Does family background influence educational differences in Finnish women's completed fertility?

Jessica Nisén[1], Mikko Myrskylä[2], Karri Silventoinen[1], Pekka Martikainen[1]
[1] University of Helsinki, Department of Social Research
[2] Max Planck Institute for Demographic Research
Correspondence to: jessica nisen(at)helsinki.fi

The role of family background for women's educational differences in fertility has been discussed but still remains unclear. Preferences towards having children, educational attainment, and occupational career may be influenced by characteristics that are clustered in the families of origin. This study explored the role of family background for educational level differences in Finnish women's completed fertility. The data consisted of 35,222 women born in 1940–1950 who were living in households sampled (10%) from the Finnish Census of Population in 1950 with an extensive register follow-up until 2009. Adjustment of measured socio-demographic family background characteristics and family fixed effects were employed to study the effect of family background on the association between educational level and the completed number of children. Having any children and the number of children beyond the first one were analyzed as secondary outcomes. Analysis methods were Poisson and logistic regression. The level of education was categorized as basic, lower secondary, upper secondary, and tertiary level of education. As expected a negative association between the level of education and the completed number of children was found: year of birth - adjusted relative risk (RR) with 95% confidence interval (CI) of the tertiary educated was 0.89 95%CI 0.87–0.91 as compared to the basic educated. Adjusting for parental education and occupational status of the family head moderately attenuated the association (tertiary educated: RR 0.91 95%CI 0.89–0.94). In the fixed effects model no statistically significant association between the two variables was found (tertiary educated: RR 0.98 95%CI 0.92–1.05), but the sample selection in the analysis called for cautiousness of interpretation. All in all family background seemed to have a moderate contribution to educational differences in Finnish women's completed fertility, the larger part of the association being caused by other reasons than family background.

INTRODUCTION

For several decades education has been viewed as one of the central determinants of variation in women's fertility behavior and has also been understood to be related to changes in cohort fertility behavior (Andersson et al., 2009; Kravdal & Rindfuss, 2008; Rindfuss, Morgan, & Offutt, 1996). Higher education in Western countries is typically modestly related to lower completed fertility (Andersson et al., 2009; Fieder & Huber, 2007; Hoem et al., 2006b; Kravdal & Rindfuss, 2008; Nettle & Pollet, 2008; Rindfuss et al., 1996; Rønsen & Skrede, 2010; Toulemon & Lapierre-Adamcyk, 2000; Weeden et al., 2006). A key question related to any association found between educational level and fertility is whether this association is because of a causal impact of one variable on another (Gustafsson & Kalwij, 2006). The alternative explanation to causality between the two variables is that educational level and fertility may be to some extent jointly determined (Billari & Philipov, 2004; Martin-García & Baizán, 2006; Skirbekk, Kohler, & Prskawetz, 2006; Tavares, 2010; Upchurch, Lillard, & Panis, 2002). A possible source for any selective mechanism is the family background (Axinn, Clarkberg, & Thornton, 1996; Miller 1992; 1994; Rijken & Liefbroer, 2009; Thornton 1980). It is often argued there would be some third factors, like preferences towards family life, that precede both educational level and fertility or evolve during the life course including steps in educational and family careers and that these are likely to be related to the determination of educational and fertility outcomes to some extent (Billari & Philipov, 2004; Hakim, 2000; Hoem, Neyer, & Andersson, 2006a, 2006b; Kravdal, 2001, 2007; Kreyenfeld, 2002; Morgan & Rindfuss, 1999; Tavares, 2010). However the nature and importance of these factors are not well understood. Naturally, selective and causal processes can to some extent take place simultaneously and are not mutually exclusive ways to explain educational differences in fertility. This study aims to analyze the role of family background selection for women's educational differences in completed fertility.

THEORETICAL FRAMEWORK

Educational differences in fertility can be theorized to be formed through causal and selective mechanisms in the life course (Billari & Philipov, 2004; Hoem et al., 2006a, 2006b; Lappegård & Rønsen, 2005; Martín-García & Baizán, 2006). Women's preferences, the institutional setting of the educational system and working life conditions all influence

educational and fertility outcomes (Hoem et al., 2006a, 2006b). Causal mechanisms include those of education on fertility and vice versa.

