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Parental ages and the intergenerational transmission of education: evidence from Germany, Norway, and the United States

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ABSTRACT

The diverging destinies hypothesis predicts that educational inequality increases in contemporary societies because parents with higher levels of education postpone the birth of their children. This hypothesis is supported by empirical evidence demonstrating that advanced parental ages improve children's educational outcomes. However, the consequences of socioeconomic differences in parental ages for the intergenerational transmission of education also depend on whether the associations between parental ages and child education vary by parental education. To test this hypothesis, we use data from three countries representing different welfare regimes: Germany, Norway, and the United States. In all three countries, children's educational attainment at the secondary school level increases with higher parental ages more in families with low than in families with highly educated parents. In other words, the intergenerational transmission of education is stronger for younger than for older parents. Consequently, our findings nuance the diverging destinies hypothesis by demonstrating that increasing parental ages in socioeconomically disadvantaged families increases educational mobility more than decreasing parental ages in socioeconomically advantaged families. These findings are qualitatively the same in all three countries, suggesting that diverging destinies also occur in countries outside the United States.

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Introduction

Children born into different families do not have the same chances of succeeding in life. One important measure of children's success in life is the extent to which they attain education. The level of education of women and men is associated with their parents' educational attainment; in a sense, parents transmit their educational attainment to their children (Black and Devereux 2011; Breen and Jonsson 2005; Torche 2015). Recent research has investigated how the intergenerational transmission of education is affected by parental fertility (Breen and Ermisch 2017; Grätz 2023; Hillmert 2013, 2015; Lawrence and Breen 2016; Maralani 2013; Mare 1997, 2011; Mare and Maralani 2006; Skopek and Leopold 2020; Song and Mare 2015). These studies estimated the contributions of two aspects of parental fertility – childlessness and the number of children – to the intergenerational transmission of education. However, less is known about a third component of parental fertility: the ages at which parents have their children. In the present study, we quantify the contribution of parental ages to the intergenerational transmission of education at the level of secondary education.

Previous research has consistently found that children born to older parents have higher educational outcomes (Augustine *et al.* 2015; Barclay and Myrskylä 2016; Duncan, Lee, Rosales-Rueda, and Kalil 2018; Fishman and Min 2018; Grätz 2018; Kalmijn and Kraaykamp 2005; Leigh and Gong 2010; Mare and Tzeng 1989). However, this line of research has not investigated whether parental ages contribute to the intergenerational transmission of education. To address this gap in knowledge, we ask to which extent parental ages contribute to the intergenerational transmission of education.

Answering this research question is important because in many countries, women and men delay the birth of children (Lesthaeghe 2010; Mills *et al.* 2011). Moreover, these delays in parental ages are concentrated in socioeconomically advantaged families (Duncan, Kalil, and Ziol-Guest 2017; Martin 2004; McLanahan 2004). For this reason, McLanahan (2004) argued that children growing up today experienced diverging destinies, thus allowing already advantaged children from parents with high levels of education to increase their advantage by also benefiting from the older ages at which their parents have them. Consequently, the diverging destinies hypothesis predicts that socioeconomic differences in parental ages will favor children with highly educated parents and therefore increase inequality of educational opportunity.

However, for this prediction to be correct, the finding that the age at which men and women become parents varies by their level of education, as McLanahan (2004) has shown, is insufficient. The consequences of parental ages for educational inequality also depend on the consequences of parental ages for children's educational attainment. In particular, if these consequences vary by parental education, whether, and the extent to which, parental ages contribute to the intergenerational transmission of education are open questions. Some evidence suggested that the positive consequences of higher parental ages for children's educational attainment were stronger for children whose parents had lower levels of education (Grätz 2018). Under such circumstances, the consequences of socioeconomic differences in the distribution of parental ages are reduced. Consequently, whether, and the extent to which, parental ages contribute to the intergenerational transmission of education remains unclear, and this question can be answered only empirically.

The consequences of parental ages for the intergenerational transmission of education may vary across countries. Different welfare regimes have different incentives for choices about educational attainment, childrearing, and work-life balance. In our study, we compare Germany, Norway, and the United States. These countries represent three different welfare regimes, which influence social inequality through decisions about education and employment as well as family matters (Esping-Andersen 1990). We quantify the extent to which parental ages contribute to the intergenerational transmission of education by using data from the German Socio-Economic Panel Study (SOEP), the United States Panel Study of Income Dynamics (PSID), and Norwegian register data.

Parental demographic behavior and the intergenerational transmission of education

Most studies on the intergenerational transmission of educational advantage are retrospective: they estimate the association between children's and parents' education from the children's perspective (Black and Devereux 2011; Breen and Jonsson 2005; Torche 2015). Recently, this retrospective approach has been criticized because it necessarily conditions on childbirth and overcounts children from large families (Breen and Ermisch 2017; Grätz 2023; Lawrence and Breen 2016; Maralani 2013; Mare 1997; Mare and Maralani 2006; Skopek and Leopold 2020). Accordingly, restricting the sample to children is a way in which

parental fertility affects estimates of intergenerational educational mobility. Research comparing retrospective to prospective models of intergenerational mobility, which start with the parental generation, quantified the contributions of childlessness and family size to intergenerational mobility.

Although prospective models of intergenerational mobility recognize parental fertility as a crucial factor for educational mobility, they do not consider the parental timing of childbirth. Parental birth timing is another aspect of parental fertility that can contribute to intergenerational educational mobility. Delaying childbirth is linked to advanced education, thus causing higher parental ages to be associated with higher educational attainment. In addition, the distribution of parental ages at the time of childbirth is socially stratified (Duncan *et al.* 2017; Martin 2004; McLanahan 2004).

Parental ages and children's educational outcomes

The older parents are at the time of childbirth, the better the educational outcomes of their children (Augustine *et al.* 2015; Barclay and Myrskylä 2016; Duncan, Lee, Rosales-Rueda, and Kalil 2018; Fishman and Min 2018; Grätz 2018; Kalmijn and Kraaykamp 2005; Leigh and Gong 2010; Mare and Tzeng 1989). In contrast, childbearing in the teenage years has particularly strong negative consequences for children's labor market and educational outcomes (e.g. Addo, Sassler, and Williams 2016; Brooks-Gunn and Furstenberg 1986; Fergusson and Woodward 1999; Geronimus, Korenmann, and Hillemeier 1994; Levine, Emery, and Pollack 2007; Levine, Pollack, and Comfort 2001; Turley 2003).

The associations between parental ages and children's educational attainment can be confounded by unobserved factors. To control for unobserved variables that may differ among families, several studies used family fixed effects models. These models control for the most important unobserved variables that might confound the associations between parental ages and children's educational outcomes. Therefore, such models provide good approximations of the causal effects of parental ages on child education. Most studies that used family fixed effects models found positive effects of advanced parental ages on children's educational outcomes, which were similar in size to those found with models that did not include family fixed effects (Barclay and Myrskylä 2016; Duncan *et al.* 2018; Grätz 2018; Kalmijn and Kraaykamp 2005). The only exception

is a study using data on the United States, which had a small sample size and was underpowered to detect statistically significant effects of parental ages on child education in family fixed effects models (Fishman and Min 2018). However, even in this study, the estimates resulting from family fixed effects models were not statistically significantly different from the estimates obtained via cross-sectional regression models. Given the results from these studies, our results are therefore likely to approximate the underlying causal effects of parental ages on child education, although our analysis is descriptive.[1]

Three mechanisms link parental ages to child education. First, older parents might have accumulated more economic, cultural, and social resources (Mare and Tzeng 1989). In line with this possibility, Powell, Steelman, and Carini (2006) found positive associations between advanced parental ages and material resources, social capital, and cultural capital among parents in the United States. The greater life experience of older parents may make them more efficient at parenting (Augustine *et al.* 2015; Bornstein *et al.* 2006; Conger *et al.* 1984; Kalmijn and Kraaykamp 2005). Furthermore, older mothers may also have more noncognitive skills, owing to more stable mental health (Duncan *et al.* 2018; Kessler *et al.* 2005).

