



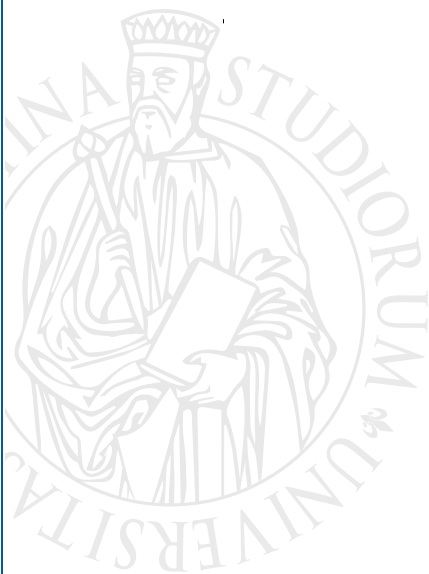
UNIVERSITÀ
DEGLI STUDI
FIRENZE

DISIA

DIPARTIMENTO DI STATISTICA,
INFORMATICA, APPLICAZIONI
"GIUSEPPE PARENTI"

**Life-course trajectories
of childless women:
Country-specific or universal?**

Valentina Tocchioni, Anna Rybińska,
Monika Mynarska, Anna Matysiak, Daniele Vignoli



**DISIA WORKING PAPER
2021/01**

© Copyright is held by the author(s).

Life-course trajectories of childless women: Country-specific or universal?

Valentina Tocchioni^a, Anna Rybińska^b, Monika Mynarska^c, Anna Matysiak^d, Daniele Vignoli^e

Abstract

While existing research has documented complexities in the life-courses of childless women, few studies to date have systematically examined the life-course pathways of the childless from a comparative, cross-country perspective. In this paper, we analyse biographies of childless women in four countries – Germany, Italy, Poland, and the United States – in order to investigate whether pathways into childlessness are country-specific or commonly shared across institutional, cultural, and geographical settings. Partnership, education, and employment histories are examined using sequence analysis with dynamic Hamming distance to reveal distinct clusters of life-course trajectories in each country. The results highlight a marked variation in the life-courses of childless women both *within* and *between* the analysed countries. Although a few typical clusters can be identified in all of the examined settings, the size of the clusters, as well as the socio-demographic characteristics of women within them, differ across countries.

Keywords: childless women, life-course, sequence analysis, discrepancy analysis, cluster analysis

Acknowledgements: Valentina Tocchioni and Daniele Vignoli acknowledge the financial support provided by the European Union’s Horizon 2020 research and innovation programme / ERC Consolidator Grant Agreement No 725961 (EU-FER project “Economic Uncertainty and Fertility in Europe”, PI: Daniele Vignoli) as well as the Miur-PRIN Grant GDR (“The Great Demographic Recession”, PI: Daniele Vignoli). Anna Rybińska acknowledges partial support from the Population Research Training grant (T32 HD007168) and the Population Research Infrastructure Program (P2C HD050924) awarded to the Carolina Population Center at The University of North Carolina at Chapel Hill by the Eunice Kennedy Shriver National Institute of Child Health and Human Development. Anna Matysiak acknowledges the financial support by the Polish National Agency for Academic Exchange (NAWA) within the Programme Polish Returns 2019.

^a University of Florence, Department of Statistics, Computer Science, Applications “G. Parenti”, Florence, Italy. Corresponding author. email: valentina.tocchioni@unifi.it

^b Duke University Sanford School of Public Policy, Durham, NC, US

^c Cardinal Stefan Wyszyński University in Warsaw, Institute of Psychology, Warsaw, Poland

^d University of Warsaw, Warsaw, Poland

^e University of Florence, Department of Statistics, Computer Science, Applications “G. Parenti”, Florence, Italy

1. Introduction

Due to a widespread increase in permanent childlessness across low-fertility countries (Kreyenfeld and Konietzka 2017; Rowland 2007; Brini 2020), recent decades have seen considerable research into the process of remaining childless. Childlessness is no longer perceived as a static characteristic, but rather a process unfolding over the course of one's life (Keizer et al. 2008; Mynarska et al. 2015). While singleness continues to be an important factor in the process of remaining childless, the role of professional and educational choices is increasingly acknowledged in the literature (e.g., Heaton et al. 1999; Köppen et al. 2017; Tanturri and Mencarini 2008). Additionally, recent research has highlighted marked heterogeneity in the socio-demographic characteristics of childless individuals (Mynarska et al. 2015; Tocchioni 2018).

Heterogeneity in facets of childlessness is also visible in comparative, cross-country studies. Despite the fact that the majority of research on childlessness has applied a country-specific perspective (e.g., Chudnovskaya 2019; Ciritel et al. 2019; Mynarska and Rytel 2019), a handful of studies show a marked variation in childlessness trends (Sobotka 2017) and correlates across countries (Beaujouan et al. 2016; Miettinen et al. 2015; Rijken and Merz 2014).

In this paper, we examine both sources of heterogeneity in the process of remaining childless. We adopt an exploratory approach and attempt to reconstruct a diversity of life-course trajectories related to having no offspring in four distinct countries: Germany, Italy, Poland, and the United States. We focus on women born between the late 1950s and the 1960s, considering three dimensions of their life-courses: partnership histories, employment spells, and educational attainment. We use sequence analysis, together with discrepancy and cluster analysis, to re-construct life trajectories of childless women in these countries, quantify the heterogeneity in the childless life-course between the countries and, finally, classify childless women in each country into sub-populations that follow similar biographic developments.

Our findings reveal a large diversity in life experiences of childless women both within and between countries. We further show pathways to childlessness that are universal across different contexts, as well as those unique to a specific country. Our approach highlights how different institutional settings shape trends of childlessness, while simultaneously doing justice to the variety of paths that can result in a childless life.

2. Childlessness over the life-course

Childlessness is no longer an exception among adults, and is increasingly common among younger cohorts. A growing number of people remain childless, due to either individual choices or life contingencies, or a combination of both (McQuillan et al. 2012; Rybinska and Morgan 2019). As relevant research expanded, events in three life spheres – partnership, education, and employment status – have been identified as major contributors to the process of remaining childless (Koropecjy-Cox and Call 2007; Lee and Gramotnev 2006).

Singlehood and partnerships play a key role in contemporary childlessness (Berrington 2017; Jalovaara and Fasang 2017; Rotkirch and Miettinen 2017). Union histories may affect individuals' life-courses, and lead to childlessness either because of a lack of a partner or union dissolution (Keizer et al. 2008; Thomson et al. 2012). Additionally, childlessness has recently been linked to the increasing complexity of union histories (Hart 2018). Even within stable unions, disagreement on

parenthood timing or family size – as well as fecundity problems – could lead to permanent childlessness (Fiori et al. 2017; Letherby 1999; Tanturri and Mencarini 2007).

Prolonged education and labour market participation are also associated with a higher probability of remaining childless (Abma and Martinez 2006; Dorbritz 2008; Hara 2008; Hayford 2013; Keizer et al. 2008). The most common explanation relates to the postponement mechanism. As women remain in education longer, and then strategically postpone childbearing so as to secure their career prospects (Gustafsson 2001), they could well find themselves at an age where female biological fecundity is reduced (Velde and Pearson 2002). This could, consequently, lead to childlessness. It ought to be noted that this is but one of the many ways in which education and employment can affect childlessness. Research has also shown that the opportunity costs of motherhood are especially high for those with higher educational attainment (Barthold et al. 2012), thereby suggesting that continuous employment might be associated with a higher risk of childlessness for this group.

