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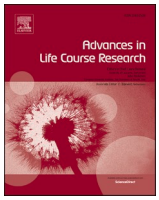

Family structure transitions and educational outcomes: Explaining heterogeneity by parental education in Germany

Kristina Lindemann [1]

Goethe University Frankfurt, Institute of Sociology, Frankfurt am Main, Germany

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ABSTRACT

Recent research has documented that the effect of parental separation on children's educational outcomes depends on socioeconomic background. Yet, parental separation could lead to a stable single-parent family or to a further transition to a stepfamily. Little is known about how the effect of family structure transitions on educational outcomes depends on the education of parents and stepparents, and there has been limited empirical research into the mechanisms that explain heterogeneity in the effects of family transitions. Using longitudinal data from the German Socio-Economic Panel and models with entropy balancing and sibling fixed effects, I explore the heterogeneous effects of family transitions during early and middle childhood on academic secondary school track attendance, grades and aspirations. I find that family transitions only reduce the academic school track attendance among children of less educated parents living in stepfamilies or with a single mother after parental separation, and among children of highly educated fathers living in single-mother families. The mechanisms that partly explain these effects relate to reduced income and exposure to poverty after parental separation. The findings underscore the importance of considering the stepparent's educational level, indicating that the adverse consequences of parental separation on educational outcomes are mitigated when a highly educated stepfather becomes part of the family. Overall, these findings align more closely with the resource perspective than the family stability perspective.

1. Introduction

A growing share of children in Europe have experience of living in a single-parent family after parental separation and in a stepfamily after the parent repartners (Thomson, 2014). Prior research has established that parental separation and repartnering are negatively associated with children's educational outcomes (Amato, 2010; McLanahan & Percheski, 2008; Sweeney, 2010). Recent studies have shifted towards examining cumulative histories of family structure transitions instead of considering parental separation and the transition to a stepfamily as isolated life events (Raley & Sweeney, 2020). This shift is important because family dissolution and repartnering as life events significantly alter a family's life conditions (DiPrete, 2002). Viewed from a resource perspective, these transitions alter the available resources within the family, while from a family stability perspective, they contribute to increased instability and stress. Furthermore, within the context of social stratification processes, understanding how the educational backgrounds of parents and stepparents shape the effects of family structure transitions becomes crucial. Despite this importance, prior studies have paid limited attention to investigating how trajectories of family structure transitions influence children's educational outcomes depending on parental education, and to empirically testing the underlying mechanisms of this heterogeneity.

Recent research has begun to explore the heterogeneous effects of parental separation by socioeconomic status but the findings have been inconclusive (Bernardi & Boertien, 2017). Some studies suggest that parental separation has less effect on educational outcomes of children from families with higher socioeconomic status (Grätz, 2015; Kalmijn, 2015a; Mandemakers & Kalmijn, 2014; Schulz, 2022) whereas other evidence shows the opposite (Bernardi & Boertien, 2016; Bernardi & Radl, 2014; Brand et al., 2019; Erola & Jalovaara, 2017).

However, parental separation is often followed by a transition to a stepfamily. For example, about half of single mothers in Germany move in with a new partner within 5 years of becoming single parents (Bastin, 2019). The transition to a stepfamily introduces an additional parental figure into children's lives, which might become important for intergenerational transmission processes (Leeuw & Kalmijn, 2020). From the resource perspective, this family transition may potentially compensate

E-mail address: lindemann@soz.uni-frankfurt.de.
[1] ORCID: 0000–0003-4664–7101

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for previous disadvantages by reducing maternal stress and offsetting the loss of financial resources after separation (Osborne et al., 2012). On the contrary, the family stability perspective suggests that the introduction of a stepparent may increase instability, disrupt family routines, and elevate the potential for conflict, leading to reduced educational outcomes for children (Fomby & Cherlin, 2007). In the U.S. context, some empirical evidence has indicated that the transition to a stepfamily could enhance cognitive skills and behavioral outcomes for children of college-educated mothers and for those born into higher-income families (Ryan et al., 2015; Wagmiller et al., 2010). Nonetheless, the available evidence remains limited and inconclusive regarding whether parental socioeconomic status differentiates how family structure transitions affect children's educational outcomes.[2]

This study explores how family structure transitions during early and middle childhood influence educational outcomes depending on parental education in Germany. I focus on children's transition to the academic secondary school track because it is the primary pathway to university education in the German system, making it a highly consequential transition (Neugebauer et al., 2013). As childhood family transitions may have additional longer-term effects beyond the secondary school transition, I also analyze adolescents' aspirations to pursue a university degree and their academic performance in school. Both of these measures reflect the potential for future university attendance.

This research centers on the trajectory of family transitions, encompassing the type and sequence of family structure transitions. Specifically, I examine children born into two-parent families who experience parental separation and subsequently either live in a stable single-parent family or undergo a transition to a stable stepfamily. The analysis extends previous research by considering the educational level of the stepparent in addition to maternal and paternal education. Furthermore, empirical research on the factors explaining heterogeneity in the effects of family structure transitions is still sparse (Raley & Sweeney, 2020). This study probes these mechanisms by assessing the mediating role of financial difficulties, residential mobility, maternal employment, childcare time and wellbeing. In the empirical analysis, I use data from the German Socio-Economic Panel (SOEP) study and employ entropy balancing (matching technique) and siblings fixed effects models to examine how different trajectories of family structure transitions affect educational outcomes. This contributes to research that increasingly highlights the importance of mitigating bias resulting from the selection into family transitions and omitted variables (Härkönen et al., 2017; McLanahan et al., 2013).

Germany stands out as an important case study, providing a theoretical context where the significance of the resource perspective diverges from that in the United States. Unlike the U.S., Germany features low financial barriers to education, providing a comprehensive public education system from kindergarten to university, coupled with relatively generous social transfers supporting families (OECD, 2011). Consequently, it is likely that the resource perspective has a reduced influence in the German context compared to the United States. Nevertheless, the family stability perspective remains highly relevant, aligning with challenges observed in other contexts. Despite Germany's supportive social policies, institutional factors, such as the level of public childcare provision and the tax system, favor mothers who work part-time (Trappe et al., 2015), posing challenges for single mothers. Overall, children growing up in single-parent families in Germany are more likely to experience economic insecurity, with roughly 42% of single-parent households living in relative poverty in 2018 (Federal Statistical Office 2019).

[2] Previous research has also explored the role of other types of population heterogeneity besides socioeconomic status, and suggested that children born outside marriage and to racial or ethnic minority parents are less negatively affected by family structure transitions (e.g. Bzostek & Berger, 2017; Guetto et al., 2022; Heard, 2007; Lee & McLanahan, 2015).

2. Background

There are several ways in which a family transition could affect educational outcomes of children, such as the change in economic, social and time resources available in the family and the increased levels of stress (Amato, 2010; Sweeney, 2010). It is likely that the extent of the change in resources and the levels of stress depends on parental education and varies by the type of family structure transition.

