Institutional Change and Family Formation.

Exploiting the Natural Social Experiment of the Reunification of East and West Germany in 1989

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Abstract

Family formation patterns vary greatly across countries, yet we know little about which institutional conditions drive this variation (Elzinga & Liefbroer 2007). We use the reunification of East and West Germany in 1989 as a natural social experiment to study how rapid and massive institutional change affects women's family formation patterns between age 15 and 34. The study is based on a historical comparative cohort design following the logic of a difference-in-difference design. We propose an application of bootstrap re-sampling methods to recent innovations in sequence analysis (Aisenbrey & Fasang 2010, Lesnard 2010) to analyze family formation processes holistically. Findings from the German Life History study show a rapid diversification of East German family formation with the break-down of the regulative communist state and the insecurities and turmoil of the transition process. Our findings forcefully demonstrate the sensitivity of family formation to rapid and massive institutional change.

NOTE: FIGURES SHOULD BE VIEWED IN COLOR

EXTENDED ABSTRACT AND PRELIMINARY RESULTS

Introduction

Family and housing policies set incentives and constraints on couple relationships and fertility. Besides single transition, such as marriage or motherhood, they shape holistic family formation patterns. Family formation patterns consist of a series of sequentially linked states, such as uncommitted relationships, cohabitation, marriage, and parenthood. The sequence of family formation, instead of single elements within this process, becomes the unit of analysis. Family formation varies greatly across countries, yet we know little about which institutional conditions drive this variation (Elzinga & Liefbroer 2007). To examine how family and housing policies shape family formation patterns, this paper compares women born 1953-1955 and 1971 in East and West Germany.

The German reunification produced a historically unique situation, in which two previously radically different institutional regimes were instantaneously absorbed into the former West German model. We capitalize on this 'natural experiment' of the German reunification in 1989, to draw more general conclusions about how rapid and massive institutional change affects family formation and fertility. Family and housing policies of the communist regime in the East German Democratic Republic (GDR) differed markedly from the social market economy of the Federal Republic of Germany (FRG) in the West. The GDR regime aimed at population growth through pro-natalist family policies. An extensive childcare infrastructure was put into place to promote population growth and at the same time adhere to the socialist ideology of broadly incorporating women into the labor force. In addition, access to benefits and housing were conditioned on marriage and parenthood. In West Germany, the main breadwinner model was the core organizing

2

principle of family and housing policies. Foreseeing women in the role as homemakers and caretakers, the infrastructure for public childcare was limited and female labor force participation far lower than in East Germany. The pro-natalist East German family policies generated higher fertility in the GDR than the FRG. Since reunification however, East German fertility has converged toward lower West German levels (Cassens et al. 2009). We are interested to see, if these converged fertility curves are embedded in more similar family formation patterns in East and West Germany after the re-unification than before.

The paper proposes a new way of measuring similarity of family formation sequences between groups and the degree of standardization of family formation patterns using sequence analysis and bootstrap re-sampling methods. To both illuminate the German case and draw more general conclusions about the impact of family and housing policies on family formation patterns, this paper addresses both a quantitative and a qualitative aspect of family formation. First, the degree to which rapid institutional change in East Germany affects the degree of de-standardization of family formation. We follow (Brückner & Mayer, 2005) and define standardization as the process "by which specific states or events and the sequences in which they occur become more universal for given populations", i.e. to what extent family formation is similar for different people. Second, we identify the most salient substantive qualitative family formation patterns under different institutional conditions.

Historical-Comparative Cohort Design

Our comparative design essentially follows the same logic as difference in difference design (Figure 1). We analyze the difference in family formation within each German sub-society, and

between the two sub-societies before and after reunification by comparing family formation of women born 1953/55 and 1971 who experienced their family formation between 15 and 33 right before and right after the reunification.