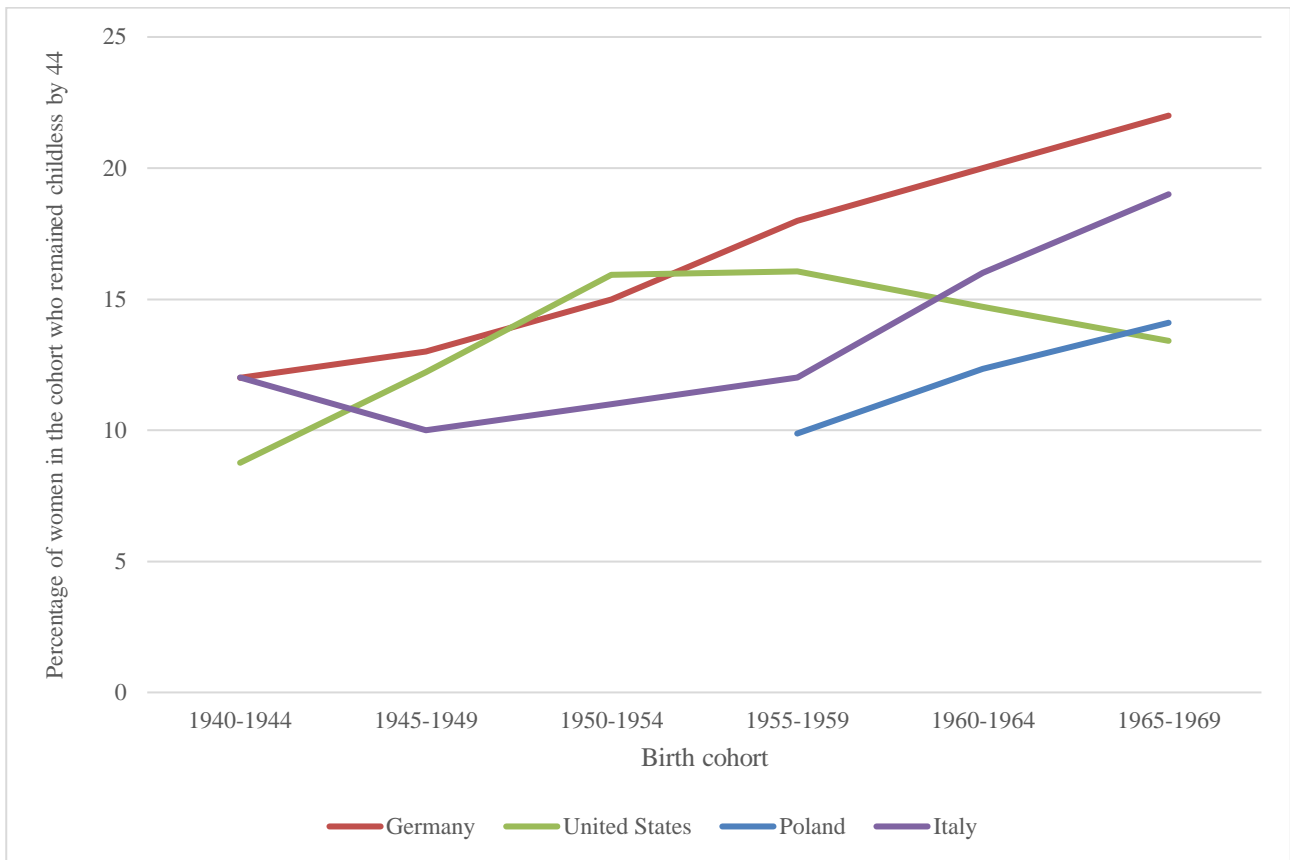
On the other hand, difficulties within the labour market, and prolonged spells of unemployment, may serve to increase women's economic uncertainty and negatively impact their financial situation, both of which may lead to childbearing postponement and childlessness (Alderotti et al. 2021; Baudin et al. 2015; Busetta et al. 2019; Mynarska et al. 2015; Vignoli et al. 2020). As this effect might be particularly pronounced among women with lower levels of educational attainment (Baudin et al. 2015), it is evident that the role of employment needs to be considered jointly with educational attainment when investigating the causes of childlessness.

The above literature review suggests that partnerships, education, and employment trajectories that unfold over the course of one's life have a demonstrable impact on childlessness. To capture this diversity in life pathways, a new generation of studies have used sequence analysis to jointly analyse different life spheres over time and their connection to permanent childlessness (Jalovaara and Fasang 2017; Mynarska et al. 2015; Tocchioni 2018). Using this approach in a comparative perspective allows the detection of country-specific factors as well as shared factors behind childlessness trends, while simultaneously highlighting within-country heterogeneity of individual biographies related to life without offspring. For instance, while a large group of childless, single women with medium education and stable employment exists in both Italy and Poland, country-specific types of childless women were present in the two settings, such as childless stay-at-home wives in Italy or women with unstable employment in Poland (Mynarska et al. 2015). We will follow this strand of literature, as this paper seeks to detect the regularities and differences in the paths to childlessness along the three life spheres of partnership, education, and employment across four different countries.

3. Country contexts

Our (abovementioned) four countries – Germany, Italy, Poland, and the United States – represent distinct geographical regions in the world, namely: Continental, Southern, and Central & Eastern Europe, and the Anglo-Saxon region. They differ not only in terms of history, economics, and institutions, but also in family life patterns. In this section, we provide a brief description of each country in terms of relevant fertility trends, as well as education, employment, and partnership indicators – measured at approximately the time when the women in the included cohorts reached young or mid-adulthood (with certain data limitations, see Figure 1 and Table 1).

Figure 1: Rates of permanent childlessness by cohort of birth and country. Germany, Italy, Poland, and the United States.



Source: Germany: Kreyenfeld and Konietzka 2017; Italy: Istat (dati.istat.it); Poland and the United States: Human Fertility Database (<https://www.humanfertility.org>)

Table 1: Selected indicators on fertility, partnership, education, and employment in Germany, Italy, Poland, and the United States.

	Germany	Italy	Poland	US
% of childless women (1965 cohort)	22.0% ^a	18.4% ^b	14.1% ^c	13.4% ^c
Women's mean age at first child (1990)	26.9 ^m	26.9 ^m	23.3 ^c	24.3 ^c
Total Fertility Rate (1990)	1.45	1.36	1.99	2.08
Women's mean age at first marriage (1990)	25.9 ^d	25.9 ^e	23.0 ^f	24.0 ^k
Crude marriage rate (1990)	5.7 ^d	5.6 ^e	6.7 ^e	9.8 ^k
Total first marriage rate - women (1990)	0.57 ^d	0.68 ^d	0.71 ^f	0.71 ^k
Crude divorce rate (1990)	1.7 ^d	0.5 ^e	1.1 ^e	4.7 ^j
Divorces per 100 marriages (1990)	30.0 ^d	8.7 ^e	16.6 ^e	42.0 ^l
% tertiary educated people aged 25-34 (1990)	19.8%	6.7%	14.2% ^g	24.0%
% tertiary educated women aged 25-34 (1990)	17.1%	6.5%	18.4% ^g	23.6%
Labour force participation rate people aged 15-64 (1990)	67.4%	59.5%	69.4% ^h	76.5%
Employment rate people aged 15-64 (1990)	67.9% ^d	51.9% ^e	58.8% ⁱ	72.2%
Employment rate women aged 25-54 (1990)	67.1% ^d	46.2% ^e	66.7% ⁱ	79.9%
% of NEET people aged 15-29 (1997)	14.3%	25.7% ^g	18.8%	12.6%
% of NEET women aged 15-29 (1997)	18.1%	30.5% ^g	24.6%	16.7%

Source: Unless otherwise stated, OECD database (<https://data.oecd.org/>); ^a Kreyenfeld and Konietzka 2017; ^b Istat; ^c Human Fertility Database (<https://www.humanfertility.org/>); ^d Eurostat (eurostat.ec.europa.eu), 1991; ^e Eurostat; ^f Eurostat, 1993; ^g data from 1995; ^h data from 1992; ⁱ 1993; ^j Singh et al. 1995; ^k Clarke et al. 1995. ; ^l females only, data for 1995, Schoen and Standish 2001; ^m UNECE Statistical database (<https://w3.unece.org/PXWeb2015/pxweb/en/STAT/>).

Our study covers women born in the late 1950s and 1960s. Steady increases in childlessness were reported for those cohorts in Germany, Italy, and Poland, with the proportion of childless women being the lowest in Poland and the highest in Germany. In the United States, however, the pattern diverges. The increase occurred earlier and, for the analysed cohorts, a downward trend can be observed.

