Childhood family structure in 16 European countries

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Abstract

At the end of the 20th century we saw great changes in family dynamics with rates of separation and re-partnerning increasing across Europe. Previous research has primarily focused on adults but less is known about how these family demographic changes have affected children's family structure. From previous studies we know that there are regional differences in children's propensity to experience parental separation, re-partnering as well as being born to a lone mother. A link between maternal education and children's risk of experiencing certain family transitions have also been found, but the evidence are mixed and the educational gradients are not always clear. In this thesis, I use data from the Harmonized Histories dataset on 16 European countries to find which family structures are the most common for European children and how they vary across regions and by maternal educational level. I use sequence and cluster analysis to identify the set of family structures which best captures the family life course of children up to age 15. I partly find similar results as previous studies with regard to the regional differences and educational gradient in family structure. New findings show that there is a North/South divide in the propensity of children to remain with their original parents throughout childhood as well as experiencing parental separation and stepfamily formation. Further, I corroborate previous findings on the relationship between maternal education and childhood family structure as well as provide new results. One important finding is that children of highly educated mothers who experience parental separation are more likely than children of less educated mothers to remain with a single mother rather than to enter into a new stepfamily. This holds for most European regions. In sum, this research contributes to the field of family demography by analyzing children's longitudinal family structure and by incorporating both country of residence and socioeconomic background. It highlights the need for incorporating the entire life course of children, as well as the geographical and socioeconomic context for a more complete understanding of how family demographic changes have played out for European children.

Keywords: child outcomes, Europe, comparative, divorce, stepfamily, sequence analysis

Introduction

The European family dynamics of the late 20th century underwent large changes as compared to previous decades. In particular through increasing rates of divorce and re-partnering. From the amassed family demography literature, the majority of attention has been placed on investigating the changing family dynamics from the adult perspective, while less is known about children's family structures. Understanding the extent to which children experience various family circumstances and when transitions occur is crucial as both family structure and transitions have the potential to influence child wellbeing and future outcomes (Fomby and Cherlin, 2007). Consequently, exploring the landscape of children's family experiences becomes imperative for a comprehensive understanding of the evolving dynamics of European family structures.

The demographic studies that have been carried out on children's experiences of family transitions in Europe (such as Andersson, 2002; Kennedy and Thomson, 2010; Thomson, 2014), have primarily looked at the degree to which children experience particular events. Albeit important, transitions are only one part of the family experience. Increasing attention has been placed on the importance of studying duration as well as the sequence of transitions. This has been done within the US literature on childhood family experiences (Johnston et al., 2020; Mitchell, 2013) using profile-based methods such as latent class analysis and sequence analysis but so far it has not been done on a representative sample of the European child population. To fully understand the changes in family structure during childhood we need methodological advancements to better capture potential diversity.

Further, there has been ample research on how the intensity of divorce, re-partnering, multi-partner fertility, and single-mother births have developed among adults in Europe, and how the processes have differed between European regions. Despite this rich body of comparative research, very little has been done to document the implications for children's family structures and to what degree they differ between countries. Open questions that remain to be answered are to what degree children's family experiences mirror adult experiences and if the same processes that drive changes in adult family trajectories also affect children in the same fashion. In terms of divorce, it seems that the increasing rate of separations among adult couples has not been mirrored among children and that it is highly dependent on parental educational level (Kalmijn and Leopold, 2021). In some European countries, children of highly educated parents have not experienced an increased risk of parental separation at all.

The objective of this thesis is to provide a descriptive analysis of children's family structure trajectories in Europe. I will attempt to answer the following questions: (1) What are the most common family structures among European children, and how do

they vary across European countries and regions? (2) How does the risk of experiencing a particular family structure differ by the mother's socioeconomic status, as measured by level of education? In particular, I will analyze how the family states *living with original parents*, *living with a single mother*, and *living in a stepfamily* are distributed over European children's first 15 years of life. This will be accomplished by generating a set of family history sequences for European children, based on the Harmonized Histories data set. Analysis will be performed by sequence analysis, through which I will generate clusters of the most common family structures. I will then perform a descriptive analysis of the proportion of children who experience these structure types at the country and regional levels. Further, I will describe how the most common structure groups are associated with the mother's socioeconomic status. This will contribute to our current knowledge of children's family lives by describing how their family structure changes over time, relating it to both the region of residence and socioeconomic background. Thus we will gain further knowledge on how children's family lives vary both within and between European regions.

Before describing the methods in greater detail, I will outline the main theoretical frameworks of this thesis as well as previous research on children's experiences of family structure changes. In the end, I will present the results of my analysis and put them into context in the discussion and conclusion sections.

Theory and previous research

Family demographic drivers of childhood family structure

The three childhood states that I will be analyzing in this study, *living with original parents*, *living with a single mother* and *living in a stepfamily*, arise due to circumstances and decisions made by the child's parents. So to understand the family conditions of children, we first need to know which processes at the parental level shape family forms. How common these processes are among adults (and among parents in particular) will determine how common different family structures are for children. In this section, I will outline the parental processes that lay behind why children are in one state or another as well as provide summary measures of how common they are in Europe and their relationship to socioeconomic status. In the next section, I will provide more detail on how these processes are reflected for children and how the intensities differ between European regions.

The large majority of European children are born into a union. This is the family state I call *living with original parents*. Commonly, when we think about being born into a

union we imagine both adults to also be the biological parents of the child. Although this is the most common of children being conceived, there are however other processes that give rise to children being born into a union. Assisted reproductive technologies, in particular egg and semen donation, can lead to a child being born into a union where one of the parents is not the biological parent. Population-wide data on maternal union status at childbirth in Europe between 1975 and 2004 indicate that between 80-97% of births are within a union, with large differences between countries (Perelli-Harris et al., 2012). This shows that a large share of, and in some countries almost all, children are born into a parental union.

Living with a single parent is a state that can arise from three main processes: birth to a single mother, parental separation, and the death of a parent. Births to single fathers through surrogacy exist but are so far very limited (Jones et al., 2023). In terms of single-mother births, we have already indicated that single-mother births account for 3-20% of all births in Europe during the time period 1975 to 2004 (Perelli-Harris et al., 2012). One important predictor that has been found cross-nationally in Europe is that there is a negative educational gradient associated with single-mother births (Perelli-Harris et al., 2010b). Lower education is associated with an increased risk of giving birth as a single mother compared to giving birth in a union. This gradient can to some degree be explained both by a lower likelihood of entering a partnership as pregnant as well as less access to contraceptives and abortions (Koops et al., 2021).

Children being born into a union may later experience living with a single parent due to parental separation. This may be the result of separation from a cohabiting union or divorce from a marriage. In terms of divorce, it has been steadily increasing in Europe across a wide set of countries during the latter half of the 20th century (Härkönen, 2014; Kalmijn, 2007; Kalmijn and Leopold, 2021). Estimates of net divorce rates (annual divorces per 1000 married women) in Europe between 1990 and 2000 ranged from 6.41 to 20.35 (Kalmijn, 2007). A review by Amato and James (2010) found that important predictors of divorce were female employment and female income. This is hypothesized to stem from that these resources make women less dependent on men for their sustenance, thus opening up the possibility for divorce. The same review also found that the association between education and divorce risk varies across countries, and later studies have also found that the country context seems to matter more than education in explaining the prevalence of union dissolution (Perelli-Harris and Lyons-Amos, 2016). Union dissolution may also occur when a non-marital cohabiting union ends and dissolution rates of cohabitation are consistently higher than for marriages (Andersson et al., 2017). However, the consequences for children do not directly reflect those of adults in this sense, as the presence of children within the union at the time of dissolution is much lower for cohabiting unions than for marriages (Gałęzewska et al., 2017). The third process that may lead to living with a single parent is the case when the other parent passes away.

Single-country studies have found that the percentage of children who experience the loss of a parent is around 3% before age 12 in Sweden (Hiyoshi et al., 2021) and 5% before age 16 in the UK (Akerman and Statham, 2011) but there are no cross-European population measures on the prevalence of childhood bereavement.

It is important to note that separation does not always entail that children end up with just one single parent. Joint physical custody has become more common, where children at times live both with their mother and their father after separation. In most European countries, around 0-10% of children live in a symmetric joint physical custody arrangement when the family is not intact (Steinbach et al., 2021). Sweden is an outlier where the occurrence is 20%. In the case where a parent is the sole carer of a child, this is most often the mother. However, it has been estimated, using the European Community Household Panel Survey, that in 1996 around 10% of European lone parents were fathers (Chambaz, 2001).