The first line of arguments emphasizes the influence of education on fertility. This influence is most likely to consist of several aspects (Lappegård & Rønsen, 2005). First, fertility is known to be low during educational enrolment (Blossfeld & Huinink, 1991; Hoem, 1986; Lappegård & Rønsen, 2005). This may be because of role incompatibility because studying and parenting are both time-consuming activities. Also lack of financial resources and social norms discouraging parenting while studying may contribute to lower fertility during enrolment. However, longer enrollment can then lead to lower fertility through postponement of family formation (Hagestad & Call, 2007; Keizer, Dykstra, & Jansen, 2008; Rindfuss & Bumpass, 1976). This is because women face biological age constraints to their fecundity, but also social norms concerning the right timing of having children may influence fertility decisions. Second, the microeconomic argument is to predict negative effect of educational level on fertility because of higher opportunity costs of having children for the more highly educated. The counter prediction is that of higher fertility following higher education because of higher actual and/or potential earnings and thus an income effect. These two effects are likely to be gender-specific, with traditionally the former being more important for women (Becker, 1991; Gustafsson, 2001; Liefbroer & Corijn, 1999). However, due to the social change towards more equal gender roles in Nordic countries women's economic assets (income effect) may have gained more importance for family formation in recent decades (Jalovaara, 2010; Oppenheimer & Lew, 1995). In addition, the economic theory has suggested there to exist a tradeoff between the quantity and quality of children, thereby contributing to the lower fertility of the highly educated (Becker, 1981; Becker & Lewis, 1973).

At the same time, any effect found at the individual level can be influenced by the characteristics of the partner (Kreyenfeld, 2002). People are known to mate assortatively by educational level, and this is obviously critical with respect to fertility outcomes (Kravdal & Rindfuss, 2008; Oppenheimer, 1988; Schwarz & Mare, 2005). In addition to these, a sociological explanation for the effect of education on fertility is offered by the effect of educational attainment on life values and orientation. Loosening of traditional norms and the trend towards individualism may encourage the seeking of fulfillment in life without children

(Lestaeghe, 1983; van de Kaa, 1996). Also the use of contraceptives differs according to educational category and may thus contribute to fertility differences as a proximate mechanism or as a cause itself (Kravdal, 2007; Kravdal & Rindfuss, 2008).

The second line of arguments on the causal relationship between educational level and fertility is concerned with influence of childbearing on educational outcomes (Hofferth, Reid, & Mott, 2001; Hoffman, Foster, & Furstenberg, 1993; McElroy, 1996; Morgan & Rindfuss, 1999). Having children may have a negative influence on educational outcomes in particular because both parenting and studying are time-consuming and thus potentially competing activities. As compared to men, women's biological and social role in childbearing and early childrearing is more likely to have a negative influence on their education (Dearden, Hale, & Woolley, 1995; Woodward, Fergusson, & Horwood, 2006). Early timing of fertility may also affect aspirations for further fertility though human and other capital accumulation: if childbirth at young age inhibits the mother from further educational or occupational career this may make continuing concentration on family life more rewarding relative to other possibilities in life (Morgan & Rindfuss, 1999).

Next we turn to possible selective mechanism for educational differences in completed fertility. It has been argued that interaction between genetic predispositions and characteristics of the social environment in childhood and youth would produce (variation in) motivation for having children (Miller, 1992, 1994). It has been proposed too that since the availability of effective contraceptives in Western countries some rather stable preferences of women would influence their choices in family and working life (Hakim, 2000). However, others have emphasized that this kind of preferences are likely to be influenced by various social contexts such as educational systems during the life course (Hoem et al., 2006a; Surkyn & Lesthaeghe, 2004). Previous studies stated that educational choices in women are unlikely to be fully exogenous to fertility decisions, that is independent of decisions concerning fertility, although the former would precede the latter (Billari & Philipov, 2004; Kravdal, 2001, 2007; Kreyenfeld, 2002; Martin-García & Baizan, 2006; Tavares, 2010; Upchurch et al., 2002), and again that lower average educational outcomes of very early mothers are unlikely to reflect only causal effects of motherhood on education (e.g. Geronimus & Korenman, 1992; Hofferth et al., 2001; Hoffman et al., 1993).