The youngest women in our sample entered adulthood approximately in 1990. In the 1990s, women in Poland and the United States, on average, transitioned to motherhood at a younger age (in their early 20s) and went on to have markedly more children (on average) compared to women in Germany and Italy. While women married at a young age in all four countries, marriage rates were higher in the United States compared to the European countries. Furthermore, while divorce rates were remarkably low in Italy and Poland, they were relatively high in Germany and the United States where, in 1990, out of 100 marriages respectively 30 and 42 ended in divorce.

Except for Italy, trends in employment were similar across the countries in the considered period. Among women aged between 25–54, the employment rates spanned from 46.2% in Italy to 79.9% in the United States, with Germany and Poland closer to the United States with an approximate rate of 67%. Regarding education, the prevalence of tertiary education among women aged 25–34 in the early 1990s was low in Italy (6.5%), but significantly higher in Germany (17.1%), Poland (18.4%), and the United States (23.6%). An important interplay between education and employment

career is represented by the young people not in education, employed, or in training (NEET) status statistics (see Table 1). Among young women, NEET prevalence varied from 16.7% in the United States to 30.5% in Italy.

In the 1980s and 1990s, the United States and Italy were two market economies characterised by a period of economic prosperity and the expansion of higher education. East and West Germany, however, constituted separate economic and political entities, only moving towards unification after the fall of the Berlin Wall in 1991. Poland was under communist rule following the end of the Second World War until 1989. During the study period, none of the four countries provided satisfactory conditions for work-family reconciliation (Matysiak and Węziak-Białowolska 2016), and public support for parents could be considered weak.

4. Data and methods

We selected childless women aged 40 or over at the interview date for our analyses. We took this decision so as to focus on women who have reached the age when childbearing is highly unlikely. Table 2 (below) offers information about data sources and sample size. The four data sources were selected due to their comparability in terms of birth cohorts, and for the richness of information collected about respondents' fertility, partnership, and employment histories. They are also large enough to ensure a non-negligible share of childless women.

Table 2: Data source and sample size information for Germany, Italy, Poland, and the United States.

Country	Data source	Date of survey	Birth cohorts	Sample size
Germany	ALWA Survey Working and Learning in a Changing World	2007-2008	1956-1968	391
Italy	Household Multipurpose Survey on Family and Social Subjects	2009	1956-1969	768
Poland	Gender and Generation Survey	2011	1956-1968	219
United States	National Longitudinal Survey of Youth 1979	Multiple waves between 1979 and 2014	1957-1964	581

In order to describe the different life-course trajectories of childless women, we used sequence analysis (Abbott 1995). We analysed education, employment, and partnership histories, and explored how these life spheres were intertwined by assigning a status to each month of each woman's life between the ages of 15–40 with respect to these three spheres. Our state space, i.e., the set of all possible states that an individual could assume, consists of eight statuses constructed using the following characteristics:

- in education (yes/no), computed using the date when the highest degree was obtained¹;

¹ Consequently, women who left education early but then returned in later life were classified as being continuously in education until they finalised their highest degree. This is an important shortcoming of this data set as it demonstrates the complexity of harmonizing life-course trajectories across country-specific data sources. As education has been identified

- working (yes/no), computed using dates for each employment spell;
- in a co-resident union (yes/no), computed using dates for each union spell.

In the next step, we computed differences in life sequences between women within each country using the dynamic Hamming distance (Lesnard 2010), which shares many similarities with the more common optimal matching algorithm (Abbott and Tsay 2000). Nevertheless, the optimal matching algorithm overestimates the importance of episode duration (Elzinga and Studer 2015), whilst the dynamic Hamming distance appears suitable for determining whether variation across sequences are due to timing differences from the postponement of events or differences in spell durations (i.e., postponement of a union or length of stay within it; Studer and Ritschard 2016).

Once we reconstructed life-course sequences, we followed with discrepancy analysis (DA) (e.g., Struffolino et al. 2016; Studer et al. 2011), which allowed us to directly measure the life-course heterogeneity across countries. Using DA, we could *quantify* the strength of the association between sequences and a time-invariant covariate (the country) by computing a pseudo-R² value. Through 5,000 permutation tests, we were able to ensure a precise measure of the strength of this association.

In the last analytical step, we applied a cluster analysis to identify trajectories with similarities across the *timing*, *duration*, and *sequencing* of states among sequences. We employed Ward's algorithm to create a universe of typical or 'ideal-type' life trajectories of childless women (Aassve et al. 2007). We used average silhouette widths to measure the coherence of the assignment of each sequence to a cluster (e.g., Devillanova et al. 2019; Raab and Struffolino 2019).

We conducted several sensitivity analyses to check the robustness of our findings. These were replicated using different distance metrics (i.e., optimal matching algorithm), and the comparison of clusters emerging from the diverse distance metrics supported the choice of dynamic Hamming distance as highly sensitive to the timing and duration of sequences (results available upon request). Additionally, due to Poland's smaller sample size, we repeated the analyses for Poland using an extended sample, including women born between 1939–1971 (609 women in total). The results obtained from these additional analyses corroborate the findings reported in this manuscript (available upon request).

5. Results

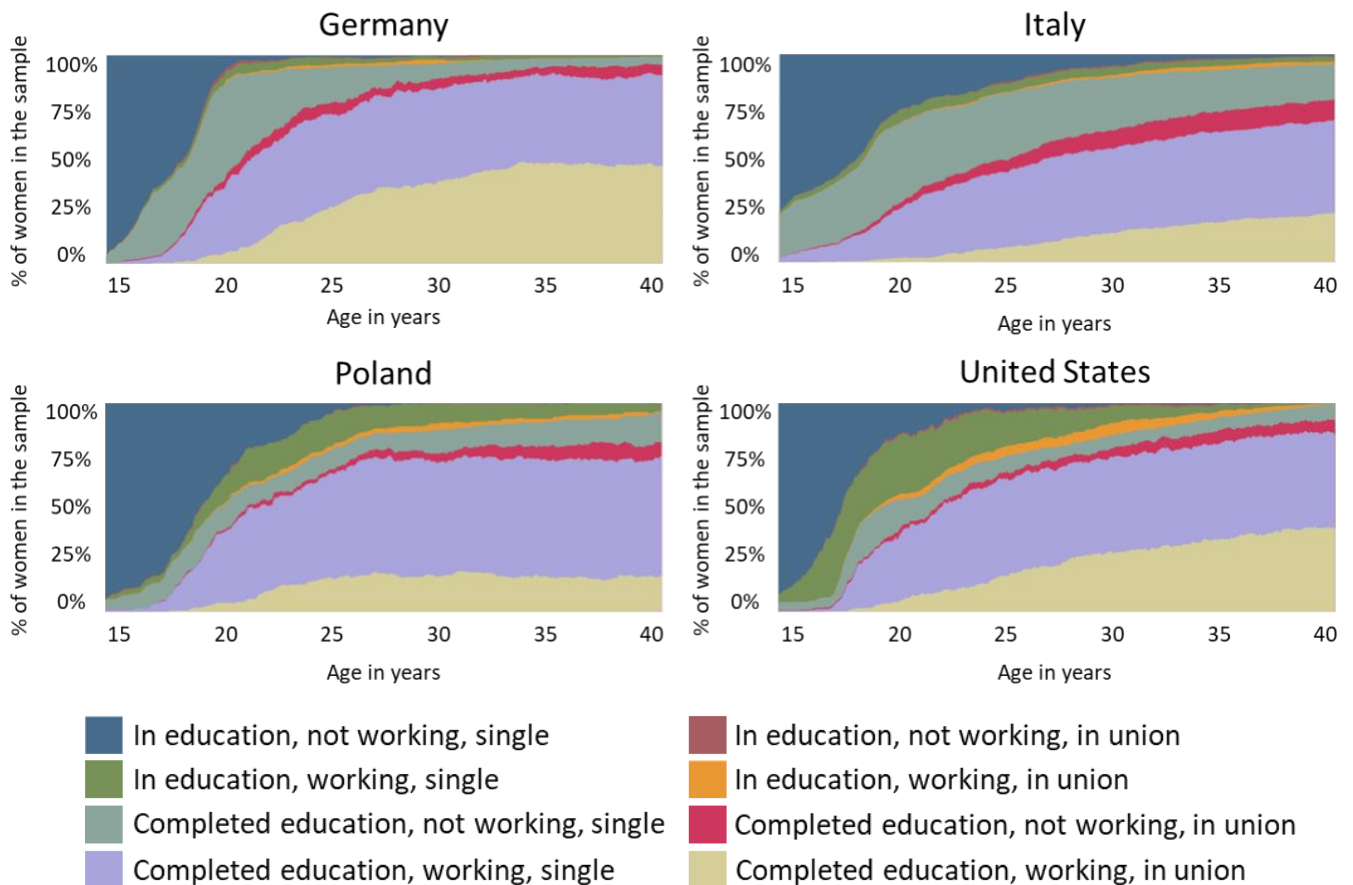
Figure 2 shows the life trajectories of childless women in each of the four countries. The differences in the life-courses of childless women across countries are visible as early as at age 15: while in Germany and Poland, the vast majority of women were still 'in education, not working, single', as much as 25% of women in Italy had already finished schooling. In the United States, already by age 15, we could distinguish a small proportion of women who worked without having concluded their education, but this group of women was not identified in any of the other countries. Many women in Poland and the United States completed their schooling later in life, presumably returning to school after a break.

