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Abstract

The role of grandparents is increasingly important in ageing countries. We use a life course approach aiming at assessing the association between individual family histories (partnership and fertility histories) and grandparenthood-related outcomes (being grandparent, number of grandchildren, having at least one young grandchild). We use retrospective data collected in the third wave of the Survey of Health, Ageing and Retirement in Europe (SHARE), called SHARELIFE, and sequence analyses to cluster individuals according to similar patterns of family histories. Family histories show a considerable degree of heterogeneity with respect to timing, quantum and probability of experiencing certain events. This heterogeneity is reflected in strong variability in the probability of having (young) grandchildren and their number at different ages across the clusters of family trajectories. Our results provide a detailed demographic profile of grandparenthood and have important implications for the understanding of current and possible future developments of the grandparent role.

Keywords: Europe; Family histories; Grandparents; Life course approach; Sequence analysis; SHARE.

BACKGROUND

It is well recognized that in contemporary advanced societies, where population ages, lives of grandparents and grandchildren greatly overlap (Harper, 2005; Margolis, 2016) and a consistent proportion of grandparents provide care to their grandchildren (Bengtson, 2001; Bordone et al., 2016; Glaser et al., 2010; Hank & Buber, 2009). As a consequence of demographic changes in fertility and mortality, compared to the earlier 1900s, nowadays grandparents are more likely to survive throughout their grandchildren childhood (Uhlenberg, 2005). Today’s grandparents are also on average healthier and have fewer grandchildren to support than in the past (Timonen & Arber, 2012).

An increasing number of studies have investigated the impact of looking after grandchildren on grandparents’ health and wellbeing. Most studies focusing on supplementary childcare have reported positive effects of grandchild care on grandparents’ outcomes, including health and healthy behaviors (Arpino & Bordone, 2014; Di Gessa et al., 2016; Hughes et al., 2007) and life satisfaction (Moore & Rosenthal, 2015). Other studies have shown negative consequences on grandparents’ physical and psychological health (Grinstead et al., 2003; Triadò et al., 2014), and social participation (Arpino and Bordone, 2016) especially for women and when instrumental and high intensity childcare are considered.

Grandparental childcare is also important for enhancing young mothers' labour force participation, particularly in countries where the services offered by the market are costly and public provision is scarce (Aassve et al., 2012; Arpino et al., 2014).

Despite the extensive literature on determinants and consequences of grandparental childcare, limited recent research has focused on the demography of grandparenthood. Notable exceptions are Margolis (2016) and Leopold & Skopek (2015a, 2015b). Using the Sullivan method applied to Canadian data, Margolis (2016) estimated the number of years spent as grandparent and how this has changed between 1981 and 2015. She found that the average length of the grandparent life stage has slightly decreased among women from 24.7 to 24.3 years but increased among men from 17.0 to 18.9 years. Leopold & Skopek (2015a) used survival methods to estimate the median age at becoming grandparent, the length of grandparent phase of life and its overlap with other important roles in 24 European countries. Leopold & Skopek (2015b) investigated similar questions comparing different cohorts in East and West Germany. Both studies highlighted that grandparenthood overlaps rarely with active parenting but frequently with worker and filial roles.

Our contribution to this emerging literature is twofold. First, we consider three important demographic aspects of grandparenthood: being a grandparent, number of grandchildren, and having at least one young grandchild (age 10 or younger). This latter aspect is crucial as the likelihood of (regular) provision of grandchild care is higher when grandchildren are young (see e.g., Hank & Buber, 2009; Oppelaar & Dykstra, 2004). Second, we examine the role of family histories, and more specifically fertility and partnership histories, in influencing the demography of grandparenthood.

We use sequence analysis as an analytical tool to identify typologies of family histories, i.e. groups of people who follow similar family trajectories from age 15 to 49. The key advantage of sequence analysis is that it allows taking into account the complexity of family histories by considering simultaneously the *timing*, *quantum* and *ordering* of individuals' family events, providing a reduced number of groups of trajectories that can be interpreted and analyzed in a meaningful way (Aassve, Billari & Piccarreta, 2007). This analysis is implemented separately for women and men to recognize the gendered nature of family histories, for example, with respect to the timing of partnership formation and fertility (e.g., Elder, 1998). In a second step, we study how grandparenthood-related outcomes vary across the groups of family histories.

METHOD

Data and variables

Our analyses are based on data from the Survey of Health, Ageing and Retirement in Europe (SHARE; http://www.share-project.org/). SHARE is a panel survey representative of the non-institutionalized population aged 50 and over from different European countries (Börsch-Supan et al., 2008). The first wave was carried out in 2004/05 and every second year since then it was attempted to re-interview all individuals. Wave 3 (2008/09), called SHARELIFE, differently from the other waves, only collected detailed retrospective information on different life dimensions.

We use SHARELIFE to construct fertility and partnership histories between age 15 and 49 (both included), which gives 35 time points on a yearly time scale. SHARELIFE also provided information on most control variables. Information on other control variables and outcomes were obtained from the second wave of SHARE (2006/07) or, in case of missing data, from the first wave. We restrict our sample to women and men aged 50 years and over at the time we measure the outcomes. Additionally, in order to consider only people at risk of being grandparent, we restrict our analyses to those who had at least one child. After discarding respondents with incomplete information on family histories or other variables, our working sample consists of 21,147 individuals (56.7% women and 43.3% men) of which 68.2% became grandparent within the study period (70.1% women and 66.3% men).

The SHARE questionnaire asked each respondent to indicate the total number of grandchildren and the year of birth of the youngest offspring of each of their child. With this information we constructed our three outcome variables: being or not grandparent; number of grandchildren; having at least one grandchild aged 10 or younger.

Our explanatory variables are the clusters of family histories, obtained as we describe in the next section, and age at the time we measure the outcomes. Age is categorized in five-year intervals starting with age 50–54 and ending with 75 and older.

We adjust for a number of control variables measuring individuals' early life conditions using questions in SHARELIFE about respondents' situation at age 10: co-residence with biological parents, co-residence with s grandparents, main parental breadwinner's occupation, household's overcrowding rate (number of people living in the household divided by the number of rooms), and whether at least one of the parents was a heavy drinker. In addition, from SHARELIFE we obtained data on self-reported health during childhood (up to age 15) and the percentage of years the respondent has been employed from age 15 to 49. These control variables are introduced to reduce the risk of capturing effects due to family background and work histories and not to respondents' family histories *per se*. For example, respondents from poorer socio-economic origin may be more likely to display nonstandard family histories (Oppenheimer et al., 1997). We further control for country of residence and education.

Analytic strategy

Our empirical approach consists of two steps. First, by applying sequence and cluster analyses, we obtain clusters of similar family histories separately by gender. Second, we analyze the association between these clusters and grandparenthood-related outcomes.