2.1. Heterogeneous Effects of Parental Separation

Parental separation is typically the first family transition that children born to a two-parent family experience. Some previous research has suggested that the dissolution of a two-parent family might have more negative consequences for children's outcomes than transition to a stepfamily (Bzostek & Berger, 2017; Lee & McLanahan, 2015; Ryan et al., 2015). Transition to single parenthood often reduces household income and economic security due to the loss of economies of scale and pooled incomes (Western et al., 2012). On the one hand, lower-educated are more likely to fall into poverty after divorce, with mothers being especially vulnerable (Hogendoorn et al., 2020). Prior research has suggested that educational outcomes are reduced by exposure to poverty (e.g. Duncan et al., 1998) and that income shocks during childhood have stronger negative effects on the educational outcomes of children living in lower-income families (Hardy, 2014). Moreover, advantaged families might be able to alleviate the negative consequences of parental separation on educational outcomes by increasing investments in their children (Grätz, 2015; Mandemakers & Kalmijn, 2014). On the other hand, the absolute loss of resources after one parent moves out is likely larger for advantaged families with more to lose (Bernardi & Boertien, 2016, 2017; Bernardi & Radl, 2014; Ryan et al., 2015). Transition to a single-parent family could bring about greater changes for them in terms of their opportunities, lifestyles or moving to a different neighborhood. For example, a study by Bernardi and Boertien (2016) found, using British data, that reduced family income explains why parental separation affects more negatively educational attainment among the children of highly educated parents.

Besides economic resources, several mechanisms by which parents transmit social advantage to their children require involvement in the child's life and social interaction throughout the socialization period (Biblarz & Raftery, 1993; J. S. Coleman, 1988). It is difficult for non-residential parents to provide help with schoolwork, systematic advice on educational decisions (Erikson & Jonsson, 1996) or time spent on education-related activities (e.g. Cano et al., 2019) to the same extent that residential parents do. Yet, prior research has suggested that a higher educational level increases the likelihood for non-residential fathers to maintain a close relationship with their children (Cheadle et al., 2010; Kalmijn, 2015b), providing more time and social resources for the family (Coleman, 1988). Moreover, some evidence has suggested that separation increases parenting stress more for less educated mothers, possibly because the ability to cope with relationship disruption and access to resources differ by maternal education (Cooper et al., 2009). Then again, separations are less common and possibly less anticipated among families with higher socioeconomic resources, which could lead to more stress and stronger psychological shock for these families (Brand et al., 2019; Ryan et al., 2015).

Altogether, transition to a single-parent family might affect educational outcomes of children living in lower-educated families more negatively as these families have a higher risk of poverty and fewer resources to mitigate adverse consequences of parental separation. However, the opposite is also possible. Children of highly educated parents might be more negatively affected because of the larger absolute loss of resources and possible larger psychological shock.

2.2. Heterogeneous effects of the stepfamily

In contrast to parental separation, transition to a stepfamily, from the resource perspective, holds the potential to increase the family's economic, time and social resources (Lee & McLanahan, 2015; Osborne et al., 2012). For example, a study by Jansen et al. (2009) found for single mothers in Europe that repartnering helps to alleviate economic consequences of divorce more than increasing the labor force participation. In addition, re-partnering likely has a positive influence on maternal wellbeing (Osborne et al., 2012), which could improve the quality of parenting. However, from a stress or family stability perspective, the transition to a stepfamily is another family transition that can interrupt family routines and lead to conflict, potentially lowering children's outcomes (Fomby & Cherlin, 2007).

Only a few previous studies have explored whether the consequences of living in a stepfamily for children's educational outcomes depend on parental socioeconomic status. Two of these studies focused on cross-sectional family structure status and indicated that heterogeneity by socioeconomic status is likely limited (Acs, 2007; Martin, 2012). However, Wagmiller et al. (2010) found that a transition from a single-mother family to a married two-parent family is associated with gains in cognitive skills for children of college-educated mothers but not for children of less educated mothers. Moreover, a study by Ryan et al. (2015) showed that children's behavioral problems increased after transition to a single-parent family and reduced following transition into a stepparent family among children born to higher-income families, whereas no associations were observed among low-income families.

Likewise, little is known about how the consequences of living in a stepfamily interact with the stepparent's education. Overall, expectations for stepparents to provide social and financial resources to their stepchildren are less clear than expectations for parents (M. Coleman et al., 2000). Stepparents might also have responsibilities to their non-residential biological children, which could reduce their involvement with stepchildren (Hofferth & Anderson, 2003). Yet, due to their greater social and financial resources, highly educated stepfathers might be able to provide more support to their stepchildren than less educated stepfathers. Thus, from the resource perspective, children could benefit from the addition of a stepparent with high resources to the family, as this may increase the economic and emotional stability within the family (Ryan et al., 2015). Moreover, given that educational aspirations are often higher among highly educated parents (Haller & Portes, 1973), this may also hold true for highly educated stepparents. A recent study by King et al. (2020) showed that stepfathers' higher educational aspirations for stepchildren are associated with children's college attendance. In addition, from the perspective of intergenerational mobility, there is some evidence that stepfathers can be influential for intergenerational transmission of socioeconomic status (Erola & Jalovaara, 2017), especially when the child's contact with the non-residential father is limited (Leeuw & Kalmijn, 2020). Finally, it is important to acknowledge that due to educational assortative mating (Schwartz, 2013), highly educated mothers are more likely to repartner with a highly educated partner than less educated mothers.[3]

Thus, from the resource perspective, the transition to a stepfamily for both lower-educated and higher-educated families likely entails an increase in resources available to the family, potentially improving children's educational outcomes. Families might especially benefit from the entry of a highly educated stepparent, significantly improving the family's resources and fostering higher educational aspirations. However, from the family stability perspective, it could also entail an increase in conflict that could counterbalance the positive effect of resources.

[3] Prior research in Germany has found that education and employment status of single mothers does not affect their likelihood of repartnering (Bastin, 2019).

3. Data and variables

3.1. Data and sample

This study employs data from the German Socio-Economic Panel (SOEP, version 35) using all waves of the SOEP conducted between 1984 and 2018. The SOEP is a large-scale longitudinal study representative of private households in Germany. It surveys individuals in about 15,000 households and respondents are interviewed annually (Goebel et al., 2019). My analysis focuses on children who continuously reside with their mother because single-parent households, constituting nearly a fifth of all families with children, are predominantly headed by mothers, accounting for approximately 90% in 2018 in Germany (Federal Statistical Office 2019).

The analytical sample is restricted to children born between 1980 and 2004 into two-parent families. It includes children who were in the SOEP since birth as well as children whose household joined the SOEP when they were younger than 11 and had not yet experienced any family transition. I obtained information about family transitions before joining the SOEP from three sources: 1) retrospective relationship spells reported by mothers, 2) questions about marital history asked in 1985 and 3) a question about the number of years lived with both parents asked of children when they were about 17 years old. The full sample yielded data about family transitions and secondary education attendance for 6237 children born into two-parent families and living together with their mother.