Furthermore, women in the United States spent the most time working – on average 18.5 out of 25 years of observation – while women in Italy spend the least time working – on average 12.1 out of 25 years of observation. With respect to partnership history, Germany and the United States can

as an important component of childless life, we have decided to nonetheless include this measure in our analyses, along with careful discussions of its implications throughout our manuscript.

be characterised by marked spells of co-residential unions – in Germany, women spent approximately 8.4 years in a union, and 6.9 years in the United States. For comparison, women spent an average of only 4.6 years in co-residential unions in Italy and 4.4 years in Poland (see Table 3).

Figure 2: Chronograms representing life-course trajectories of childless women in Germany, Italy, Poland, and the United States.



Note: The graph represents the distribution of the eight identified states within each country's sample at each month from age 15 through 40.

Table 3: Mean time spent in education, working, and in co-residential unions between ages 15 and 40. Childless women in Germany, Italy, Poland, and the United States.

	Germany	Italy	Poland	US
Mean number of years spent until the highest level is completed	4.0	5.8	7.5	7.6
Mean number of years spent working	16.8	12.1	16.6	18.5
Mean number of years spent in a co-residential union	8.4	4.6	4.4	6.9

Our first step involved using a discrepancy analysis to quantify how much of the variance in the life-course sequences was accounted for by the country indicator. The estimated pseudo- R^2 was equal to 0.04 (p-value < 0.001 based on 5,000 permutations), indicating that 4% of the variance in the computed sequences resulted from the country covariate. Although the country-effect was small but significant, for the cluster analysis, we grouped sequences for each country separately in order to identify the types of childless women's life trajectories within each country. In total, seven life-course trajectories were identified: while two were common to all countries, five were identified only in some of these countries. We distinguished four distinct life-course trajectories of childless women in Poland and the United States, and five different childless women's profiles in Germany and Italy (see Table 4 and Figure 3; additional cluster characteristics are included in the Appendix in Table A1-A4). We follow with a detailed description of the identified clusters.

Table 4: Life-course profiles of childless women. Percentage values and total absolute values. Germany, Italy, Poland, and the United States

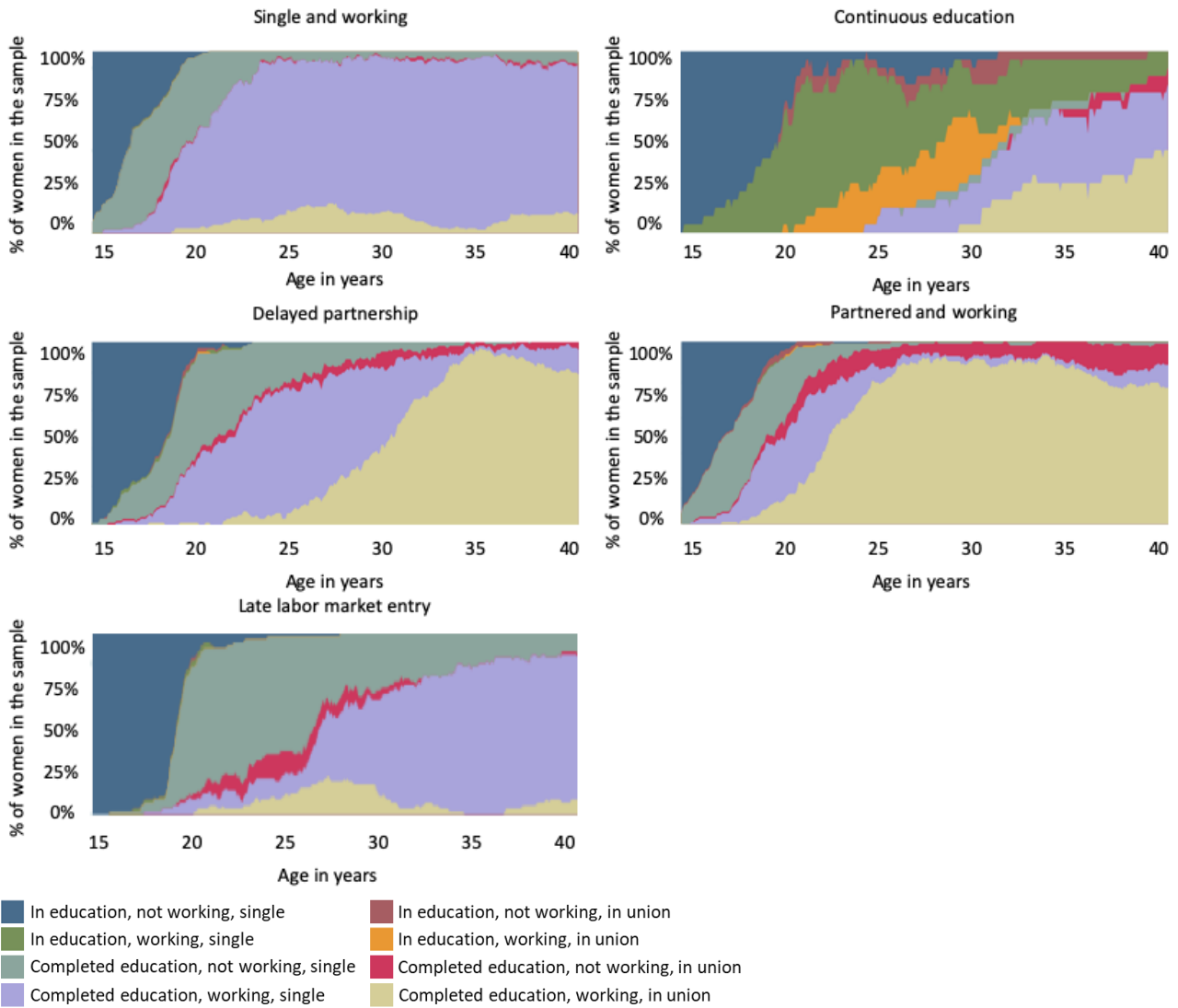
a) Universal clusters

Universal cluster	Germany	Italy	Poland	United States
<u>Single and working</u> (They left the educational system before the age of 20, and spent most of their adult life working and without a partner.)	28.1	42.1	52.1	40.8
<u>Continuous education</u> (They combined education and work, spending most of their twenties both working and in education, their union status varied over the life-course.)	5.6	9.1	8.7	24.1
Total (n)	33.8 (132)	51.2 (393)	60.7 (133)	64.9 (377)