Sequence and cluster analysis of family trajectories

We define the possible states that shape family trajectories based on two dimensions: individuals' partnership status (living without a partner = 0U; living with a partner = 1U) and number of children. To keep the number of states manageable and to avoid states with small number of cases, we group parities higher than the second, which produces four categories: 0 children (0C), 1 child (1C), 2 children (2C) and 3 or more children (3+C). Combining partnership and fertility variables gives 8 possible states (0U0C; 0U1C; 0U2C; 0U3+C; 1U0C; 1U1C; 1U2C; 1U3+C) that we measure at each age from 15 to 49, resulting in a trajectory (sequence) of 35 states for each individual.

Once all individuals trajectories are defined, we calculate distances among them using a dynamic algorithm known as Optimal Matching Analysis (OMA; Sankoff & Kruskal, 1983). OMA generates distances between sequences based on three arithmetic operations: insertion, deletion, and substitution. Following previous studies (e.g., Aassve et al., 2007), insertion and deletion costs are set to one and substitution costs are empirically defined as the inverse of the transition rates, so that the more common the transition between two states observed in the data, the lower the substitution cost.

Applying OMA separately to the subsamples of women and men, we obtain two matrixes of distances for each gender. Next, we employ hierarchical Cluster Analysis (CA) using Ward (1963)'s minimum variance criterion to both matrixes to obtain clusters of family trajectories. At the initial step, all clusters are singletons, i.e. contain a single individual. At each next step, the algorithm combines the pair of clusters that leads to the minimum increase in total within-cluster variance after merging. SA, OMA and CA are implemented using the R package *TraMineR* (Gabadinho et al., 2011).

Regression analyses

The second stage of the empirical analyses consists in investigating the association between clusters of family trajectories and three outcomes related to demographic aspects of grandparenthood: 1) being grandparent (i.e., having at least one grandchild or not); 2) number of grandchildren; 3) probability of having a young grandchild (i.e. aged 10 or smaller). For both first and third outcomes we use logit models and for the second one we use a Poisson model. In each model we interact family histories clusters with age categories. All regression models are estimated in STATA 14 separately by gender.

RESULTS

Sequence and cluster analysis

We start by describing the clusters of family histories obtained from cluster analysis applied to the distance matrixes generated by the optimal matching procedure. An important step in cluster analysis is to determine the number of clusters. However, a completely satisfactory and universally accepted solution is not available in the literature (Yan, 2005). Several goodness of fit statistics are available and they may give raise to different cluster solutions. Following common practice in cluster analysis, we combine insights from statistical measures with the need of obtaining a substantively interpretable solution. To interpret clusters we use the medoid sequence, i.e. the sequence that is least distant from all the other sequences within a cluster (Aassve et al., 2007; Kauffman & Rousseeuw, 1990). Comparing the medoid sequences of different cluster solutions, we opt for a 7-cluster solution for women and a 8-cluster solution for men that appear to be the most appropriate for our research aims. According to the average silhouette width, our cluster solutions have less classification quality than other solutions with less clusters. Nevertheless, heterogeneity of substantive importance was masked by the more parsimonious solutions. Our cluster solutions provide a higher differentiated pattern of family trajectories with enough sample size for each cluster in order to develop the second step of our analysis.

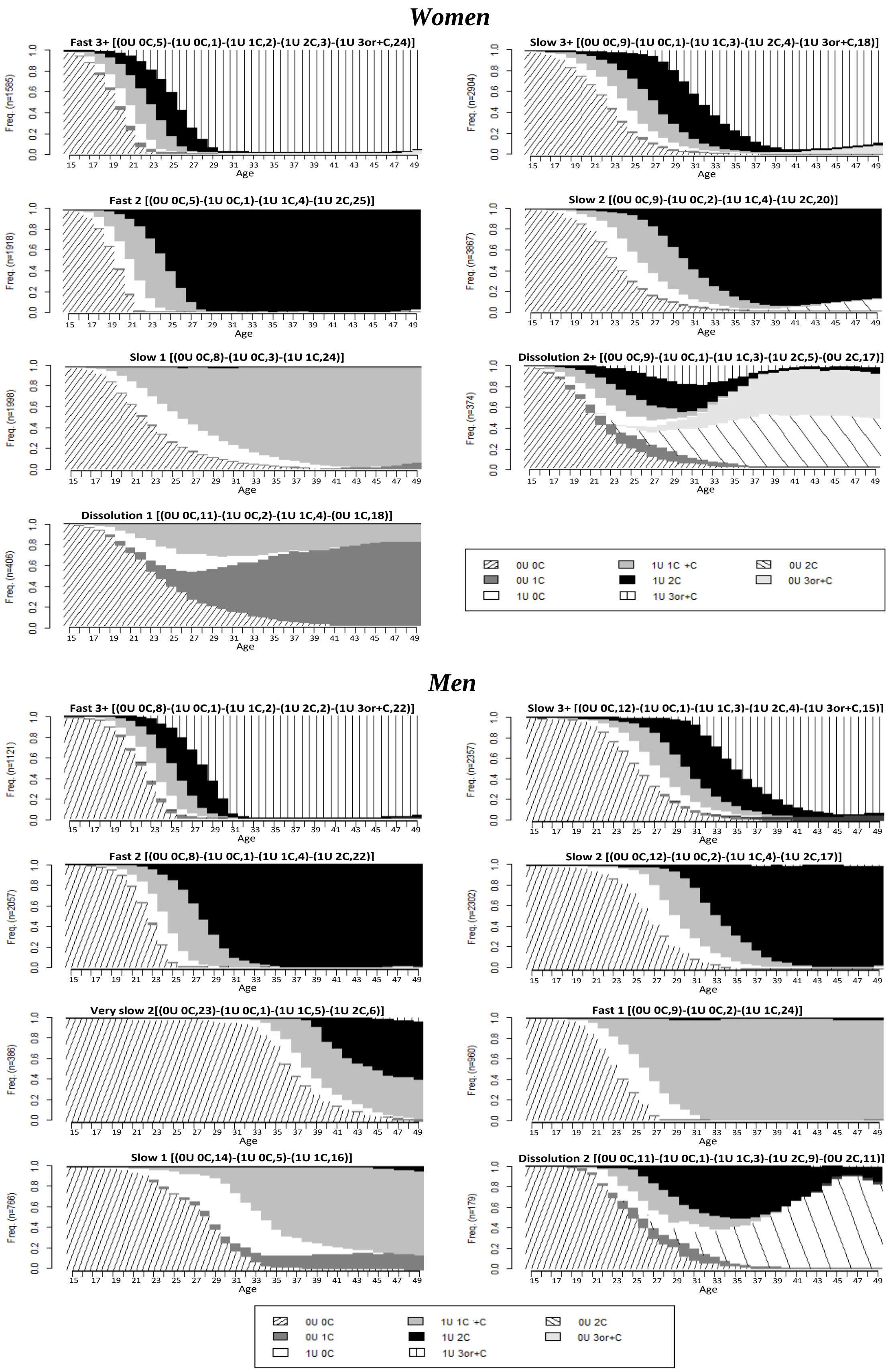
Table 1 reports summary statistics on several variables related to partnership and fertility for the different clusters of family histories by gender. State distribution graphs in Figure 1 offer a more dynamic view by plotting for each cluster and gender the proportion of individuals in each of the 8 states at each time point. On the top of each graph it is also reported the cluster's medoid sequence. The description of the clusters of family histories reveals a great variety of family trajectories for both women and men. Clusters are characterized by different timing of entry into first union, timing and quantum of fertility, and prevalence of union dissolution (either for separation/divorce or partner's death).