I restricted this sample further by excluding children whose parents lived in the German Democratic Republic in 1989 ($n = 1313$) because of rather persistent sociocultural differences between West and East Germany regarding single motherhood (e.g. Raab, 2017). Moreover, the sample for East Germany was too small for a separate analysis of family transitions. I also removed children who were born outside Germany ($n = 181$) and data from the SOEP samples for new migrants (samples M2-M5). I further excluded children with no information about maternal education ($n = 20$) and children whose parent died ($n = 53$). I excluded a relatively small group of students attending comprehensive schools that consist of both academic and non-academic tracks ($n = 398$). Finally, due to a very small group size, I could not analyze children who had experienced a dissolution of their stepfamily before the age of 12 ($n = 31$), the majority of whom were from less-educated families.

The final sample size for the models with entropy balancing is 4241 children. The siblings fixed effects models included only families with at least 2 siblings for whom the secondary school track is observed. The final sample size for these models is 3180 siblings, including 360 siblings with different family structure experiences (see methods section).

3.2. Outcome variables

The main outcome variable is attendance at *academic secondary school* (*Gymnasium*) as opposed to attendance at non-academic secondary school (*Realschule* and *Hauptschule*). The type of secondary school track is determinative in Germany's highly stratified educational system as only the graduates of the academic track are eligible for university. Students are selected into different tracks typically at age 10–12, depending on the federal state. The rationale is to assign students into tracks based on their academic performance, but this transition is strongly affected by social background (Neugebauer et al., 2013). For example, Dumont et al. (2019) found that higher educated parents make early subtle interventions into the track selection process to make sure that their children will be eligible for the academic track. There is some later track mobility and a few alternative paths to tertiary education are available for students on non-academic tracks (Buchholz & Schier, 2015). I analyzed respondents' secondary school track at about age 14 to exclude possible immediate track mobility after the transition to secondary school.

I also tested whether family transitions during childhood, in addition

to affecting secondary school attendance, have further independent longer-term effects on other educational outcomes related to tertiary education entry. For this, I focused on *grade point average* (GPA) and *aspirations* to pursue a university degree at age 16 or 17 (measured in the SOEP Youth Study). I calculated standardized GPA based on grades in math and German, as the SOEP includes information about grades only in these two subjects and in the first foreign language. I rescaled the GPA measure for the higher grades to denote better performance (i.e. opposite to German practice). To measure educational aspiration, I classified students as *aspire to attain a tertiary education degree* if they planned to pursue a degree from an academic university or a university of applied sciences. Note that the sample size for the analysis of these two latter outcomes is smaller, as the respondents born before 1983 did not take part in the SOEP Youth Study and the respondents born after 2001 had not yet replied to it in 2018.

3.3. Trajectories of family structure transitions

I analyze trajectories of family structure transitions for children born into a two-parent family. I focus on two trajectories: (1) children experiencing parental separation and thereafter living in a stable *single-mother family* or (2) children experiencing both parental separation and formation of a stable *stepfamily*. I focused on family transitions occurring before transition to secondary education, meaning the child was 1 to 10 years old when their parents separated. After separation, the family had either remained a single-mother family or the stepfather had moved in by the time the child was 11. I defined separation as occurring when the father moved out of the household, regardless of whether the parents were married or cohabiting. In the sample, fewer than half of the children whose parents separated lived in a stepfamily by age 11. The control group is made up of children living continuously in a two-parent family. As an additional analysis, I also compare children living in a single-mother family with those living in a stepfamily, but this comparison is based on a significantly smaller sample. Overall, in the sample, the average age at separation was slightly higher for children living in single-mother families (6.4 years) than for children living in stepfamilies (4.8 years, the average age at the mother's repartnering was about 7.9 years).

The SOEP does not ask about the biological father of the child, but it is possible to identify the mother's partner. Therefore, I assumed that the mother's partner living in the same household at the time when the child was born was the *father*. The mother's partner who moved into the household after separation is defined as a *stepfather*.

3.4. Parental background and the child's characteristics

The *educational levels of the mother, father and stepfather* are measured as binary variables, indicating whether each parent has attained a high level of education – meaning a tertiary education qualification or completion of academic secondary education (*Abitur*). In the sample,

Table 1
Descriptive statistics for variables in the analyzed samples, by trajectories of family structure transitions.

	Sample 1: full sample			**Sample 2: siblings sample**		
	Single-mother family	Step-family	Stable two-parent	Single-mother family	Step-family	Stable two-parent
Outcome variables						
Academic track attendance (%)	32	27	44	35	37	45
Standardized GPA (*mean*)	-0.13	-0.09	0.01	-0.16	-0.17	0.04
Aspiration to university degree (%)	30	29	38	31	32	39
Child's characteristics						
Girl (%)	50	53	50	41	45	50
Birth order (%)						
1st	53	54	50	36	31	37
2nd	33	34	34	36	32	42
3rd or later	14	12	16	28	37	20
Birth year (*mean*)	1994.5	1992.3	1993.8	1995.7	1994.1	1994.1
Family (before separation):						
M highly educated (%)	21	21	25	17	31	27
F highly educated (%)	19	18	31	28	29	34
M or F: highest parental occupation, ISEI (*mean*)	50.5 (14.5)	47.2 (15.6)	49.5 (16.1)	-		-
Household income decile (*mean*)	5.4 (2.6)	5.1 (2.4)	5.7 (2.4)	-		-
F unemployed (%)	5	4	4	-		-
M or F born outside Germany (%)	21	15	29	-		-
M's age at childbirth (*mean*)	29.6 (5.3)	26.8 (4.8)	29.3 (5.1)	-		-
M and F married (%)	89	92	97			
Number of children (*mean*)	2.2 (1.0)	2.2 (1.1)	2.4 (1.0)			
Living in rural area (%)	26	35	27			
Variables at age 11						
Stepfather highly educated (%)	-	22	-			
Household income decile (*mean*)	4.1 (2.9)	5.0 (2.9)	5.8 (2.6)	-		-
M's employment status (%)						
Employed full-time	27	26	14	-		-
Employed part-time	50	43	53			
Unemployed	8	6	3	-		-
Inactive	15	25	30	-		-
M's childcare hours (*mean*)	6.1 (5.3)	7.6 (7.0)	5.6 (4.9)			
M's life satisfaction (*mean*)	6.7 (1.9)	7.1 (1.7)	7.4 (1.6)	-		-
M's satisfaction with health (*mean*)	6.8 (2.1)	7.1 (2.5)	7.2 (1.9)	-		-
Variables after separation/age 6-11						
Residential mobility (%)	60	84	22			
Ever in poverty (%)	70	49	19			
Poverty and mobility (%)	42	41	6			
N (children)	266	164	3811	192	158	2830
N (families)				68	61	1250

Notes: M=mother, F=father. Standard deviations in parenthesis. Descriptive statistics refer to the imputed sample. Descriptive statistics for federal states are not presented.

fewer than a third of fathers and a quarter of mothers were highly educated (see Table 1 for sample's descriptive statistics) and about 80% of the sample had both parents with either a high or low level of education.