b) Country-specific clusters

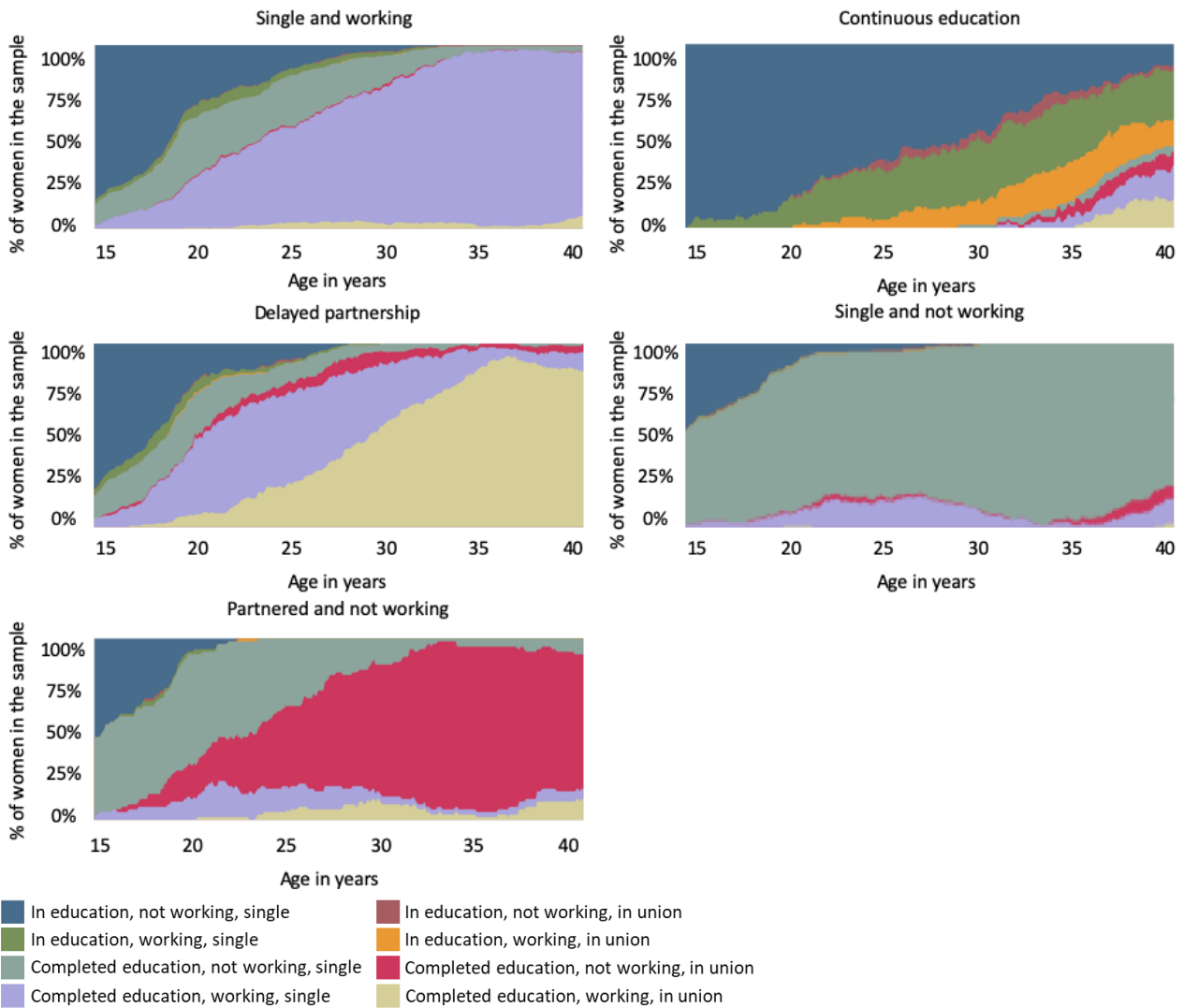
Country-specific cluster	Germany	Italy	Poland	United States
<u>Delayed partnership</u> (They worked and stayed in education up to the ages of 22–24, they partnered later in their adult life.)	24.6	21.1		29.3
<u>Single and not working</u> (They left educational system before the age of 20, did not enter into a union, and did not work.)		18.6	11.0	5.9
<u>Partnered and working</u> (They partnered over the life-course and continuously worked, they varied in terms of time spent in education.)	26.3		28.3	
<u>Late labour market entry</u> (They spent longer time in education, up to the ages of 22–24, and experienced a non-employment spell between the end of education and labour market entry, which happened late. They were not in a union.)	15.3			
<u>Partnered and not working</u> (They spent most of their life-course in unions, and finished education between the ages of 18–20. They did not work over the life-course.)		9.1		
Total (n)	66.2 (259)	48.8 (375)	39.3 (86)	35.1 (204)

Figure 3a: Chronograms representing life-course trajectories of childless women across 5 clusters in Germany.



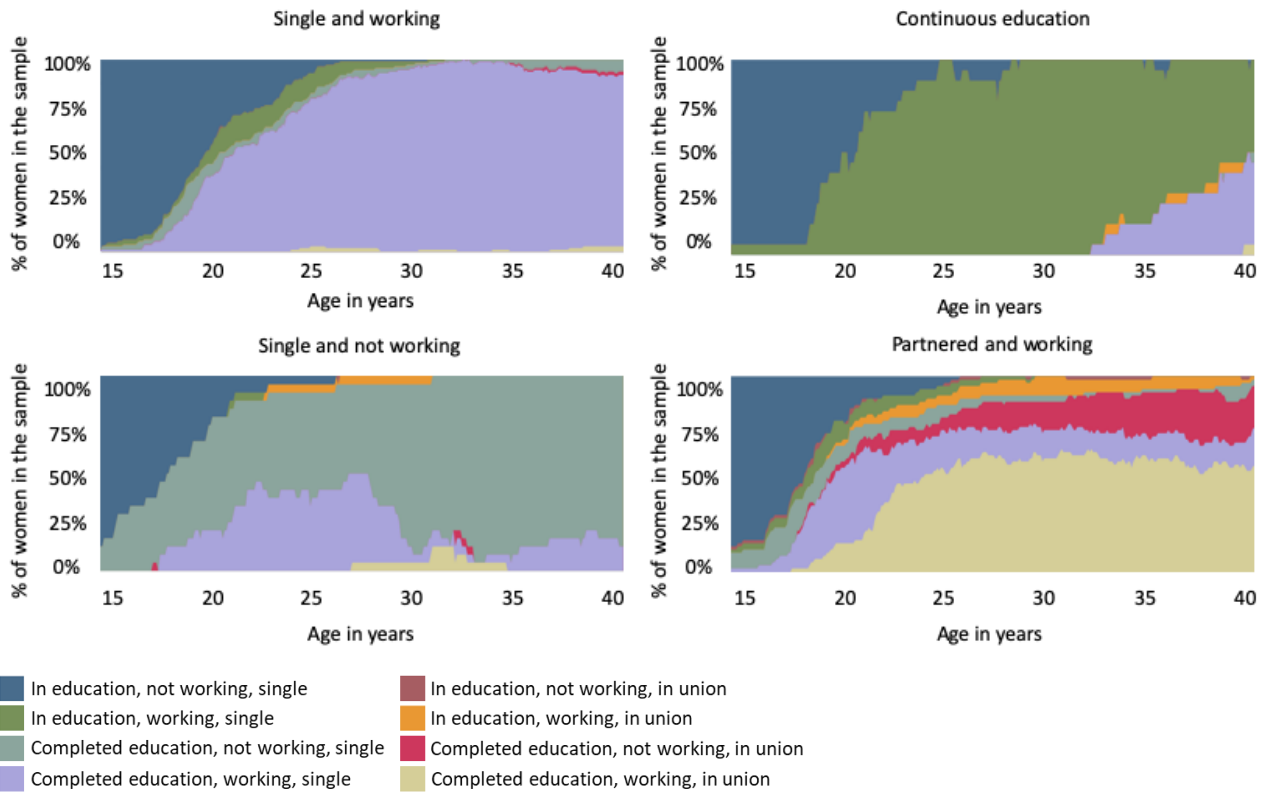
Note: The graph represents the distribution of the eight identified states within each country's sample at each month from age 15 through 40.

Figure 3b: Chronograms representing life-course trajectories of childless women across 5 clusters in Italy.



