the same indel costs as in the main analyses and changed the substitution matrix to a constant value of 1, 1.5, and 2. Figure A4 shows the results for using a substitution matrix based on the transition rates in the data and indel costs of 1.5. The remaining results are very similar (not shown but are available on request). Next, we explore different methods to calculate the distances between pairs of sequences. Keeping the same cost regime as in the main analysis, we have tested the sensitivity of our results using the longest common subsequence (Elzinga & Studer, 2015) (not shown but available on request) and the dynamic Hamming distance (Lesnard, 2004, 2006) (Figure A5).

The choice of the cost regime and distance measures only minimally influence the emerging clusters. The largest difference is the way in which individuals are classified into clusters based on their employment histories. In the main analysis, the first cluster is smaller and more homogeneous; it represents individuals who were students or part-time employed at the time of arrival with many transitioning to full-time employment later. In the sensitivity analyses, this cluster is larger and includes many individuals who were full-time employed at the time of arrival. These full-time employed individuals were largely in the second cluster in the main analysis, which is also why we observed a larger proportion of those who arrived as and remained unpartnered in the second cluster. To conclude, these differences are small,

mainly pertain to the differential classification of a small number of individuals in the analyses, and do not alter our groupings, the main results, or conclusions. Furthermore, using the specifications selected for the main analysis allows us to better isolate those who arrive to the UK as students.

Finally, keeping the same costs and distance measures as in the main analysis, we have explored whether and how using different clustering methods influence our results (not shown but available on request). We have used hierarchical clustering with Ward's distance, as well as Partitioning Around Medoids (PAM) using the results of the hierarchical cluster analysis as starting values following Studer (2013). Regardless of the clustering method used, we found the same three clusters as shown in the results section. There are some small differences; while the results of hierarchical cluster analysis are almost identical to those in the main analysis, PAM arrives at slightly different groupings. Cluster 3 is small and mainly consists of inactive and part-time employed individuals. Those who were full-time employed and were classified into cluster 3 in the main analysis are grouped into cluster 1 by PAM. This means that PAM arrives at a much more heterogeneous cluster 1 and a much smaller cluster 3 than the agglomerative nested clustering algorithm used in the main analysis. To conclude, the results are robust to using different cluster analysis methods. Where there are small differences, the agglomerative nested clustering algorithm arrives at more homogeneous and substantively more relevant groupings than the other two methods justifying our choice of using this method.

Number of clusters

Another challenge during sequence analysis is deciding on the number of clusters. The WeightedCluster package (Studer, 2013) includes several measures to assess the quality of the clusters obtained and to help choosing the number of clusters that fits the data best. We have calculated a range of statistics available in the package for a two-, three-, and four-cluster

solution (Table A3). The statistics show inconclusive results; many recommend two or four clusters. Therefore, we have also visually inspected the two-, three- and four-cluster solutions. The two-cluster solution (Figure A6) distinguishes between those who are single, childless, and employed/students and those who are married with children and are either employed or inactive. In the next step of cluster analysis, the first cluster splits into two groups; these are the first two clusters presented in the results section. These two clusters are substantively different, and they still have a large enough number of observations to constitute two separate groups. In the next step of cluster analysis, the third cluster splits into a further two clusters (Figure A7). However, the fourth cluster is very small (157 cases), and these two clusters are very similar regarding fertility and employment trajectories. It contains individuals who were either single or separated. As the fourth group is not large enough and it is not substantively different from the third group, we chose to analyse the three-cluster solution.

Validity of the MCSA approach

A recent study by Piccarreta (2017) argued that a joint analysis of several domains is only reasonable and effective if these domains are also statistically associated with each other. She proposed several measures to calculate the strength of the interrelationship between more than two domains. We calculated Pearson's correlation and Cronbach's alpha to measure the statistical association between the domains of partnership, fertility, and employment (Table A4). According to these measures, the association between each pair of domains as well as all three domains is weak to moderate. However, we know from the empirical literature that these domains are interrelated in individuals' lives. Therefore, we deem it justified from a substantive point of view to analyse how partnership, fertility, and employment trajectories jointly evolve in the lives of immigrants.

Second, it is recommended to check that the results of MCSA are not dominated by patterns in just one domain (Piccarreta, 2017). We have conducted single-channel SA separately for partnership, fertility, and employment trajectories. Regarding partnership trajectories (Figure A8), we found the following three clusters: those who are and remain never partnered, those who form or dissolve partnerships, and those who are married. The fertility clusters are: childless, those who arrive with two or more children, and those who have a(nother) child following migration to the UK (Figure A9). We also found three employment clusters: employed, students and part-time employees, and those who are inactive (Figure A10). Overall, these groups are similar to what is identified in the MCSA but the joint analysis of these three domains allows us to highlight how these different domains intersect and jointly evolve in the lives of migrants after their arrival in the UK.

Weighted analysis

The sampling design of the UKHLS is complex and the immigrant and ethnic minority boost samples were taken from high ethnic minority concentration areas. Therefore, it is argued that to provide unbiased population estimates, researchers need to use weights and to account for the complex sampling strategy (McFall et al., 2019). In the results section we have presented unweighted results for two reasons. First, we only focus on immigrants and do not compare them with the native British. This means that even if immigrants are overrepresented in the data in comparison to natives, this issue is not relevant for our analysis. Second, it is not trivial which weights researchers should use when retrospective information is utilised, and immigrants enter the country and the dataset at different time points.

Nonetheless, we have conducted robustness checks using cross-sectional weights from the first wave (2009/10) of UKHLS. 135 individuals were excluded from the analysis because they were not yet included in the dataset at wave 1 meaning that they do not have a value for

the cross-sectional weight. Thus, we conduct the weighted analysis on a sample of 2,350 individuals. We incorporate weights both into the definition of the sequence objects and during clustering. The weighted results (Figure A11) are very similar to what is shown in the main analysis; the largest difference is again in cluster 1 regarding employment histories; rather than isolating students, this group is a mix of students and full-time employed individuals.

Conclusion and discussion

Recent studies have highlighted that immigrants' childbearing and partnership as well as childbearing and employment trajectories are closely related and hence need to be studied jointly. However, no study has analysed jointly the complex interrelationships between all three life domains of immigrants. In this study, we used multi-channel sequence analysis to establish a typology of joint trajectories of partnership, fertility, and employment among immigrants in the UK during the first five years after arrival.