For children to experience living in a stepfamily, it requires that the single parent form a new cohabiting partnership or marriage. This may occur either through re-partnering after separation or when forming a partnership after being a lone birth parent. There are no cross-European studies on the partnering dynamics of lone birth mothers with them as the unit of analysis, but taking the child perspective Andersson et al. (2017) shows the percentage of children born to lone mothers who are in a stepfamily before the age of 6. The percentages range from 25% to 55% depending on the European country, thus it is a quite common event but by age 6 the majority of children born to lone mothers remain with a single mother. The partnering opportunities of lone mothers are not necessarily equal within countries. Kalmijn and Monden (2010) finds that among lone birth mothers in the Netherlands, the risk of entering a union is higher for mothers with average income than for those who are poor. Contrarily, Jalovaara and Andersson (2018) finds that the reverse pattern is true for Finnish children, where children to poor mothers are more likely to experience living in a two-parent family. Thus, the link between socioeconomic status and union formation for lone mothers is not necessarily the same in European countries.

As for entering a new union after union dissolution, Gałęzewska et al. (2017) finds that in 2005 around 60-80% of European women repartner within ten years of first union dissolution. The estimates are also similar either if the first union is a marriage or cohabiting union. As for the social determinant of re-partnering, findings from Estonia, Lithuania, Poland, and Hungary indicate that education does not seem to be associated with women's risk of re-partnering, but that education can play a role for men in the propensity to re-partner (Maslauskaitė and Baublytė, 2015). However, Dahlberg (2018) finds that for countries in Northern and Western Europe, mothers with post-secondary education are more likely to re-partner than mothers with secondary education and lower. This pattern is also found among fathers but is generally

weaker. So as with union formation after being a single parent, education is not a consistent predictor of the risk of entering a new partnership.

Other aspects that are important to consider when tracing children's family experiences are whether cohabitation is included as a measure as well as the prevalence of joint physical custody. Relying on the US National Survey of Family Growth, Rally and Wildsmith (2004) found that when adding family transitions into and out of cohabitation, family instability (calculated from transitions into and out of parental partnerships) increased by 30% for White children and over 100% for Black children. This highlights the importance of including cohabitation in studies on childhood family structure. As for joint physical custody, in a majority of European countries, it is a fringe arrangement that only 5% or less of children in non-intact families experience, whilst it is more common in Sweden (21%) and Belgium (13.5%) (Steinbach et al., 2021). This makes it hard to examine the actual family experiences of children based on surveys where parents are the anchors or where children's experiences are not tracked after separation on both the maternal and paternal sides. If the prevalence was similar across countries it would be simpler to approximate children's experiences based on parental reports. The current praxis of following children's family trajectories on the maternal side will now underreport the total experienced complexity more in countries such as Sweden and Belgium whereas it will be a good approximation in countries where joint physical custody is uncommon. There are findings from the UK that show that children's family complexity (measured with a compound complexity index) is similar between father's and mother's family lives over childhood (Rowold and Winkle, 2022), indicating that a fair share of complexity is missed when only accounting for children's experiences on the maternal side. Attempts to ameliorate this issue have been made (see Kalmijn et al., 2018) but are so far uncommon.

Mapping European differences among children's family experiences

As we saw in the section above, the prevalence of family states and the rates of transitions differ between adults in European countries. In this section, I will outline how these processes are reflected in the life course of children and how they differ between European regions. To describe these patterns I will divide Europe into five geographic regions which partly have a shared history as well as common family demographic trends. In previous studies on family dynamics in Europe, it has been common to divide Europe into Northern, Western, Southern, and Eastern Europe (see for example Billari et al., 2001; Fokkema and Liefbroer, 2008; Kalmijn, 2007; Thomson, 2014). In the western parts of Europe, there has been a consistent North-South divide in family tie patterns (Reher, 1998) which can be expected to influence family transitions. There is however a point in separating the Nordic countries from

the more Central-Western countries as they have been seen as forerunners in terms of family demographic changes (Ohlsson-Wijk et al., 2020). In terms of the Eastern European countries, there is diversity in family behaviors and they have been divided into up to 5 distinct regions in previous research (Thornton and Philipov, 2009). Within this study a two-part division of Eastern Europe will be used, Central-Eastern and South-Eastern. South-Eastern Europe will consist of the Balkan countries and Central-Eastern of the countries north of, and including, Hungary (for the exact countries see Table 1). This division is used as previous research have found differing patterns of adult family dynamics between these two regions (Kalmijn, 2007).

There are few descriptive studies on children's family structure from a European comparative perspective. This section will rely on data from Andersson et al. (2017) for summarizing the general regional variation. Regarding union status at birth, children from Northern, Southern, and South-Eastern Europe are the most likely to be born into a union. The percentage is around 98% for Northern, 96% for Southern and 95% for South-Eastern Europe. As for Western Europe, there is some within-region variation but the average is around 93-97%. It is the least common in Central-Eastern Europe where 87-95% of children are born into a union. Conversely, being born to a single mother is most common in Central-Eastern Europe. As for experiencing parental separation, there are large regional variations but some patterns emerge. Separation is the least common in Southern and South-Eastern Europe where the percentage of children who experience separation by age 15 is around 12%. It is about twice as common in Northern Europe at around 24-28%, and in Western and Central-Eastern Europe, the percentages range from 26% to 36%. The Netherlands and Germany stand out from the rest of Western Europe, as fewer children experience parental separation (14% and 18% respectively). Finally, the percentages that experience a reconstituted family also differ between regions. For those whose parents separate, 30-60% of children experience a stepfamily within 6 years across European regions. The exceptions are Italy and Bulgaria where only 14% and 21% respectively experience stepfamily formation. For children born to lone mothers, stepfamily formation is experienced by 55% of children in Northern Europe, 34-54% in Western Europe, 50-61% in Southern Europe, 39-49% in Central-Eastern Europe, and only around 25% in South-Eastern Europe.

In the previous section, we saw that there is a connection between education and family dynamics for the adult population in Europe. However, the association between education and family transitions may differ depending on whether an individual has children or not. If the association between education and family transitions is stronger for parents than for childless individuals, the educational disparity in family structure will be more pronounced from children's perspective. On the other hand, if the association is weaker for parents, the educational gradient will be less evident for children. In terms of separation, Kalmijn and Leopold (2021) find that the separation

surge among adults in late 20th-century Europe has been trivial for children to highly educated parents in many European countries. It has been more noticeable among children to couples with lower education, but generally, the separation surge has not been directly reflected in the experiences of children. As for stepfamily formation, it has been found that there is no association between parental education and the risk of entering a stepfamily in Sweden (Turunen, 2011).

Taken together, these findings show that there is both large between and within regional variation in children's family experiences. This is partly a reflection of the variation among the adult population. In the next section, I examine the potential consequences these experiences may have for children apart from simply the household composition.

The consequences of family structure

Associations have also been found between childhood family structure and a set of adverse proximate and future outcomes. These consequences occur in multiple domains, ranging from well-being to educational outcomes. A recent systematic review (Hadfield et al., 2018), of the so-called Instability Hypothesis, found mixed support for the theory that family transitions entail negative outcomes for children. They found variations depending on context, type of transition, and effects for only certain groups. In this section, I will summarize some of the effects that have been documented to be associated with the family demographics processes and states outlined in this thesis.

Negative child outcomes associated with divorce have been studied along many different dimensions. Averdijk et al. (2012) found that parental separation led to an increase in both aggressive and internalizing behavior (such as sadness, insomnia, and social withdrawal) among children in Zürich, controlling for parental conflict, maternal depression, and financial difficulties. The effect was partly mediated by maternal depression. Similar results were found in the U.S context, where children of divorce, who were propensity-score-matched to children of intact families, showed higher levels of both internalizing and aggressive behavior following parental separation (Weaver and Schofield, 2015). This effect was found both in the short- and long-term following separation. There are also potential health consequences of divorce, where German children experiencing divorce, studied using a panel setup, were found to increase their BMI after divorce (Brockmann, 2013). There are also consequences on school outcomes. Havermans et al. (2014) found an association between divorce and less school engagement among Belgian children. A large part of the effect was mediated by the parent-child relationship, financial problems at home, and parental conflict. Swedish children experiencing divorce have also been found to show decreased psychological well-being and lower educational attainments (Gähler and Palmtag,

2015)

The transition of re-partnering has also been studied, but not to the same degree. Bachman et al. (2009) studied adolescents from low-income urban US families, and found that neither risks nor benefits increased as a result of maternal marriage on a wide battery of adolescent well-being indicators. Although introducing a new partner in the household increased financial resources, it was not associated with improvements in home environment or maternal well-being, which could explain why adolescent functioning did not increase significantly. In a further US study, children's academic achievement was not found to be improved when their single mother married (Wagmiller et al., 2010). The small benefits to academic performance were also to a large degree distributed among the children to mothers with higher education. There is yet little evidence for the case that maternal re-marriages increase the life chances and well-being of their children (Hadfield et al., 2018).