Family background serves as a source for the preferences that individuals have for their family life and educational choices because these preferences may be guided by factors that are clustered in the families of origin (Axinn et al., 1996; Miller, 1992, 1994; Thornton, 1980). Growing in a large family may influence one's way of thinking towards opting for a large family oneself (Murphy & Knudsen, 2002; Pouta, Järvelin, Hemminki, Sovio, & Hartikainen, 2005). Also mothers' fertility preferences have been linked to their children's fertility preferences (Axinn et al., 1996). Area of residence in childhood and youth and parental educational level and social class can be viewed as indicators of the wider social and cultural grouping of the family. In families with higher parental socioeconomic status life goals other than family building, such as having a career, might be emphasized (Rijken & Liefbroer, 2009; Scott, 2004). Children living in urban areas are more likely to be under the influence of less traditional lifestyles which may influence preferences towards a smaller family size and prolonged education (Lestaeghe, 1983). Material resources of the family of origin again may influence one's consumption aspirations which may lead to striving for better economic standing though further education before or instead of having children (Easterlin, 1966; Thornton, 1980). At the same time, some genetic mechanisms may be involved, e.g. number of siblings may partly reflect genetic predispositions towards fertility or parental educational level cognitive or other partly genetically determined characteristics (Kohler, Rodgers, & Christensen, 1999; Rodgers et al., 2008).

All in all, the potential mechanisms that transmit influences of the family background on second generation fertility are likely to be complex and not necessarily grasped by only the concept of preferences (Kravdal, 2007; Thornton, 1980). Any selection mechanism to educational differences in fertility can operate also regardless of any preferences for childbearing e.g. though unplanned pregnancy because of poor contraceptive use or unwished childlessness because of lack of a partner or. The causality between fertility and partnership formation is however problematic as the latter is not independent of the former (Rindfuss et al., 1996). Further, completed fertility is a consequence of several sequential steps taken during the life course, but choices done earlier in life have consequences for later transitions (Elder, 1992; Kravdal, 2001). Transition to motherhood at an older age is associated with lower completed fertility which to some extent may reflect preferences on childbearing (Andersson et al., 2009). Any selective mechanism on educational differences in completed fertility may operate partly through earlier transitions which have spill-over effects on later

transitions (Kravdal, 2001; Kreyenfeld, 2002; Morgan & Rindfuss, 1999). For example, having the first child at relatively old age may make it more difficult for women to have further children although "late starters" are likely to accelerate their later transitions as compared to "early starters" (Andersson et al., 2009; Rindfuss & Bumpass, 1976).

ANALYTICAL APPROACH AND RESEARCH QUESTIONS

In this study we aim to analyze how educational level differentiates women's completed fertility in Finnish cohorts born between 1940 and 1950. Previous Scandinavian studies report a modest negative association between educational level and completed fertility but also changing cohort fertility patterns: differences in women's completed fertility by educational level have decreased in cohorts born around the mid 20th century (Andersson et al., 2009; Kravdal & Rindfuss, 2008; Rønsen & Skrede, 2010). Our main interest, however, lay beyond the associations in looking at how potential differences by educational level are influenced by family background by asking the following questions:

1. How strongly are differences in women's completed fertility by educational level influenced by family background?

2. Do socio-demographic family background characteristics explain these differences?

The study is based on a large sample of households drawn from the Census of Population in Finland in 1950 with extensive follow-up from which siblings belonging to the same families of origin can be identified (Statistics Finland, 1997). We used family fixed effects regression in looking at whether associations found in the whole sample of women were found also within families that is here within female sibling groups. The fixed effects analysis was an attempt to control for all the characteristics that are shared by sisters, this referring to social family environment and partly to genetic make-up. The method of analysis has been previously employed in fertility research in the analysis of young age parenthood and educational outcomes (e.g. Geronimus & Korenman, 1992; Hofferth et al., 2001; Hoffman et al., 1993). In addition to the family fixed effects models we ran parallel conventional regression models including measured socio-demographic family characteristics to see whether these explained some of the associations. We analyzed the total completed number of children as the main outcome variable. However, as the life course processes that lead to having the first child are likely to be somewhat different from those of having any subsequent

children in relation to educational level (Kravdal, 2001, 2007; Kreyenfeld, 2002; Lappegård & Rønsen, 2005), we also analyzed two secondary fertility outcomes: having any children and the number of children beyond the first one.