To account for the characteristics of the family before separation, the analysis includes variables for *paternal unemployment* and the highest *occupational position of parents* about one year before separation. Occupational position is measured using the International Socio-Economic Index of occupational status (ISEI). I also include the pre-separation annual *household net disposable income* weighted by household size (based on OECD-modified equivalence scale) and expressed in deciles. For the control group, household income and parental ISEI are measured as averages between age 1–10 and paternal unemployment is measured about age 6. Note that maternal employment status is not included as women might increase their participation in the labor force in anticipation of divorce (Özcan & Breen, 2012). The analysis controls for the *marital status of parents*, *the age of the mother* when the child was born, whether at least one of the *parents was born outside Germany*, as well as *residence in a rural area* and the *number of children (age < 16)* living in the household before separation (Table 1). *The child's characteristics* include gender, birth order of the child and dummies for birth years to control for birth cohort specific effects. The analysis also controls for the *federal state* where the child lived at the age 11 to account for slightly varying educational practices across different states in Germany.

3.5. Mediating variables

The mediation analysis tested the extent to which financial and time resources and maternal wellbeing explain the effects of family transitions on educational outcomes. First, I use *household net disposable income* weighted by household size and expressed in deciles to estimate the importance of the current financial situation. Second, the variables *maternal employment* (full-time, part-time, unemployed or inactive) and *maternal time spent on childcare* (a typical number of hours per weekday reported by the mother) should at least partly capture the mother's use of time. Third, I use the variables *maternal life satisfaction* and the mother's self-reported *subjective health* to capture the psychological consequences of separation (both are measured on a 10-point scale). The measurements are taken when the child is 11 years old. Finally, to measure the longer-term financial situation, I examine whether the child experienced *residential mobility* (yes/no) or *poverty* (yes/no) after separation. I also combined these two measures into one variable – did the child experience both poverty and residential mobility (yes/no) – to capture cumulative disadvantages, as exposure to poverty might lead to moving to a more disadvantaged neighborhood. Following a standard definition in the European Union, I defined the household to be in poverty if its income was below 60% of median household income in the given year (income was weighted by household size using OECD-modified equivalence scale). For children from stable two-parent families, these two variables were measured at ages 6 to 11, i.e. during primary school and after average age of parental separation.

I imputed missing values in control and mediating variables using multivariate imputation by chained equations (Buuren & Groothuis-Oudshoorn, 2010). Missing values exceeded 2% for the following variables: highest parental ISEI (12%), father's education (6%) and unemployment (14%), pre-separation household income (4%) and exposure to poverty (24%).

4. Analytical strategy

The empirical analysis relies on the models with entropy balancing weighting and siblings fixed effects. These methods help to limit the bias due to the selection into family structure transitions. I also present the results of simpler linear probability models that include a large set of control variables measured prior to parental separation.

More specifically, I use *entropy balancing* that is a matching technique (Hainmueller, 2012; Hainmueller & Xu, 2013). It balances the samples of children who experienced family transitions and those who did not by using a large set of observed covariates that predict the occurrence of parental separation. Based on prior research on family transitions (e.g. Amato, 2010; Raley & Sweeney, 2020), I used the following pre-separation covariates for balancing: highest parental occupation, paternal unemployment, household income, marital status, mother's and father's education, migration status, living in rural area, the number of children and maternal age at childbirth. Models are also balanced for federal state of residence and for child's gender, birth order and birth year.

I focus on the average treatment effect of the treated or ATT (Gangl, 2010) aiming to estimate whether children who experienced a specific trajectory of family structure transitions ($D_i = 1$) would have had a different educational outcome (Y) in the absence of such an experience ($D_i = 0$). Because this counterfactual situation cannot be measured for these children (treatment group), the children who did not experience family transitions are used (control group). I first employed entropy balancing to find weights (w_i) that balance covariates between two groups to match the control group with the treatment group (see Table S1 and S2 in the online appendix). These weights are assigned by a reweighting scheme that minimizes the entropy distance metric (Hainmueller, 2012). The balancing requirements were that covariates have the same mean and variance in the control group as in the treatment group. Thereafter, I estimated linear (probability) regression models using these weights. Hence, the treatment effect (ATT) has the following basic form (also Zhao & Percival, 2016):

$$ATT = \sum_{D_i=1} \frac{Y_i}{n_1} - \sum_{D_i=0} w_i Y_i \quad (1)$$

I used subgroup analysis to investigate heterogeneous effects by parental education. For this I used the entropy weighting procedure separately for each subgroup, as the relevance of different characteristics affecting selection into family transitions could vary somewhat across groups. Thereafter, I used these new weights for each subgroup to estimate regression models.

Despite a large set of pre-transition covariates in the analysis, the results of the models with entropy balancing weighting can be biased if some unobserved variable predicts both the trajectory of family structure transitions and educational outcome.

To address this I use *siblings fixed effects models* to compare educational outcomes of siblings who have different experiences of family structure transitions (Sigle-Rushton et al., 2014). The assumption is that the family environment that older siblings experienced before separation resembles the family environment that younger siblings would have experienced without family transitions. I aim to estimate the ATT using the following model:

$$Y_{ij} = \beta_0 + \beta_1 D_{ij} + \beta_k X_{ij} + \mu_j + \varepsilon_{ij} \quad (2)$$

where Y_{ij} is the educational outcome of individual i living within family j. More specifically, siblings are nested within mothers and the sample includes only siblings who have the same father, i.e. half-siblings are not included in the analysis. The treatment variable (D_{ij}) takes the value 1 if the sibling experienced a family transition before age 11 and zero if the sibling did not. Sibling fixed-effects (μ_j) control for attributes shared within the family, so they account for unobserved family circumstances common to all siblings in the same family, such as parental characteristics and family environment. The model also includes a set of control variables X_{ij} that vary across siblings, i.e. gender, birth order and dummies for year of birth. Moreover, I test the heterogeneity of the treatment by including the interaction term $(\beta_2 D_{ij} SES_j)$between family structure transitions and the siblings-invariant measure of parental education in the model.

The main limitations of the sibling fixed-effects method are that children without siblings cannot be analyzed and the effects of family

transitions can only be estimated when siblings differ in their experiences (Sigle-Rushton et al., 2014). This results in small sample sizes. Furthermore, sibling fixed-effects modeling relies on the assumption that educational choices made before separation occurred under qualitatively distinct circumstances from those made after the separation. However, separation is often a process rather than a discrete event. If separation was preceded by extensive and long-term parental conflict, it could have influenced the educational outcomes of older siblings. Consequently, sibling fixed-effects models might underestimate the consequences of separation. Unfortunately, the SOEP data does not provide information on the extent of parental conflict before separation.