Apart from the outcomes of family transitions, there is also a literature on the effects of the long-term states of living with a single mother or in a stepfamily, contrasted with living in a nuclear family with original parents. For the case of single-mother families in the U.S., Fomby and Osborne (2017) found that children born to lone mothers showed higher levels of behavioral problems than those born into nuclear families. Youth in single-mother families in Germany have also been found to experience lower well-being than those living with their mother and father, or their mother and a stepfather (Walper et al., 2015). There are also external factors to consider, which might influence the well-being of children in single-mother families, one example comes from Sweden where living in a single-parent household is associated with a higher risk of bullying for children (Låftman et al., 2017).

The studies outlined in this section have one thing in common, namely that they study either singular transitions or family states. In a review of the research on family diversity and complexity among adolescents, Pearce et al. (2018) argues that to better understand both the family circumstances of adolescents as well as how family characteristics are related to certain outcomes, we need new methods. They suggest, among others, the use of "profile-based" methods, such as latent class analysis and cluster analysis. So far, very few studies have been conducted on children's family structure using this type of methodology but we will look more closely at two studies that have.

Using the U.S. National Longitudinal Survey of Youth, Mitchell (2013) created a five-type classification of children's family structure on the maternal side using latent class analysis. The model distinguished between living with (1) married biological parents, (2) cohabiting biological parents, (3) cohabiting stepfather, (4) married stepfather and (5) single mother. The five-class solution created typologies that Mitchell named, "Married biological parents who divorce", "Long-term single moth-

ers", "Continuously married biological parents", "Cohabiting biological parents who marry or break up" and "Gain a stepfather". This study can be credited as an early attempt at finding childhood family trajectories but is in some senses lacking. They distinguished between cohabiting and married parents which gave rise to the final category "Cohabiting biological parents who marry or break up", which makes little substantive sense. Classifying children who experience a separation into the same group as those who might experience a strengthening of the parental relationship seems to be just an artifact of how the model and its states are constructed. Therefore, we need to be aware of how model construction can influence the outcomes with this type of data-centric analysis.

A more recent study, using the children of the participants in the National Longitudinal Survey of Youth, performed and compared classifications of family trajectories through both latent class analysis and sequence analysis (Johnston et al., 2020). This study did not distinguish between cohabitation and marriage and revealed some further patterns in family structure changes, and where each pattern was intuitively interpretable. In particular, the findings indicate that latent class analysis and sequence analysis are both appropriate for the analysis of childhood family structure, but that sequence analysis may be more suitable for distinguishing exclusive groups as well as in larger comparative studies.

Aims and expectations

This thesis aims to further our understanding of children's family lives in Europe by examining them through the entire childhood life course. By using the profile-based methods of sequence and cluster analyses I aim to distill the diversity of family trajectories to a set of distinct family structure types. By doing this I will be able to compare the children of different countries and create a descriptive picture of childhood family lives in Europe and to further understand their similarities and differences. Given that within-country differences are also to be expected, I will aim to see to what extent the mother's educational level is related to the family trajectory of her children. In particular, I will try to answer the research questions:

1. What are the most common family structures among European children, and how do they vary across regions and countries?
2. How does the likelihood of experiencing a particular family structure differ by the mother's socioeconomic status, as measured by level of education?

Given the descriptive character of this paper, I will not do any formal hypothesis testing but in light of the theories and previous research outlined above, I have some expectations of what will be seen in the data. As for the first research question, I expect that we will see the smallest variation in trajectory cluster membership in Southern

and South-Eastern Europe where a large majority of children will live their entire childhood in intact families. In Central-Eastern, I expect there to be a larger share of non-intact family trajectories which will consist of both children born to lone mothers and children of divorce. In Northern Europe I expect that trajectories driven by lone-mother births will be rare, but that there will be a sizable share of children who experience divorce and stepfamily formation. Similar patterns are expected for Western Europe, perhaps with a smaller degree of stepfamilies and a somewhat larger degree of lone-mother births compared to Northern Europe. As for the second research question, I expect that the proportion of children with intact family histories will increase with increasing education. In particular, I expect that the incidence of non-intact families driven by birth to lone mothers will decrease with education.

Data and Methods

Analytical strategy

As has been outlined, the family structure of children may exhibit many different patterns and if we want to fully understand this complexity, we need to study how these patterns play out over time. One fruitful analytic method that has been used within the life course literature is sequence analysis (for an overview see Liao et al., 2022). The foundation of sequence analysis lies in describing temporal processes as a series of states and state changes over discrete time units (such as months or years). It thereby provides a format for describing individual life course trajectories.

We can expect that the structures that children experience are a finite yet potentially complex mix of the three family states *living with original parents*, *living with a single mother* and *living in a stepfamily*. We can expect two main different structural pathways, the first is for children born into a union and the second for children born to a single mother. Following this initial family constellation, children born into a union may experience parental separation and eventually stepfamily formation. Children born to a lone parent can experience stepfamily formation without any intermediate family state. Following the first stepfamily, children may also experience multiple parental dissolutions and new stepfamilies. Since this can yield a multitude of family structures over time, we need a way to reduce this complexity to a comprehensible form. One way of capturing these structural changes and finding the most common patterns is through cluster analysis. Cluster analysis is a data-centric approach that deviates from traditional statistical methodologies in two main ways: 1) the units of analysis and 2) data assumptions (Aisenbrey and Fasang, 2010). Traditional statistical models usually study probabilities of events or degrees of change whereas sequence and cluster analysis studies patterns of time.

Cluster analysis is a suitable method for answering my research questions for several reasons. Firstly, it allows us to distill children's family structure experiences into a discrete set of typical structure groups. Thus, we see what the most typical family life courses look like, taking both time and cross-sectional family status into account. It is also possible to perform this without any prior notions about what family structures to study. This means that the groups found will reflect the data in an unbiased fashion, without any influence of normative ideas about what family structures to look for. Secondly, it creates a classification that can be used for all countries of study. Clustering at the full study population level means that we can compare how common certain life courses are between countries and regions in a standardized way. Finally, it has been shown that clustering sequences give consistent results in classifying life course trajectories and that it is particularly suitable for comparing groups (Barban and Billari, 2012).

The first step in the analysis consists of defining family states and generating individual family sequences. As the data does not track both original parents of a child, I will only follow the mother's partnership trajectory with the assumption that children are residing at least part-time with their mother during their childhood. This is an assumption I have to make as the data does not contain information if the child resides with the responding parent. Thus, joint physical custody and father-only households are not taken into account, and the family structure on the father's side is not measured. This will probably make the measures of family complexity biased downwards. A positive note is that it will avoid the problem that men tend to underreport their number of children in retrospective surveys (Juby and Bourdais, 1999). So although an analysis solely on the mother's side is a limitation, we can proceed as long as we keep that limitation in mind. Having constructed the parental structure sequence, I compute sequence dissimilarities and generate clusters for the full study population. The final number of clusters is selected using both cluster quality criteria and the substantive significance of the cluster division.

The problems of the validity of clustering typologies have been recognized for a long time, and methods for ameliorating this deficit have been developed within the bioinformatics literature (for an overview see Luxburg, 2010), few sequence analysis studies within the social sciences have taken this issue to heart. To improve the validity of the typology, I will use a parametric bootstrap technique proposed by Hennig and Lin (2015) and implemented for sequence data by Studer (2021a) to aid with the selection of the final clusters.

Once the family typology is in place, I will show the proportion of the different family types for each country and region in the study, thus describing how children's family structure vary across Europe. This will also be broken down further by the mother's educational level.