We found three types of joint trajectories. Immigrants in the first group ('single, childless, students') arrive as and largely remain single and childless and are either in education, or part-time employment when they arrive. The second group ('partnered, childless, full-time employed') consists of immigrants who arrived as single and childless but later became partnered and parents. They are largely in full-time employment. Finally, the third group represents family migration; individuals in this group arrived as married and half of them had at least one child at the time of arrival. Five years after migration, almost all of them are married and have become parents. Individuals in this group tend to be employed or inactive.

Immigrants from South Asia (India, Pakistan, and Bangladesh) are most likely to belong to the 'family migrants' cluster, whereas those from Africa tend to be in the 'single, childless, students' cluster. European, Western, and Caribbean immigrants' trajectories are characterised as 'partnered, childless, full-time employed'. Regarding the socio-economic

profile of the joint trajectory types, family migrants tend to be older at the time of arrival than immigrants in the two other clusters. Women and individuals with lower levels of education are more likely to be family migrants, whereas men and those with higher levels of education are more likely to belong to the two other clusters. These gender differences are not surprising given that (traditional) labour migration with family reunification has been a defining characteristic of immigration to the UK. Those who migrated more recently tend to belong to the 'single, childless, students' group indicating the increasing importance of international student migration in the UK. Immigrants who arrived earlier are more likely to be partnered, childless, and full-time employed.

Our stratified analysis by gender showed very similar clusters among women and men. However, we also observed important differences in employment patterns between men and women. Both men and women in the first group (single, childless) are either in education or in employment at the time of arrival in the UK; many students later become full-time employed. The situation is different for the second (partnered, childless) and the third group (family migrants). While most men in these groups are in full-time employment, a large share of women are inactive, especially among marriage migrants. Although many native women are likely to work part-time or stay at home after childbirth, the low employment rates among partnered migrant women with children are striking. The potential reasons for the observed patterns are migrant selectivity, cultural factors (for some groups) and the fact that motherhood penalties are pronounced for migrant women.

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Appendix

Table A1. Average marginal effects (AME) from multinomial logistic regression, standard errors (SE) and significances, N = 2,485

	Type 1 Single, childless, students			Type 2 Partnered, childless, full-time employed			Type 3 Family migrants		
	AME	SE	Sig	AME	SE	Sig	AME	SE	Sig
Migrant origin									
EU	Ref			Ref			Ref		
Rest of Europe & West	0.046	0.034		-0.098	0.042	*	0.052	0.036	
India	-0.064	0.023	**	-0.216	0.033	***	0.280	0.031	***
Pakistan	-0.050	0.026		-0.359	0.035	***	0.409	0.035	***
Bangladesh	0.009	0.031		-0.339	0.039	***	0.330	0.039	***
Caribbean	0.035	0.038		-0.139	0.050	**	0.104	0.045	*
Africa	0.122	0.024	***	-0.248	0.030	***	0.126	0.026	***
Other	0.116	0.026	***	-0.235	0.032	***	0.119	0.029	***
Migration cohort									
1956-1989	Ref			Ref			Ref		
1990-2004	0.046	0.016	**	-0.046	0.022	*	0.000	0.021	
2005-2014	0.082	0.023	***	-0.084	0.028	**	0.003	0.026	
Age at arrival									
18-24	0.204	0.021	***	-0.031	0.024		-0.173	0.022	***
25-29	Ref			Ref			Ref		
30+	-0.104	0.015	***	-0.191	0.023	***	0.296	0.024	***
Education									
Low	-0.071	0.017	***	-0.046	0.022	*	0.117	0.021	***
Medium	Ref			Ref			Ref		
High	-0.047	0.022	*	0.069	0.026	**	-0.023	0.023	
Sex									
Male	Ref			Ref			Ref		
Female	-0.106	0.016	***	-0.101	0.019	***	0.207	0.017	***
N	2485			2485			2485		

Source: Authors' calculations using UKHLS data, waves 1–9 (2009–2019).
Notes: *p < .05; **p < .01; ***p < .001

Table A2. Results of Bayes information criterion (BIC) and Likelihood ratio test (LRT) when comparing men's and women's partnership, fertility, and employment trajectories

	LRT	p-value	BIC difference	Bayes Factor
Partnership trajectories	1.014	0.485	-4.284	0.117
Fertility trajectories	2.284	0.259	-3.014	0.351
Employment trajectories	13.114	0.001	7.815	202.539

Source: Authors' calculations using UKHLS data, waves 1–9 (2009–2019).

Table A3. Measures of cluster quality for 2, 3, and 4 clusters

	2 clusters	3 clusters	4 clusters
Point Biserial Correlation (PBC)	**0.55**	0.44	0.52
Hubert's Gamma (HG)	**0.64**	0.53	**0.64**
Hubert's Somers' D (HGSD)	**0.64**	0.53	**0.64**
Average Silhouette Width (ASW)	**0.32**	0.21	0.23
Average Silhouette Width weighted (ASWw)	**0.32**	0.21	0.23
Calinski-Harabasz index (CH)	**591.16**	431.55	337.62
Pseudo R squared (R2)	0.19	0.26	**0.29**
Calinski-Harabasz index using squared distances (CHsq)	**1225.92**	863.48	721.80
Pseudo R squared using squared distances (R2sq)	0.33	0.41	**0.47**
Hubert's C (HC)	**0.16**	0.23	0.18