Finally, the mediation analysis explores the mechanisms through which family structure transitions might affect educational outcomes. I used entropy balancing and included each potential mediator separately to the set of covariates used to calculate the weights for balancing the control group. This strategy has previously been employed in the analysis of propensity score matching, where mediators and pre-treatment confounders are used to balance observations across the joint distribution of mediators and confounders (e.g. Huber et al., 2017; Lindemann & Gangl, 2019). I do not intend to offer a causal interpretation of the mediating effects, because the long-term effects of family transitions are probably due to multiple mechanisms and the SOEP data about the child's wellbeing is limited.

5. Results

5.1. Transition to secondary education

I start with exploring how the trajectories of family structure transitions in childhood affect academic secondary school attendance and thereafter, I analyze whether these transitions could have further consequences on adolescents' aspirations to attain a university degree and their grades in school. Fig. 1 presents the results for academic secondary school attendance from simpler linear probability models, and from models with entropy balancing and siblings fixed effects.

The linear probability models show that compared to growing up in a stable two-parent family, living in a single-mother family after parental separation is associated with about a 10% points lower likelihood of attending academic secondary school. The models with entropy balancing and sibling fixed effects show similar results. Likewise, linear probably models show that having an experience of both parental separation and transition to a stepfamily is associated with about a 11% points lower likelihood of attending the academic track. The model with entropy balancing provides a similar result, but the siblings fixed effects model shows that experiencing both parental separation and a stepfamily is not linked to a reduction in academic track attendance. This might be because the model captures more recent family transitions, as the age differences between siblings are typically not large. In accordance, data in Fig. S1 in the online appendix indicate that children living in stepfamilies are not less likely to attend the academic track when parental separation occurred at the ages 6–10, but the negative consequences arise for earlier separations. Among children living in single-mother families, age at parental separation has no such differentiating role.[4]

The experience of living in a stepfamily is cumulative to the experience of living in a single parent family in this study. Thus, in Table S4 (appendix) I present further analysis using single-mother families as a comparison group for stepfamilies. The results show that the transition to a stepfamily does not additionally reduce the academic track attendance. The results from the siblings fixed effects model even indicate that siblings who were already living in a stepfamily at the time of educational transition might be more likely to continue in the academic track than their older siblings who were still living in a single-mother family at the same age, although the difference is not statistically significant at conventional levels.

Overall, these findings are consistent with a previous studies by Grätz (2015) and Schulz (2022) that showed a negative effect of parental separation on the academic secondary education attendance in Germany. However, research focusing on the German context has turned little attention to family structure transitions after separation.

5.2. Heterogeneous effects by parental education

I next turn to the main question of how the consequences of family structure transitions depend on parental education. Fig. 2 presents the results for the academic secondary school attendance by subgroups with different parental education using the models with entropy balancing (see Table S5 in the online appendix for the interaction terms between family transitions and parental education from linear probability and siblings fixed effects models). It is important to note that entropy balancing is based on observed variables, but single-mother and stepfamilies might be selected on unobserved variables that could introduce bias into the estimates. Therefore, explicit causal interpretation of the results is not possible, but entropy balancing can reduce the bias due to selection on observable characteristics. Finally, note also that the analysis includes the educational level of the other parent among the balancing variables to adjust for the possible impact of educational homogamy on selection to separation.

First, the findings show that parental education plays an important role for children living in a stable single-mother family after parental separation (panel a in Fig. 2 and interactions in online Table S5). In this group, parental separation reduces the likelihood of attending the academic track for children of less-educated mothers and fathers (respectively 13% and 9% points) but there is no such negative effect for children of highly educated mothers. However, the likelihood of attending the academic track reduces by about 19% points if a highly educated father moved out, compared to the counterfactual situation of a highly educated father living with the family. Although the negative effect seems large in magnitude, children with highly-educated parents are overall much more likely to attend academic secondary school (online appendix Fig. S2), meaning that they have more to lose from family transitions (i.e. the "floor effect", see Bernardi and Radl, 2014). To explore further the importance of maternal and paternal education, I estimated an additional model with the interaction effects between different combinations of parental education and family structure transition. Although the sample size is relatively small, the results suggest that the negative association between a highly educated father moving out and the child being less likely to pursue the academic track is mostly driven by families where the mother has less education (online appendix Table S6).

Second, for children living in stepfamilies after parental separation, Fig. 2 (panel b) shows that the academic secondary school attendance is reduced among less educated families (12–13% points) but not among highly educated families (however, note that the interactions between parental education and stepfamily in the online Table S5 do not reach to statistical significance at conventional levels). In addition, children who have less educated stepfathers are about 15% points less likely to attend the academic track, whereas there is no negative effect among children who have highly educated stepfathers (Fig. 2). Obviously, the educational level of the mother, father and stepfather are strongly correlated because of educational assortative mating. Less than 15% of repartnered mothers in the sample have a new partner whose educational level differs from the father of their child. Hence, most children who have highly educated stepfathers also have highly educated fathers. I previously found that when a highly educated father moves out, children who stay in single-mother families have poorer educational outcomes; by the same mechanism, when a highly educated stepfather moves in, these consequences might be alleviated. In accordance, the results in Table S7 (online appendix) show that living in a stepfamily is not associated with

[4] Note that the results did not differ by the child's gender (Table S3).

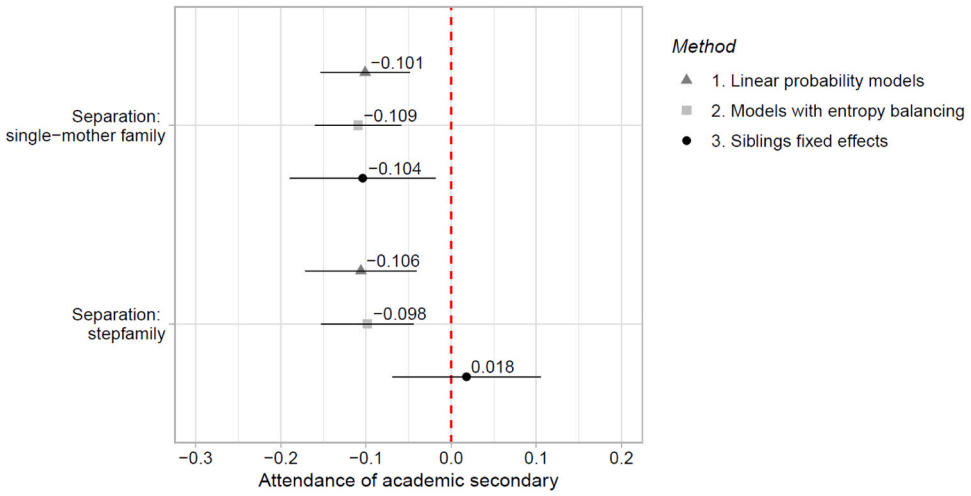

Fig. 1. The effect of trajectory of family structure transitions on the likelihood to attend the academic track, *Notes*: Coefficients with 95% confidence intervals. The control group consists of stable two-parent families with respective educational level, presented by the line crossing the horizontal axes at 0. Simple linear probability model (LPM) and LPM models with entropy balancing weighting control/are balanced for child's gender, birth order and birth year, federal state of residence, mother's and father's education, migration status, maternal age at childbirth and following pre-separation controls: highest parental occupation, paternal unemployment, household income decile, marital status, living in rural area and the number of children. Siblings FE model controls for child's gender, birth order and birth year. For entropy balancing weighting, see Tables S1 and S2 in the online appendix for the balance of covariates in the control and treatment group.