Among women, the cluster *Fast 3+* is characterized by a relatively "fast" entry into first partnership (mean age = 20.2), early first birth (mean age = 20.9) and by an average number of children higher than 3 (4.1). The medoid sequence for this cluster is: [(0U 0C,5)-(1U 0C,1)-(1U 1C,2)-(1U 2C,3)-(1U 3or+C,24)]. This corresponds to a "ideal-type" woman who lived without a partner and childless from age 15 to 19, at the age of 20 lived with a partner, the next year had a child, at age 23 had her second child, and three years later the third one. She remained in this state of living with a partner and having three or more children until the end of the analyzed trajectory (age 49). *Fast 3+* is the cluster of women that started a union the earliest and ended up having the highest average number of children.

Table 1. Descriptive statistics on the main characteristics of the clusters of family histories, by gender.

Clusters of family Histories	Sample size		Age at 1st time living with a partner			Experience of a union dissolution (%)	Widow (%)	Re-partnered (%)	Age at 1st child		Total number of children (at age 49)
	Frequency	%	Mean	Median	Never (%)				Mean	Median	Mean
Women											
Fast 3+	1,585	12.1	20.2	20.0	0.0	7.7	3.6	8.3	20.9	21.0	4.1
Slow 3+	2,904	22.2	23.2	23.0	0.0	11.4	5.4	10.5	24.7	25.0	3.4
Fast 2	1,918	14.7	20.0	20.0	0.0	7.5	2.1	9.1	21.4	22.0	2.0
Slow 2	3,867	29.6	24.2	24.0	0.0	13.4	5.1	9.9	26.5	26.0	2.0
Slow 1	1,998	15.3	23.7	23.0	0.0	11.3	4.6	11.9	27.2	26.0	1.0
Dissolution 2+	374	2.9	22.5	22.0	26.5	53.2	19.3	19.5	23.7	23.0	2.8
Dissolution 1	406	3.1	25.4	24.0	17.5	58.1	18.0	27.3	27.1	26.0	1.0
Total	13,052	100	22.7	22.0	1.3	13.6	5.3	10.9	24.7	24.0	2.4
Men											
Fast 3+	1,121	11.1	22.7	23.0	0.0	8.8	1.7	8.9	23.3	24.0	3.9
Slow 3+	2,357	23.3	26.3	26.0	1.1	11.9	2.1	10.9	28.0	28.0	3.4
Fast 2	2,057	20.3	23.0	23.0	0.0	7.0	1.1	7.2	24.4	25.0	2.0
Slow 2	2,302	22.7	27.1	27.0	0.0	10.6	0.9	10.0	30.1	30.0	2.0
Very slow 2	386	3.8	37.0	37.0	1.0	7.0	0.3	7.5	39.4	39.0	1.6
Fast 1	960	9.5	23.9	24.0	0.0	10.9	0.8	11.3	26.4	27.0	1.0
Slow 1	766	7.6	28.2	29.0	0.0	26.8	3.7	21.0	33.3	33.0	1.0
Dissolution 2	179	1.8	26.5	25.0	23.5	65.9	10.6	23.5	27.3	27.0	2.1
Total	10,128	100	25.7	25.0	0.9	12.1	1.6	10.6	27.8	27.0	2.4

Figure 1. State distribution and medoid sequences of the clusters of family histories, by gender



The cluster *Slow 3+* differs from *Fast 3+* essentially with respect to the timing of first partnership formation (mean age = 26.3) and first birth (mean age = 28.0), both happening later. However, women in *Slow 3+* also have a relatively high number of children (mean = 3.4). Clusters *Fast 2* and *Slow 2* are similar to clusters *Fast 3+* and *Slow 3+*, respectively, in terms of partnership formation and first birth timing. However, women in both clusters report lower fertility levels (mean number of children is 2 for both clusters).

Women in *Slow 1* are similar to those in *Slow 2* as far as the timing is concerned (mean age at first birth is slightly higher: 27.2 *vs* 26.5) but differ in terms of fertility (mean number of children is 1 instead of 2). The last two clusters *Dissolution 2+* and *Dissolution 1* are considerably smaller than the others (Table 1) and differ because of considerably higher percentage of women that experience union dissolution (53.2% and 58.1%, respectively). Correspondingly, also the percentage of women that experienced more than one partnership is substantively above the average level. On the other hand, these clusters also include women that never lived with a partner. The two clusters *Dissolution 2+* and *Dissolution 1* differ with respect to the timing of first union and first birth, which happened around 3 years earlier for *Dissolution 2+*, and the average number of children (2.8 and 1.0, respectively).

Men, as expected, experience partnership formation and fertility events later than women (by three years, on average; Table 1). However, most clusters of family histories for men are similar in terms of structure to those found for women. For example, also for men *Fast 3+* is a cluster characterized by relatively early first union formation and first birth and by the highest average total number of children. The cluster solution for men is characterized by two clusters that we did not find for women: *Very slow 2* and *Fast 1.* In cluster *Very slow 2*, first child and union formation occur much later than in the other clusters (e.g., average age at first child is 39.4), whereas in cluster *Fast 1* the average age for both events is below the total average among men. However, fertility for men in cluster *Very slow 2* is higher (1.6) than for men in cluster *Fast 1* (1.0).

Family histories and the probability to be grandparent

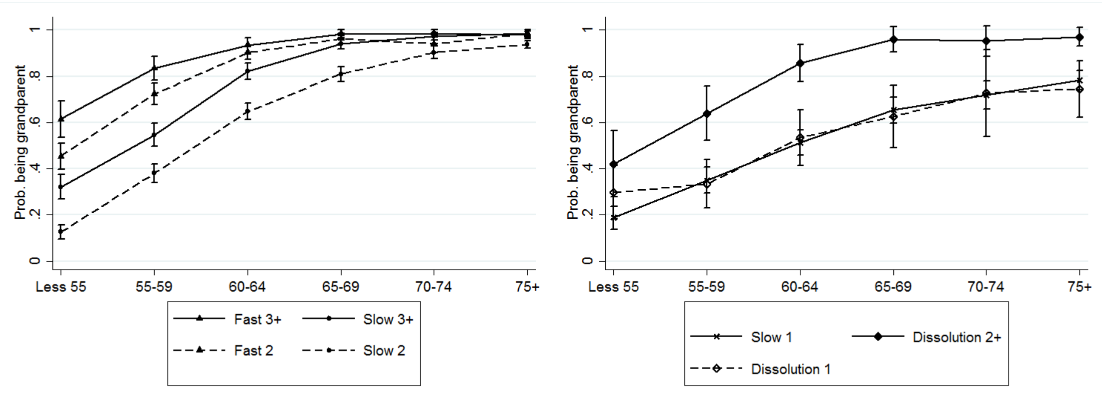
In the second step of our analyses, we analyze how grandparenthood-related outcomes vary across the clusters of family histories previously identified at different ages and by gender. We start considering the probability to be grandparent. Figure 2 displays predicted probabilities of being grandparent with 95% confidence intervals from logistic models that included all control variables and were estimated separately by gender (see tables A.1 and A.2 in the appendix for complete estimates of all models). Predictions are obtained for each cluster of family trajectories and age category. Although models included all clusters simultaneously, these are displayed in two separate panels for graphical convenience.