Data

The data used in this study comes from the birth and union histories in the Harmonized Histories data set (Perelli-Harris et al., 2010a). This data set is compiled from a set of national surveys, primarily the Generations and Gender Survey, but also with other nationally representative surveys on partnerships and childbearing. The data is based on individual retrospective reports on partnership and childbearing histories. The information on children is based on biological children so I do not analyze adoptees in this thesis. I also use information on the highest achieved education, represented as a 3-level scale which has been constructed from ISCED 1997. The levels are primary (ISCED 0-2), secondary (ISCED 3-4), and tertiary education (ISCED 5-6). Education is measured at the time of the interview, and not at the time of first birth. This is a drawback but not a major issue as it can be expected that most mothers have attained their highest level of education before their first birth.

The surveys were conducted differently in different countries. Generally, they were conducted through interviews (Fokkema et al., 2016), but self-filled web questionnaires were also used (Instituto Nacional de Estadística, 2019). Different sampling procedures were also used and more detailed information can be found in Fokkema et al. (2016) and Perelli-Harris et al. (2010a). Response rates are available for most surveys and are presented below.

I include 16 countries in my analysis, and together they cover all of the five European regions that I analyze. From Northern Europe I include Norway and Sweden, from Western Europe I include Austria, Belgium, France, and the Netherlands, from Southern Europe I include Spain and Italy, from Central-Eastern Europe I include Belarus, Czech Republic, Estonia, Hungary, Lithuania, and Poland and finally, South-Eastern Europe is represented by Bulgaria and Romania.

In cleaning the data I removed all men, childless women, respondents with missing birth information as well the respondents where there was missing or contradictory information on the time of union start or dissolution. To be able to analyze the trajectories from the children's lived experience I reshape the data so that each child becomes a unit of observation rather than the mother. At the start, I have 171,249 children. I remove children with missing birth months or where the birth is reported to have occurred before the mother is born. As I want to track children's experiences until the age 15, I remove those in the sample who have not turned 15 at the time of the interview as well as those who left home or died before their 15th birthday. As I am interested in family changes after the advent of the Second Demographic Transition, I only keep those children born after 1980. In total 46,572 children, to 29,473 mothers, remained in the sample.

In Table 1 I show basic information about the study population. For all countries in

the study children born between 1980 and 1988 are included. In some countries such as Belgium, Netherlands, Poland, Spain, and Sweden there are also children born well into the 1990s and the early 2000s. Each country, except Austria, is well represented with over 1,000 children. Belarus, Norway, Poland, and Spain all have over 3,300 children included. That over 12,000 of the 46,572 respondents come from the Catholic countries Poland and Spain, might bias the analysis towards favoring clustering solutions that work well for these particular family contexts. Which is a discussion I will return to later. Apart from this, there is a well-balanced sample with good representation from all European regions and enough respondents to perform subgroup analyses.

Weights were not used in the analyses for two major reasons. The first is that not all countries included weights in the dataset (such as Poland and Czech Republic) and the second is that my limited computational resources did not allow for the inclusion of weights in the cluster analysis.

Sequence generation

For each child, a family history was constructed on the maternal side, which is composed of the mother's partner's history during the child's first 15 years of life. To construct this history, a STate-Sequence format (STS, Gabadinho et al., 2011) is used. This means that for each time point of the child's life, a column is generated which is filled with values describing the mother's union status. The process time for analysis is from birth until turning 15, with quarterly precision. In STS format this is represented by 60 consecutive states, each capturing three months.

Firstly, union spells were constructed. As there is no information on who is the father of the child if a mother was partnered at the time of birth, that partner was assumed to be the other main parent. Then for each quarter, the representative state was coded as either *Single*, *Original parents* or *Step* depending on the mother's partner status in the first month of each quarter. The state is coded as *Single* if the mother is not in a union during the first month of the quarter. It is coded as *Original parents* if the mother is still in a relationship with the same partner as at the time of birth. Finally, a state is coded as *Step* if the mother is with a different partner than at the time of birth. All consecutive partners are assumed to be new, i.e. no re-partnering with a former partner is assumed to occur. I do not distinguish between opposite-sex and same-sex partnerships, and the original parents are not necessarily the same as the biological parents but simply constitute the partnership that the child is born into. Formally, the maternal union sequence can be described as the vector **S** where

$$\mathbf{S} = (s_1, s_2, s_3, \cdots, s_{60}) | s_i \in \{\text{Original parents, Single, Step}\} \qquad (1)$$

Table 1: Descriptive information on survey years, response rates, cohorts included, and number of children from each country. SFS 2006, Belarus GGS and Hungary GGS have missing information on response rates.

Country	Survey	Survey years	Response rate	Child cohorts	N. children
Northern					
Norway	GGS wave1	2007 - 2008	60.2%	1980 - 1993	3,166
Sweden	GGS wave 1	2012 - 2013	54.7%	1980 - 1998	2,828
Western					
Austria	GGS wave1	2008 - 2009	61.3%	1980 - 1994	942
Belgium	GGS wave1	2008 - 2010	41.8%	1980 - 1995	1,427
France	GGS wave1	2005 - 2005	65.2%	1980 - 1990	1,706
Netherlands	FFS	2003 - 2003	44.6%	1980 - 1988	1,490
Netherlands	OG 2013	2013 - 2013	57%	1980 - 1998	2,840
Southern					
Italy	GGS wave1	2003 - 2003	19.1%	1980 - 1988	1,237
Spain	SFS 2006	2006 - 2006		1980 - 1991	2,853
Spain	SFS 2018	2018 - 2018	54.4%	1980 - 2003	6,168
Central-Eastern					
Belarus	GGS wave 1	2017 - 2017		1980 - 2002	3,453
Czech Republic	GGS wave 1	2005 - 2005	49.1%	1980 - 1990	1,504
Estonia	GGS wave1	2004 - 2005	70.2%	1980 - 1990	2,076
Hungary	GGS wave1	2004 - 2005		1980 - 1990	2,130
Lithuania	GGS wave1	2006 - 2006	35.6%	1980 - 1991	1,825
Poland	GGS wave1	2010 - 2011	33.3%	1980 - 1996	6,243
South-Eastern					
Bulgaria	GGS wave1	2004 - 2004	74.8%	1980 - 1989	2,433
Romania	GGS wave1	2005 - 2005	83.9%	1980 - 1990	2,251
Total					
		2003 - 2018		1980 - 2003	46,572

[1] GGS = Generations and Gender Survey

[2] FFS = Family and Fertility Survey

[3] SFS = Spanish Fertility Survey

[4] OG = Onderzoek Gezinsvorming

An example sequence of a child's first two years of life, where the mother is first partnered for 12 months (four quarters), then single for 6 (two quarters), and finally re-partnered for 6 months (two quarters) is visible in Table 2.

Table 2: Two-year union state sequence example

1	2	3	4	5	6	7	8
OP	OP	OP	OP	Si	Si	St	St

Analysis

Having constructed the maternal union sequence, I calculate a dissimilarity matrix using a Dynamic Hamming Distance algorithm. A benefit of this approach is that it increases the sensitivity to sequence timing (Lesnard, 2010), which we know is important from the life course literature. The substitution costs are derived from the transition rates in the data and thus reflect transition probabilities in this particular sample. This is the most data-centric approach possible for defining substitution costs and also reduces potential researcher biases, with the drawback of potentially reducing the external validity of the final clustering solution.

This dissimilarity matrix is used to cluster the sequences, which is done using Ward's method (Ward, 1963). Being an agglomerative method, it starts with k number of clusters where each observation in the sample is its own cluster, $k = N$ in the first step. The algorithm then progressively merges clusters until there is only one cluster containing all N observations. Larger clusters are formed in steps by iteratively merging the two clusters that yield the smallest within-cluster sum-of-squares, measured as the sum of the squared Euclidean distances between each sequence in the cluster and the centroid sequence. Given that this clustering method produces solutions between 1 and N clusters, a choice regarding the final number of clusters needs to be made. This choice will be based on sociological relevance and cluster quality indices.

In choosing the number of clusters, it is of interest to maximize internal cluster homogeneity as well as between-cluster differences, and a common measure of this propriety is the Average Silhouette Width, introduced by Kaufman and Rousseeuw (1990). This measure produces a value between -1 and 1, where a larger value indicates a stronger structure. I also use Hubert's C, which captures the discrepancy between the partition obtained and the theoretically best partition, given the particular number of clusters and their distances (Hubert and Levin, 1976). Hubert's C is defined in the range $[0, 1]$ and a smaller value indicates a better partitioning. The issue with assessing cluster quality is that, unlike in traditional statistical modeling, there is no null model to compare the results with. So, even though Kaufman and Rousseeuw

([1990](#)) proposes an interpretation of the Average Silhouette Width measure, it cannot be generalized to all cluster applications.