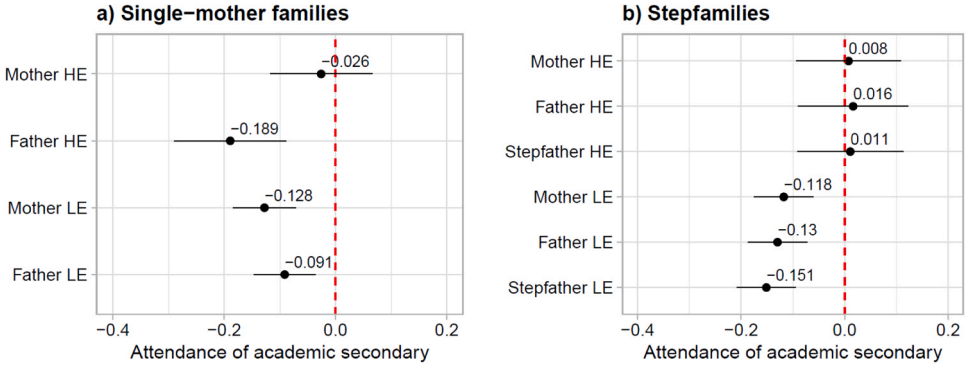

Fig. 2. Subgroup analysis of heterogeneous effect of trajectory of family structure transitions on the likelihood of attending the academic track by parental education, *Notes*: HE – highly educated, LE – lower-educated. Coefficients with 95% confidence intervals from linear probability models with entropy balancing weighting, separate models for each subgroup. The control group is stable two-parent families with respective educational level, presented by the line crossing the horizontal axes at 0. The subgroup analysis of stepfather's education used father's educational level for the control group.

lower household income or lower maternal well-being among children of highly educated fathers. However, the moving in of a lower-educated stepfather does not make much further difference for children's educational transitions. This observation is supported by additional analysis that changes the reference group: when children of less educated fathers in single-mother families are set as a control group, having a less educated stepfather move in does not further reduce the academic track attendance (online appendix Table S4).

5.3. Explaining heterogeneous effects

I next explore the mechanisms explaining why the adverse effects of family structure transitions arise among (1) children of highly educated fathers living in a single-mother family and among children of two lower-educated parents living (2) in a single-mother family or (3) in a stepfamily.[5] I use models with entropy balancing, where a potential mediating variable is included among the variables balancing the control group to match with the treatment group. This analysis aims to explore associations rather than to give a causal interpretation to mediating effects (see methods section). Each model presented in Fig. 3 examines one aspect of possible mediation by including one or two possible mediators. However, I did not condition simultaneously for all possible mediating variables, as most tested variables turned out not to operate as mediators.[6]

The upper panel of Fig. 3 presents the results for children of highly educated fathers living in a single mother family. Parental separation reduces their likelihood of attending the academic track by about 19% points (baseline Model 0). More than 40% of this negative association is explained by reduced income; other potential mediators are not relevant (Models 1–6). Therefore, the main explanation for why parental separation affects educational transitions of these children appears to be reduced financial opportunities after a highly educated father moves

[5] See separate analysis for less educated mothers and fathers in Fig. S3 in the online appendix.

[6] An alternative strategy for testing the mediation would be to focus on the interacting effects between family transitions and parental education and to add mediators among interacting variables. However, interpreting the results of multiple interactions for multiple groups is rather complicated.

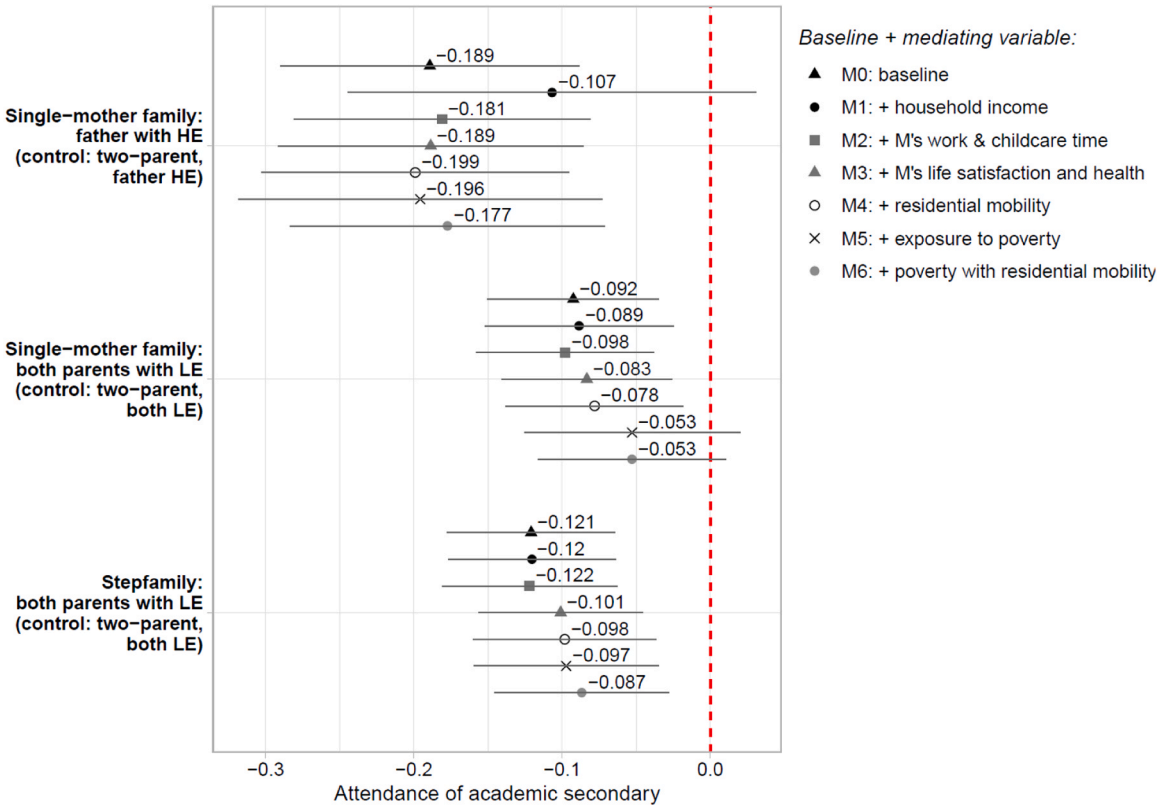

Fig. 3. Mediation analysis for the effect of trajectory of family structure transitions on the likelihood of attending the academic track, by parental education, *Notes*: HE – high education, LE – lower education. Coefficients with 95% confidence intervals from linear probability models with entropy balancing weighting, separate models for each subgroup. Fig. S2 in the online appendix presents the mediation analysis separately for lower-educated mothers and fathers. The control group consists of stable two-parent families with respective educational level, presented by the line crossing the horizontal axes at 0.

out.