Clusters of women and men in the left hand side of Figure 1, all characterized by average total fertility of 2 or more, differ with respect to the timing of grandparenthood. At the youngest ages there is a considerable heterogeneity across clusters in the probability of being grandparent, both for women and men. Within the youngest age group (50-54), for both genders the highest probability to have at least one grandchild is found for the *Fast 3+* cluster, characterized, as demonstrated in the previous section, by a relatively early entry into union and first birth and high average total number of children. Within this cluster, the prevalence of grandparenthood at ages 50-54 is around 60% both for women and men (61% and 58%, respectively). The *Slow 3+* cluster, characterized by a slower transition to partnership formation and parenthood, reports much lower percentages (32% for women and 17% for men). Prevalence of grandparenthood at ages 50-54 is extremely low within the *Slow 2* cluster (13% for women and 3% for men).

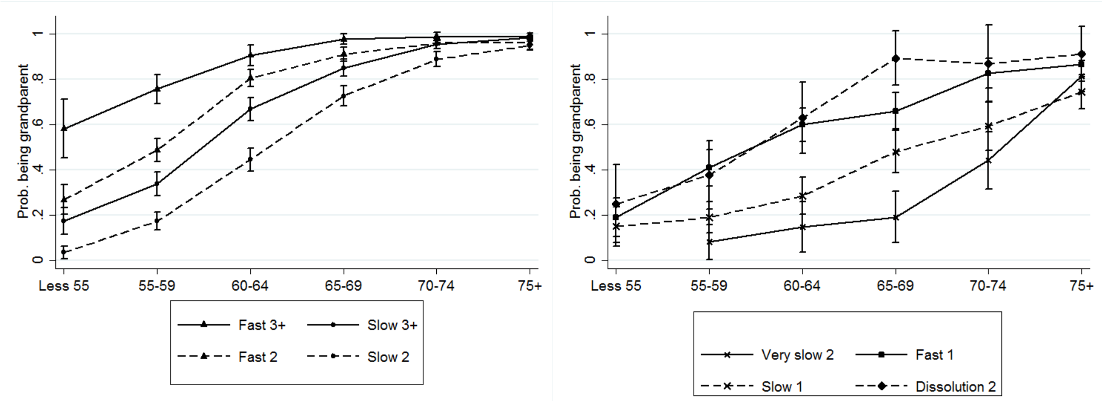
Prevalence of grandparenthood increases for all clusters with age and by age 75 in most clusters virtually all individuals are grandparents. Exceptions are most clusters in the right side panels of Figure 2. Among women, the probability of being grandmother above age 75 remains below 80% for the clusters *Slow 1* and *Dissolution 1* meaning that among women who had on average only 1 child, the risk of remaining grandchildless is much higher than among those who had more children. Similarly, clusters in the right hand side for men (*Very Slow 2, Dissolution 2, Fast 1* and *Slow 1*) at ages 75 and above exhibit a prevalence of grandfatherhood between 74% and 91%. We notice that clusters where the prevalence of union dissolution is high do not display significantly different probability of grandparenthood as compared to clusters with similar total number of children (compare, for example, clusters *Slow 1* and *Dissolution 1* for women or *Very Slow 2 and Dissolution 2* for men). This seems to indicate that union dissolution *per se* does not affect the probability of being grandparent.

Figure 2. Predicted probability of being grandparent with 95% confidence intervals by age and family histories clusters

Women



Men



Family histories and number of grandchildren

Figure 3 displays the predicted number of grandchildren with 95% confidence interval from Poisson regression models estimated separately for women and men and including all control variables. Predictions are obtained for each cluster of family trajectories and age category.

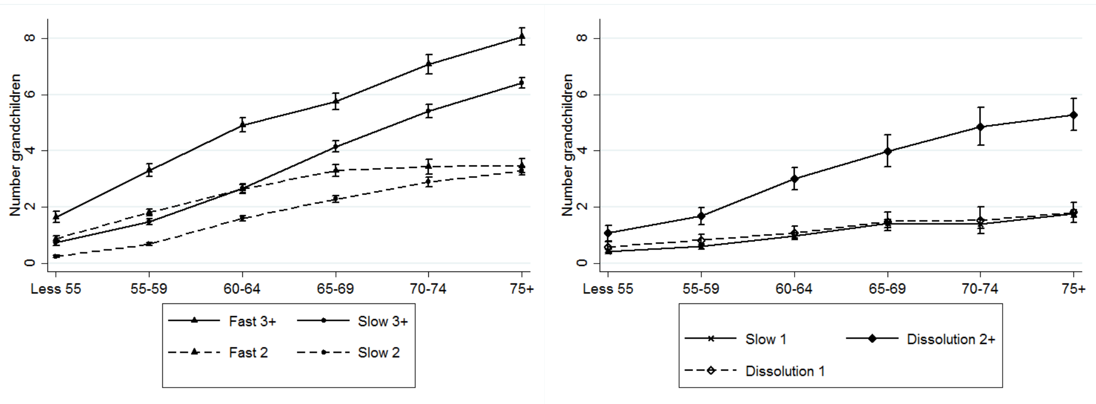
From Figure 3 it appears evident that differences across clusters not only concern the *timing* of grandparenthood but also its *quantum*. Clusters in the left hand side, which in Figure 2 mostly differed with respect to the timing of becoming grandparent, show, as expected, substantive differences also as to the average number of grandchildren. The graphs quantify the expectation that individuals who had more children are also more likely to have more grandchildren. Both grandmothers and grandfathers in the clusters *Fast 3+* display the highest number of predicted grandchildren at all ages, ranging on average from about 1.5 (women = 1.6; men = 1.4) at ages 50-54 to more than 7.5 (women = 8.1 ; men = 7.6) at age 75 and older. Their counterparts in the clusters *Slow 3+* have on average less than one grandchild (women = 0.7; men = 0.3) at ages 50-54 and around 6 (women = 6.4; men = 5.9) at ages 75 and older. The gap in the total number of grandchildren between the two types of clusters may be in part due to censoring, i.e. some of the respondents' children in cluster *Slow 3+* may have additional children after the end of our observation period.

The average number of grandchildren for both women and men in clusters *Fast 2* follow a similar patter than for those in clusters *Slow 3+* up to ages 60-64 but then the two patterns becomes to be rather different, and the *Fast 2* grandparents report 2 grandchildren less on average than the *Slow 3+* ones. This indicates that children of *Fast 2* respondents also had on average about 2 children relatively fast.