A potential solution is to use parametric bootstrapping to generate *null-model like* distributions, cluster them, calculate a cluster quality index, and compare it to the quality index value of the clusters from the actual data (Hennig and Lin, 2015). This has recently been applied to sequence analysis (Studer, 2021a) and to my knowledge, this study will be one of the first to apply this technique. In practice, I generate a data set of 50 sequence sets that are similar but non-clustered using a combination of both sequencing and timing parameters (for the detail of the process see Studer, 2021a). Then the Average Silhouette Width and Hubert's C are calculated for each cluster solution ranging from 2 to 10 clusters for each of the 50 bootstraps. This produces a confidence interval for each of the quality measures for each k grouping. This provides a baseline measure of the quality indices for data that is not clustered. If the index values of the cluster solutions for the actual data fall out of this bootstrapped range, it is a strong indicator that the particular clustering solution represents a "true" cluster and not just an artifact of the clustering process. However, that a cluster is true from a purely data-centric view, does not mean that it holds any form of social significance. Therefore, apart from using cluster quality indices, I will also look at the theoretical basis of the best-performing cluster solutions when selecting the number of clusters to use. Further, I only consider 2 to 10 clusters as a larger number of clusters would be unwieldy in terms of discussing the number of groups, and the number of members in the smaller clusters would be too few to carry out any form of description on the country level. I provide a visual summary of the sequence clusters by an index plot for each cluster.

In the next step, I describe the proportions of children who belong to each cluster, on a country and regional level. This allows us to detect similarities and differences between European countries as it relates to children's family experiences. In the final step, I also relate parental union histories to the mother's educational level to see if there are also patterns stratified by socioeconomic status and if these are similar or different between countries.

The analysis is performed in R and relies on the packages **TraMineR** and **Weighted-Cluster** (Studer, 2021b) for the sequence and cluster analysis. Sequence visualizations are made using **ggseqplot** (Raab, 2022.)

Ethical considerations

The Harmonized Histories data set is de-identified to protect the personal integrity of the study participants and all analysis presented are as aggregated results. To get access to the data I have signed a pledge of confidentiality, pledging not the share the

data and only perform analysis related to the approved project. The data collection has been approved in each country and has been done under the oversight of the GGP Ethics Board and its Data Protection Office. I do not deal with any directly sensitive personal data such as ethnicity, political opinions, or union membership. Thus, this paper has a small to no likelihood of harming survey participants in any way. On the other hand, we can not expect there to be any direct benefits to the survey participants either. The indirect benefits, which are shared with the rest of the European population, may come from an increased understanding of children's family structures and how they relate to both country of residence and socioeconomic status. In the long term, this research may contribute a small piece of understanding of what drives children's family conditions, which is a first step to improving them.

While I do not analyze any sensitive personal data, I think it is important to acknowledge that my research subject may be sensitive in certain contexts. Blended families, stepfamilies, and single mothers are still stigmatized across Europe and the question of family relations, both in terms of norms, values, and legal protection is a debated political topic. As such, I avoid making normative claims surrounding particular family configurations and try to remain objective and close to the data when describing family trajectories, especially in light of mothers' socioeconomic backgrounds.

In order the improve both the transparency and reproducibility of my research all code for generating the results, as well as the thesis, is available as a replication package on GitHub .[1] Anyone wishing the reproduce this research will have to apply for the Harmononized History dataset and then it will be possible to re-run my exact analyses using the replication package. I have used version control for both the code and the writing of the thesis, allowing anyone interested to scrutinize the research process in great detail and with full transparency.

Results

I will discuss the results in three parts. Firstly, I will describe the results of the cluster diagnostic tests to determine the optimal number of groups to select from the cluster analysis. Secondly, I will describe the groups selected and how they are related to family demographic processes. Finally, I will show how common these childhood family structure groups are across European countries and regions. I will highlight both between and within regional differences as well as show the relation with maternal educational level.

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[1]https://github.com/addegezon/family_complexity_in_childhood

Cluster diagnostics

To select the appropriate number of groups from the cluster solutions, we look at the diagnostics of the cluster bootstrap model for the Average Sillhoute Width and Hubert's C. When using Average Sillhoute Width as a quality indicator we want a value that is as high as possible and with Hubert's C we want as low a value as possible. The results from the cluster diagnostic bootstrap are presented in Figure 1. The blue shaded area represents the 95 confidence intervals of the standardized Average Sillhoute Width and Hubert's C bootstrap. This represents the value of the cluster quality indices in the null model. The green line is the highest (for the Average Sillhoute Width) and lowest (for Hubert's C) value of this bootstraped null model. The navy blue line shows the index values for different numbers of clusters. As none of the purple points cross the bootstrapped values, all cluster solutions can be argued to represent an actual cluster. So to determine the number of groups to choose, we simply need to look at the index values.

Figure 1: Standardized Average Silhouette Width and Hubert's C for actual and bootstrapped data

We see that the top scoring solution for the Average Sillhoute Width is the 6-cluster solution, and Hubert's C the solutions are progressively getting better for each number of clusters above 5. Given that the Average Silhouette Width suggests the 6-cluster solution and that this gives a solution with a fair amount of children in each cluster, I choose to use the 6-cluster solution in my analysis. Working with six clusters still allows us to uncover heterogeneity in the complex family trajectories while still getting enough power to perform subgroup analyses. As for the nearby cluster solutions, I discarded the 5 cluster solution as it grouped two clusters which were differentiated by timing in the 6 cluster solution, thus losing vital information.

The 7-cluster solution was discarded as three of the clusters became too small to perform subgroup analyses.

Final clusters

The 6-cluster solution is visualized in Figure 2. This is a sequence index plot that shows the unique sequences in each cluster. Each horizontal line represents a unique family trajectory as it changes over time. The labels of the clusters are my qualitative classifications of the information displayed in the index plots. These clusters are the groups that best represent the childhood family structures in the data. Together, they form a classification of the most common and internally valid experiences of family structure in childhood. In a sense, they show the six most typical life courses of European children,
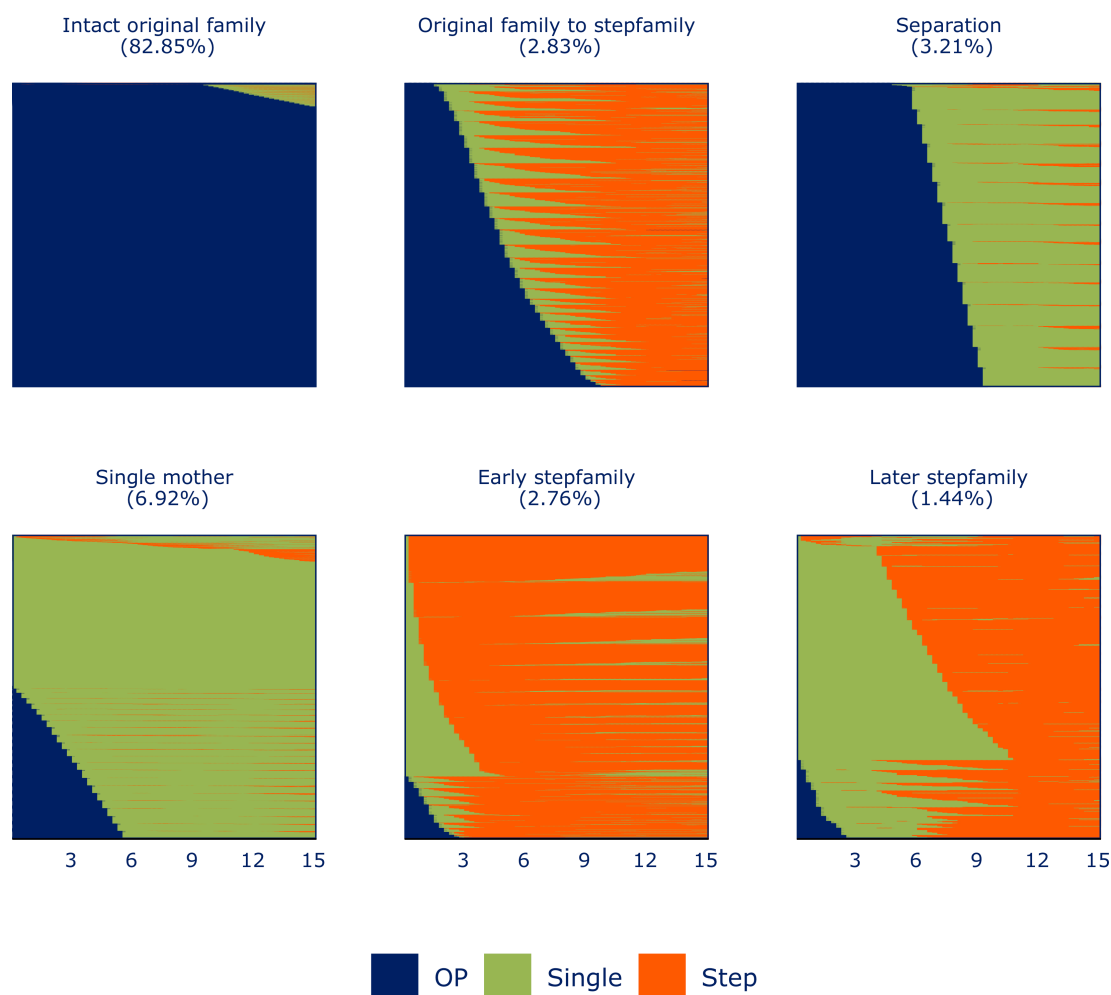