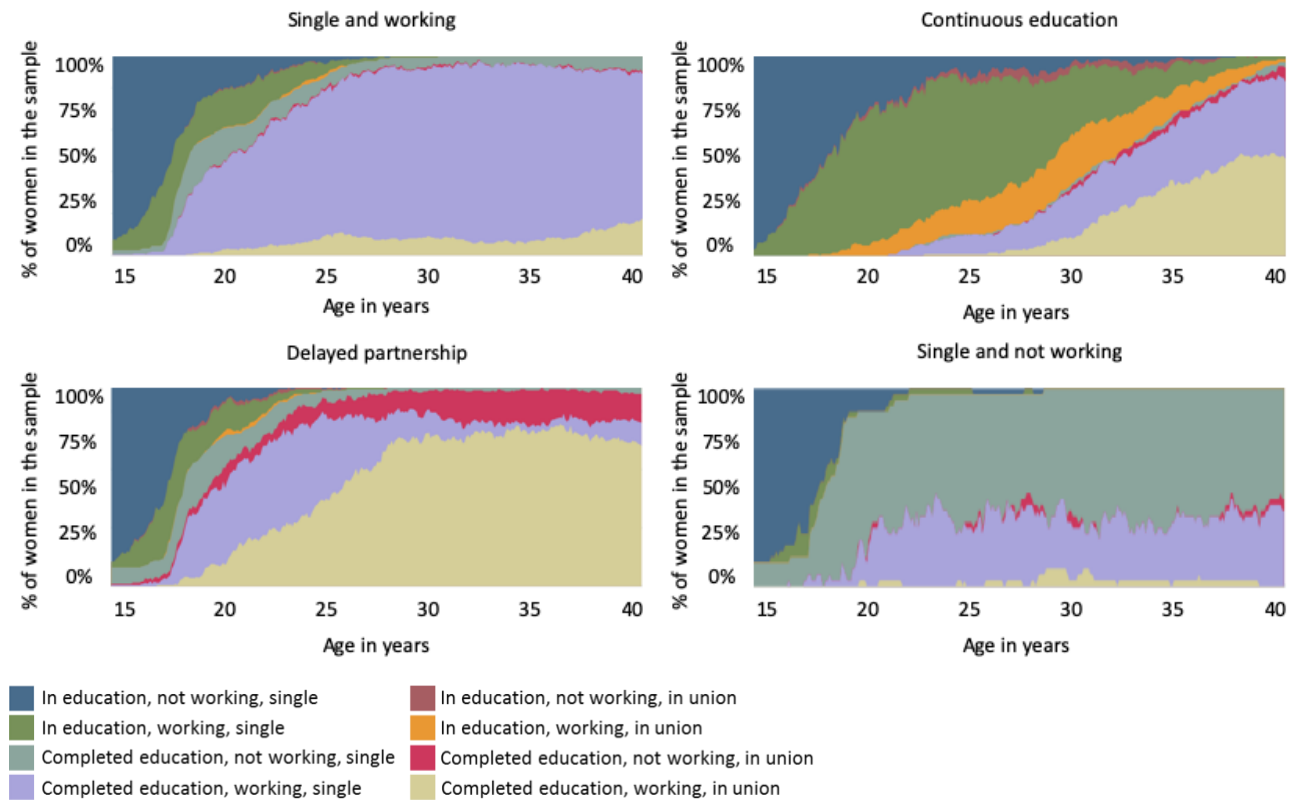
Note: The graph represents the distribution of the eight identified states within each country's sample at each month from age 15 through 40.

Figure 3c: Chronograms representing life-course trajectories of childless women across 4 clusters in Poland.



Note: The graph represents the distribution of the eight identified states within each country's sample at each month from age 15 through 40.

Figure 3d: Chronograms representing life-course trajectories of childless women across 4 clusters in the United States.



Note: The graphs represent the distribution of the states within the cluster in each country (with the cluster numerosity reported on y axis) at each month between the age of 15 and 40 (on x axis).

First, we considered the two clusters present in all four countries. The first category, *Single and working*, was the most numerous cluster in each country, comprising 28.1% of German women to 52.1% of Polish women. Women belonging to this cluster completed their education at a relatively young age, and spent most of their adult life working and without a co-resident union.

The second universal cluster, *Continuous education*, was especially prevalent in the United States, including 24.1% of childless women assigned within it. In comparison, under 10% of childless women were assigned to this group in the three remaining countries. This cluster comprised women who either spent a longer period in education in young adulthood or returned to education later in life. Interestingly, many women in this cluster in Italy spent a considerable amount of their adult lives outside of employment. Union status in this cluster also varied over the life-course and among countries: while in Germany, Italy, and the United States it comprised both single women and those in co-residing unions, in Poland nearly all women did not enter into a union.

The remaining clusters were not detected in all four countries. The *Delayed partnership* cluster was identified in Germany, Italy, and the United States. In each of these three countries, it consisted of a relevant proportion of childless women – from 21.1% in Italy to 29.3% in the United States. Women in this cluster postponed union formation until their late 20s or early 30s. In all three countries, childless women in this group experience a marked period of non-working in their 20s.

The *Single and not working* profile was characterised by women who completed their education at a young age, and remained both single and outside of the labour market. We identified

the cluster in Italy, Poland, and the US, although it was residual in the latter country (5.9% compared to 11% in Poland and 18.6% in Italy). Women belonging to this cluster shared a life-course pattern highly similar to the NEET youth for both educational and employment careers.

We identified the *Partnered and working* cluster in Germany and Poland. It describes a traditional pattern in the transition to adulthood, involving women who had completed their education, began working, and entered unions at a young age (although earlier in Germany than in Poland). While it was common only to two countries, it accounts for a large proportion of childless women both in Germany and Poland (26.3% and 28.3%, respectively).

Moreover, we identified the *Late labour market entry* cluster in Germany. This group consisted of 15.3% of German childless women. While they studied for longer, they faced difficulties upon entry into the labour market, living a prolonged period of non-employment before starting work during their late 20s, while not entering into a union.

Finally, we detected a small (9.1%) cluster of *Partnered and not working* women in Italy. This group was formed by women who completed their education at a young age, did not work, and entered a union relatively early (during their 20s).

6. Discussion

While trends of childlessness unfold in their own way in different countries (Sobotka 2017), this variability *across* countries is coupled with a large diversity in life-course pathways related to childlessness *within* each setting. In line with previous research, we found childlessness to be strongly linked to singlehood, but we also identified a complex set of intersections of relationship, employment, and education histories across the life-courses of childless women. Specifically, in each country, we identified four or five distinct life-course patterns. The childless universe does not appear to be uniquely formed by highly educated, working women. In the studied countries, the largest cluster consisted of single and working women, who left the educational system at a relatively young age. In several of the analysed countries, we also identified a meaningful share of childless women who remained single and had very weak attachments to the labour market.

The revealed diversity in a childless life-course can have important implications for women. Indeed, while some childless women might accumulate resources over their life-course, others might instead deplete them, for example, by coping with lack of a partner or employment. Such differences in accumulated capital might translate into tangible variation in the economic and personal well-being throughout adulthood and into old age.

Given its important implication, this large heterogeneity of women's experiences should not be neglected in cross-country comparisons. In fact, considering both within and between country variability provides us with a more nuanced picture of how distinct contexts shape the lives of childless women.

The types of childless women identified were not universal across countries. Indeed, only two types were. Moreover, even when a cluster was identified in multiple countries, the proportion of women within it varied. For instance, while we found a group of childless women strongly attached to education in all four settings, it was far more numerous in the United States than in any other country. When comparing the structure of clusters, we can see that partnered childless women are over-represented in Germany and the United States, compared to Italy and Poland, indicating that childlessness within marriage was less of a phenomenon in the latter countries in the analysed cohorts.

While some of the differences between childless women in the analysed countries merely reflected more general discrepancies in terms of education and labour market systems, others showed a more nuanced picture. For instance, the larger proportion of single professional childless women identified in the United States may relate to tertiary education having been more prevalent in the United States generally – for men and women, as well as mothers and the childless. Yet it also suggests that a group of women, who chose a childless lifestyle in order to fulfil their professional aspirations, emerged in the United States earlier than in other contexts. However, the observed larger proportion of partnered childless women in Germany and the United States clearly confirms a looser link between marriage and parenthood in both countries, as first-time marriage rates were comparable across the four countries at the time when the women analysed reached adulthood.