METHOD

Study participants and measurement of fertility

The data was based on a 10% sample of households drawn from the 1950 Finnish Census of Population (Statistics Finland, 1997). Information on persons who belonged to the sampled households had subsequently been linked to information from population censuses in 1970 to 1995 and other registers. The original data consisted of 411,628 persons of whom 91,452 were born between 1940 and 1950 and were living in a one or two parent family at the time of the census in 1950. Of these persons 44,671 were women. Respondents with unknown information on family background variables or own education in the age of 30–34 (n=8,402) were left out of the study sample. Of these further those not present in the population census in the age of 45–49 (n=1,047). Loss to follow-up was mainly due to emigration from Finland to other countries (e.g. to Sweden in the late 1960s and early 1970s) and to less extent for mortality that took place between the year 1950 and 1990/1995. This left us with a final sample of 35,222 women.

Information on live births was linked to the data via personal identification numbers given to all Finnish citizens in the beginning of the 1970's. Practically all children who were born prior to this but still living with their parents were registered. The original fertility information consisted of links to both biological and adopted children, but here we took into account only the biological links in order to measure the number of biological children born to the study participants. However, this left out only very few mother-child links: 0,01 children in total fertility. The share of mothers was reduced by 0,5 %-points when categorizing women with only adopted children as childless. This study operated with three fertility measures (Table 1). The main outcome variable was the number of children. Having any children (versus no children) and number of children beyond the first one were treated as secondary outcome variables. The study was based on measures of completed fertility: the study participants were in the age of 59 or older at the end of the follow-up in 2009.

Educational level and other explanatory variables

The main explanatory variable, level of education, was categorized into four classes: basic (9 years at maximum), lower secondary (approx. 10–11 years), upper secondary (approx. 12 years), and tertiary (approx. 13 years or more) level of education (Table 1). The basic level of education refers to a maximum of nine years of only general type of education. The lower secondary level of education refers to short vocational training (<3 years) accomplished in addition to general education. The upper secondary education refers to either general education (upper secondary graduates) or to a vocational training (≥3 years) accomplished in addition to general education. Tertiary level of education refers either to a university degree or to a vocational training taken at the highest level (including e.g. specialized nurses and elementary school teachers). The level of education was used as a categorical variable and the year of birth as a continuous variable in all analyses. Women belonging to the same families of origin were identified by identification code collected in 1950 for place of residence, household and family. The participants of this study sample came from altogether 26,214 families. We measured several socio-demographic characteristics of the family of origin (as categorical variables). The distributions of these variables are shown in Table 2.

Socioeconomic position of the family of origin included measures of parental education and occupational status. The educational level of father/mother was categorized as less than primary school, primary school, more than primary school, and no father/mother in the family. Occupational status of the family head was divided into categories of those in a professional/administrative position, workers, farmers with <10 hectares (100 a) of land, farmers with ≥10 hectares of land, and self-employed or other. Family type was categorized as two parents with children, mother and children, and father and children. Number of children in the family of origin was categorized as one, two, and three or more. Three variables measuring overall living conditions included house ownership (owner, renter, other or unknown), crowding (number of persons per heated rooms: <2, 2<3, 3<4, ≥4) and standard of living (poor, modest, good). For standard of living the category poor referred to a household with no modern facilities e.g. electrical light in the household, modest to a household with one item and good with at least two items. The language of the family of origin was categorized into Finnish and other, where the category other refers foremost to the Swedish-speaking minority in Finland. Area of living consisted of five geographical areas: Helsinki (capital) region, rest of Uusimaa (area surrounding capital region), Western Finland,

Eastern Finland and Northern Finland (in 1950 mainly agricultural areas). Family structure was measured by variables family type and number of children living in the household in 1950.