Figure 2: Sequence index plot of the 6-cluster solution. The horizontal axis represents time, spanning the entire childhood, and each line is an individual family structure. Each shows different distributions of the states OP (Original Parents), Single (living with a single mother), and Step (living with mother and stepfather). The percentages in parentheses show the proportion of all European children who are classified as belonging to the cluster.

A first thing to note is that the *Intact original family* cluster is by far the largest one,

with around 83% of children in the full sample belonging to this cluster. On the opposite end of the spectrum, we have the "Later stepfamily" cluster, which contains 1.4% of children. Before showing the distribution of these clusters by country, I would like to spend some time discussing each cluster and what information we can derive from these visualizations.

Starting with the *Intact original family* cluster, we see that not all individuals live in an intact original family throughout childhood. A fair proportion (7.2%) of children experience parental separation at some point, but all of them experience it after the age of 9. Thus this group consists of children who spend their entire childhood with their original parents, with a small number experiencing parental separation at the end of childhood.

The cluster *Original family to stepfamily* is composed of children who are all born into a parental union and spend at least some time in it before their parents divorce and eventually end up in a stepfamily. In the index plot, we can see that most children spend quite a short time with a single mother before she re-partners. We also see that a few children end up living with a single mother again towards the end of the observed period. So also this cluster contains some heterogeneity, but generally consists of children born into a union and then experiencing a parental separation between the ages 3 and 10, and a maternal re-partnering between the ages 4 and 12 depending on the time of separation.

In the third plot, *Separation*, we observe a group of children who all are born into a parental union and experience a parental separation between the ages 6 and 9. A few experience stepfamily formation but most remain with a single mother throughout the rest of childhood. Here we can note that there is no "late separation" cluster, these few have instead been classified with the *Intact original family* group.

The cluster *Single mother* consists of children who spend the large majority of their childhood with a single mother. Around half of the children in this group are born into a union but experience parental separation early in their lives. So although this group contains children who move between family states, the general experience throughout childhood is living with a single mother. The fifth category, *Early stepfamily*, seems to contain some heterogeneity within the cluster where we see two common forms of family trajectories. The dominant one, which I have named the cluster after, consists of children being born to a single mother and who then enter a stepfamily before the age of 10. There is also a small group who are born into a union but experience a divorce shortly afterward. The sixth category *Later stepfamily* also contains these two types of trajectories, but here stepfamily formation occurs later in childhood.

Table 3: The percentage of children classified according to each family type by European country grouped by region.

Country	Intact original family	Original family to stepfamily	Separation	Single mother	Early stepfamily	Later stepfamily
Northern						
Norway	80.07	4.67	3.00	6.19	3.44	2.62
Sweden	77.97	7.53	4.46	6.22	2.40	1.41
Total	*79.08*	*6.02*	*3.69*	*6.21*	*2.95*	*2.05*
Western						
Austria	71.97	5.73	3.72	7.01	8.17	3.40
Belgium	78.84	3.99	4.20	10.23	1.33	1.40
France	78.78	4.57	4.34	8.50	2.34	1.47
Netherlands	87.92	2.47	2.61	5.03	1.11	0.85
Total	*82.74*	*3.52*	*3.36*	*6.84*	*2.19*	*1.36*
Southern						
Italy	90.54	0.40	2.99	3.40	2.18	0.49
Spain	85.05	1.43	2.06	6.21	3.38	1.87
Total	*85.71*	*1.31*	*2.17*	*5.87*	*3.24*	*1.71*
Central-Eastern						
Belarus	76.31	2.37	4.29	11.38	3.79	1.85
Czech Republic	75.00	2.93	4.39	11.30	4.52	1.86
Estonia	74.66	6.26	5.49	7.90	4.34	1.35
Hungary	84.08	2.86	3.33	5.68	2.58	1.46
Lithuania	76.11	2.30	5.64	11.62	3.56	0.77
Poland	86.99	1.41	2.59	6.31	1.76	0.93
Total	*80.81*	*2.59*	*3.85*	*8.44*	*3.01*	*1.29*
South-Eastern						
Bulgaria	88.74	1.52	2.10	5.34	1.48	0.82
Romania	89.60	1.82	2.40	3.91	1.60	0.67
Total	*89.15*	*1.67*	*2.24*	*4.65*	*1.54*	*0.75*
Total						
	82.85	2.83	3.21	6.92	2.76	1.44

Regional distribution

In Table 3 we see the percentages of children belonging to each cluster by European country. This table will mainly be used as a reference for the upcoming results, but I will spend some time discussing the group *Intact original family* before moving on to visualize the distribution of the other groups.

First off, there seems to be a North-South divide in the probability of children experiencing an *Intact original family*. In Northern and Western Europe, the average is around 77-80% for Norway, Sweden, Belgium, and France. Austria has a lower proportion of around 72% and the Netherlands has a much higher proportion of children in this cluster (88%). If we contrast this to Southern Europe, we see that the averages are 91% for Italy and 85% for Spain. The same divide can be seen among the Eastern countries where all Central-Eastern countries except for Poland and Hungary have a proportion lower than 80% in this group while the South-Eastern proportion is closer to 90%. In general, this is the same pattern found in Table A-31 in Andersson et al. (2017), where the proportion belonging to the group *Intact original family* is similar to the cumulative percent ever out of union at age 15. Although the regional patterns are similar the levels differ, which I will return to in the discussion. From this table it is hard to discover general regional patterns for the other cluster so to discover them,

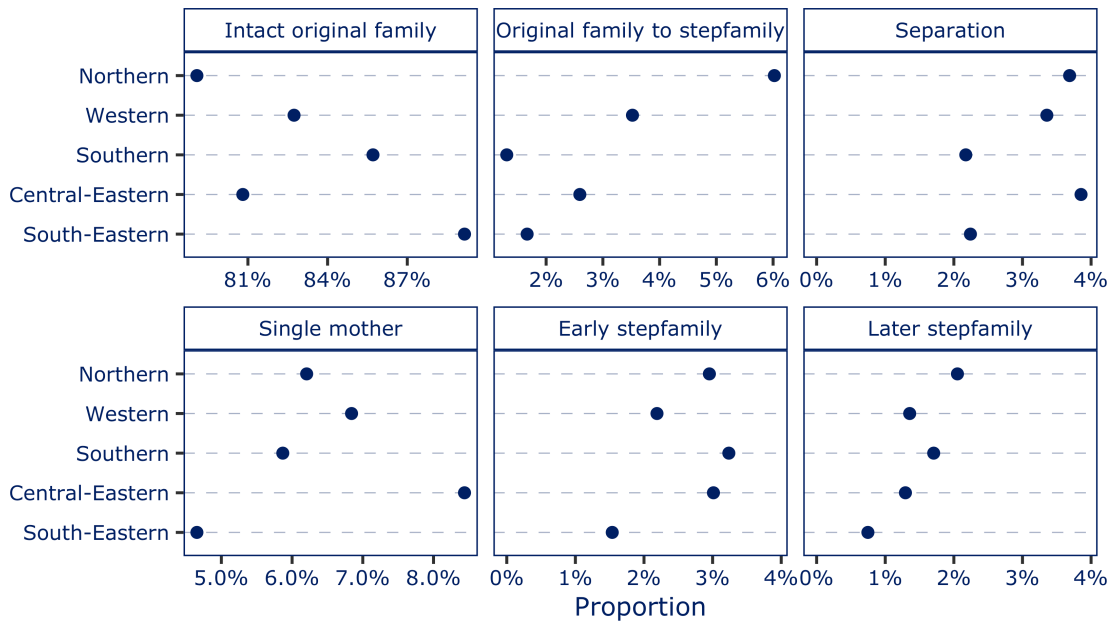I show the regional mean percentages in Figure 3.