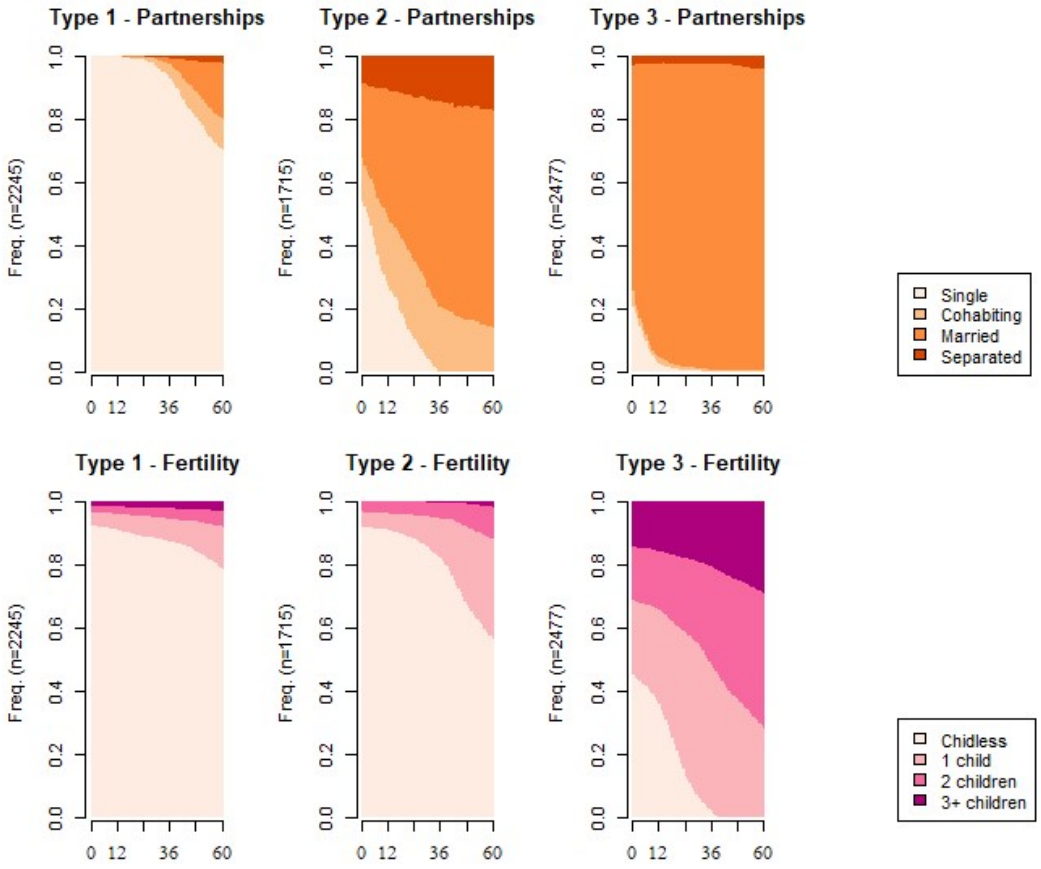
Source: Authors' calculations using UKHLS data, waves 1–9 (2009–2019).
Notes: Boldface highlights the best fit according to each measure. A higher value indicates better fit for all measures except for Hubert's C, where a lower value indicates better fit.

Table A4. Measures of correlation between the three domains of partnership, fertility, and employment

Pearson's correlation			
	Partnership	Fertility	Employment
Partnership	1		
Fertility	0.161	1	
Employment	0.049	0.057	1
Joint	0.655	0.670	0.544
Cronbach's alpha			
Partnership & fertility	0.277		
Partnership & employment	0.094		
Fertility & employment	0.107		
All three domains	0.227		

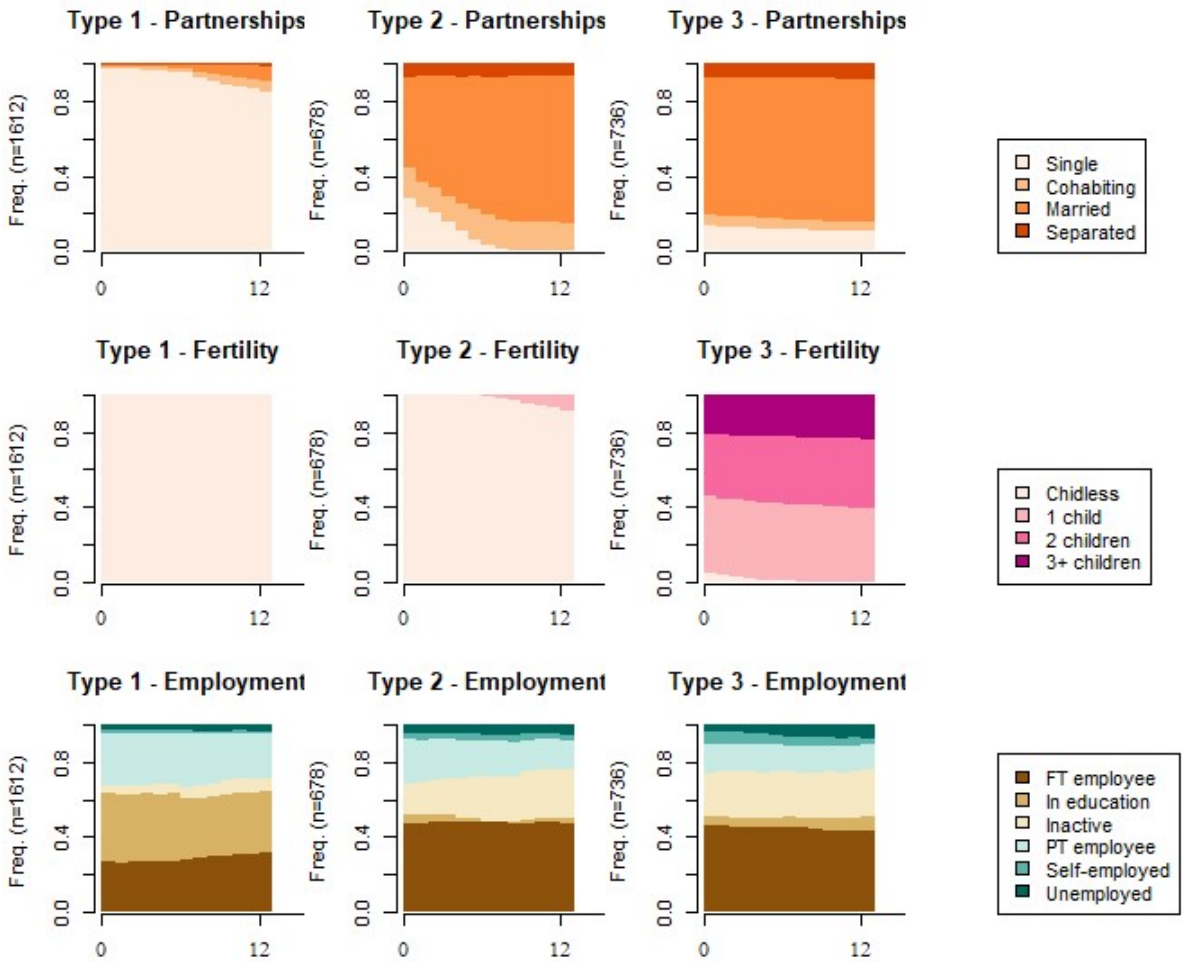
Source: Authors' calculations using UKHLS data, waves 1–9 (2009–2019).