Second, an important reason why advanced parental ages are beneficial for children is that postponing birth results in children being born in later time periods. Consequently, later-born children profit from positive period effects, particularly from educational expansion. This effect, far from being purely mechanical, is the main reason why higher parental ages positively affect children's educational attainment, according to Barclay and Myrskylä (2016). Therefore, to identify the causal effects of advanced parental ages on children's educational attainment, avoiding conditioning on period effects is critical, because such conditioning may introduce overcontrol bias. For instance, Kalmijn and Kraaykamp (2005) controlled for the educational attainment of a birth cohort in their family fixed-effects model. This control led to overcontrol bias, because the within-family variation is largely due to siblings differing in when they attend school. From the children's perspective, whether a higher level of education is achieved because of educational expansion or other reasons does not matter. Barclay and Myrskylä (2016) showed that maternal age was positively associated with child education in

[1]We could not use family fixed effects in the present study, because we needed to select only the first-born children in each family, as described in the sample selection section below. Furthermore, we were interested in determining the extent to which differences in parental ages between families contribute to educational inequalities between families.

Sweden. These associations persisted in family fixed effects models but disappeared after the addition of controls for year of birth – which, according to the authors, captured period effects such as educational expansion.[2]

Third, biological mechanisms should lead to a negative effect of advanced parental age on child education and cannot explain the positive effects of higher parental ages found in many studies (Barclay and Myrskylä 2016; Fishman and Min 2018). For instance, advanced maternal age increases the risk of a preterm birth (Jacobsen, Ladfors, and Milson 2004) and a lower birth weight (Khoshnood, Wall, and Lee 2005).[3] Via these pathways, advanced maternal age should lead to lower educational outcomes (Behrman and Rosenzweig 2004; Black, Devereux, and Salvanes 2007; Conley and Bennett 2000). In addition, advanced maternal age increases the likelihood of children being cognitively disabled (Cohen 2014).

From the perspective of the literature connecting parental demographic behavior to the intergenerational transmission of education (Breen and Ermisch 2017; Maralani 2013; Mare 1997; Mare and Maralani 2006; Song and Mare 2015), the estimation of the effects of parental ages on child education has a shortcoming that has often gone unnoticed: intergenerational mobility can appear different when examined from the child's perspective rather than the parent's perspective. Song and Mare (2015) differentiated between the retrospective (perspective of the child) and the prospective (perspective of the parent) approach to intergenerational mobility.

In the literature, most studies estimating the associations between parental ages and child education have taken the child's perspective. Consequently, these studies have been based on samples representative of the children's generations rather than the parents' generations (Barclay and Myrskylä 2016; Fishman and Min 2018; Grätz 2018; Kalmijn and Kraaykamp 2005). The only exception is Duncan *et al.* (2018), who used a sample of women as their starting point and compared children born to these women in different years.[4]

[2]The addition of controls for year of birth to the family fixed effects models by Barclay and Myrskylä (2016) was criticized, because the effects of maternal age and birth year are linearly dependent in family fixed effects models (Keiding and Andersen 2016; Kravdal 2019). Nonetheless, period effects are an essential mechanism underlying why parental ages affect child education.

[3]Contrary to the findings of these studies, Goisis et al. (2017) found no negative effects of maternal age on preterm delivery and birth weight in family fixed effects models by using data on Finland.

[4]One reason why previous research has not realized this issue may be that studies have often used family fixed effects models. These models by definition compare children born to the same mother (and/ or father) in different years. The analysis in the present study, however, compares parental ages at the

In our study, we use the perspective of the parents' generation. We followed the prospective approach to intergenerational mobility, because sampling a cohort of children leads to comparing parents belonging to different cohorts. Sampling a cohort of mothers and fathers, however, yields representative results for the parental generation. The parental perspective is more interesting from a counterfactual perspective, because parents can choose when they have children, but children cannot choose their parents' ages. Comparing parents from the same generation provides answers to the counterfactual question of the consequences if a mother (or a father) has a child several years earlier or later.

Parental ages and the intergenerational transmission of education

We investigate whether and the extent to which parental ages contribute to the intergenerational transmission of education at the secondary school level. Although the studies discussed in the two preceding sections suggest a positive answer to this question, this needs not be the case. The contribution of parental ages to the intergenerational transmission of education depends on three factors. First, parental ages at birth can vary across social groups. The diverging destinies hypothesis predicts that highly educated parents give birth to children later than low educated parents. Evidence suggests that this is the case, at least in the United States (Duncan *et al.* 2017; Martin 2004; McLanahan 2004). Second, parental ages can affect educational mobility only if advanced parental ages are correlated with children's educational attainment. This aspect has been demonstrated by the studies discussed in the previous section (Barclay and Myrskylä 2016; Fishman and Min 2018; Grätz 2018; Kalmijn and Kraaykamp 2005). Third, the associations between parental ages and child education can vary by parental education. Depending on the direction of this variation, the consequences of parental ages for the intergenerational transmission of education may be reduced or increased.[5]

Why should the consequences of parental ages on child education vary by parental education? We do not expect any reason why the biological processes should differ by parental education. However, the accumulation mechanism and the period mechanisms may vary by parental

first childbirth across different families; therefore, explicitly taking the prospective approach to follow one parental generation is crucial.

[5]Our approach follows Bernardi and Boertien (2017), who applied the same three-step reasoning to study the contribution of family structure to the intergenerational transmission of education.

education. In terms of accumulation of resources over the life course, this accumulation may be more important for lower than for highly educated parents. The reason for this is that the overall level of resources is lower in lower than in higher educated families. The period mechanism also suggests that theoretically we expect stronger consequences of higher parental ages for parents with lower levels of education. The reason is that educational attainment has increased over time more for the offspring of lower than for the offspring of higher educated families (Breen *et al.* 2009). If lower educated parents postpone their birth, their children profit from this increase in educational equality across cohorts. Completing a secondary education requires some resources but not so many. Therefore, lower educated families may need some time to accumulate these resources. However, for highly educated families, they have enough resource already at younger ages and their accumulation of resources over the life course may not be necessary for their offspring completing upper secondary education.

Augustine *et al.* (2015) found a link between maternal age at the time of birth of the first child and children's educational performance via parenting only for children of highly educated but not for children with low educated mothers in the United States. In contrast, Duncan *et al.* (2018) found a weaker association between maternal age and children's reading skills for highly educated mothers but no differences based on maternal education for math skills in the United States. Grätz (2018), through family fixed effects models, found that parental ages affected children's education in families with parents with low but not high levels of education in Germany.