Figure 3: Percentage of children belonging to each cluster, by region. Note that the x-axis scales between plots differ.

Looking at the non-intact clusters, we also see a consistent North/South divide in the likelihood of children belonging to each cluster. South-Eastern Europe has a lower percentage of children for all other clusters than *Intact original family*. Southern Europe also has a lower percentage of children in the groups *Original family to step-family*, *Separation* and *Single mother* than Northern, Western, and Central-Eastern Europe. In contrast to the North-South divide, Southern European children also have a relatively high likelihood of being in the *Later stepfamily* group, and the highest likelihood of belonging to the group *Early stepfamily*. This pattern reflects that out of those children born to a single mother, Southern European children tend to experience a maternal re-partnering at some point to a higher degree than children from Western, Northern, and Central-Eastern Europe.

Central-Eastern children are less likely than Western and Northern European children to experience stepfamily formation after being born to a union (*Original family to stepfamily*), but the most likely to experience parental separation without entering into a stepfamily (*Separation*). In the single mother-driven groups, they are the most likely to be born to and spend their childhood with a single mother, but entering a stepfamily after a single-mother birth is about as common as the European average see Table 3. Just as with the *Intact original family group*, there is much diversity within this region. Once again, Estonia stands out with 6.3% of children belonging to the *Original family to stepfamily* group, which is *on par* with the Nordic countries and is more than twice as common as the Central-Eastern average at 2.6%. We can also see that among children from Belarus, Czech Republic, and Lithuania, over 11% of children belong to the *Single mother* group, which is almost twice as common as

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the European average.

Children in Northern countries are prone to end up in stepfamilies compared to the other regions. This is regardless of union status at birth but it is particularly pronounced for those born into a union. Northern children are more than twice as likely as the average Western European child to belong to the *Original family to stepfamily* group (and almost 5 times as likely compared to Southern European children).

Finally, children from Western countries, generally follow the same pattern as the Northern countries but to a lesser degree. The only exception is that being in the *Early*- or *Late stepfamily* groups is less common in Western Europe than the European average. As for the within-regional difference visible in Table 3, we see that children from the Netherlands are less likely to appear in any of the other groups than *Intact original family* as compared to the regional average. We also see that single-mother driven structures are very common in Austria, where 18.6% of Austrian children belong to either the *Single mother*, *Early stepfamily* or *Late stepfamily* group.

Educational associations

As outlined in the theory section, these patterns may shift once we take the mother's socioeconomic status into account and therefore I also present the cluster distributions by maternal educational level. In Figure 4 this is visualized as separate dot charts for each cluster. I show the proportion of children who belong to each cluster, by region and maternal level of education. This illustrates which maternal educational levels are most predictive of group membership for each region. We can also see, with some caution, that the further the educational levels lay from each other, the greater the stratification by education is for the particular cluster. The exact country proportions can be found in Table A1 in the Appendix.

Starting with the *Intact original family* group, we see that this group is overrepresented among children whose mothers have tertiary education across all regions. Mothers with primary education are the least likely to have children in this group, except Southern Europe where being in an *Intact original family* is the least common among children to mothers with secondary education. We can also see that the stratification by level of education varies between countries. Tertiary and primary education are relatively strongly stratified in Northern Europe, less so in Western, Southern, and Central-Eastern Europe. Part of this could be explained by selection, as there are few in the Northern European countries with only primary education. In South-Eastern Europe we see very little educational stratification in this group.

For the other two family structures that originate with a union at birth, we see partly different patterns. Except in Southern Europe, children of mothers with tertiary edu-

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Figure 4: Proportion of children in each cluster, grouped by region and maternal level of education. Note that the x-axis scales between plots differ.

cation are the least likely to be in the *Original family to stepfamily* group and the most likely to be in the *Separation* group. This shows that children of tertiary educated mothers are relatively more likely (compared to children of less educated mothers) to remain with a single parent rather than to experience re-marriage. For children to mothers of the other two educational groups, the findings are not as consistent across countries. Taken together with the result that children to primary educated mothers are generally underrepresented in the *Separation* cluster, it further points to that it is children to mothers with lower rather than higher education that experience stepfamily formation after union dissolution. Children to secondary educated mothers generally lay between children to primary and tertiary educated mothers in their likelihood of belonging to either the *Original family to stepfamily* or *Separation* group. The exception is in Southern Europe where children of mothers with secondary education are the most likely to belong to the *Separation* group.

Finally, we turn to the three clusters that start with a lone mother. As with the *Intact original family* group, we see different degrees of educational stratification across regions. There is a very weak to no stratification in the Eastern European regions for the group *Single mother* but somewhat for the three other regions. For Northern and Western Europe children with primary educated mothers are most likely to belong to this group, and for Southern Europe, the same is true for children of secondary educated mothers. Looking at the two clusters that involve a partnership after being born to a lone mother we see strong education gradients for most regions. Generally, children to mothers with primary education are overrepresented and children to mothers with tertiary education are underrepresented. Children to mothers with secondary education fall somewhere in between. This association is especially strong for the Northern European countries. The only region where this pattern is very different is within South-Eastern Europe. There we see that children with primary educated mothers are strongly overrepresented in the *Early stepfamily* group while we see no clear difference between maternal education and belonging to the *Later stepfamily* group. This points to that education is related to differences in timing in partnering after a lone birth in Southern Europe.

Discussion

In this thesis, I set out to describe the most common family structure types experienced by European children and how they vary according to European region and maternal level of education. I found six major family patterns for children: *Intact original family*, *Original family to stepfamily*, *Separation*, *Single mother*, *Early stepfamily*, and *Late stepfamily*. The first three patterns are characterized by being born into a parental union and then diverging based on whether the original parents separ-

ate, and further by stepfamily formation. The latter three patterns are characterized by being born to a lone mother, and then they diverge based on the timing of maternal partnering. None of the clusters are dominated by children who experience multiple parental separations or multiple stepfamilies, although such patterns are visible in Figure 2. This means that those more complex trajectories were not yet common enough to be detected and singled out by the clustering algorithm at the time of study. It also means that most results can be compared with the results found by Andersson et al. (2017), given that five of these six groups can be derived from the processes they study. The exception is the group *Later stepfamily*, where maternal partnering generally occurs more than six years after birth which is a period not studied by Andersson et al. (2017).

Concerning the regional variation in group composition, some results were in line with my prior expectations. Both Southern and South-Eastern Europe had a high share of children in the *Intact original family* group (86% and 89% respectively). This was higher than the total European share which was 83%. Another expectation that was met was the children in Central-Eastern Europe had the highest risk of belonging to any of the groups marked by birth to a single mother. I expected that children in Northern and Western Europe would experience similar levels of divorce and stepfamily formation which was partly found. Children from Northern and Western Europe had a similar likelihood of being in the *Separation* cluster, but Northern European children had a much higher likelihood of being in the *Original family to stepfamily* cluster (6.0% versus 3.5% on average).

As for general similarities and differences, there is no clear-cut distinction between Western and Eastern countries, echoing the results of Andersson (2002), but the results can partly be interpreted to reflect a North/South divide instead. This is most pertinent in that Southern and South-Eastern countries have a high proportion of children in intact families and few experience parental separation and stepfamily formation. This is in contrast to Northern, Western, and Central-Eastern Europe where parental separation and stepfamily formation are more common. However, the groups *Single mother*, *Early stepfamily*, and *Later stepfamily*, do not follow the North/South pattern.

For most clusters and regions, there is a strong within-regional variation by maternal level of education. In terms of experiencing separation, one important finding which complements the findings of Kalmijn and Leopold (2021), is that although children to tertiary educated mothers are generally the most likely to be in an *Intact orginal family*, if they do experience parental separation they are more likely to remain with a single mother than to enter a stepfamily. So although Kalmijn and Leopold (2021) finds that the separation surge has been negligible for some children of highly educated mothers we can now also expect that for these regions, children of tertiary

educated mothers who experience parental separation are more likely to live with a single mother than those children to primary or secondary educated mothers who are more likely to end up in a stepfamily. This also points to the importance of incorporating the entire childhood life course in the analysis.