Figure 1: Comparative cohort design: women's family formation before and after the reunification in East and West Germany
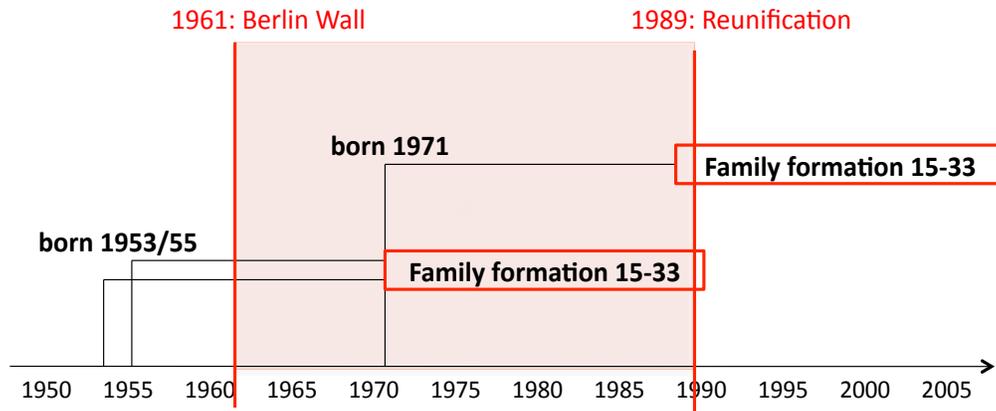

Table 1 summarizes relevant institutional differences in the former German Democratic Republic (GDR) and Federal Republic of Germany (FRG). In the former GDR, family support policies conditioned access to state-regulated resources on marriage and parenthood. However, there was also broad support for unwed mothers that favored housing access and parental leave and thus set incentives to premarital births and a delay of marriage for the one-year period of these provisions (Huinink 1995; Trappe 1995). There was a strong social and medical norm for women to have children in their early twenties encouraged by generous child benefits and facilitated by the access to almost universal and daylong child care in 'Kinderkrippen' and 'Kindergärten'.

In West Germany, there was a strong norm for having children secured in a marriage. This was normatively anchored in more salient Christian values than in communist East Germany (Engelhardt et al. 2002). From a practical point of view, West German women were far

more economically dependent on a male breadwinner to sustain themselves and their children. Female employment participation was lower compared to East Germany and often only part-time (Brückner 2004). A lack of public childcare provision particularly for children under the age of three, necessitated one parent, usually the mother, to stay at home with little children. In addition, tax incentives for marriage and a male breadwinner – female homemaker specialization were far stronger in West Germany (tax splitting among spouses).

Table 1: Institutional differences in East and West Germany

	GDR/East Germany	FRG/West Germany
1	Pro-natalist family policies conditioned access to state-regulated benefits on marriage/motherhood (e.g. housing, parental leave)	Little state support for unwed mothers, high tax incentives for main breadwinner marriage (tax splitting among spouses)
2	High and full-time female employment	Medium and part-time female employment
3	Extensive public child care infrastructure	Lack of public child care infrastructure, especially for children under three
4	Divorce easy and cheap	Divorce costly and complicated

These distinct East and West German housing and family policies were in effect until the reunification in 1989. In 1989, women born 1953/55 were 34 and 36 years old, slowly approaching the end of their active family formation phase. Women born 1971 were 19 years old, and just beginning of their active family formation (figure 1). After 1989 the former West German institutional model was essentially adopted across reunified Germany.

Because the West German policies were adapted to different structural conditions in the former East than in the former West, they may still partially exert different incentives for family formation. For instance, tax splitting among spouses is a high incentive for marriage particularly

when differences in labor force participation and earnings among spouses are vast. If both partners have earnings on a similar level, as still was much more so the case among East German couples after reunification, there is far less to be gained from tax splitting. Also, the more developed public childcare infrastructure largely stayed in effect in the East after reunification. Together with the normative acceptance of premarital births established during the GDR, these legacies of the GDR regime can be expected to continue to affect women's partnership formation and fertility in East Germany after reunification despite an apparent convergence of median fertility ages in East and West Germany.

Hypotheses

Based on the above differences in family and housing policies, we formulate three hypotheses that correspond to three comparisons:

Hypothesis 1: family formation is more similar between East and West German women after reunification than before reunification.

This hypothesis implies a convergence of family formation between East and West German women after reunification and corresponds to a comparison of between group differences (East - West) before and after reunification.

Hypothesis 2: standardization of family formation will be stable for West German women before and after reunification.