Statistical method

The approach of the study was to use the adjustment of measured family background characteristics and family fixed effects for making inference on the role of family clustering for the observed associations. The analysis strategy was following (see Table 3). We ran eight models for the main fertility outcome of which Models 1–5 used the whole sample of women (N=35,222) and Models 6–8 only the sample of women who were included in the fixed effects model (Model 8) (N=15,749). Model 1 included only the level of education (or other explanatory variable) and year of birth as covariates. Models 2–5 were nested by adding one or more of those family background covariates that were found to associate significantly ($p<0.05$ using the Wald test) with the number of children when year of birth and level of education where adjusted for. These variables included all measured family background covariates except the language and the type of the family of origin (results not shown but available on request). Model 6 included only the year of birth and level of education as covariates (compare to Model 1). Model 7 included in addition to these the measured family background covariates (compare to Model 5). Model 8 used the family fixed effect estimation to adjust for all those family characteristics that by default were shared by sisters coming from the same families of origin (adjusted additionally for year of birth). This analysis with eight models is then replicated (with the family background covariates found to associate with the completed number of children) for the secondary fertility outcomes, having any children and the number of children beyond the first one. The analysis method and sample used in Models 6-8 however vary between different fertility outcomes (see Tables 4 and 5).

Poisson regression analysis was used to model the main explanatory variable, the completed number of children. In Poisson regression the number of children is modeled as a count variable. The central assumption in this model that the mean of the outcome variable equals its variance was met for number of children and number of children beyond the first one (see Table 1). In the analysis on the secondary outcome variables logistic regression analysis (having any children) and Poisson regression analysis (number of children beyond the first one) were used. The family fixed effects versions of these models were calculated by

conditional likelihood method in order to measure associations based on variation only within families (same-sex sibling groups) (Allison, 2009). These models can be expressed as $log\ \lambda_{ij} = \mu_i + \beta \boldsymbol{x}_{ij} + \gamma \mathbf{z}_j + \alpha_j$ (Poisson) and $log\ (p_{ij}/1\text{-}p_{ij}) = \mu_i + \beta \boldsymbol{x}_{ij} + \gamma \mathbf{z}_j + \alpha_j$, (logistic) where *i* stands for an individual (family member) and *j* for a same-sex sibling group (family). In these models $\boldsymbol{x}$ stands for predictors varying within families, $\boldsymbol{z}$ for predictors varying between families (constant within families), and α for unobserved fixed effects. In conditional maximum likelihood estimation, the likelihood function of an individual is conditioned on the sum of the functions of individuals belonging to the same group. Thereby, $\boldsymbol{z}$ and α are not estimated. In all models clustering of siblings within families was taken into account in the calculation of confidence intervals. All confidence intervals (CI) were calculated by bootstrap procedure with non-parametric resampling (with 1,000 replications) (Carpenter & Bithell, 2000). Results from Poisson regression are reported as relative risks (RR) and those from logistic regression as odds ratios (OR). All statistical analyses were performed by Stata Version 10 (StataCorp, 2007).

RESULTS

Descriptive statistics of the study population are shown in Tables 1 and 2. The largest educational group was women with basic level of education: nearly half possessed only this type of education (46%). Over a quarter (27%) had reached lower secondary education, 15% upper secondary, and 12% tertiary level education. Vast majority (84%) had children. The mean number of children in total was 1.85 (variance 1.71). Among those with any children the mean number of children beyond the first one was 1.20 (variance 1.26). Descriptive statistics on the family background characteristics are shown in Table 2. The majority of women came from worker families (42%) and from families where parents had gained primary level education only (father: 87%; mother 92%). Vast majority of women came from families with two parents (93%) and over a half had more than two siblings (59%). Living in an owned flat (60%), living with less than three persons per one heated room (65%), and with a modest standard of living (46%) were typical for the families where these women came from. Vast majority (94%) came from Finnish speaking families and from Western or Eastern parts (83%, mainly countryside areas) of the country.