Regarding children's risk of entering a stepfamily after divorce, I partly corroborate previous research and partly provide new findings. I find the same patterns as Dahlberg (2018) in that for Northern, Western, and Central-Eastern Europe it is more common for children of mothers with lower education to experience stepfamily formation after separation. These educational patterns are in contrast to Turunen (2011) who finds no association between maternal education and the risk of entering a stepfamily in Sweden. In a similar vein, Maslauskaitė and Baublytė (2015) found that there was no effect of education on women's chances of re-partnering in Central-Eastern Europe. My results show that there is such a pattern for children, indicating that education plays a different role for women who have children than for women in general. I find that in Central-Eastern Europe, children of mothers with primary education are more likely to end up in a stepfamily compared to children of mothers with tertiary education.

Another finding that stands out, and warrants further analysis, is the educational pattern in South-Eastern Europe among the single mother birth groups. In all other regions, there is a clear educational gradient for the groups *Early*- and *Later stepfamily* where both of these family structures are the most common to children of mothers with primary education. However, in South-Eastern Europe the *Early stepfamily* group follows this pattern while the *Later stepfamily* group shows no educational stratification. This indicates that there is an association between the mother's educational level and timing of partnering for lone mothers in South-Eastern Europe. The analyses that I perform here are not enough to discover why this might be the case.

In sum, regional variations exist in children's risk of experiencing different family structures. Once we take maternal education into account we also see large variations within regions, which highlights that there are socioeconomic gradients in the risk for experiencing different family forms that children's life courses are to some degree stratified by their maternal socioeconomic status. However, it is not only that children of mothers with higher education are more likely to experience an intact family throughout childhood. Other family structures, which have been described as more vulnerable positions, such as living part of the childhood with a separated mother are more common among tertiary-educated mothers in some regions.

Limitations

There are a set of limitations with this study which are important to keep in mind when reading and interpreting results, as well as when designing further studies on children's family demography. The first limitation, which partly comes from the data and partly from design choice, is the removal of the father's partnership histories as discussed in the method section. What is needed to ameliorate this is information on where the child resides after divorce. However, it would also require a more complex methodology as both parent's partnership trajectories would have to be modeled in tandem for each child.

Another set of limitations related to the data are the study period, overrepresentation of certain countries as well and response rates. The study period, in which I track children born between 1980 and 2003 with the bulk being born in the 1980's and early 1990's is perhaps a bit too early to capture some changes in family demographic behaviors. At the same time, it captures an important time point when changes were on the way but perhaps had not yet fully manifested in all countries studied. In terms of overrepresentation of certain countries, this is primarily a potential issue for the cluster analysis where countries with more children represented will have a stronger weight in which clustering solutions are chosen. There is no clear way to fix this issue as using survey weights would have introduced the problem that larger countries would shape the clustering solution to a larger extent. Another cross-country issue is the one of survey response rates. Some response rates are relatively high around 70-85%, which is an indicator that the sample will be nationally representative. Other response rates, such as Italy at 19.1% or Poland at 33.3%, are very low and thus the results from these countries need to be interpreted with caution concerning their national validity. Further analyses could incorporate weights to ameliorate this issue.

Finally, another limitation of this study is that I do not capture the entire family context of the children that I study. Apart from the parental structure, siblings are also an important component of family life. In particular in relation to changing parental dynamics, where we can expect changes in half- and stepsibling composition occurring during the period that I study.

Conclusion

In conclusion, this thesis represents a contribution to the field of childhood family dynamics. Few studies have compared and analyzed European children's family structure with a longitudinal perspective. I contribute to this research by employing sequence analysis, a previously unused methodology in comparative childhood family

structure research. Further contributions come from taking both geography and education into account.

One of the key results is the emergence of a North/South divide in children's propensity to experience particular family structures. This geographic pattern highlights the importance of the regional context in which children are situated. Additionally, I confirm the previously found association between maternal education and childhood family structure. One such corroborated finding is that children of highly educated mothers are less likely to experience parental separation. However, a new observation is that in the cases where children of highly educated mothers experience separation, they are more likely to remain with a single mother rather than enter into a stepfamily. This illustrates the significance of following children across multiple family transitions. The findings of this study invite further reflections on the interplay between country context and socioeconomic factors in the shaping of childhood family structure. It shows the need for incorporating the entire life course of children for a more complete understanding of how family demographic changes have played out for European children.

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Appendix

Table A1: Percentage of children in each cluster, over country by maternal level of education.

EDU_3	Intact original family	Original family to stepfamily	Separation	Single mother	Early stepfamily	Later stepfamily
Romania						
Primary	89.2	1.5	2.3	4.2	2.5	0.4
Secondary	89.7	2.4	2.3	3.8	0.9	0.9
Tertiary	91.6	NA	4.2	3.0	0.6	0.6
Bulgaria						
Primary	87.6	1.3	2.2	5.5	2.4	1.0
Secondary	89.1	1.8	2.0	5.1	1.3	0.8
Tertiary	88.9	1.2	2.3	5.9	1.0	0.8
Poland						
Primary	84.3	2.2	2.5	6.8	2.8	1.4
Secondary	88.0	1.2	2.6	5.7	1.6	0.9
Tertiary	85.4	1.6	2.7	8.6	1.3	0.4
Hungary						
Primary	81.0	2.9	3.7	5.5	4.9	2.0
Secondary	84.6	3.2	2.7	5.7	2.2	1.6
Tertiary	86.5	1.7	4.6	5.8	1.0	0.5
Belarus						
Primary	69.6	2.0	2.0	20.6	4.9	1.0
Secondary	76.2	2.7	4.5	10.8	4.0	1.8
Tertiary	77.5	1.6	3.8	11.8	3.1	2.1
Lithuania						
Primary	79.1	NA	4.4	12.1	4.4	NA
Secondary	74.5	2.5	5.3	13.0	3.9	0.9
Tertiary	80.3	2.3	6.8	7.5	2.5	0.7
Czech Republic						
Primary	63.8	4.7	4.2	13.6	10.3	3.3
Secondary	76.5	3.0	4.5	10.3	3.9	1.8
Tertiary	80.3	1.4	2.8	13.6	1.9	NA
Estonia						
Primary	66.5	9.4	5.3	10.6	6.5	1.8
Secondary	71.1	7.6	6.2	8.6	5.0	1.5
Tertiary	80.8	3.9	4.6	6.4	3.1	1.1
Italy						
Primary	92.5	0.3	1.9	2.1	2.7	0.6
Secondary	86.8	0.7	4.9	5.1	2.0	0.4
Tertiary	93.8	NA	1.8	4.5	NA	NA
Spain						
Primary	85.0	1.2	1.7	6.1	3.9	2.2
Secondary	83.0	1.8	2.8	7.3	3.4	1.7
Tertiary	87.8	1.9	2.5	5.3	1.7	0.8
Netherlands						
Primary	86.1	2.9	2.4	6.1	1.4	1.2
Secondary	88.5	2.6	2.3	4.8	0.9	0.9
Tertiary	90.1	1.7	3.3	3.8	0.8	0.3
Belgium						
Primary	73.5	6.3	4.0	13.3	1.3	1.6
Secondary	80.6	3.7	5.2	7.3	1.9	1.3
Tertiary	81.7	2.3	3.5	10.3	0.8	1.4
France						
Primary	77.8	4.5	4.4	8.9	2.4	1.9
Secondary	79.2	5.1	4.4	7.7	2.4	1.2
Tertiary	79.5	3.8	4.2	9.2	2.1	1.2
Austria						
Primary	68.8	6.2	2.3	6.2	11.5	5.0
Secondary	72.4	6.1	3.7	7.8	7.0	3.0
Tertiary	78.8	1.2	8.8	3.8	6.2	1.2
Norway						
Primary	74.4	5.4	3.0	7.3	5.3	4.5
Secondary	79.5	5.7	3.5	5.5	3.5	2.2
Tertiary	83.7	3.2	2.5	6.2	2.5	2.0
Sweden						
Primary	68.9	9.5	5.4	9.5	5.4	1.4
Secondary	77.3	9.2	3.7	5.5	2.5	1.9
Tertiary	81.1	5.1	5.0	6.3	1.8	0.8