We assume that the standardization of family formation within West Germany will be stable, due to the relative institutional stability before and after the reunification. This hypothesis corresponds to a comparison of family formation within West Germany over time.

Hypothesis 3: family formation will be more de-standardized for East German women after reunification than before.

This hypothesis is based on the assumptions that women react to rapid and massive institutional change with individual strategies of 'muddling through' (Moen 2005) the turmoil of the transition process. This will lead to a stronger de-standardization of family formation after the reunification than before. This hypothesis corresponds to a comparison of East German women over time.

Data

The data comes from the German Life History Study (GLHS) (Mayer 2008). We analyze retrospective life history data for women born 1953 in East Germany collected in 1991/1992, and for women born 1955 in West Germany collected in 1988/1989. The data for women born 1971 in East and West Germany was collected between 1996 and 1999, and followed up panel again in 2005 (Hillmert 2004; Matthes, Lichtwardt & Mayer 2004; Matthes 2005). Only cases for which panel information is available are included in the analysis, which allows us to analyze family formation of this cohort until age 34. The sample of the panel study was truncated before field work had to be concluded at a given point in time. The panel sample is (positively) biased, but only for the West Germans, in the sense that on average the panel participants married earlier and

7

had more children at the point of the first interview. This is likely due to the fact that panel participants with children were easier to contact during the fieldwork. However, panel participants and non-participants are not notably different with regard to the proportion married and having children at the time of the first interview in East Germany (Mayer & Schulze 2010, Tab. 8). There are some inconsistencies in information from the basic surveys and the panel follow-up. In this case, we gave precedence to information from the basic surveys, since it is less prone to recall error. In most cases deviations were only a few months in the timing of a change in partnership status.

The analysis sample is based on 466 women born 1955 in West Germany and 265 women born 1953 in East Germany. We have data for 474 women born 1971, of which 132 were born in East Germany and 342 women in West Germany (table 2). The length of family formation sequences is 216 month, 18 years between age 15 and 34 for women born 1971; and 185 months from age 15 to 32 for women born in the early 1950s.

Table 2: Sample

	N	*Age last observed*
East Germany 1953	265	38
West Germany 1955	466	33
East Germany 1971	132	34
West Germany 1971	342	34

The state space of family formation states is shown in figure 2, along with the colors used to indicate them in the subsequent analyses: single, cohabiting without child, cohabiting with child, married with child, married without child, and divorced/widowed.

Figure 2: family formation states

	single
	cohabiting, no child
	cohabiting, child
	married, no child
	married, child
	divorced/widowed

Methods

To calculate pairwise distance between family formation sequences as an indictor for the de-standardization of family formation, we use Lesnard's dynamic Optimal Matching (OM) Distance, a variant of Optimal Matching Analysis (Lesnard 2006, 2008, 2010). Sequence analysis was first introduced to the social sciences by Abbott (Abbott 1995, Abbott & Forrest 1986) in the mid 1980s in the form of Optimal Matching (see Aisenbrey 2000, and MacIndoe & Abbott for comprehensive introductions). Optimal Matching was originally developed in the natural sciences to analyze sequences of DNA and is based on the idea that the distance (or similarity) between to processes can be represented as the 'cost' of turning one sequence into another in a pair wise comparison of all sequences with every other sequence. This sequence alignment is performed based on two transformation operations: substitution of states and insertion/deletion of states at some point in the sequence.

Initial criticism of the method in the social sciences (Levine 2000, Wu 2000) triggered a 'second wave' of technical innovations both within the Optimal Matching framework and through the development of new sequence techniques tailored at social science data (Aisenbrey & Fasang 2010, Brzinsky-Fay & Kohler 2010, Gauthier et al. 2010). Lesnard's dynamic OM distance is one of these new sequence analysis tools that offers an improved account of the timing of certain transitions within a process (Lesnard 2006, 2008). Lesnard's dynamic OM distance is a variant of Optimal Matching that employs only substitution operations, no indel operations. It can account for non-linear dependencies of processes on time, by introducing time point specific substitution costs.[1]