The differences between these three studies can be due to methodological differences. Duncan *et al.* (2018) as well as Grätz (2018) employed family fixed effects models. Duncan *et al.* (2018) focused on educational performance as an outcome, whilst Grätz (2018) looked at educational attainment. Finally, Augustin *et al.* (2015) looked also at educational performance as an outcome but employed path modeling.

In sum, the contribution of parental ages to the intergenerational transmission of education is based on the combination of three components (the variation in the distribution of parental ages by parental education, the associations between parental ages and child education, and the variation in these associations by parental education). Because the contributions of these three components can have different directions, whether, and the extent to which, parental ages contribute to the intergenerational transmission of education remains an open

Table 1. Expectations about the relationships between parental ages, parental education, and child education.

Component	Expectation
Variation in the distribution of parental ages by education	Highly educated parents have their first child at older ages
Association between parental ages and child education	Higher parental ages are positively associated with higher levels of child education
Variation in the association between parental ages and child education	The positive associations between parental ages and child education are stronger for parents with a low than for parents with a high level of education

empirical question. We clarify our hypotheses and our expectations in Table 1.

One study conducted a similar analysis to ours but differed in crucial aspects. Duncan *et al.* (2017) analyzed whether changes in maternal ages in the United States across cohorts born between 1954 and 1985 contributed to changes in the gap in children's educational attainment by parental income. In contrast, our analysis focuses on whether parental ages explain gaps in educational attainment by parental education. In addition, Duncan *et al.* (2017) did not consider whether the associations between parental ages and child education varied by parental income (condition 3 in the list above). The estimates from Duncan *et al.* (2017) also had overcontrol bias, because the models were conditioned on parental income, a potential mediator of the effects of parental ages on child education. The use of this control was justified in the analysis, because their study was primarily focused on identifying the consequences of parental income for child education. Parental ages were confounding variables in estimating this relationship. However, to identify the contribution of parental ages to intergenerational mobility, not conditioning on mediating variables such as parental income is important.

Cross-country differences in the contribution of parental ages to the intergenerational transmission of education

We analyze data from Germany, Norway, and the United States – three countries representing the three welfare regimes originally distinguished by Esping-Andersen (1990). In addition, these countries also differ in their level of educational inequality. For instance, Grätz *et al.* (2021) found educational equality, measured via the non-similarity of siblings in their educational outcomes, to be higher in Norway than in Germany and the United States.

The idea of diverging destinies was developed with the United States in mind. The question therefore arises as to whether this idea might apply to other societies. In particular, the Scandinavian social democratic welfare regime might buffer the negative consequences of disadvantageous parental demographic behaviors. Contrary to this hypothesis, however, negative associations between parental ages and child outcomes were also observed in societies other than the United States, including Germany (Grätz 2018), Sweden (Barclay and Myrskylä 2016), and the Netherlands (Kalmijn and Kraaykamp 2005). Nevertheless, parental ages might contribute differently to the intergenerational transmission of education in different countries.

Norway is classified as a social democratic welfare regime (Esping-Andersen 1990), characterized by a fairly low level of economic inequality, free public childcare, and large transfers to families with children. Young parents might particularly profit from the transfers to families. Therefore, we expected parental ages to have the lowest contribution to the intergenerational transmission of education in Norway among the three countries.

The United States is classified as a liberal welfare regime (Esping-Andersen 1990). This welfare regime has a high level of economic inequality and fairly low financial support to citizens in need, such as young parents. We therefore expected women and men to profit the most from giving birth at higher ages in the United States among the three countries. Consequently, the intergenerational transmission of education is expected to be more affected by parental ages in the United States than in Germany and Norway.

Finally, Germany is a conservative welfare regime (Esping-Andersen 1990). The level of economic inequality in Germany is between that in the United States and Norway. Family support is generous but less so than in Norway. We therefore expected the contribution of parental ages to the intergenerational transmission to education to be larger in Germany than in Norway but smaller than that in the United States.

Data and methods

Data

We use data on men and women born between 1951 and 1960 in Germany, Norway, and the United States. Germany is analyzed using data from version 36 of the German Socioeconomic Panel Study (SOEP; Goebel *et al.* 2018). For Norway, we use data from extensive administrative registers containing individual-level data for the entire

population. For the United States, we employ the Panel Study of Income Dynamics (PSID).

In all three countries, we examine the educational outcomes of the first-born children of men and women. This design corresponds to our aim of conducting the analysis from the perspective of mothers and fathers to answer the question of how intergenerational educational mobility might appear if these men and women did not differ in their ages at the time of birth of the first child. The sample selection criteria of examining only the outcomes of first-born children is introduced to control for birth order. Conditioning on birth order is crucial, because parental ages and birth order are closely associated, and their effects may go into different directions (Barclay and Myrskylä 2016; Grätz 2018; Härkönen 2014; Kalmijn and Kraaykamp 2005).

Importantly, to avoid sample selection bias, the first-born children of the mothers and fathers included in our sample are required to have completed their education, at least to the level at which we measure education.[6] This aspect is particularly crucial, because we aim to examine the effects of postponing childbearing and need to avoid introducing sample selection bias by conditioning on the early birth of children (Breen and Ermisch 2017; Skopek and Leopold 2020).

We measure children's educational outcomes in 2019 (United States and Germany) and 2017 (Norway).[7] The youngest respondents (of the parental generation) included in our study are born in 1960. On the basis of the assumption that parents would no longer be fertile by the age of 40, the youngest children would be at least be 18 years old when we measure their educational attainment. At that age, they could not yet have completed tertiary education but would have completed secondary education. We therefore top-code our outcome variable years of education at 13 years, as detailed in the next section.[8]

Even though we top code the education variable, it still covers a larger distribution of educational attainment than a dummy for secondary education. Figure 1 shows histograms of the distribution of years of

[6]Research on educational reproduction uses samples of women and men (and not of mothers and fathers) to avoid conditioning on the birth of a child (Breen and Ermisch 2017; Lawrence and Breen 2016; Song and Mare 2015; Skopek and Leopold 2020). However, this framework is not suitable for the present analysis. The question of the contribution of parental ages to the intergenerational transmission of education can be answered and is relevant for only men and women who have children, i.e., mothers and fathers.

[7]In the PSID, the last observed wave for each respondent was used to counteract sample bias due to attrition. More than 70% of the observations came from the 2019 wave. However, some observations date to the early 1990s waves; all these respondents were older than 18 years at the time observed.

[8]The do-files to replicate all analyses are available at: https://osf.io/ntkj2/.

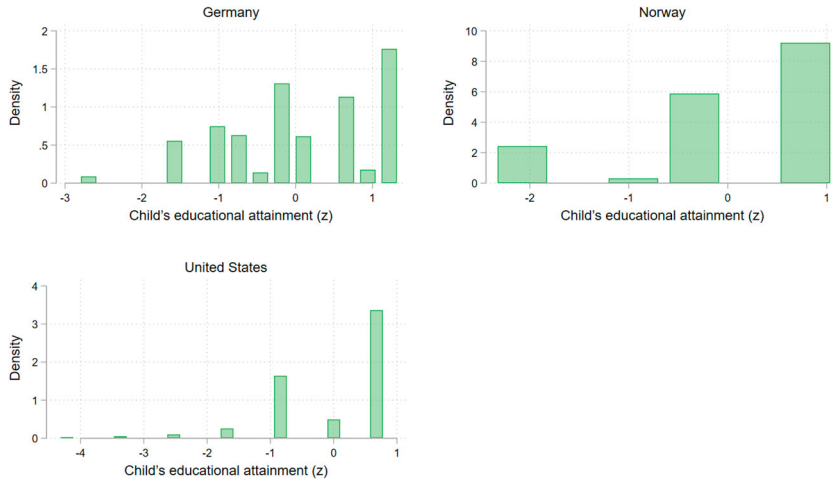

Figure 1. Distributions of children's educational attainment (years of education).

education in our data sets. As can be seen, in all countries there is quite some variation in educational attainment.