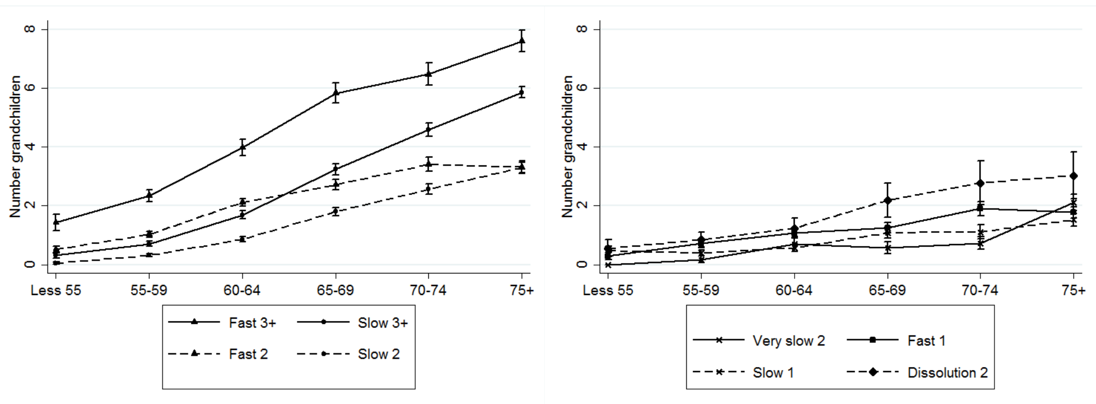
Among women, the clusters *Slow 1* and *Dissolution 1* exhibit the lowest average number of grandchildren at all ages, ranging from about 0.5 at the youngest ages to 1.8 at the oldest ages. For men all clusters in the right hand side (*Very Slow 2, Dissolution 2, Fast 1* and *Slow 1*) show low average values of the number of grandchildren.

Figure 3. Predicted number of grandchildren with 95% confidence intervals by age and family histories clusters

Women



Men



Family histories and the probability of having a grandchild aged 10 or younger

Figure 4 displays the predicted probability of having a grandchild aged 10 or younger with 95% confidence intervals from logistic models estimated separately for women and men and including all control variables. Predictions are obtained for each cluster of family trajectories and age category. As a sensitivity check we tried different age thresholds to define a young grandchild (8 and 12 years) and results were very similar to those presented here.

Figure 4 indicates that there is considerable heterogeneity across clusters of family histories also in the probability to have a young grandchild. At the youngest ages, the probability of having a young grandchild tends to coincide, evidently, with that of being grandparent displayed in Figure 2. Among women, the probability of having a young grandchild is the highest for the cluster *Fast 3+* at ages 50-54 and 55-59. From age 65 this probability turns to be the highest for cluster *Slow 3+*. The curves for these two clusters are rather similar but that for *Slow 3+* is shifted to the right, i.e. they differ mostly for the timing with which a higher or lower prevalence of young grandchildren is observed. Similarly, the pair of clusters *Fast 2* and *Slow 2* also display similar prevalence of having at least one young grandchild with a lag of 5 years. However, women in these clusters are about 20 percentage points less likely to have a young grandchild at any age compared to their counterparts in the corresponding clusters with higher fertility (*Fast 3+* and *Slow 3+*, respectively). Results for men for these 4 clusters are qualitatively similar. However, compared to women, men in *Fast 3+* exhibit the highest probability to have young grandchildren at older ages (65-69). For both women and men in the cluster *Slow 3+*, at ages 75 and older the prevalence of grandparents with young grandchildren is quite high (about 40% and 50%, respectively).

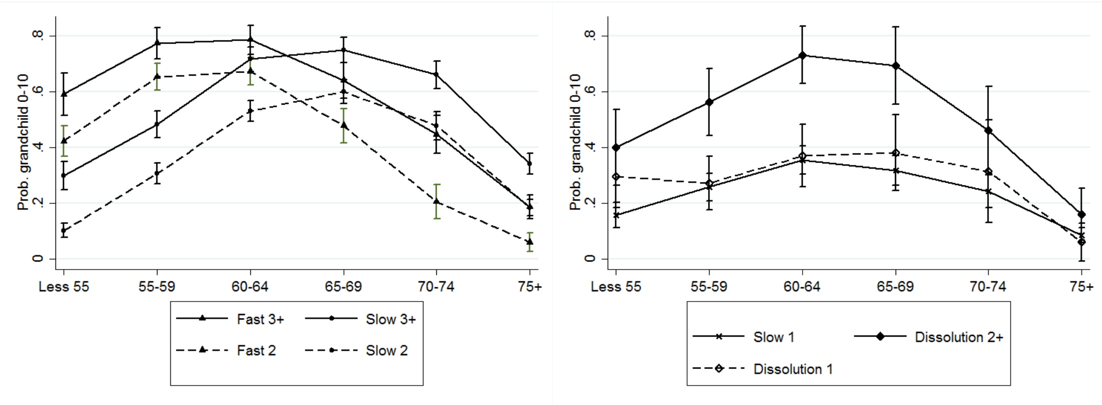
For women, the remaining clusters in the right hand side of Figure 4 (*Slow 1*, *Dissolution 2+*, *Dissolution 1*) show an inverse U-shaped pattern: the probability of having a young grandchild is maximum at central ages (60-64 and 65-69). Whereas at the extreme ages the three clusters exhibit similar probabilities, for central ages there is a substantive gap between women in the *Dissolution 2+* cluster as compared to those in the other two clusters. This gap reaches about 36 percentage points at ages 60-64 when the prevalence of grandmothers with a young grandchild is 73% (twice the prevalence of the other two clusters), which is not statistically different than those observed at the same ages for the clusters with similar fertility in the left hand side of Figure 4. For men, clusters in the right hand side of Figure 4 display a less systematic pattern. Only the Dissolution 2 cluster reaches a high prevalence of grandfathers with a young grandchild at ages 65-69 comparable to that of their female counterparts 5 years before. The other clusters tend to exhibit lower probabilities and reach the pick at different ages. Interestingly, clusters *Very Slow 2* for men is the only one showing the highest prevalence of grandparents with a young grandchild in the oldest age group: at ages 75 and older the 50% of men that experienced a "very slow" transition to the first and second child have a young grandchild.

CONCLUSION

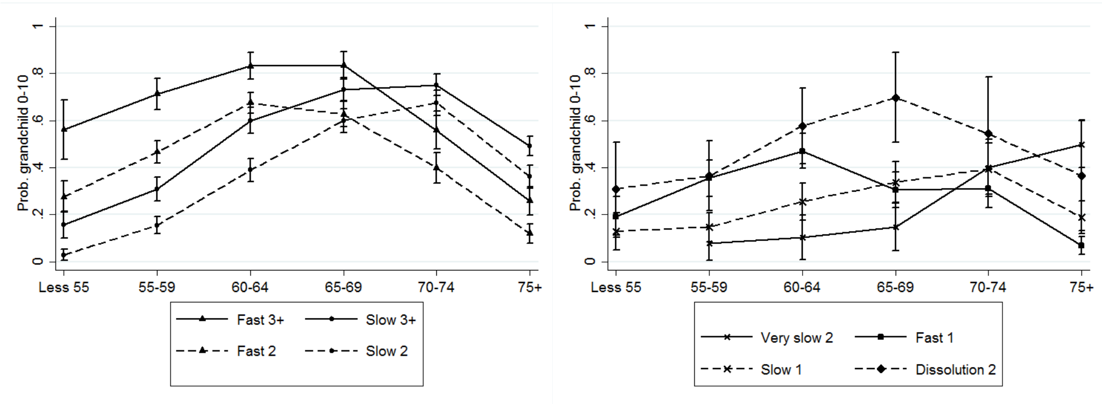
This study investigated for the first time how individual fertility and partnership histories influence three grandparenthood-related outcomes later in life: the probability of being grandparent, the number of grandchildren and the probability of having at least one grandchild aged 10 or younger.