Substitution costs between two income types are calculated separately at each time point (Lesnard 2010). Substitution costs are inversely proportional to the frequency of transition between two family formation states at each time point, such that substitution of two income types is 'cheaper', and thus generates less distance, when transitions between these two family formation states are frequent. This yields pair wise distances at each time point that are summed up to an overall distance. Formally, time dependent substitution costs s_t between two states a and b are defined as the sum of four probabilities (Lesnard 2010: 401):

$$s_t(a,b) = \begin{cases} 4 - [p(X_t = a \mid X_{t-1} = b) + p(X_t = b \mid X_{t-1} = a) \\ + p(X_{t+1} = a \mid X_t = b) + p(X_{t+1} = b \mid X_t = a)] & \text{if } a \neq b \\ 0 \\ & \text{otherwise} \end{cases}$$

Substitution costs are derived from the data itself making this technique particularly suitable for exploratory analyses. What does this mean in the context of family formation

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[1] The dynamic Hamming dissimilarity measure differs from OM in that it does not apply indel operations and thus can only handle sequences of equal length.

processes? For instance, the transition from being single to getting married is more frequent when people are in their 20s than when they are in their teens. Substitutions between the two states being single and being married are regarded as 'cheaper', thus generating less distance between two sequences, during time periods of the family formation process in which transitions between these two states are very frequent.

Sequence distances as an indictor for de-standardization and between group differences

Figure 3 shows a simple example of a sequence distance matrix in which each sequence is compared to all other sequences. We calculate this matrix for the 1953/55 cohorts and for the 1971 cohort. The upper left rectangle of the matrix shaded in orange shows the distances within East Germany – every East German woman is compared to every other East German women. The mean of these distances indicates the degree of de-standardization of family formation for East Germany. The lower right rectangle of the matrix in figure 3 is respectively captures the degree of de-standardization of family formation within West Germany. The green rectangles in the upper right and lower left (the matrix is semetric) capture between group distances between East and West German women – every East German women is compared to every West German women and vice versa.

11

Figure 3 Sequence distance matrix as an indicator for de-standardization within groups and between group differences

			East Germany		West Germany		
	ID	1	...	100	101	...	200
	1	0					
East Germany	...		0		pair wise distances		
	100			0			
	101	pair wise distances			0		
West Germany	...					0	
	200						0

Bootstrap re-sampling of sequence distances

Since sequence distances are calculated between each possible pair of sequences, pairs of sequences become the unit of analysis. The N of each possible pair of sequences is given by $\frac{N(N-1)}{2}$. To calculate bootstrap confidence intervals, I draw 1000 random samples from the original sequences with replacement and calculate the respective mean pair wise sequence distance 1000 times, once for each bootstrap sample. The bootstrap confidence intervals represent the variation of these means. Bootstrapping of sequence distances is more complicated than the usual bootstrap, because the independently observed re-sampling units, in this case the family formation sequences, are different from the units, which the statistic is calculated from, in this case the mean pair wise sequence distances. Stata and R Code to calculate bootstrap confidence intervals for sequence-distances is available from the author. Note that while the principle of deriving them always remains the same for Lesnard's dynamic OM distance, the

time point specific substitution cost matrices are different for each bootstrap sample. The substitution cost matrices for this measure depend on time point specific transition rates between income states, which will differ for each bootstrap sample of sequences.

Lesnard's dynamic OM distance cannot identify regularities where people generally go through the same patterns but at varying speeds.[2] Instead, in line with our research focus, Lesnard's dynamic OM distance regards two processes of a similar order but experienced at varying speeds as distinct from each other. This places maximum emphasis on the timing and pacing of family formation sequences to determine sequence similarity.

We calculate pair wise dynamic OM distance between all family formation sequences separately for women born 1953/55 and for women born 1971. The distances are direct indictors of de-standardization. Just as the concept of de-standardization, they capture a relational property and not a characteristic of individual sequences. To identify salient substantive family formation patterns distances before and after the reunification, we further analyze the sequence distances with ward cluster analysis. We test to what extent cluster membership differs for East and West German women in the two cohorts to see if there is a polarization of distinct East and West German family formation patterns in the two cohorts.