Variables

Parental Ages. We measure maternal and paternal ages at the time of the birth of their first children. We use continuous variables of both parents' ages, in line with previous research finding linear associations between parental ages and child education (Duncan *et al.* 2018; Kalmijn and Kraaykamp 2005). Because of the collinearity between parents' ages, we use only models including either maternal age or paternal age as an independent variable.

Children's Educational Attainment. The primary outcome of the analysis is children's educational attainment, measured in years of education. Years of education is a continuous variable measuring the shortest number of years in education required to complete school and to obtain a final degree. We top-code the years of education because not all children in our dataset could have completed tertiary education. We do so by replacing all values of years of education greater than 13 with 13. Consequently, 13 years of education indicates the highest level of education in our data, corresponding to the highest level of secondary education in the examined countries. To enable comparison of the outcomes across countries, we standardize the top-coded years of education within each country. The results therefore must be interpreted in terms of standard deviations.

The findings could be different for higher levels of education, for instance university education, an outcome which is according to Bernardi and Comolli (2019) of more relevance to more highly than lower educated parents. Unfortunately we cannot test this in the present study.

Parental Education. We measure parental education by using the highest level of education of both parents in the household. We distinguish between a lower and a higher level of parental education. In Norway and the United States, a lower level of parental education is defined by having attained less than tertiary education, and a higher level of education is defined as having attained tertiary education. In Germany, a country with a lower attainment of tertiary education, a lower level of parental education is defined as completion of one of the two lower tracks in the German education system (*Hauptschule or Realschule*) or leaving the education system without a school leaving certificate or a foreign certificate. A higher level of education is defined for mothers and fathers who had achieved the highest German school leaving certificate (*Abitur*). As shown in the descriptive statistics reported in Table 1, our definitions of lower and higher parental education allow us to construct higher and lower parental education groups of nearly the same size in all three countries. The country-specific measures of parental education also allow us to focus on the most central dividing line in terms of parental education in each of the three countries included in our analysis (a similar approach can be found in Grätz *et al.* [2021]).

Control Variables. We control for child gender and family size in all models. Child gender is operationalized via a dummy variable, which is set to 1 for male children. Family size counts the number of children in a family. In the United States, we control for a dummy variable distinguishing between white and non-white race. In Germany and Norway, we distinguish between German/Norwegian and non-German/non-Norwegian nationals, referring to the nationality of the parents. Therefore, all models control for dummy variables, which are set to 1 for mothers and fathers who do not have German/ Norwegian nationality or were non-white in the United States. The descriptive statistics on all variables included in the analysis are shown in Table 2.

Analytic strategy

The analysis proceeds in three steps. First, we examine whether highly educated parents are older than low educated parents when they have their first child. Using OLS regression models (Table 2), we estimate the

Table 2. Descriptive statistics.

	United States		Norway		Germany	
	Mean	SD	Mean	SD	Mean	SD
Child's educational attainment (z)	0.01	0.98	0.01	1.00	0.10	0.98
Child is male	0.48	0.50	0.51	0.50	0.54	0.50
Maternal age	22.96	5.13	24.59	4.77	24.38	4.41
Paternal age	25.73	4.81	26.43	4.84	26.30	4.69
High parental education	0.35	0.48	0.39	0.49	0.33	0.47
Family size	1.93	1.68	1.59	1.09	2.45	0.83
Child is nonwhite	0.46	0.50				
Imm. background, Mother			0.06	0.23	0.09	0.28
Imm. background, Father			0.06	0.23	0.09	0.29
Observations	1,086		189,819		978	

Sources: PSID. SOEP v36 (DOI: 10 .5684 /soep-core.v36). Norwegian administrative registers.

associations between parental education and parental ages at the birth of the first-born child. These models show that parental education is a predictor of maternal and paternal ages, i.e. the gap in childbearing age according to parental education, which was previously demonstrated for the United States (Duncan *et al.* 2017; Martin 2004; McLanahan 2004).

Second, we estimate models predicting the first-born child's education by using parental education and parental ages as independent variables. For each country, the first model estimates the actual size of the intergenerational transmission of education. Two further models estimate the associations between parental ages (maternal and paternal) and child education. Finally, the last set of models (Models 4 and 5 in Table 3) in this part of the analysis include the interactions between parental ages (maternal and paternal) and parental education. The interactions capture the variations in the associations between parental ages and child education by parental education. On the basis of the last models, we also estimate and report how the intergenerational transmission of education varies by parental ages using graphical displays of predicted probabilities.

Third, in the final step in the analysis, we apply the Blinder–Oaxaca decomposition (Blinder 1973; Oaxaca 1973) to quantify the extent to

Table 3. OLS regression models predicting parental ages.

	United States		Norway		Germany	
	Maternal age	Paternal age	Maternal age	Paternal age	Maternal age	Paternal age
High parental education	3.39** (0.31)	3.41** (0.34)	3.64*** (0.02)	3.22** (0.02)	3.16** (0.28)	3.02**(0.31)
Observations	971	721	189,819	189,819	978	978

Standard errors in parentheses. Controls for family size, race (United States), parents' non-German nationality (Germany), and parents' non-Norwegian nationality (Norway) not shown. Sources: PSID. SOEP v36 (DOI: 10 .5684/soep-core.v36). Norwegian administrative registers.

† $p < 0.1$, * $p < 0.05$, ** $p < 0.01$.

which the intergenerational transmission of education could be explained by parental ages. The decomposition is implemented with the 'oaxaca' command in Stata 15 (Jann 2008). We decompose the gap in educational attainment by parental education into a part explained by the distribution of parental ages ('endowments'), a part explained by the associations between parental ages and child education ('coefficients'), and a part explained by the interaction between these two components.

The starting point of the decomposition is the mean difference

$$R = E(Y_A) - E(Y_B) \quad (1)$$

The mean difference can be decomposed into three components (Jann 2008):

$$R = E + C + I \quad (2)$$

with $E = \{E(X_A) - E(X_B)\}' \beta_B$ being the 'endowments,'
$C = E(X_B)' (\beta A - \beta B)$ being the 'coefficients,'
and $I = \{E(X_A) - E(X_B)\}' (\beta_A - \beta_B)$ being the 'interaction.'

As in other applications of the Blinder–Oaxaca decomposition, this is a descriptive but still informative exercise (Duncan *et al.* 2017). In particular, the decomposition allows us to estimate a counterfactual value of the intergenerational transmission of education in the absence of differences in the distribution of parental ages by parental education and in the associations of parental ages and child education by parental education.[9]

We consider two counterfactual decompositions to estimate intergenerational mobility in the absence of socioeconomic differences in parental ages. In the first counterfactual scenario, we fix parental ages at the mean of parental ages in the group of children with low educated parents. In the second counterfactual scenario, we fix parental ages at the mean of parental ages for children with highly educated parents. Therefore, we simulate two different counterfactual scenarios: In the first, highly educated parents have their first child earlier. In the second, low educated parents postpone their first birth. The results vary across these two counterfactual situations, because the consequences of parental ages for educational outcomes vary between children whose parents have low and high education levels, as demonstrated by the results reported in Table 4 below.