Figure 4. Predicted probability of having a grandchild aged 10 or younger with 95% confidence intervals by age and family histories clusters

Women



Men



We used retrospective data from SHARELIFE (2008/09), the third wave of the Survey of Health, Ageing and Retirement in Europe (SHARE), to reconstruct complete family life courses between ages 15 and 49 and data from the first two waves of SHARE to measure demographic outcomes related to grandparenthood.

Applying sequence and cluster analysis to SHARELIFE we built a typology of family histories, separately by gender. These methods confirmed to be useful tools to summarize efficiently the complexity of family life courses that were found to differ strongly across clusters of individuals with respect to timing and quantum of partnership formation and fertility and the prevalence of events such as union dissolution. This allowed analyzing how the demography of grandparenthood varied across a meaningful limited number of groups of individuals.

Our research adds to a few recent study on the demography of grandparenthood (Leolpold and Skopek 2015a, 2015b; Margolis 2016). Differently from these studies we explored the variability of the demography of grandparenthood across groups of individuals. Our findings point to a great heterogeneity in the demography of grandparenthood across different clusters of family histories both for women and men. For the cluster of people who experienced an early entry into partnership, a fast progression to first and higher order births and exhibited a high total fertility (*Fast 3+*) we found a high prevalence of grandmothers (61%) and grandfathers (58%) already at ages 50-54. This group was also characterized by the highest average number of grandchildren at all ages (reaching 8.1 grandchildren for women and 7.6 for men at ages 75 and older).

Very different patterns were found for other clusters. Compared to *Fast 3+*, for example, both women and men in the *Slow 2* cluster, characterized by a relatively high age at first union and first birth and by a total fertility of about two children, reported a considerably lower prevalence of grandparenthood at ages 50-54 (13% and 3%, respectively) and a lower average number of grandchildren at ages 75 and older (around 4 for both women and men).

Our results demonstrate that the demography of grandparenthood varies tremendously across different groups of individuals. Future studies should examine the demography of grandparenthood taking into account not only average measures at the population level, such as the median age at grandparenthood, but also variabilities within populations. Our findings suggest that the de-standardization of family life trajectories (Elzinga & Liefbroer, 2007) also implies an increased variability in the demography of grandparenthood over time.

Our study has also some limitations. We analyzed complete life courses between ages 15 and 49 for individuals born in different time periods and countries. Therefore, individuals were exposed to different historical, structural and cultural contexts that may have influenced family histories. Our data did not allow implementing separate analysis by cohort and country. For example, although we controlled for country-level fixed effects, sample sizes were not sufficient to implement country-specific analyses. Descriptive statistics on the prevalence of each cluster of family history by country indicate that some clusters are more frequent in some countries than in others (see table A.3 in the appendix). For example, *Fast 3+* trajectories are especially frequent in Poland, *Slow 3+* in Spain, *Slow 2* in Greece and clusters of family histories characterized by high proportions of union dissolutions are more frequent in the Netherlands and in Sweden. Our pooled analyses did not allow describing the demography of grandparenthood in each country but they did permit showing the relationship between family histories and demographic aspects of grandparenthood, highlighting their variability across different clusters of family histories.

Our work has several important implications for the development of intergenerational relationships. We found that family histories strongly impact on the probability of having (young) grandchildren. Therefore, individuals in the different clusters of family histories have unequal chances to enjoy taking care of grandchildren and of benefiting from its positive effects on health and subjective wellbeing usually found in the literature on secondary grandchild care (Arpino & Bordone, 2014; Di Gessa et al, 2016; Moore & Rosenthal, 2015). Clusters also differ regarding the average number of grandchildren, which is also relevant for intergenerational relationships because the higher the number of grandchildren the lower the time that can be dedicated to each of them (Oppelaar & Dykstra, 2004).

We found that the clusters characterized by a high prevalence of union dissolution did not differ greatly from clusters with very low prevalence of union dissolution but similar fertility, suggesting that union dissolution *per se* does not impact substantially on the demography of grandparenthood. Still, union dissolution may reduce the quality and frequency of grandparent-grandchildren relationships (King, 2003).

Importantly, our study also demonstrates a high heterogeneity across clusters of individuals in the timing of grandparenthood, i.e. the probability of having (young) grandchildren and their number at different ages varies strongly across clusters. This has important implications for the development of the grandparent role and its possible interference with other roles. Age at which grandparents have (young) grandchildren influences the probability of taking care of them (Hank & Buber, 2009). Some studies also showed that age moderates the effect of having grandchildren and grandchild care. For example, Bordone and Arpino (2016) found that grandparents feel older than their grandchildless counterparts at younger ages but such an effect is reversed in later life.

Age at which people have grandchildren is also important because it may impact on the likelihood of grandparenthood being ill-timed because of simultaneous conflicting roles (Oppelaar & Dykstra, 2004). Margolis and Wright (2016) found that having simultaneously aging parents, children, and grandchildren is very common in the United States among people in their fifties and sixties. Leopold and Skopek (2015a) found that both in the United States and in European countries grandparenthood frequently overlaps with participation in the labor market. Although we did not study conflicting roles directly, our results allow supposing that the likelihood of overlaps between grandparenthood and other roles varies across groups of people who experienced different family life trajectories. An interesting avenue for future research is to forecast future prevalence of overlaps between different roles and study their consequences on grandparents' wellbeing and intergenerational relationships.