De-standardization of family formation

Table 3 shows mean sequences distances as an indicator for the de-standardization of family formation for all of Germany, as well as within and between the German sub-societies before and the reunification. 95 percent bias corrected and accelerated confidence intervals are in

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[2] To uncover this type of regularity algorithms with indels or time warping are necessary.

parentheses and the far right column shows the difference in the means before and after the reunification. Numbers highlighted in bold are statistically significantly different from one another before and after the reunification.

Contrary to common conjectures, across all of Germany, family formation is not more de-standardized after reunification than before. Within West Germany, family formation is not stable as hypothesized in hypothesis 2, but even significantly more standardized after the reunification. The main story lies in a substantial de-standardization of family formation in East Germany after the reunification, in support of hypothesis 3. Family formation is more de-standardized by 38.5 percent (317.5/133.1) after the reunification.

Table 3: Mean sequence distances as an indicator for de-standardization

	Before Reunification Cohort 1953/55	After Reunification Cohort 1971	Difference
Germany	403.6 (392.7 - 416.2)	412.8 (402.9 - 425.3)	9.2
West Germany	**429.1** (417.3 - 440.8)	**391.6** (381.9 – 405.1)	**-37.5**
East Germany	**317.5** (293.9 - 343.3)	**450.6** (436.3 - 469.3)	**133.1**
East-West Difference	407.6 (398.9 - 425.8)	433.2 (419.2 – 445.5)	25.6

Equally countering common conjectures of a convergence of family formation between East and West German women, since the reunification, the distance between East and West German family formation sequences is larger after the reunification than before. Even though this difference is not significant since the bootstrap confidence intervals overlap, there is certainly no support for the convergence hypothesis (hypothesis 3).

Since the information in means is inherently limited, the full distribution of the pair wise sequence distances in table 3 is displayed in figure. Note the rapid shift from a right to left skewed distribution before and after the reunification within East Germany (lower right), which indicates a massive de-standardization of family formation with the breakdown of the regulative communist state.

**Figure 4: Distribution of pairwise sequence distances as indictors of de-standardization**
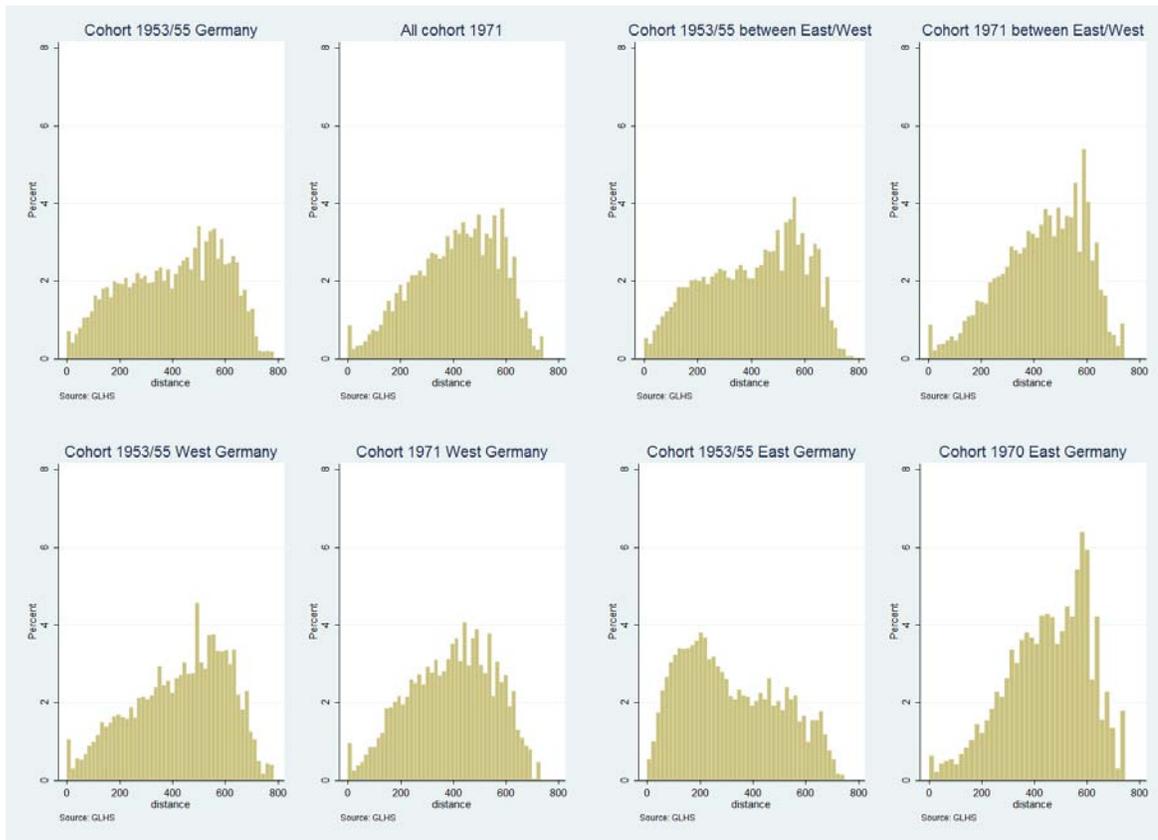
*Substantive family formation patterns*