The sample sizes differ across countries. In particular, the sample sizes are quite small in Germany and the United States (less than 1,000 cases).

[9]Bernardi and Boertien (2017) used a decomposition analysis to estimate the contribution of family structure to the intergenerational transmission of education in the United States, the United Kingdom, Italy, and Germany.

Table 4. OLS regression models predicting children's educational attainment (years of education).

	United States					Norway					Germany				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
High parental education	0.59**	0.43**	0.39**	0.82**	0.89*	0.59**	0.55**	0.57**	1.17**	1.19**	0.67**	0.59**	0.59**	1.22**	1.01**
	(0.06)	(0.06)	(0.07)	(0.28)	(0.36)	(0.00)	(0.00)	(0.00)	(0.03)	(0.03)	(0.06)	(0.07)	(0.06)	(0.37)	(0.37)
Maternal age		0.05**		0.05**			0.01**		0.02**			0.02**		0.03**	
		(0.01)		(0.01)			(0.00)		(0.00)			(0.01)		(0.01)	
Paternal age			0.04**		0.05**			0.01**		0.02**			0.03**		0.03**
			(0.01)		(0.01)			(0.00)		(0.00)			(0.01)		(0.01)
High parental education X Maternal/ Paternal Age				−0.02	−0.02				−0.02**	−0.02**				−0.02†	−0.02
				(0.01)	(0.01)				(0.00)	(0.00)				(0.01)	(0.01)
Constant	0.03	−1.04**	−0.78**	−1.19**	−0.97**	0.02**	−0.24**	−0.16**	−0.47**	−0.40**	0.33**	−0.28	−0.38*	−0.50*	−0.53*
	(0.06)	(0.15)	(0.18)	(0.19)	(0.23)	(0.00)	(0.01)	(0.01)	(0.02)	(0.02)	(0.10)	(0.20)	(0.19)	(0.23)	(0.23)
Observations	971	971	721	971	721	189,819	189,819	189,819	189,819	189,819	978	978	978	978	978

Standard errors in parentheses

Note: Controls for family size, child is male (all countries), race (United States), parents' non-German nationality (Germany), and parents' non-Norwegian nationality (Norway) not shown.

Sources: PSID. SOEP v36 (DOI: 10 .5684/soep-core.v36). Norwegian administrative registers.

†$p < 0.1$, * $p < 0.05$, ** $p < 0.01$.

This decreases the chance to find statistically significant associations in this countries.

Findings

The associations between parental education and parental ages

A central assumption of the diverging destinies hypothesis is that men and women with lower and higher education differ in the ages at which they become parents (Duncan *et al.* 2017; Martin 2004; McLanahan 2004). Highly educated parents are older when they have children, thus placing them at an advantage because of the positive associations between parental ages and child education. We test whether parental education is positively associated with parental ages for cohorts of men and women in the United States, Norway, and Germany. Table 3 reports OLS regression models in which maternal and paternal ages are the outcome variables, and parental education is an independent variable.

The results show that parental education is strongly associated with maternal and paternal ages at the time of birth of the first child. In the United States, high parental education is associated with a 3.39 year delay in the mother's age at the time of birth of the first child. In families with high education, men have their first child when they are 3.41 years older than men from families with low education, on average. In Germany, high parental education is associated with a first birth approximately 3.16 years later for women and 3.02 years later for men, on average. In Norway, high parental education is associated with a first birth at 3.64 years older among Norwegian women and 3.22 years older among Norwegian men.

Despite slight differences across countries, these findings are in line with the first condition of the diverging destinies hypothesis in all three countries. Socioeconomically advantaged parents have children later in their life courses than socioeconomically disadvantaged parents. Unexpectedly, the differences are largest for women in Norway, but the estimates vary little between men and women and across countries.

The associations among parental education, parental ages, and child education

The results reported in Table 2 support the first condition that must be met for the diverging destinies hypothesis to be fulfilled, indicating that highly educated women and men have their first child later than

women and men with lower education. However, differential birth timing does not necessarily result in different educational attainment for the offspring of these parents (as discussed above). Therefore, Table 4 reports models estimating the associations among parental ages, parental education, and child education.

These models lead to three central findings. First, model 1 shows a strong intergenerational transmission of education. On average, children whose parents have high education levels have 0.59 standard deviation more years of schooling than children whose parents have low education levels in the United States. We observe similar associations between parental and child education in Germany and Norway. In Germany, the association between parental education and children's education is 0.67 standard deviation of years of education. In Norway, a high level of parental education is associated with 0.59 standard deviation more years of education.[10]

Second, in line with previous research, parental ages are strongly associated with child education, as demonstrated by models 2 and 3. These associations are strongest in the United States and weakest in Norway. In all three countries, the associations are equally strong for maternal and paternal ages. In the United States, a 1-year increase in maternal (paternal) age is associated with a 0.05 (0.04) standard deviation increase in the number of years of education among children. In Germany, a 1-year increase in maternal (paternal) age leads to a 0.02 (0.03) standard deviation increase in children's years of education. In Norway, every increase in maternal and paternal age is associated with 0.01 standard deviations more years of education. Although these associations are smallest in Norway, they remain meaningful, because they imply that a 10-year-difference in maternal or paternal age is associated with an increase in children's education by 0.10 standard deviations of years of education in Norway. The associations are much larger in the United States, where a 10-year-difference in maternal age corresponds to a 0.50 standard deviation gap in years of education. Although most previous research has focused only on mothers, the finding of an equally large association between the father's age and child education is in line with those from studies that included the father's age (Mare and Tzeng 1989).

[10]These estimates are smaller than conventional estimates of intergenerational mobility but cannot be compared with those from other studies because of the top-coding of years of education at 13 years (see *Data* and *Variables* sections).

Third, Models 4 and 5 include the interactions between parental ages and parental education. Therefore, these models allow us to test whether the associations between parental ages and child education vary by parental education. Indeed, we find that in all three countries, the associations vary by parental education. In the United States, each 1-year increase in maternal (paternal) age is associated with a 0.05 (0.05) year increase in children's years of education among the offspring of parents with low education. In families with highly educated parents, these associations are reduced to half. On average, a 1-year increase in maternal (or paternal) age is associated with a 0.05–0.02 = 0.03 (or 0.05–0.02 = 0.03) standard deviation increase in years of education among children with highly educated parents. This means that the associations between parental ages and child education are approximately twice as large in families with low educated parents than in families with highly educated parents in the United States. The difference is statistically insignificant in the regression table, but statistically significant differences are observed in the predicted probabilities reported below.

These findings are also observed for the other two countries included in our analysis. According to the results for Germany, the interactions between parental ages and parental education are negative and similar in size to those in the United States. In Norway, the size of the interactions between parental ages and parental education is the same as that in the United States. Consequently, for both maternal and paternal ages in Norway, the associations between parental ages and children's education are virtually zero for highly educated mothers and fathers. This finding suggests that the demographic behavior of parents postponing birth to a later age is beneficial only for children from socioeconomically disadvantaged families, but not for children from socioeconomically advantaged families in Norway.