Figure A1. Results of cluster analysis following a two-channel (partnership and fertility) sequence analysis (n = 6,437)



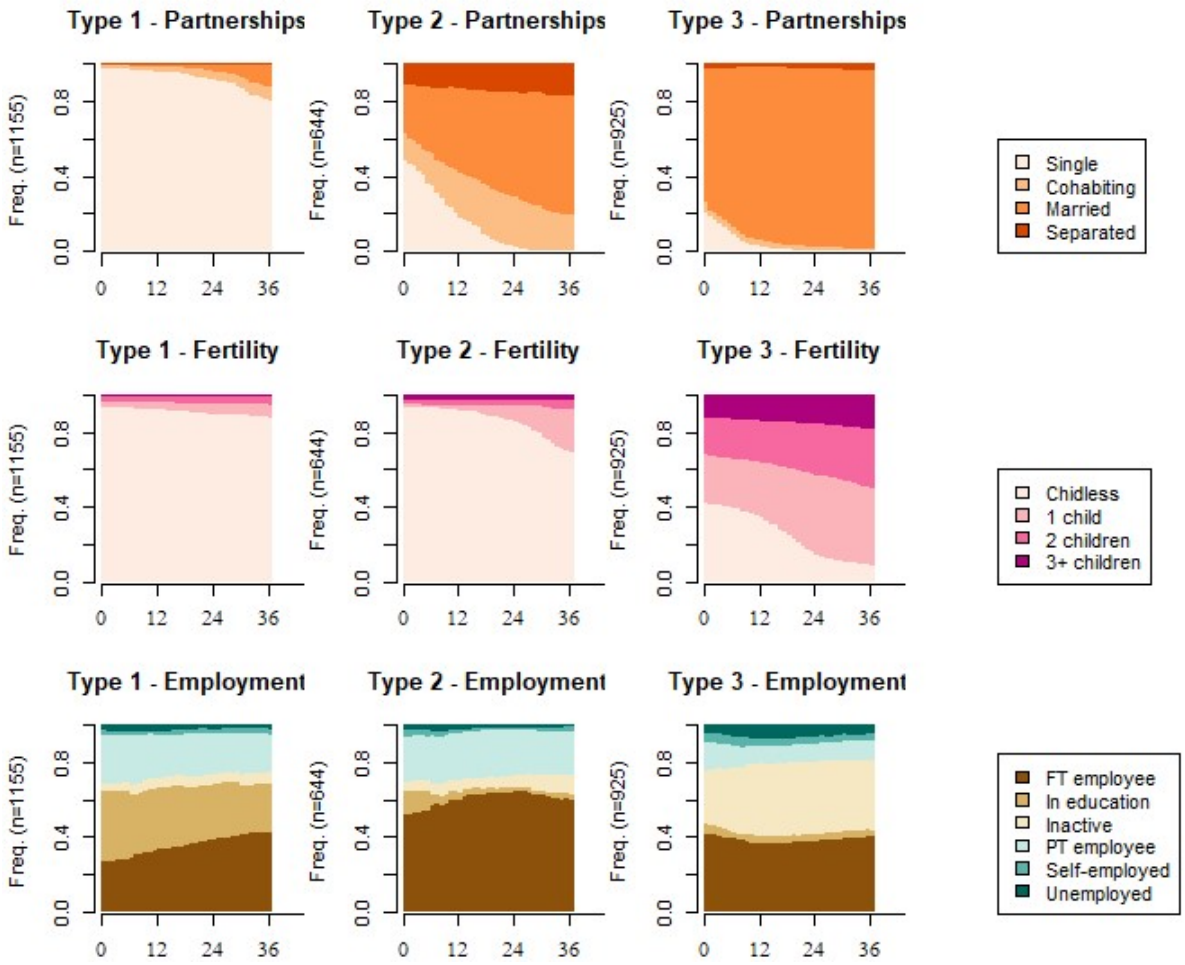
Source: Authors' calculations using UKHLS data, waves 1–9 (2009–2019).
Notes: The 'Separated' category includes separated as well as widowed individuals.

Figure A2. Results of cluster analysis using a one-year observation window (n = 3,026)