A modest negative association between a woman's educational level and her completed fertility is shown in Table 3 (Model 1). RR of the tertiary level educated was 0.89 (95%CI

0.87, 0.91) as compared to the basic level educated women. When parental education and occupational status of the family head were adjusted for the association was moderately reduced (Model 2): RR of the tertiary level educated women was 0.91 (95%CI 0.89, 0.94) as compared to the basic level educated women. Further adjustments had smaller if any effects on the association (Models 3–5). When all measured family background covariates were included in the model there was still a significant association (RR of the tertiary educated 0.92 with 95%CI 0.90, 0.95). Subsequent models in Table 3 used only the sample of women entering the fixed effects model (N=15,749). Model 6 shows the association adjusted for year of birth in this sample. It was clearly weaker than in the whole sample of women: RR of the tertiary level educated was 0.94 (95%CI 0.90, 0.98). Model 7 adjusted for measured family background characteristics in this sample: the association was further somewhat reduced (RR of the tertiary educated group 0.97 (95%CI 0.93, 1.02). Finally, in the fixed effects model adjusted additionally for year of birth there was no significant association between educational level and completed number of children: RR of the tertiary level educated group was 0.98 (95%CI 0.92, 1.05).

Table 4 reports the regression models for the one of the secondary fertility outcomes: having any children. Also here a negative, somewhat stronger than for the main fertility outcome, association was found between woman's level of education and her risk of having any children: age-adjusted OR of the tertiary level educated group was 0.59 (95%CI 0.55, 0.64) as compared to the basic level educated group (Model1). When adjusting for parental education and family socioeconomic status (Model 2) this association was weakly reduced: OR of the tertiary educated group was 0.63 (95%CI 0.58, 0.70). Further adjustments did not seem to have much effect on the association (Models 3–5). The association between educational level and having any children found in the restricted sample of women (N=4,494) adjusted only for year of birth was clearly weaker than the association found in the whole sample (Model 6 vs. Model 1): OR of the tertiary educated was 0.85 with 95%CI 0.72, 0.99. Adjusting for measured family background characteristics in this sample had a similar weakly attenuating effect as found in the whole sample (OR of the tertiary educated group 0.89 with 95%CI 0.76, 1.07), but the association after the adjustments was only marginally significant (Model 7). Finally, the association found in the fixed effects model adjusted additionally for the year of birth was according to the point estimates of similar magnitude as found in the

restricted sample with measured family background characteristics adjusted for although not statistically significant: OR of the tertiary educated group was 0.86 (95%CI 0.65, 1.09).

Table 5 reports the regression models for the other of the secondary fertility outcomes: number of children beyond the first one. Adjusted only for year of birth there was a relatively weak U-shaped association between the two variables (Model 1), with the upper secondary educated having the lowest number of children beyond the first one (RR 0.90 95%CI 0.87, 0.93). Adjusting for parental education and occupational status of the family head attenuated this weak association (Model 2), further adjustments hardly (Models 3–5). In the restricted sample there was an association attenuated compared to corresponding one in the whole sample (Model 6 vs. Model 1): RR of the upper secondary educated women was 0.94 (95%CI 0.94, 1.07). Adjustment for measured family background characteristics (Model 7) and for family fixed effects (Model 8) further reduced the small differences, and statistically significant differences were no longer found in the fixed effects model.