On the basis of the last two sets of regression models, we visually demonstrate how the relation between maternal (or paternal) ages and the child education varies by parental education.

Figure 2 shows the predicted years of education by parental education and its variation by maternal age. In the United States, the number of years of education increases by maternal age for children whose parents have lower and higher education. However, the increase is larger for children whose parents have lower education. Consequently, educational mobility increases with increasing maternal age. The gap in years of education by parental education is largest at the parental age of 15 and vanishes up to age 35, an age at which the differences in

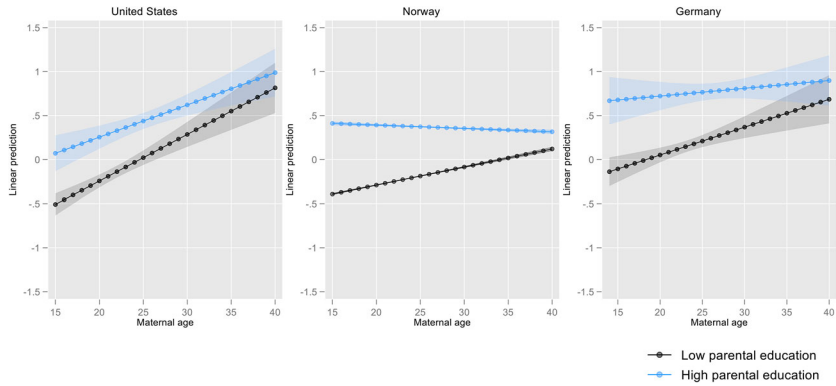

Figure 2. Association between maternal age and children's educational attainment (years of education) by parental education.

years of education by parental education is no longer statistically significant.

The pattern in Germany is very similar to that in the United States. In Norway, the variation in children's years of education by maternal age is even slightly negative (although substantively small) among children with highly educated parents. Because of the increasing educational attainment with increasing maternal age among children whose parents have lower education, the gap in years of education by parental education in Norway also decreases with increasing maternal age. However, even around a maternal age of 40, a small, statistically significant difference remains.[11]

Figure 3 shows the predicted number of years of education (expressed as z-scores) by parental education and its variation by paternal age. The results are very similar to those for maternal age. Therefore, we preliminarily conclude that children from socioeconomically advantaged families might have less of an advantage according to their parents' ages at the time of childbirth than has often been assumed. These children are more likely to have older parents (Table 2), but they experience a smaller increase in their education if they are born to older parents (Table 3, models 4 and 5). This result, which is line with earlier results comparing siblings to one another in Germany (Grätz 2018), casts doubt on the idea that parental ages explain a substantial part of the intergenerational transmission of education. However, this idea is properly

[11]Estimates in Norway are much more precise than those in the other countries, owing to the use of register data.

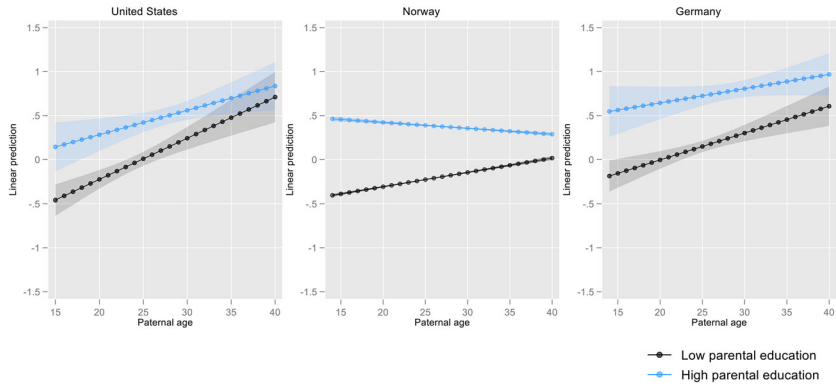

Figure 3. Association between paternal age and children's educational attainment (years of education) by parental education.

tested only in the counterfactual scenarios reported in the next and final step in the analysis.

The contribution of parental ages to the gap in educational attainment by parental education

On the basis of the results reported in the previous section, the extent to which parental ages contribute to the intergenerational transmission of advantage remains an open question. The analysis reported in this section tests and quantifies this contribution. For this purpose, we use Blinder–Oaxaca decompositions to estimate the intergenerational transmission of education in two counterfactual scenarios.

Figure 4 presents the results of these decomposition analyses. We compare the actual difference (adjusted for gender, family size, race, and parental nationality, as in the models reported in Table 4) in the children's years of education between families with parents with low and high education to two counterfactual scenarios. In the first counterfactual scenario, the maternal (or paternal) age is decreased in the group of children with highly educated parents to the average maternal (or paternal) age in the group of children whose parents have low education levels. The second counterfactual scenario increases the parental ages among children whose parents have low education levels to the higher average parental age found among children with highly educated parents.[12]

For each country, the first three bars in Figure 4, which examine maternal age, reveal differences between the counterfactual scenarios,

[12]The full results of the decompositions are shown in Tables S1 and S2 in the *Online Supplement*.

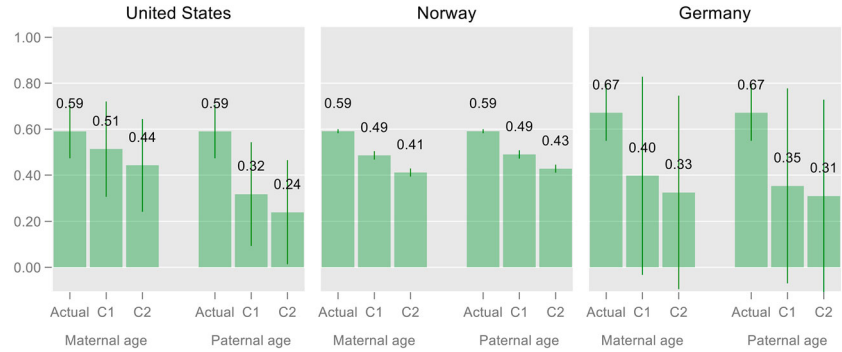

Figure 4. Actual and counterfactual estimates of the gap in children's educational attainment (years of education) between children with low and children with highly educated parents.

Note: Counterfactual 1 (C1): Maternal/ Paternal age fixed at the country-specific average value of the low educated parents. Counterfactual 2 (C2): Maternal/ Paternal age fixed at the country-specific average value of the highly educated parents.

in line with the interaction between parental ages and parental education reported in Table 4. In the United States, we observe a 0.59 standard deviation gap in children's years of education between children with lower and higher parental education. In the first counterfactual scenario, which fixes maternal age at the level observed among children whose parents have lower education, the association is reduced to 0.51 standard deviations. That is, in the hypothetical situation in which children from socioeconomically advantaged families are born to parents at the same earlier age as the parents of children from socioeconomically disadvantaged families, the intergenerational transmission of education would be reduced by 13.6%. In the second counterfactual scenario, children whose parents have lower education levels are born at the higher ages of children whose parents have higher education levels. This scenario reduces the intergenerational transmission of education to 0.44, which corresponds to a reduction by 25.4%. That is, intergenerational persistence would be reduced by around 12 percentage points more if children from socioeconomically disadvantaged families were born later than if children from socioeconomically advantaged families were born earlier.