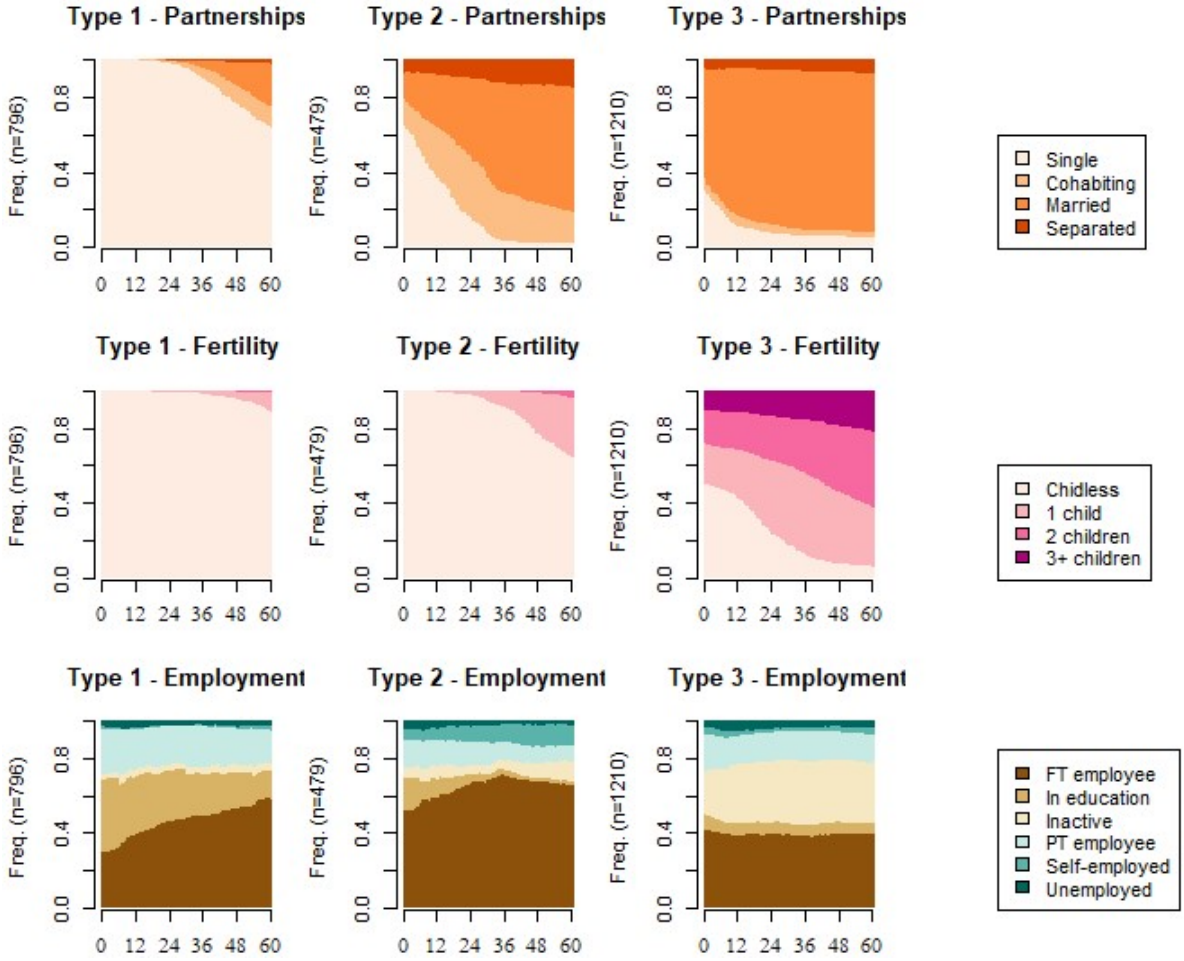
Source: Authors' calculations using UKHLS data, waves 1–9 (2009–2019).
Notes: The 'Separated' category includes separated as well as widowed individuals.

Figure A3. Results of cluster analysis using a three-year observation window (n = 2,724)



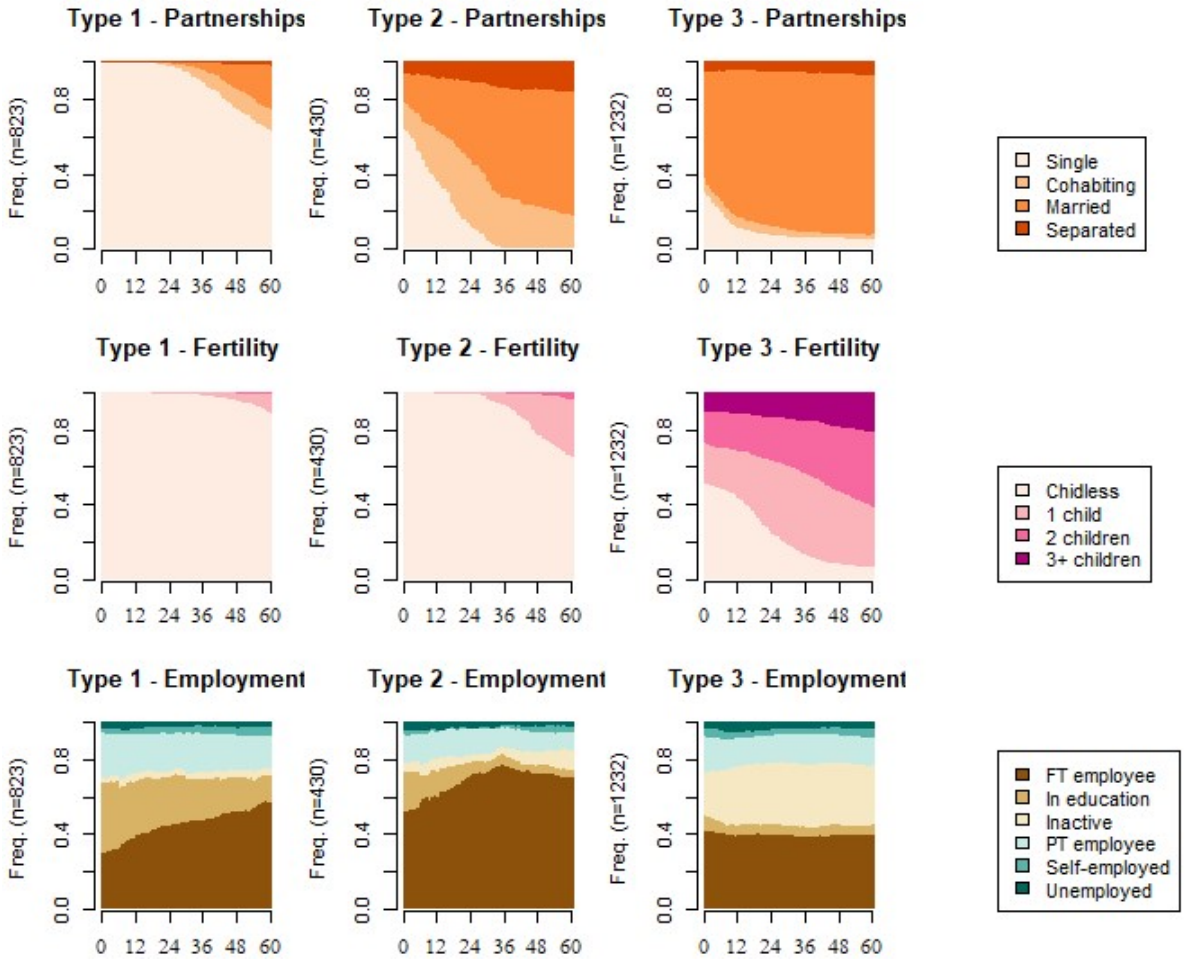
Source: Authors' calculations using UKHLS data, waves 1–9 (2009–2019).
Notes: The 'Separated' category includes separated as well as widowed individuals.