Our study has several limitations. While we analysed four countries across different institutional, cultural, and geographical settings, we did not include a Northern European country, which could have provided valuable information on the universality of some of the pathways to childlessness. Northern European countries are characterised by distinct social welfare programmes, and fertility trends markedly different from those in the four analysed countries (Thévenon and Gauthier 2011; Billingsley and Ferrarini 2014). Nevertheless, childlessness in Nordic countries has received scholarly interest (Jalovaara and Fasang 2017; Neyer et al. 2017; Rotkirch and Miettinen 2017). Furthermore, our measure of education could not account for intermittent schooling spells or returns to education later in life, instead classifying women as being continuously in education. Additionally, due to data limitations, we could not investigate neither women’s reproductive health (as well as that of the partner), nor the degree of agreement/disagreement in reproductive plans between partners. The data sources used also lack consistent measures of heterosexual living-apart-together relationships or same-sex unions (both co-residing and non-resident). These limitations highlight important challenges for future research in terms of the data collection on full partnership histories and/or health conditions of childless women and their partners.

Regardless of these limitations, this study has demonstrated the potential and benefits of analysing a process of remaining childless in a comparative perspective, while not neglecting within country heterogeneity of childless women’s biographies. The identification of different types of childless women across space, and – possibly – over time, can generate important insights into how macro context interacts with individual life-course developments leading to childlessness.

References

- Aassve, A., Billari, F. C., & Piccarreta, R. (2007). Strings of Adulthood: a Sequence Analysis of Young British Women's Work-Family Trajectories. *European Journal of Population/Revue européenne de Démographie*, 23, 369–388.
- Abbott, A. (1995). Sequence analysis: New methods for old ideas. *Annual review of sociology*, 21(1), 93-113.
- Abbott, A., & Tsay, A. (2000). Sequence Analysis and Optimal Matching Methods in Sociology. Review and Prospect. *Sociological Methods & Research*, 29(1), 3–33.
- Abma, J. C., & Martinez, G. M. (2006). Childlessness Among Older Women in the United States: Trends and Profiles. *Journal of Marriage and Family*, 68(4), 1045–1056. doi:10.1111/j.1741-3737.2006.00312.x
- Alderotti, G., Vignoli, D., Baccini, M., & Matysiak, A. (2021). Instability of employment careers and fertility in Europe: A meta-analysis. *Demography* (forthcoming).
- Barthold, J. A., Myrskylä, M., & Jones, O. R. (2012). Childlessness drives the sex difference in the association between income and reproductive success of modern Europeans. *Evolution and Human Behavior*, 33(6), 628–638. doi:10.1016/j.evolhumbehav.2012.03.003
- Baudin, T., De La Croix, D., & Gobbi, P. E. (2015). Fertility and childlessness in the United States. *American Economic Review*, 105(6), 1852–1882. doi:10.1257/aer.20120926
- Beaujouan, E., Brzozowska, Z., & Zeman, K. (2016). The limited effect of increasing educational attainment on childlessness trends in twentieth-century Europe, women born 1916–65. *Population Studies*, 70(3), 275–291. doi:10.1080/00324728.2016.1206210
- Berrington, A. (2017). Childlessness in the UK. In M. Kreyenfeld & D. Konietzka (Eds.), *Childlessness in Europe: Contexts, Causes, and Consequences* (pp. 57–76). Cham, Switzerland: Springer International Publishing. doi:10.1007/978-3-319-44667-7_3
- Billingsley, S., & Ferrarini, T. (2014). Family policy and fertility intentions in 21 European countries. *Journal of Marriage and Family*, 76(2), 428–445.
- Brini, E. (2020). Childlessness and low fertility in context: evidence from a multilevel analysis on 20 European countries. *Genus*, 76, 1-38.
- Busetta, A., Mendola, D., & Vignoli, D. (2019). Persistent joblessness and fertility intentions. *Demographic Research*, 40(8), 185-218
- Chudnovskaya, M. (2019). Trends in Childlessness Among Highly Educated Men in Sweden. *European Journal of Population*, 35(5), 939–958. doi:10.1007/s10680-018-9511-3
- Ciritel, A. A., De Rose, A., & Arezzo, M. F. (2019). Childbearing intentions in a low fertility context: The case of Romania. *Genus*, 75(1), 4. doi:10.1186/s41118-018-0046-6
- Clarke, S. C. (1995). Advance Report of Final Marriage Statistics, 1989 and 1990. *Monthly Vital Statistics Report*, 43(12).
- Devillanova, C., Raitano, M., & Struffolino, E. (2019). Longitudinal employment trajectories and health in middle life: Insights from linked administrative and survey data. *Demographic Research*, 40(47), 1375–1412. doi:10.4054/demres.2019.40.47
- Dorbritz, J. (2008). Germany: Family diversity with low actual and desired fertility. *Demographic Research*, 19(17), 557–598.
- Elzinga, C. H., & Studer, M. (2015). Spell Sequences, State Proximities, and Distance Metrics. *Sociological Methods and Research*, 44(1), 3–47. doi:10.1177/0049124114540707

- Fiori, F., Rinesi, F., & Graham, E. (2017). Choosing to Remain Childless? A Comparative Study of Fertility Intentions Among Women and Men in Italy and Britain. *European Journal of Population*, 33(3), 319–350. doi:10.1007/s10680-016-9404-2
- Gustafsson, S. (2001). Optimal age at motherhood. Theoretical and empirical considerations on postponement of maternity in Europe. *Journal of population economics*, 14(2), 225–247.
- Hara, T. (2008). Increasing childlessness in Germany and Japan: Toward a childless society? *International Journal of Japanese Sociology*, 17(1), 42–62.
- Hart, R. K. (2018). Union Histories of Dissolution: What Can They Say About Childlessness? *European Journal of Population*. doi:10.1007/s10680-018-9464-6
- Hayford, S. R. (2013). Marriage (Still) Matters: The Contribution of Demographic Change to Trends in Childlessness in the United States. *Demography*, 50(5). doi:10.1007/s13524-013-0215-3
- Heaton, T. B., Jacobson, C. K., & Holland, K. (1999). Persistence and change in decisions to remain childless. *Journal of Marriage and the Family*, 61(2), 531–539. doi:10.2307/353767
- Jalovaara, M., & Fasang, A. E. (2017). From never partnered to serial cohabitators: Union trajectories to childlessness. *Demographic Research*, 36(1), 1703–1720. doi:10.4054/DemRes.2017.36.55
- Keizer, R., Dykstra, P. A., & Jansen, M. D. (2008). Pathways into childlessness: Evidence of gendered life course dynamics. *Journal of biosocial science*, 40(6), 863–878. doi:10.1017/S0021932007002660
- Köppen, K., Mazuy, M., & Toulemon, L. (2017). Childlessness in France. In M. Kreyenfeld & D. Konietzka (Eds.), *Childlessness in Europe: Contexts, Causes, and Consequences* (pp. 77–95). Cham, Switzerland: Springer International Publishing. doi:10.1007/978-3-319-44667-7_4
- Koropecj-Cox, T., & Call, V. R. A. (2007). Characteristics of older childless persons and parents - Cross-national comparisons. *Journal of Family Issues*, 28(10), 1362–1414. doi:10.1177/0192513x07303837
- Kreyenfeld, M., & Konietzka, D. (Eds.) (2017). *Childlessness in Europe: Contexts, Causes, and Consequences*. Cham, Switzerland: Springer International Publishing. doi:10.1007/978-3-319-44667-7
- Lee, C., & Gramotnev, H. (2006). Motherhood plans among young Australian women: who wants children these days? *Journal of health psychology*, 11(1), 5–20. doi:10.1177/1359105306058838
- Lesnard, L. (2010). Setting cost in optimal matching to uncover contemporaneous socio-temporal patterns. *Sociological Methods and Research*, 38. doi:10.1177/0049124110362526
- Letherby, G. (1999). Other than mother and mothers as others: The experience of motherhood and non-motherhood in relation to “infertility” and “involuntary childlessness”. *Women's Studies International Forum*, 22(3), 359–372. doi:10.1016/S0277-5395(99)00028-X
- Matysiak, A., & Węziak-Białowolska, D. (2016). Country-Specific Conditions for Work and Family Reconciliation: An Attempt at Quantification. *European Journal of Population/Revue Européenne de Démographie*, 32(4), 475–510.
- McQuillan, J., Greil, A. L., Shreffler, K. M., Wonch-Hill, P. A., Gentzler, K. C., & Hathcoat, J. D. (2012). Does the reason matter? Variations in childlessness concerns among US women. *Journal of marriage and family*, 74(5), 1166–1181.
- Miettinen, A., Rotkirch, A., Szalma, I., Donno, A., & Tanturri, M. L. (2015). Increasing childlessness in Europe: time trends and country differences. *Families And Societies Working Paper Series*,