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APPENDIX

Table A.1. Complete estimates of regression models. Women

Independent variables	Probability of being grandparent		Number of grandchildren		Probability of having at least one grandchild 0-10	
	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
Family history clusters (Ref: Fast 3+)						
Slow 3+	-1.21	***	-0.82	***	-1.22	***
Fast 2	-0.65	**	-0.64	***	-0.68	**
Slow 2	-2.40	***	-1.95	***	-2.54	***
Slow 1	-1.93	***	-1.37	***	-2.05	***
Dissolution 2+	-0.79	*	-0.43	**	-0.77	*
Dissolution 1	-1.33	***	-1.05	***	-1.24	***
Age (Ref: Less than 55)						
55-59	1.15	***	0.70	***	0.86	***
60-64	2.18	***	1.10	***	0.94	***
65-69	3.58	***	1.25	***	0.21	
70-74	3.75	***	1.46	***	-0.58	**
75+	3.39	***	1.59	***	-1.84	***
Interactions clusters x age groups						
Slow 3+ *x* 55-59	-0.22		0.01		-0.08	
Slow 3+ *x* 60-64	0.09		0.20	*	0.84	**
Slow 3+ *x* 65-69	-0.08		0.49	***	1.73	***
Slow 3+ *x* 70-74	0.50		0.55	***	2.10	***
Slow 3+ *x* 75+	1.53	**	0.59	***	2.03	***
Fast 2 *x* 55-59	-0.01		0.03		0.08	
Fast 2 *x* 60-64	0.22		0.01		0.10	
Fast 2 *x* 65-69	-0.16		0.08		0.01	
Fast 2 *x* 70-74	-0.82		-0.09		-0.46	
Fast 2 *x* 75+	0.97		-0.21	*	-0.60	
Slow 2 *x* 55-59	0.30		0.36	**	0.49	†
Slow 2 *x* 60-64	0.36		0.82	***	1.36	***
Slow 2 *x* 65-69	-0.20		1.02	***	2.36	***
Slow 2 *x* 70-74	0.41		1.05	***	2.66	***
Slow 2 *x* 75+	1.24	*	1.05	***	2.52	***
Slow 1 *x* 55-59	-0.30		-0.36	*	-0.24	
Slow 1 *x* 60-64	-0.66	†	-0.24	†	0.14	
Slow 1 *x* 65-69	-1.48	*	-0.04		0.70	*
Slow 1 *x* 70-74	-1.35	*	-0.26	†	1.13	***
Slow 1 x 75+	-0.65		-0.15		1.15	***
Dissolution 2+ *x* 55-59	-0.25		-0.25		-0.20	
Dissolution 2+ *x* 60-64	-0.07		-0.06		0.48	
Dissolution 2+ *x* 65-69	-0.09		0.07		1.01	*
Dissolution 2+ *x* 70-74	-0.44		0.06		0.83	†
Dissolution 2+ *x* 75+	0.41		0.01		0.60	
Dissolution 1 *x* 55-59	-0.98	*	-0.35		-0.98	*
Dissolution 1 *x* 60-64	-1.18	*	-0.48	*	-0.60	
Dissolution 1 *x* 65-69	-2.20	**	-0.31		0.17	

Dissolution 1 *x* 70-74	-1.91	*	-0.49	*	0.67	
Dissolution 1 x 75+	-1.46	*	-0.45	*	-0.02	
Living with biological parents at 10 (Ref: Both)						
Only one	0.20	*	0.07	***	0.08	
None	0.63	**	0.12	***	0.28	†
Living grandparents at 10 (Ref: No)						
Yes	-0.17	*	-0.03	†	0.03	
Occupation of the breadwinner at 10 (Ref: Managers/professionals)						
Skilled manual	0.17	*	0.05	**	-0.04	
Semi-skilled & unskilled manual	0.10		-0.02		-0.13	*
Other	0.13	†	0.01		-0.19	**
Health at childhood (Ref: Good)						
Fair, poor or variable	0.02		0.02		-0.07	
Overcrowding rate at 10 (Ref: 1 or less)						
(1-1.5]	0.13	†	0.03	*	0.12	†
(1.5-2]	0.19	*	0.04	*	0.13	*
over 2	0.23	**	0.11	***	0.08	
Heavy drinking parents when 10 (Ref: No)						
Yes	0.13		0.10	***	0.09	
Working history (Ref: 75%-100% of life)						
50%-75% of life	0.05		-0.03		-0.07	
Less than 50%	-0.09		0.01		-0.11	†
Educational status (Ref: Primary)						
Secondary	-0.34	***	-0.08	***	0.00	
Tertiary	-0.78	***	-0.11	***	-0.27	***
Country of residence (Ref: Austria)						
Germany	-0.13		-0.06		0.17	
Sweden	0.17		0.20	***	0.45	**
Netherlands	-0.29	†	0.07	†	0.48	**
Spain	-0.74	***	-0.14	***	0.39	**
Italy	-0.74	***	-0.21	***	0.32	*
France	-0.12		0.10	**	0.41	**
Denmark	0.61	**	0.23	***	0.84	***
Greece	-0.99	***	-0.22	***	-0.44	**
Switzerland	-0.66	***	-0.11	**	0.02	
Belgium	0.22		0.16	***	0.57	***
Check Republic	0.47	**	0.17	***	-0.01	
Poland	1.04	***	0.24	***	0.66	***
Constant	0.58	*	0.44	***	0.16	
Pseudo R2	0.34		0.31		0.16	
N	11,999		11,999		11,653	

Note: † p < 0.10; * p < 0.05; ** p < 0.01; *** p < 0.001. The small reduction of the sample size for the third model is due to a small additional amount of missing cases on the age of the youngest grandchild.

Table A.2. Complete estimates of regression models. Men

Independent variables	Probability of being grandparent		Number of grandchildren		Probability of having at least one grandchild 0-10	
	Coef.	Sig.	Coef.	Sig.	Coef.	Sig.
Family history clusters (Ref: Fast 3+)						
Slow 3+	-1.90	***	-1.53	***	-1.94	***
Fast 2	-1.34	***	-1.01	***	-1.21	***
Slow 2	-3.69	***	-3.39	***	-3.77	***
Very slow 2	-3.14	***	-15.23		1.05	***
Fast 1	-1.78	***	-1.59	***	-1.69	***
Slow 1	-2.08	***	-1.12	***	-2.16	***
Dissolution 2	-1.43	**	-0.94	**	-1.04	†
Age (Ref: 50-54)						
55-59	0.80	*	0.50	***	0.66	*
60-64	1.92	***	1.03	***	1.35	***
65-69	3.37	***	1.41	***	1.37	***
70-74	4.06	***	1.51	***	-0.01	
75+	4.28	***	1.67	***	-1.30	***
Interactions clusters x age groups						
Slow 3+ *x* 55-59	0.09		0.33	†	0.22	
Slow 3+ *x* 60-64	0.35		0.68	***	0.75	†
Slow 3+ *x* 65-69	-0.07		0.95	***	1.33	**
Slow 3+ *x* 70-74	0.53		1.19	***	2.80	***
Slow 3+ *x* 75+	1.36		1.27	***	2.96	***
Fast 2 *x* 55-59	0.15		0.19		0.16	
Fast 2 *x* 60-64	0.50		0.38	*	0.35	
Fast 2 *x* 65-69	-0.05		0.25		0.11	
Fast 2 *x* 70-74	0.10		0.37	*	0.56	
Fast 2 *x* 75+	-0.12		0.18		0.27	
Slow 2 *x* 55-59	0.99	†	1.38	***	1.17	*
Slow 2 *x* 60-64	1.22	*	1.86	***	1.73	**
Slow 2 *x* 65-69	0.97		2.21	***	2.56	***
Slow 2 *x* 70-74	1.36		2.46	***	4.27	***
Slow 2 *x* 75+	2.00	*	2.56	***	4.26	***
Very slow 2 *x* Less 55	0.00	***			0.00	***
Very slow 2 *x* 55-59	-0.44		12.61		-4.44	***
Very slow 2 *x* 60-64	-0.86		13.49		-4.82	***
Very slow 2 *x* 65-69	-2.01	*	12.91		-4.42	***
Very slow 2 *x* 70-74	-1.49		13.05		-1.70	***
Very slow 2 *x* 75+	0.00	***	13.95		0.00	***
Fast 1 *x* 55-59	0.28		0.41		0.18	
Fast 1 *x* 60-64	-0.06		0.27		-0.02	
Fast 1 *x* 65-69	-1.25	†	0.05		-0.75	
Fast 1 *x* 70-74	-1.05		0.36		0.66	
Fast 1 *x* 75+	-0.97		0.14		0.14	
Slow 1 *x* 55-59	-0.51		-0.67	**	-0.51	
Slow 1 *x* 60-64	-1.10	*	-0.83	**	-0.51	
Slow 1 *x* 65-69	-1.70	*	-0.57	*	-0.13	