The cluster analysis yields three main clusters of family formation for both cohorts: a traditional marriage & motherhood group, a non-traditional group with a high prevalence of cohabitation and divorce, and a group of women that delay family formation until their thirties. They are displayed as sequence index plots in figure 5 (Scherer 2001, Kohler & Brzinsky-Fay 2005. Age

15

is displayed on the x-axis, and the N of cases is displayed on the y-axis. Each horizontal line in the graphs reflects one woman's family formation sequence. The colors represent different family formation states. They are ordered ascending according to the timing of first birth. Figure 6 shows the relative frequency of each pattern for East and West German women born 1953/55 and 1971.

Figure 5: Substantive family formation patterns

Modified relative sequence index plot (Fasang & Liao 2010)
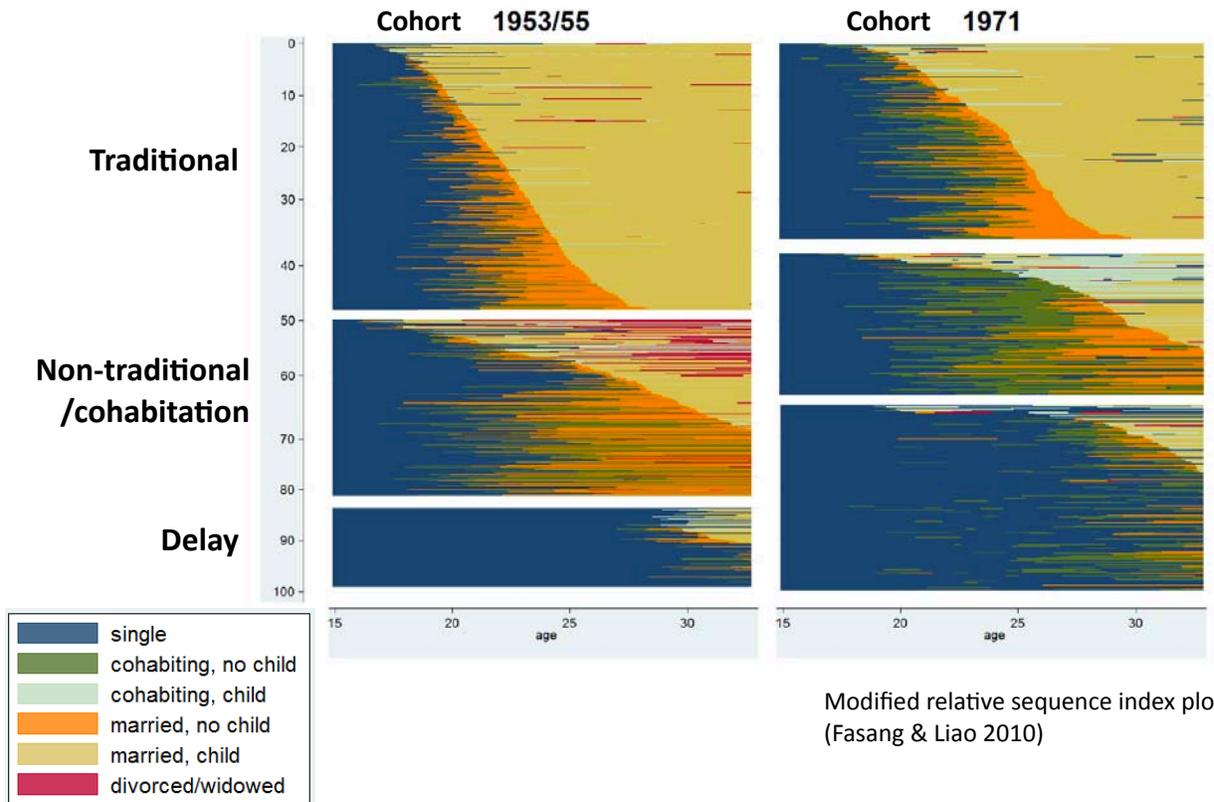
Figure 6: Family formation patterns in East and West Germany
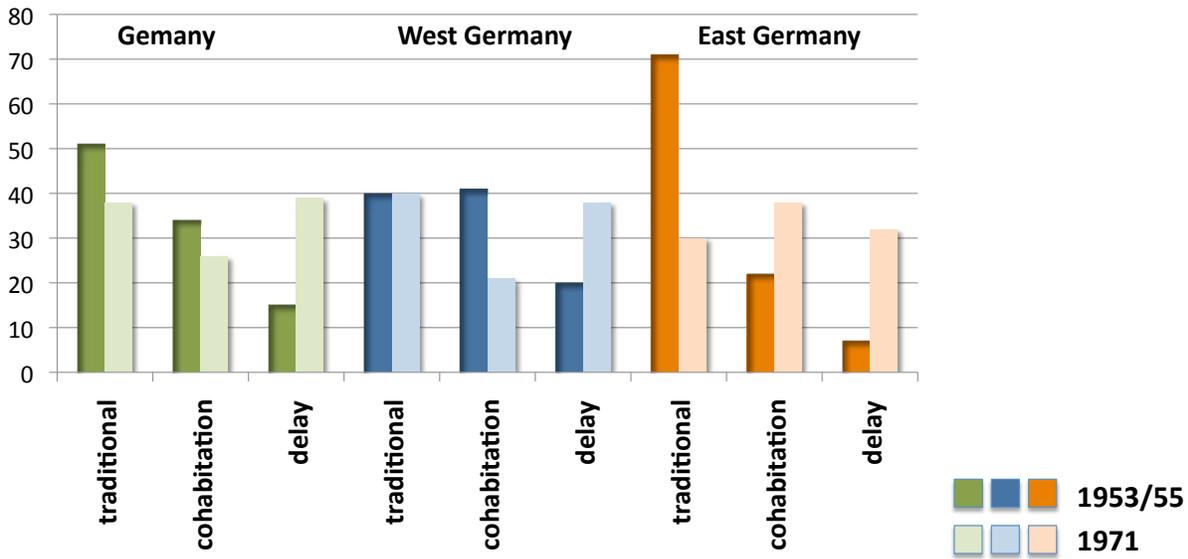
Summary of Results and Conclusion

The results can be summarized as follows. Across all of Germany there is no significant change in the standardization of family formation before and after the reunification. Qualitatively, there is a shift away from the traditional marriage and motherhood pattern to both more non-traditional family formation and delayed family formation. For West Germany, we find moderately lower de-standardization after the reunification than before, which is driven by a polarization of family formation into a traditional pattern of marriage and motherhood on the one hand, and delayed family formation on the other hand. This is the outcome of the structural difficulties for young women to combine a career and a family in West Germany. This is in line with strong incentives in taxes and family policies for a main breadwinner specialization and a population composition in which female employment is on a medium level and often only part time. In East Germany, we find rapidly more de-standardized family formation after the reunification than before in response to the breakdown of eth regulative communist state. Apparently, people reacted very

17

differently in terms of family formation in the turmoil and insecurity of the transition process, in which previously established normative guidelines for family formation no longer hold. The West German incentives for a polarization into a traditional and a delay pattern do not hold to the same extent in East Germany after the reunification. This is the case because the population composition, especially in terms of higher female employment, remains different in the East as a result of the legacy of the communist regime. Overall our findings forcefully demonstrate the sensitivity of family formation to rapid and massive institutional change and point to important interaction effects between population compositional effects and social policies as they shape family formation.

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