- Mynarska, M., Matysiak, A., Rybińska, A., Tocchioni, V., & Vignoli, D. (2015). Diverse paths into childlessness over the life course. *Advances in Life Course Research*, 25, 35–48. doi:10.1016/j.alcr.2015.05.003
- Mynarska, M., & Rytel, J. (2019). Fertility Desires of Childless Poles: Which Childbearing Motives Matter for Men and Women? *Journal of Family Issues*, 28, 1311–1337. doi:10.1177/0192513x19868257
- Neyer, G., Hoem, J. M., & Andersson, G. (2017). Education and Childlessness: The Influence of Educational Field and Educational Level on Childlessness among Swedish and Austrian Women. In M. Kreyenfeld & D. Konietzka (Eds.), *Childlessness in Europe: Contexts, Causes, and Consequences* (pp. 183–207). Cham, Switzerland: Springer International Publishing. doi:10.1007/978-3-319-44667-7_9
- Raab, M., & Struffolino, E. (2019). The Heterogeneity of Partnership Trajectories to Childlessness in Germany. *European Journal of Population*, 36(1), 1–18.
- Rijken, A. J., & Merz, E. M. (2014). Double standards: Differences in norms on voluntary childlessness for men and women. *European Sociological Review*, 30(4), 470–482. doi:10.1093/esr/jcu051
- Rotkirch, A., & Miettinen, A. (2017). Childlessness in Finland. In M. Kreyenfeld & D. Konietzka (Eds.), *Childlessness in Europe: Contexts, Causes, and Consequences* (pp. 139–158). Cham, Switzerland: Springer International Publishing. doi:10.1007/978-3-319-44667-7_7
- Rowland, D. T. (2007). Historical Trends in Childlessness. *Journal of Family Issues*, 28(10), 1311–1337. doi:10.1177/0192513X07303823
- Rybinska, A., & Morgan, S. P. (2019). Childless expectations and childlessness over the life course. *Social Forces*, 97(4), 1571–1602. doi:10.1093/sf/soy098
- Schoen, R., & Standish, N. (2001). The retrenchment of marriage: Results from marital status life tables for the United States, 1995. *Population and development review*, 27(3), 553–563.
- Singh, G. K., Mathews, T. J., Clarke, S. C., Yannicos, T., & Smith, B. L. (1995). Annual summary of births, marriages, divorces, and deaths: United States, 1994. *Monthly Vital Statistics Report*, 43(13), NCHS, National Center for Health Statistics. http://www.cdc.gov/nchs/data/mvstr/mv43_13.pdf.
- Sobotka, T. (2017). Childlessness in Europe: Reconstructing Long-Term Trends Among Women Born in 1900–1972. In M. Kreyenfeld & D. Konietzka (Eds.), *Childlessness in Europe: Contexts, Causes, and Consequences* (pp. 17–53). Cham, Switzerland: Springer International Publishing. doi:10.1007/978-3-319-44667-7_2
- Struffolino, E., Studer, M., & Fasang, A. E. (2016). Gender, education, and family life courses in East and West Germany: Insights from new sequence analysis techniques. *Advances in Life Course Research*, 29, 66–79. doi:10.1016/j.alcr.2015.12.001
- Studer, M., & Ritschard, G. (2016). What matters in differences between life trajectories: A comparative review of sequence dissimilarity measures. *Journal of the Royal Statistical Society - Series A (Statistics in Society)*, 179(2), 481–511. doi:10.1111/rssa.12125
- Studer, M., Ritschard, G., Gabadinho, A., & Muller, N. S. (2011). Discrepancy Analysis of State Sequences. *Sociological Methods & Research*, 40(3), 471–510. doi:10.1177/0049124111415372

- Tanturri, M. L., & Mencarini, L. (2007). Le caratteristiche e le motivazioni delle donne senza figli in Italia: un'analisi esplorativa. *Rivista di Studi familiari*, 2, 226–237.
- Tanturri, M. L., & Mencarini, L. (2008). Childless or childfree? Paths to voluntary childlessness in Italy. *Population and Development Review*, 34(1), 51–77. doi:10.1111/j.1728-4457.2008.00205.x
- Thévenon, O., & Gauthier, A. H. (2011). Family policies in developed countries: A ‘fertility-booster’ with side-effects. *Community, Work & Family*, 14(2), 197–216.
- Thomson, E., Winkler-Dworak, M., Spielauer, M., & Prskawetz, A. (2012). Union Instability as an Engine of Fertility? A Microsimulation Model for France. *Demography*, 49(1), 175–195. doi:10.1007/s13524-011-0085-5
- Tocchioni, V. (2018). Exploring the childless universe: Profiles of women and men without children in Italy. *Demographic Research*, 38(19), 451–470. doi:10.4054/DemRes.2018.38.19
- Velde, E. R., & Pearson, P. L. (2002). The variability of female reproductive ageing. *Human reproduction update*, 8(2), 141–154.
- Vignoli, D., Tocchioni, V., & Mattei, A. (2020). The impact of job uncertainty on first-birth postponement. *Advances in Life Course Research*, 45, 100308.

Appendix

Table A1: Sequence analysis descriptive measures of identified clusters. Germany.

	Mean number of years spent until the highest level is completed	Mean number of years spent working	Mean number of years spent in a co-residential union
Single and working	2.4	18.8	1.9
Continuous education	17.2	17.8	6.7
Delayed partnership	3.7	16.7	10.4
Single and not working	N/A	N/A	N/A
Partnered and working	2.7	17.8	17.3
Late labour market entry	4.7	11.5	6.7
Partnered and not working	N/A	N/A	N/A

Note: This is between ages 15 and 40.

Table A2: Sequence analysis descriptive measures of identified clusters. Italy.

	Mean number of years spent until the highest level is completed	Mean number of years spent working	Mean number of years spent in a co-residential union
Single and working	5.5	16.0	0.7
Continuous education	22.9	9.6	4.2
Delayed partnership	4.1	18.1	11.8
Single and not working	2.1	2.1	0.6
Partnered and working	N/A	N/A	N/A
Late labour market entry	N/A	N/A	N/A
Partnered and not working	1.9	3.2	14.4

Note: This is between ages 15 and 40.

Table A3: Sequence analysis descriptive measures of identified clusters. Poland.

	Mean number of years spent until the highest level is completed	Mean number of years spent working	Mean number of years spent in a co-residential union
Single and working	6.5	18.5	0.3
Continuous education	23.0	18.9	0.2
Delayed partnership	N/A	N/A	N/A
Single and not working	3.9	5.6	0.8
Partnered and working	6.0	16.6	14.8
Late labour market entry	N/A	N/A	N/A
Partnered and not working	N/A	N/A	N/A

Note: This is between ages 15 and 40.

Table A4: Sequence analysis descriptive measures of identified clusters. The United States.

	Mean number of years spent until the highest level is completed	Mean number of years spent working	Mean number of years spent in a co-residential union
Single and working	5.2	19.8	1.9
Continuous education	16.8	19.4	7.3
Delayed partnership	4.1	18.3	14.9
Single and not working	3.7	7.4	0.8
Partnered and working	N/A	N/A	N/A
Late labour market entry	N/A	N/A	N/A
Partnered and not working	N/A	N/A	N/A

Note: This is between ages 15 and 40.