Slow 1 *x* 70-74	-1.94	*	-0.64	**	1.49	**
Slow 1 *x* 75+	-1.46	†	-0.49	*	1.75	**
Dissolution 2 *x* 55-59	-0.20		-0.09		-0.42	
Dissolution 2 *x* 60-64	-0.29		-0.23		-0.24	
Dissolution 2 *x* 65-69	-0.15		-0.04		0.26	
Dissolution 2 *x* 70-74	-1.08		0.09		0.98	
Dissolution 2 *x* 75+	-0.85		0.02		1.55	*
Living with biological parents at 10 (Ref: Both)						
Only one	-0.07		0.01		-0.02	
None	-0.20		0.01		0.03	
Living grandparents at 10 (Ref: No)						
Yes	0.08		0.00		0.12	†
Occupation of the breadwinner at 10 (Ref: Managersxprofessionals)						
Skilled manual	0.17	†	0.09	***	0.04	
Semi-skilled & unskilled manual	0.06		0.01		-0.02	
Other	0.14		0.05	*	-0.05	
Health at childhood (Ref: Good)						
Fair, poor or variable	0.01		-0.08	**	-0.05	
Overcrowding rate at 10 (Ref: 1 or less)						
(1-1.5]	-0.03		-0.02		-0.03	
(1.5-2]	-0.03		-0.01		-0.06	
over 2	0.19	†	0.08	***	0.01	
Heavy drinking parents when 10 (Ref: No)						
Yes	0.14		0.02		0.16	†
Working history (Ref: 75%-100% of life)						
50%-75% of life	-0.12	†	-0.01		-0.16	**
Less than 50%	0.13		0.08	*	0.05	
Educational status (Ref: Primary)						
Secondary	-0.31	***	-0.09	***	0.05	
Tertiary	-0.68	***	-0.13	***	-0.14	*
Country of residence (Ref: Austria)						
Germany	0.06		0.02		0.29	†
Sweden	0.25		0.20	***	0.42	*
Netherlands	-0.09		0.12	*	0.45	**
Spain	-0.44	*	-0.11	*	0.49	**
Italy	-0.64	**	-0.29	***	0.28	†
France	0.05		0.10	*	0.46	**
Denmark	0.70	**	0.30	***	0.83	***
Greece	-1.00	***	-0.36	***	-0.46	**
Switzerland	-0.44	*	-0.01		-0.08	
Belgium	0.46	*	0.19	***	0.51	**
Check Republic	0.76	***	0.24	***	0.15	
Poland	1.13	***	0.23	***	0.63	***
Constant	0.43		0.33	**	-0.03	
Pseudo R2	0.36		0.32		0.16	
N	9,134		9,134		8,928	

Note: † p < 0.10; * p < 0.05; ** p < 0.01; *** p < 0.001. The small reduction of the sample size for the third model is due to a small additional amount of missing cases on the age of the youngest grandchild.

Table A.3. Country composition of family history clusters, by gender.

Clusters of family histories	Size		Country												
	Frequency	%	Austria	Belgium	Check Republic	Denmark	France	Germany	Greece	Italy	Netherlands	Poland	Spain	Sweden	Switzerland
Women			(n=420)	(n=1360)	(n=1004)	(n=1037)	(n=1199)	(n=887)	(n=1422)	(n=1220)	(n=1010)	(n=979)	(n=982)	(n=931)	(n=601)
Fast 3+	1,585	12.1	15.7	13.2	10.1	9.6	14.1	12.3	8.4	10.6	10.0	22.8	15.6	7.8	10.3
Slow 3+	2,904	22.2	19.8	24.9	13.1	22.8	24.0	16.2	13.2	23.6	25.3	24.2	33.9	24.2	26.1
Fast 2	1,918	14.7	14.5	12.8	27.6	17.5	11.7	13.5	18.3	12.4	13.3	17.5	7.2	13.2	9.2
Slow 2	3,867	29.6	21.7	24.8	25.5	29.8	24.1	29.7	40.2	32.3	31.4	22.8	30.2	33.7	34.3
Slow 1	1,998	15.3	18.3	19.9	16.7	13.0	17.8	22.4	15.6	18.2	9.2	8.9	10.4	13.5	13.8
Dissolution 2+	374	2.9	5.5	2.2	2.9	3.1	4.0	2.7	1.5	1.0	8.1	1.7	1.3	2.7	2.8
Dissolution 1	406	3.1	4.5	2.2	4.1	4.2	4.3	3.2	2.9	2.0	2.7	2.1	1.3	4.8	3.5
Total	13,052	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Men			(n=271)	(n=1,093)	(n=708)	(n=818)	(n=903)	(n=737)	(n=1,068)	(n=998)	(n=837)	(n=752)	(n=757)	(n=726)	(n=460)
Fast 3+	1,121	11.1	15.9	13.5	9.6	11.6	14.6	8.3	4.2	7.1	10.2	19.7	13.1	10.1	11.5
Slow 3+	2,357	23.3	21.4	22.7	13.8	21.3	26.9	18.5	15.6	24.9	25.8	27.1	35.5	24.0	26.3
Fast 2	2,057	20.3	17.7	22.7	33.8	26.9	19.3	22.0	14.2	14.2	23.2	22.3	11.2	21.3	15.2
Slow 2	2,302	22.7	17.0	15.2	18.1	20.5	17.1	19.8	39.7	29.2	23.4	15.0	25.0	23.1	24.6
Very slow 2	386	3.8	3.3	1.7	2.3	3.5	2.0	3.1	11.0	5.4	1.8	2.1	3.8	2.9	4.3
Fast 1	960	9.5	12.2	15.0	12.3	9.3	11.2	17.1	5.6	9.3	5.1	8.0	4.8	7.3	6.1
Slow 1	766	7.6	11.1	7.9	8.2	5.5	7.5	9.9	8.8	9.4	5.6	4.4	6.2	7.7	7.6
Dissolution 2	179	1.8	1.5	1.3	2.0	1.3	1.4	1.4	0.8	0.4	4.9	1.3	0.4	3.6	4.3
Total	10,128	100	100	100	100	100	100	100	100	100	100	100	100	100	100