This central finding is similar in both Germany and Norway. In Germany, the intergenerational transmission of education would be reduced by 40.3% (1–0.40/0.67) in the first counterfactual scenario and by 50.7% (1–0.33/0.67) in the second counterfactual scenario. In Norway, the first counterfactual scenario would reduce the intergenerational transmission of education from 0.59 to 0.49 (16.9%). However,

in the second counterfactual scenario, even in Norway educational persistence would be reduced by 30.5% (1–0.41/0.59).

For each country, the three next bars in Figure 4 estimate the contribution of paternal ages to the intergenerational transmission of education. Qualitatively, the findings are the same as regarding maternal age. In the United States, postponing the paternal age at the time of birth of the first child among the families with lower education reduces the intergenerational transmission of education more than postponing the maternal age. In contrast, in both Germany and Norway, the contribution of maternal ages to the intergenerational transmission of education is largely the same as the contribution of paternal ages.

In terms of cross-country differences, we conclude that, the diverging destinies are pronounced in all three countries. Contrary to our expectations we did not find the contributions of parental ages to the intergenerational transmission of education to be larger in the United States than in Germany and Norway. Qualitatively similar findings are observed in Norway, Germany, and the United States. Therefore, diverging destinies are a more general phenomena.

Discussion and conclusion

Parental demographic behavior can affect the intergenerational transmission of education. Previous studies estimated the contributions of childlessness and family size to this process (Breen and Ermisch 2017; Hillmert 2015, 2013; Lawrence and Breen 2016; Maralani 2013; Skopek and Leopold 2020). In addition, previous research investigated the contribution of family structure to the intergenerational transmission of education. Bernardi and Boertien (2017) found that the role of family structure was negligible in four countries (United States, United Kingdom, Italy, and Germany). The present study tests and quantifies the contribution of parental ages to educational mobility at the level of secondary education in Germany, Norway, and the United States.

McLanahan (2004) predicted that increasing socioeconomic differences in parental ages would increase the intergenerational transmission of education. Our findings redefine the prediction of the diverging destinies hypothesis in terms of parental ages in Germany, Norway, and the United States. Our findings show that the educational attainment of children from socioeconomically advantaged families either do not vary (in Norway) or vary only slightly (in the United States and in Germany) by parental ages. However, the educational attainment of children from

socioeconomically disadvantaged families increases with higher parental ages. As a consequence, educational mobility is reduced at higher parental ages but not due to the increase in parental age in socioeconomically advantaged families. Instead, children from socioeconomically disadvantaged families stand to profit more if their parents postpone their first birth. An increase in parental ages among disadvantaged families would increase educational mobility to a greater extent than a decrease in parental ages among advantaged families.

A consequence of these findings is that the increased accumulation of resources with higher ages in lower educated families is more important for their children's educational attainment at the secondary education level than the increased accumulation of resources with higher ages in highly educated families. This finding is in line with a reasoning, according to which only a certain amount of resources is needed for the completion of upper secondary education. Lower educated parents can accumulate the necessary resources with increasing age but the additional resource accumulation in higher educated families has no added beneficial effect.

A possibility that we are unable to investigate in the present study is that the contribution of parental ages to the gaps in educational attainment by parental resources might vary across time periods. One reason why this might be the case is that educational expansion varies across time. Results from family fixed effects models (Barclay and Myrskylä 2016) have suggested that the effects of parental ages on child education are mainly driven by period effects. Thus, a stronger contribution of parental ages to the intergenerational transmission of education would be expected if educational expansion occurs between the birth of children, so that children from younger mothers would be less affected by educational expansion than children from older mothers. To test this prediction, further research could use a cross-cohort approach to assess variation in the contribution of parental ages to the intergenerational transmission of education across cohorts.

The results reported in this study are descriptive and cannot be used to make inferences about causality. However, previous research found that positive effects of higher maternal ages on child education do persist in family fixed effects models (Barclay and Myrskylä 2016; Duncan *et al.* 2018; Grätz 2018; Kalmijn and Kraaykamp 2005). For that reason, the estimates obtained in the present study may be due to causal effects of parental ages on children. Nevertheless, further investigating the effects of parental ages on the intergenerational transmission of education by using causal identification strategies is needed.

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References

Addo, F. R., Sassler, S. and Williams, K. (2016) 'Reexamining the association of maternal age and marital status at first birth with youth educational attainment', *Journal of Marriage and Family* 78: 1252–68.

Augustine, J., Prickett, K. C., Kendig, S. and Crosnoe, R. (2015) 'Maternal education and the link between birth timing and children's school readiness', *Social Science Quarterly* 96: 970–84.

Barclay, K. J. and Myrskylä, M. (2016) 'Advanced maternal age and offspring outcomes: Reproductive aging and counterbalancing period trends', *Population and Development Review* 42: 69–94.

Behrman, J. R. and Rosenzweig, M. R. (2004) 'Returns to birthweight', *Review of Economics and Statistics* 86: 586–601.

Bernardi, F. and Boertien, D. (2017) 'Non-Intact families and diverging educational destinies: A decomposition analysis for Germany, Italy, the United Kingdom and the United States', *Social Science Research* 63: 181–91.

Bernardi, F. and Comolli, C. L. (2019) 'Parental separation and children's educational attainment: heterogeneity and rare and common educational outcomes', *Journal of Family Research* 31: 3–26.

Black, S. E. and Devereux, P. J. (2011) "Recent developments in intergenerational mobility", 1487–541 in *Handbook of Labor Economics*, edited by O. Ashenfelter & D. Card. Amsterdam: Elsevier.

Black, S. E., Devereux, P. J. and Salvanes, K. G. (2007) 'From the cradle to the labor market? The effect of birth weight on adult outcomes', *Quarterly Journal of Economics* 120: 669–700.

Blinder, A. S. (1973) 'Wage discrimination: reduced form and structural estimates', *The Journal of Human Resources* 8: 436–55.

Bornstein, M. H., Putnick, D. L., Suwalsky, J. T. D. and Gini, M. (2006) 'Maternal chronological age, prenatal and perinatal history, social support, and parenting of infants', *Child Development* 77: 875–92.

Breen, R. and Ermisch, J. (2017) 'Educational reproduction in Great Britain: A prospective approach', *European Sociological Review* 33: 590–603.

Breen, R. and Jonsson, J. O. (2005) 'Inequality of opportunity in comparative perspective: Recent research on educational attainment and social mobility', *Annual Review of Sociology* 31: 223–43.

Breen, R., Luijkx, R., Müller, W. and Pollak, R. (2009) 'Nonpersistent inequality in educational attainment: evidence from eight European countries', *American Journal of Sociology* 114: 1475–521.

Brooks-Gunn, J. and Furstenberg Jr, F. F. (1986) "The children of adolescent mothers: Physical, academic, and psychological outcomes", *Developmental Review* 6:224–51.

Cohen, P. N. (2014) "Parental age and cognitive disability among children in the United States", *Sociological Science* 1:102–10.

Conger, R. D., McCarty, J. A., Yang, R. K., Lahey, B. B. and Burgess, R. L. (1984) 'Mother's age as a predictor of observed maternal behavior in three independent samples of families', *Journal of Marriage and the Family* 46: 411–24.

Conley, D. and Bennett, N. G. (2000) 'Is biology destiny? Birth weight and life chances', *American Sociological Review* 65: 458–67.