Figure A4. Results of cluster analysis using a substitution matrix based on transition rates and indel costs of 1.5



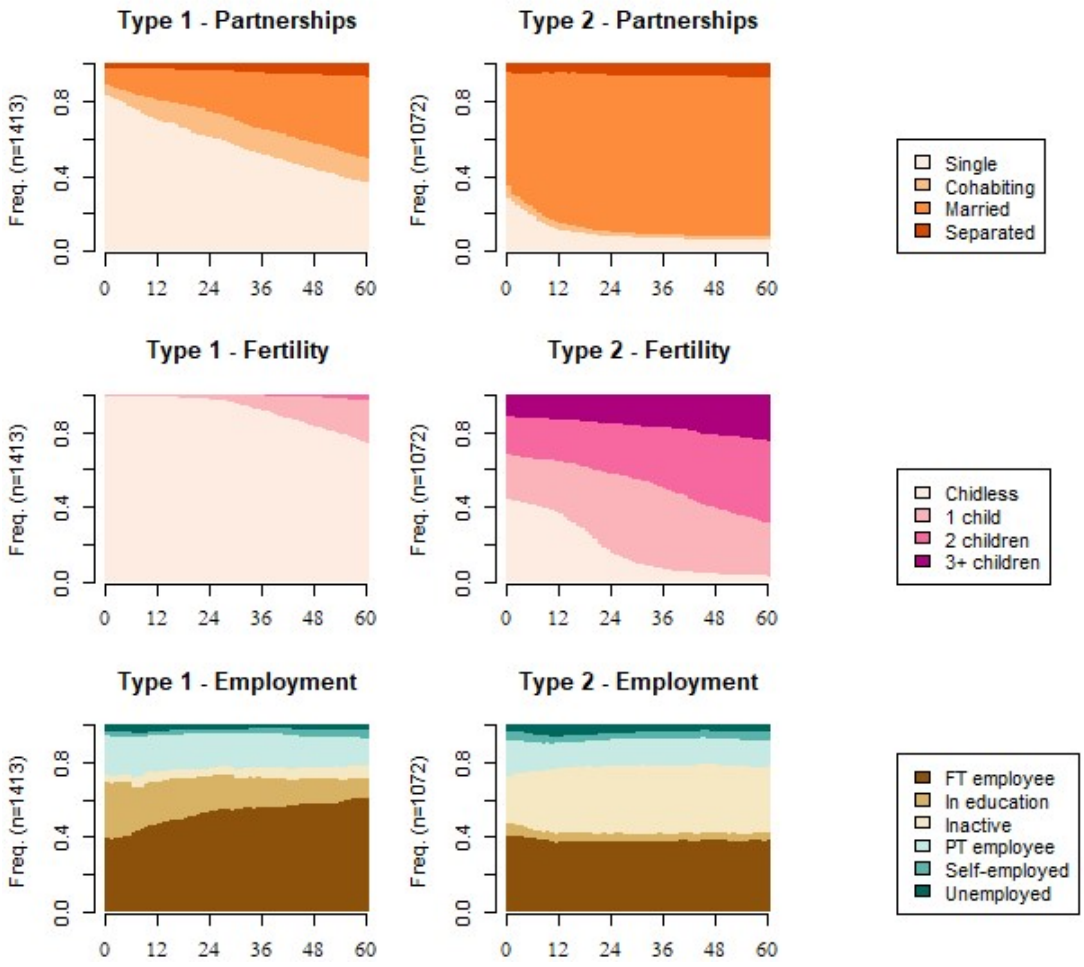
Source: Authors' calculations using UKHLS data, waves 1–9 (2009–2019).
Notes: The 'Separated' category includes separated as well as widowed individuals.

Figure A5. Results of cluster analysis using dynamic Hamming distances



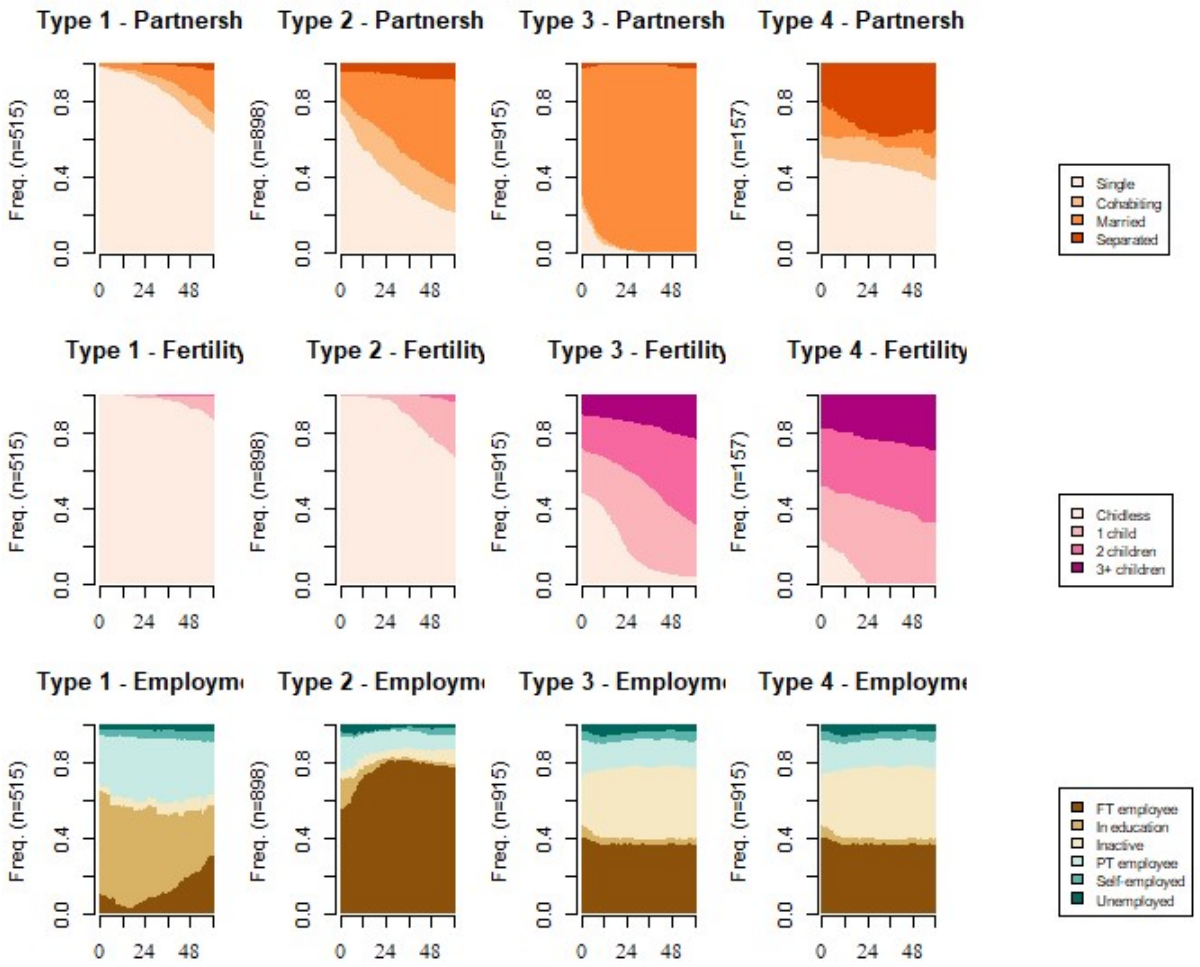
Source: Authors' calculations using UKHLS data, waves 1–9 (2009–2019).
Notes: The 'Separated' category includes separated as well as widowed individuals.