The middle panel of Fig. 3 analyses the children of lower-educated parents living in a single mother family. Parental separation reduces their likelihood of following the academic track by 9% points compared to living in a less educated two-parent family (Model 0). The variables measuring household income, maternal employment, childcare time or wellbeing do not explain this negative association (Models 1–3). Moreover, residential mobility after separation seems to have only moderate importance (Model 4). Yet, about 40% of this negative association is explained by poverty after separation (Model 5). Specifying whether the family experienced both poverty and residential mobility does not change this result (Model 6). This indicates that the exposure to poverty was as relevant, even if the family did not have to move. Thus, although when a family with less educated parents has the father move out, the decline in income might be smaller than in highly educated families, the educational transitions of children are affected by their risk of falling into poverty after separation.

The lower panel of Fig. 3 presents the results for the children of lower-educated mothers and fathers living in a stepfamily. Family structure transitions reduce their likelihood of attending the academic secondary track by 12% points compared to living in a stable lower-educated family. Model 3 suggests that approximately 20% of this association can be attributed to maternal life satisfaction and health. Further examination reveals that within lower-educated families, maternal life satisfaction and health is lower in stepfamilies than in two-parent families, and it is not significantly higher than in single-mother families (see online appendix Table S8). Notably, Model 6 shows that nearly 30% of this observed association is explained by poverty that was accompanied by residential mobility, indicating that the cumulative influences of these two economic stressors after parental separation correlate to lower educational outcomes for children living in lower-educated stepfamilies. Overall, lower-educated stepfamilies have experienced more residential mobility and poverty in the longer term than lower-educated stable two-parent families, even though the transition to a stepfamily eventually improved their income (online appendix Table S8). Additional model that includes measures of maternal well-being, poverty, and residential mobility (not presented) indicates that approximately 35% of the association is jointly explained by these factors (b = −0.077), leaving a substantial portion of the association unaccounted for.

5.4. Achievement and aspirations in adolescence

The last step of the analysis explores whether family transitions during early and middle childhood could have further influence on children's educational outcomes beyond their transition to secondary education. I focus on grade point average and aspirations to attain a university degree in adolescence, as these variables reflect the potential to attend university. Both outcomes were measured around age 16/17 when the child was attending secondary school. The analysis controls for secondary school track to examine whether family transitions have further effects beyond influencing academic track attendance. Moreover, it is relevant because the school track likely affects educational aspirations. Furthermore, grades are not directly comparable across the school tracks.

The results from linear probability models show that family transitions during childhood are not associated with significantly lower grades or aspirations in adolescence (Fig. 4). The models with entropy balancing and siblings fixed effects provide similar results. Furthermore, Fig. S4 in the online appendix presents the subgroup analysis using entropy balancing and indicates that family structure transitions do not affect these longer-term outcomes differently depending on parental

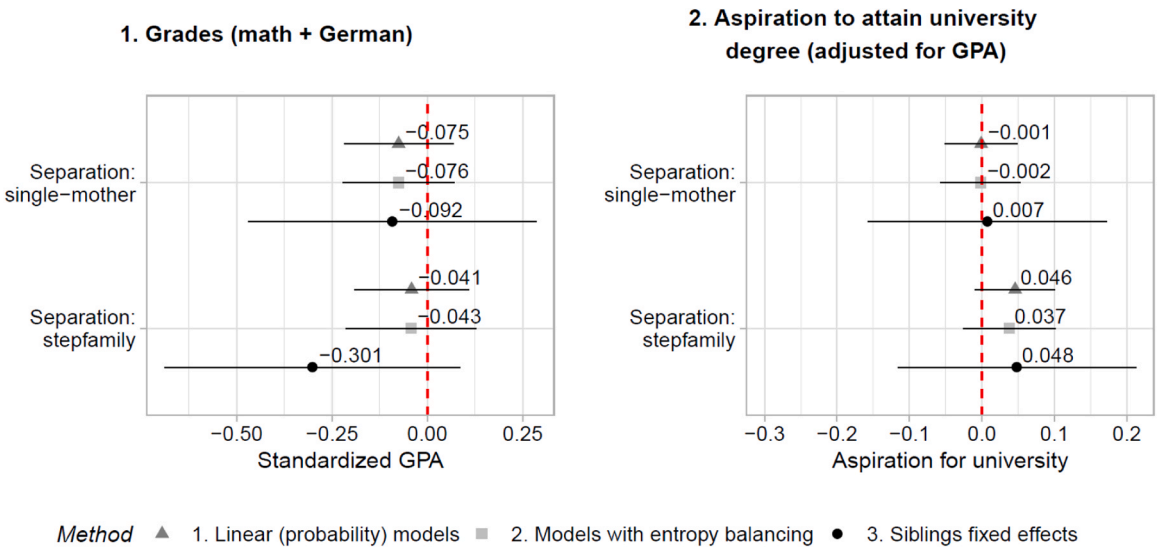

Fig. 4. The effect of trajectory of family structure transitions at age 1–10 on educational outcomes at age 16/17: grades and aspiration to attain university degree, *Notes*: Coefficients with 95% confidence intervals. The control group consists of stable two-parent families with respective educational level, presented by the line crossing the horizontal axes at 0. Simple linear (probability) models and models with entropy balancing weighting control/are balanced for secondary school track, child's gender, birth order and birth year, federal state of residence, mother's and father's education, migration status, maternal age at childbirth and following pre-separation controls: highest parental occupation, paternal unemployment, household income decile, marital status, living in rural area and the number of children. Siblings FE model controls for child's gender, birth order and birth year. Models for university aspiration also include GPA.

education. However, parental separation somewhat reduces aspirations to attain a university degree among children of highly educated fathers living in single-mother families after parental separation (Fig. S4). This finding further supports the resource perspective. However, I did not explore how experiences of family transitions during adolescence affect grades and aspirations, which is an important question to investigate in future research.

6. Discussion

This study explored how family structure transitions affect children's educational outcomes depending on parental education. While prior studies often focused on the heterogeneous effects of parental separation, it is essential to recognize that this life event may be followed by a transition to a stepfamily, significantly affecting a family's resources and overall well-being. Evaluated from a resource perspective, these transitions reshape the available resources within the family, whereas, from a family stability perspective, they contribute to heightened instability and stress. By examining the trajectories of family structure transitions and incorporating the educational background of stepfathers alongside maternal and paternal education, this study contributed to the literature on heterogeneous effects. Furthermore, as only scarce empirical research has explored why the consequences of family structure transitions differ for various social groups (Raley & Sweeney, 2020), this study further contributed by exploring several mechanisms explaining such differences.