Duncan, G. J., Kalil, A. and Ziol-Guest, K. M. (2017) 'Increasing inequality in parent incomes and children's schooling', *Demography* 54: 1603–26.

Duncan, G. J., Lee, K. T. H., Rosales-Rueda, M. and Kalil, A. (2018) 'Maternal age and child development', *Demography* 55: 2229–55.

Esping-Andersen, G. (1990) *Three Worlds of Welfare Capitalism*. Cambridge: Cambridge University Press.

Fergusson, D. M. and Woodward, L. J. (1999) 'Maternal age and educational and psychosocial outcomes in early adulthood', *Journal of Child Psychology and Psychiatry* 40: 479–89.

Fishman, S. H. and Min, S. (2018) 'Maternal age and offspring's educational attainment', *Journal of Marriage and Family* 80: 853–70.

Geronimus, A. T., Korenmann, S. and Hillemeier, M. M. (1994) 'Does young maternal age adversely affect child development? evidence from cousin comparisons in the United States', *Population and Development Review* 20: 585–609.

Goebel, J., Grabka, M., Liebig, S., Kroh, M., Richter, D., Schröder, C. and Schupp, J. (2018) 'The German socio-economic panel (SOEP)', *Journal of Economics and Statistics*. doi: 10.1515/jbnst-2018-0022.

Goisis, A., Remes, H., Barclay, K. J., Martikainen, P. and Myrskylä, M. (2017) 'Advanced maternal age and the risk of low birth weight and preterm delivery: A within-family analysis using Finnish population registers', *American Journal of Epidemiology* 186: 1219–26.

Grätz, M. (2018) 'Competition in the family: Inequality between siblings and the intergenerational transmission of educational advantage', *Sociological Science* 5: 246–69.

Grätz, M. (2023) 'The effects of female education on child education: Evidence from four educational reforms in Europe', *European Societies*. doi: 10.1080/14616696.2023.2275591.

Grätz, M., Barclay, K. J., Wiborg, ØN, Lyngstad, T. H., Karhula, A., Erola, J., Präg, P., Laidley, T. and Conley, D. (2021) 'Sibling similarity in education across and within societies', *Demography* 58: 1011–37.

Härkönen, J. (2014) 'Birth order effects on educational attainment and educational transitions in west Germany', *European Sociological Review* 30: 166–79.

Hillmert, S. (2013) 'Analysing intergenerational transmissions: From social mobility to social reproduction', *Comparative Social Research* 30: 131–57.

Hillmert, S. (2015) 'Changing structures of opportunity: A life-course perspective on social mobility and Reproduction', *European Sociological Review* 31: 184–96.

Jacobsen, B., Ladfors, L. and Milsom, I. (2004) 'Advanced maternal age and adverse perinatal outcome', *Obstetrics & Gynecology* 104: 727–33.

Jann, B. (2008) 'The blinder-oaxaca decomposition for linear regression models', *The Stata Journal: Promoting Communications on Statistics and Stata* 8: 453–78.

Kalmijn, M. and Kraaykamp, G. (2005) 'Late or later? A sibling analysis of the effect of maternal age on children's schooling', *Social Science Research* 34: 634–50.

Keiding, N. and Andersen, P. K. (2016) 'Linear effects of maternal age and period trends cannot be distinguished', *Population and Development Review*. doi: 10.1111/padr.12025.

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R. and Walters, E. E. (2005) 'Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the national comorbidity survey replication', *Archives of General Psychiatry* 62: 593–602.

Khoshnood, B., Wall, S. and Lee, K.-S. (2005) 'Risk of low birth weight associated with advanced maternal age among four ethnic groups in the United States', *Maternal and Child Health Journal* 9: 3–9.

Kravdal, Ø. (2019) 'Taking birth year into account when analysing effects of maternal age on child health and other outcomes: The value of a multilevel-multiprocess model compared to a sibling model', *Demographic Research* 40: 1249–90.

Kye, B. and Mare, R. D. (2012) 'Intergenerational effects of shifts in women's educational distribution in South Korea: transmission, differential fertility, and assortative mating', *Social Science Research* 41: 1495–514.

Lawrence, M. and Breen, R. (2016) 'And their children after them? The effect of college on educational reproduction.', *American Journal of Sociology* 122: 532–72.

Leigh, A. and Gong, X. (2010) 'Does maternal age affect children's test scores?', *Australian Economic Review* 43: 12–27.

Lesthaeghe, R. (2010) 'The unfolding story of the second demographic transition', *Population and Development Review* 36: 211–51.
Levine, J. A., Emery, C. R. and Pollack, H. (2007) 'The well-being of children born to teen mothers', *Journal of Marriage and Family* 69: 105–22.
Levine, J. A., Pollack, H. and Comfort, M. E. (2001) 'Academic and behavioral outcomes among the children of young mothers', *Journal of Marriage and Family* 63: 355–69.
Maralani, V. (2013) 'The demography of social mobility: black-white differences in the process of educational reproduction', *American Journal of Sociology* 118: 1509–58.
Mare, R. D. (1997) 'Differential fertility, intergenerational educational mobility, and racial inequality', *Social Science Research* 26: 263–91.
Mare, R. D. (2011) 'A multigenerational view of inequality', *Demography* 48: 1–23.
Mare, R. D. and Maralani, V. (2006) 'The intergenerational effects of changes in women's educational attainments', *American Sociological Review* 71: 542–64.
Mare, R. D. and Tzeng, M.-S. (1989) 'Fathers' ages and the social stratification of sons', *American Journal of Sociology* 95: 108–31.
Martin, S. P. (2004) "Women's education and family timing: outcomes and trends associated with Age at marriage and first birth", in K. M. Neckerman (ed.), *Social Inequality*, New York: Russel Sage Foundation, pp. 79–119.
McLanahan, S. S. (2004) 'Diverging destinies: How children are faring under the second demographic transition', *Demography* 41: 607–27.
Mills, M., Rindfuss, R. R., McDonald, P. and te Velde, E. (2011) 'Why Do people postpone parenthood? Reasons and social policy incentives', *Human Reproduction Update* 17: 848–60.
Oaxaca, R. (1973) 'Male-Female wage differentials in urban labor markets', *International Economic Review* 14: 693–709.
Powell, B., Steelman, L. C. and Carini, R. M. (2006) 'Advancing age, advantaged youth: parental age and the transmission of resources to children', *Social Forces* 84: 1359–90.
Skopek, J. and Leopold, T. (2020) 'Educational reproduction in Germany: A prospective study based on retrospective data', *Demography* 57: 1241–70.
Song, X. and Mare, R. D. (2015) 'Prospective versus retrospective approaches to the study of intergenerational social Mobility', *Sociological Methods & Research* 44: 555–84.
Thomson, E., Lappegård, T., Carlson, M., Evans, A. and Gray, E. (2014) 'Childbearing across partnerships in Australia, the United States, Norway, and Sweden', *Demography* 51: 485–508.
Torche, F. (2015) 'Intergenerational mobility and equality of opportunity', *European Journal of Sociology* 56: 343–71.
Turley, R. N. L. (2003) 'Are children of young mothers disadvantaged because of their mother's age or family background?', *Child Development* 74: 465–74.
Zajonc, R. B. and Markus, G. B. (1975) 'Birth order and intellectual development', *Psychological Review* 82: 74–88.