Figure A6. Results of cluster analysis: two-cluster solution



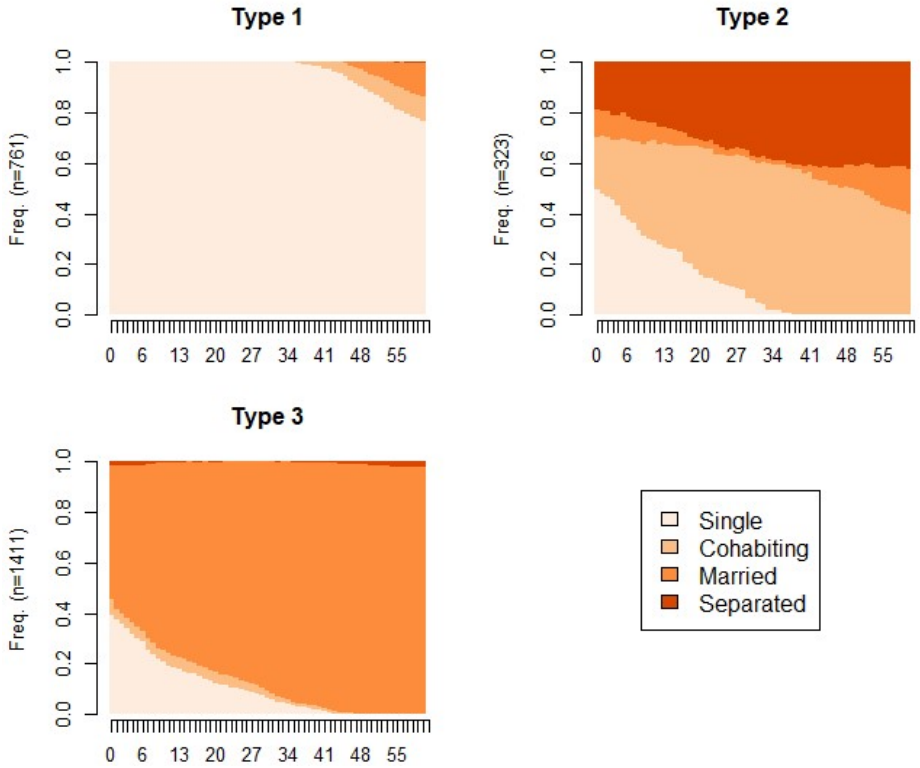
Source: Authors' calculations using UKHLS data, waves 1–9 (2009–2019).
Notes: The 'Separated' category includes separated as well as widowed individuals.

Figure A7. Results of cluster analysis: four-cluster solution



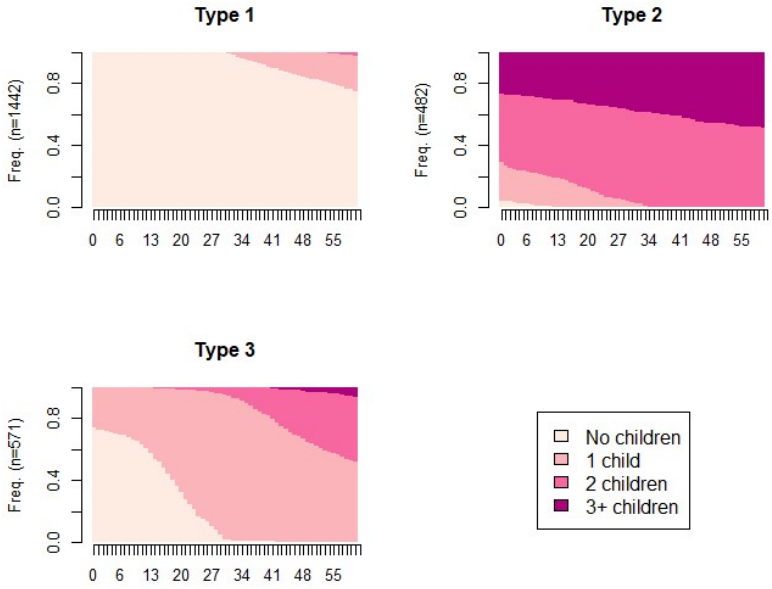
Source: Authors' calculations using UKHLS data, waves 1–9 (2009–2019).
Notes: The 'Separated' category includes separated as well as widowed individuals.