Using longitudinal data from the German Socio-Economic Panel Study (1984–2018), I found that family structure transitions during early and middle childhood reduce transition to the academic secondary school track. In the German context, this is a key educational transition for securing a smooth pathway to tertiary education. However, family structure transitions in childhood are not associated with lower grades and aspirations to attain a university degree in adolescence. This suggests that family transitions in childhood do not have additional effects on educational outcomes in adolescence beyond the negative consequences related to reduced academic track attendance.

The findings showed that parental education differentiates how family structure transitions affect the transition to secondary education. Experiences of family structure transitions reduce the academic secondary school track attendance among children of lower-educated parents either living in a stable single-parent family after parental separation or living in a stepfamily after a second family transition. However, educational outcomes of children from highly educated families were mostly unaffected. Consistent with the resource perspective, the mediation analysis indicated that experiences of poverty after separation, sometimes accompanied by residential mobility, significantly contributed to explaining the negative consequences of family transitions for educational outcomes in lower-educated families.

The findings also revealed an important exception: parental separation reduces the academic track attendance and longer-term aspirations to attend university among children of highly educated fathers living in single-mother families after separation. Aligned with the resource perspective and empirical research emphasizing the relevance of the larger loss of resources in more advantaged families (Bernardi & Boertien, 2016), the mediation analysis showed that the association between living in a single-mother family and lower attendance on the academic track is mainly explained by reduced income after the highly educated father moved out. However, family structure transitions did not impact the educational transitions of children of highly educated fathers living in stepfamilies, or of those living with a highly educated mother. It could be that these families actively compensate for the negative effects of parental separation by investing more in their children (Grätz, 2015; Mandemakers & Kalmijn, 2014; Schulz, 2022). This compensation may be particularly relevant in the German context, where highly educated parents have very high aspirations for their children to be on the academic secondary school track (Dumont et al., 2019). Moreover, a comparative study by Bernardi and Radl (2014) suggested that smaller divorce penalties among highly educated families may be specific to countries that sort children into different school tracks at an early age, often accompanied by heightened social class-based inequalities in the school system.

The findings indicated that the intergenerational consequences of living in a stepfamily are influenced by the educational level of the stepfather. I found that prior family structure transitions did not significantly affect educational transitions among children residing with a highly educated stepfather. However, academic track attendance was reduced among children of lower-educated stepfathers, although the transition to a stepfamily by itself did not appear to amplify this effect.

Thus, there seems to be no cumulative disadvantage associated with a further transition to a stepfamily. Overall, these findings for stepfamilies lean towards supporting the resource perspective rather than the family stability perspective since educational outcomes are not diminished by a further transition to a stepfamily. In particular, the introduction of a highly educated stepfather to the family could potentially increase the financial and social resources available (Ryan et al., 2015), thereby fostering educational aspirations in highly educated families, even though stepparents sometimes face unclear expectations and might have responsibilities towards their non-residential biological children (M. Coleman et al., 2000; Hofferth & Anderson, 2003). Consequently, the results of this study suggest a compensating effect of stepfathers, aligning with a recent study by Erola and Jalovaara (2017) that highlighted the relevance of stepfathers in the intergenerational transmission of socioeconomic status in Finland.

However, it is worth noting that, in contrast to the United States, the theoretical significance of the resource perspective, particularly the findings regarding the role of financial difficulties in explaining the negative consequences of family transitions, may be somewhat unexpected in the German context. This is due to the low financial barriers in the education system and the relatively generous welfare state provisions for families, even though single-parent families in Germany are still likely to experience poverty (Federal Statistical Office 2019). Prior research in Germany has indicated a moderate association between household income and secondary school choice (Schneider, 2008). Nevertheless, it has also revealed that children growing up in low-income households tend to perform lower on cognitive tests compared to children in high-income households, partly due to reduced parental investments and neighborhood compositions (Dräger & Pforr, 2022). Relatedly, families experiencing instability may have to move to a less affluent neighborhood and adapt to a new school environment, which can disrupt their social networks. Thus, future research using detailed data about the change of neighborhood or school district could offer valuable insights for a deeper understanding of the effects of family structure transitions.

Although financial constraints play a role, they do not wholly explain the negative consequences of family structure transitions. This is particularly relevant for lower-educated stepfamilies, where exposure to both poverty and residential mobility explained about a third of the negative association between family structure transitions and children's academic track attendance. Furthermore, there was some indication that lower maternal well-being contributes to explaining this negative association, providing some limited support to the family stability perspective. However, I found that maternal employment and childcare time were not relevant mediators. It is important to note that the SOEP lacks measures for child wellbeing, behavior, and academic performance at the time of the transition to secondary education or more detailed variables for parental time with children. This information could be valuable to increase the accuracy of tackling the relevant mechanisms. For example, Cavanagh and Fomby (2019) propose that family stability might affect educational attainment through the changes in school setting, children's behavior and attitudes about school, rather than solely through a reduction in cognitive skills. Thus, while the present analysis underscores the substantial role of financial difficulties in explaining the consequences of family structure transitions, the nuanced pathways through which these difficulties affect educational transitions require further exploration in future research. Nevertheless, the significance of financial difficulties emphasizes that family transitions influence educational outcomes not solely through psychological well-being or conflictual relationships, at least in the case of educational transitions crucial for children's long-term prospects.

Consistent with recent research that increasingly underlines the importance of considering selection into family structure transitions (McLanahan et al., 2013), this study relied on entropy balancing and siblings fixed effects models to identify the effects of family structure transitions on educational outcomes. However, both methods come with some caveats. Despite including a large set of pre-separation variables in the analysis, entropy balancing could be vulnerable to the omitted variable bias. In contrast, siblings fixed effects models control for unobserved variables shared between the siblings but suffer from small sample sizes, as siblings often do not differ in their family structure experiences. Notably, sibling fixed-effects models may underestimate the adverse effects of separation if it follows prolonged parental conflict, which could have influenced the educational outcomes of older siblings. Furthermore, this research concentrated on children born to two-parent families and living together with their mother, but interactions between other types of family structure trajectories and parental education should also be analyzed in future research.

This study highlights the multifaceted nature of family structure transitions in the life course and their far-reaching intergenerational consequences. It offers empirical evidence that the impact of family structure transitions on children's educational transitions intertwines with the educational backgrounds of parents and stepparents. Notably, the introduction of a highly educated stepfather to the family appeared to alleviate the adverse effects of prior parental separation, suggesting a compensatory effect, which was not observed for less educated stepfathers. Regarding the theoretical relevance of the study, it is important to emphasize that the analysis provides support for the resource perspective, underscoring the role of economic resources in influencing children's educational outcomes. Simultaneously, the results for stepfamilies offer little support for the family stability perspective, challenging the notion that family continuity alone significantly impacts children's educational trajectories. Overall, this study underscores the significance of considering the transition to a stepfamily following parental separation in understanding the heterogeneous effects of family dynamics on children's educational outcomes.

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CRediT authorship contribution statement

Kristina Lindemann: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Validation, Visualization, Writing – original draft, Writing – review & editing.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.alcr.2024.100610.

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