Figure A8. Results of cluster analysis using single channel sequence analysis: Partnership trajectories



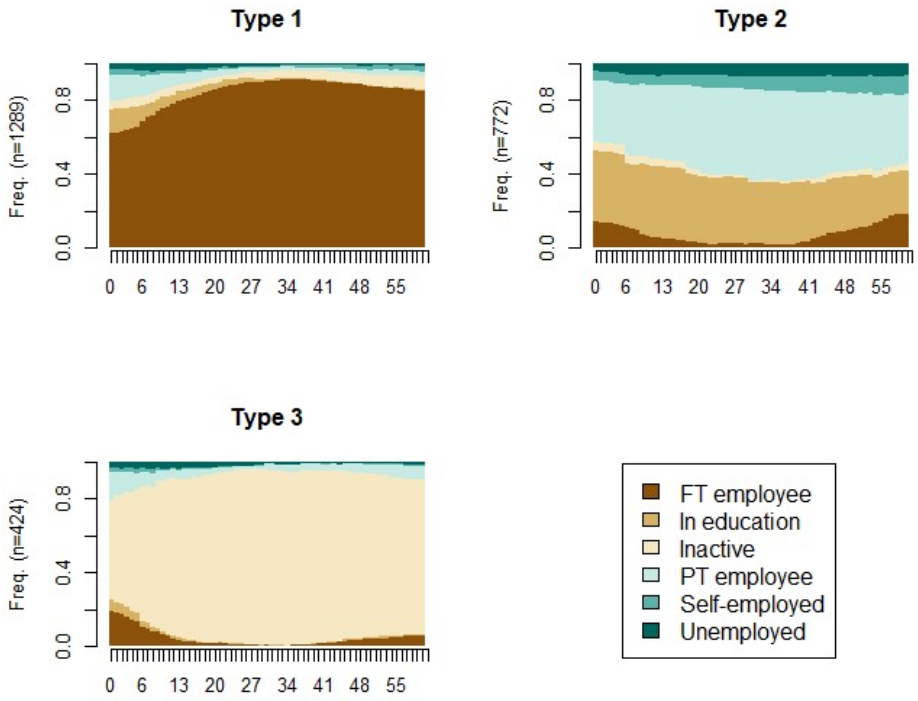
Source: Authors' calculations using UKHLS data, waves 1–9 (2009–2019).
Notes: The 'Separated' category includes separated as well as widowed individuals.

Figure A9. Results of cluster analysis using single channel sequence analysis: Fertility trajectories



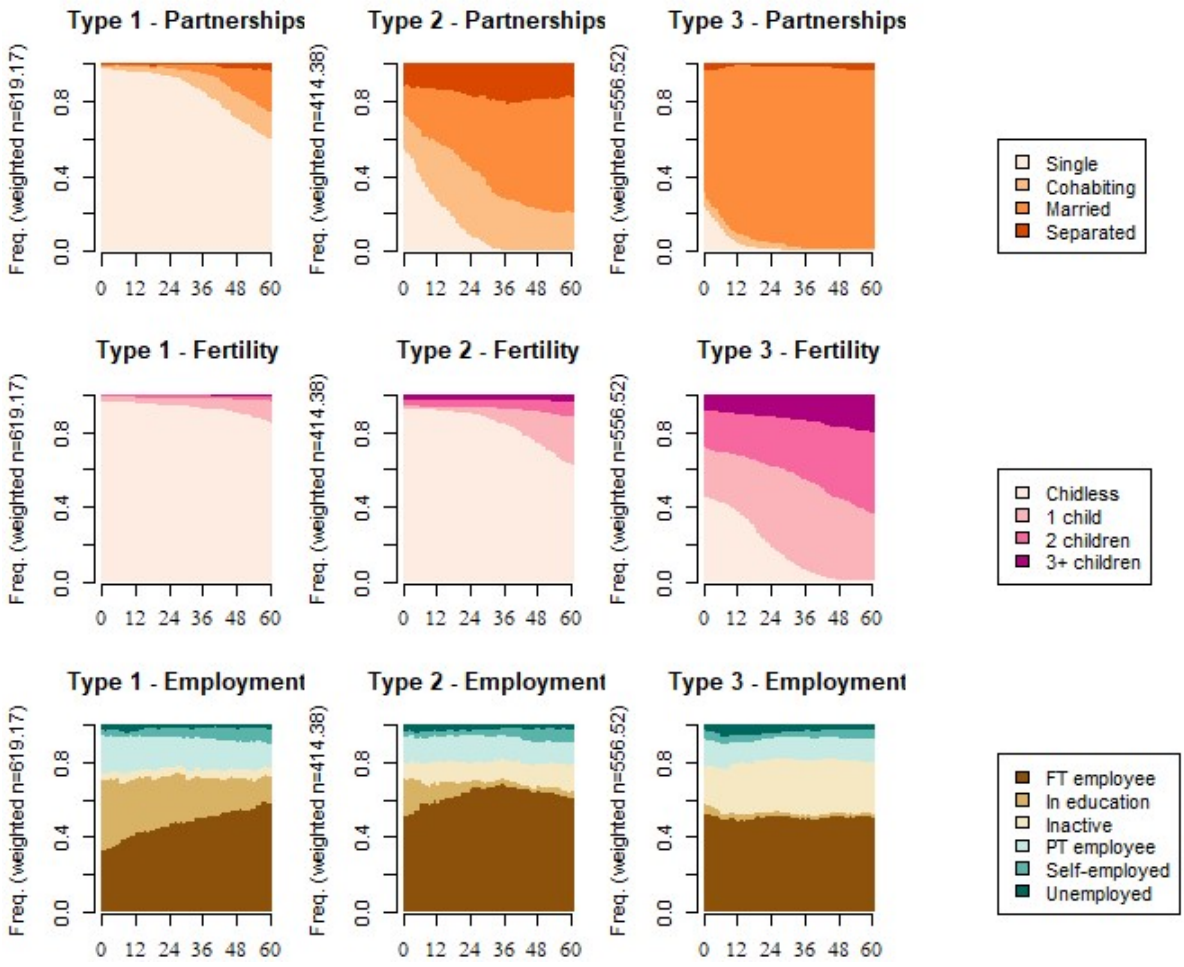
Source: Authors' calculations using UKHLS data, waves 1–9 (2009–2019).
Notes: The 'Separated' category includes separated as well as widowed individuals.

Figure A10. Results of cluster analysis using single channel sequence analysis: Employment trajectories



Source: Authors' calculations using UKHLS data, waves 1–9 (2009–2019).
Notes: The 'Separated' category includes separated as well as widowed individuals.

Figure A11. Results of weighted cluster analysis (n = 2,350)



Source: Authors' calculations using UKHLS data, waves 1–9 (2009–2019).
Notes: The 'Separated' category includes separated as well as widowed individuals.