Some additional analyses were conducted (not shown but available on request). Most women (84%) married and among those who did not childlessness was common (67%). Adjusting for a binary variable indicating whether ever married attenuated but not fully explained the educational differences in completed number of children: RR of the tertiary educated was 0.91 (95%CI 0.89, 0.93) when adjusted for year of birth and marriage and 0.94 (95%CI 0.92, 0.96) when adjusted also for the measured family characteristics (upper secondary educated: 0.91 95% CI 0.89, 0.93 and 0.93 95%CI 0.91, 0.95; lower secondary educated: 0.95 95%CI 0.93, 0.96 and 0.95 95%CI 0.93, 0.97). Further, we run models with a sample of women excluding those who had their first child by the year of turning 19 (10.7% of mothers). In this subsample (N=32,064) the educational differences in completed fertility were smaller than in the whole sample: controlled for year of birth RR of the tertiary educated was 0.96 (95%CI 0.93, 0.98) as compared to the basic educated (upper and lower secondary educated 0.95 95%CI 0.93, 0.97 and 0.99 95%CI 0.97, 1.01, correspondingly). Adjustment for parental education and occupational status of the family head attenuated the differences also in this subsample: RR of the tertiary educated was 0.98 (95%CI 0.95, 1.01) and that of the upper and lower secondary educated 0.97 (95%CI 0.94, 0.99) and 0.99 95%CI 0.97, 1.01) respectively.

DISCUSSION

Interpretation of the main results

This study aimed to look at whether family background contributes to educational differences in women's completed fertility by using a large register data set drawn from the Finnish Census of Population in 1950 with an extensive follow-up. First we looked at the magnitude of this potential contribution mainly by using family fixed effects modeling (Question 1). Second we studied whether socio-demographic family background characteristics measured in the data set contributed to the association (Question 2). The measured characteristics included measures of parental educational level, family socioeconomic position, parental number of children and family type, and several indicators of overall living conditions.

As expected there was a modest negative association between a woman's educational level and her fertility: the tertiary educated women had approx. 11% less children than their basic educated peers. Slightly surprising was that there was no difference between the upper secondary educated and tertiary educated women in their level of completed fertility. This seemed to be influenced by that the lowest tertiary educated (vocational type of education) women with relatively high fertility compared to the university educated women were included in this category. The family fixed effects model for the number of children suggested that the selective mechanisms clustered in the families of origin would be relatively strong for the association found between women's educational level and completed fertility. This is because when looking at variation only within families (in the fixed effects analysis) a higher level of education was not found to associate with lower completed fertility as was found in the conventional regression analysis. However, especially the selection of the sample in the analysis as shown inhibits from drawing such strong conclusions to be generalized. Further, there was only modest attenuation of the estimates between the model in the selected sample adjusting for measured characteristics and for family fixed effects, whereas for the secondary fertility outcomes no consistent pattern in this respect could be interpreted. That is why our conclusion is that family background all in all moderately explained the association between educational level and completed fertility among Finnish women born in 1940–1950. Two previous twin studies have suggested considerable correlation between the variance in number of children and that in level of education caused by family background influences (Kohler, Behrman, & Schnittker 2010; Kohler & Rodgers,

2003). However, Kohler et al. (2010) have also pointed out that family background influences on education may in fact affect fertility through education itself. Then again two experimental study designs in the Scandinavian context have suggested that education would not causally affect the completed number of children (Monstad, Propper, & Salvanes, 2008; Skirbekk et al., 2006).

Parental education and socioeconomic position were the measured socio-demographic family background characteristics that were found to moderately (approx. by 20%) explain the association found. Adjusting for other measured covariates after these variables were taken into account had little if any effect on the association. These results are not very surprising in the light of previous research that with varying fertility outcomes and analysis methods tends to find an effect of education on fertility even after adjusting for some confounding factors such as the number of children in the family of origin, parental class position and level of urbanization in childhood (e.g. Kravdal & Rindfuss, 2008, 865; Lappegård & Rønsen, 2005; Liefbroer & Corijn, 1999; Tavares, 2010) or using a simultaneous modeling technique that allows for correlated unobserved heterogeneity terms of the two outcomes (Billari & Philipov, 2004; Martín-García & Baizán, 2006; Upchurch et al., 2002). Using joint hazard regression based modeling for first, second and third birth simultaneously Kravdal (2007) found adjustment of similar family background characteristics as measured in this study to modestly explain the effect of education on Norwegian women's fertility.

The analysis on the secondary fertility outcomes, having any children and the number of children beyond the first one, supported the interpretation of the main outcome variable. The level of education associated somewhat more strongly with having any children than with the number of children. Among mothers only there was a weak U-shaped association between educational level and the number of subsequent children with the upper secondary educated having the least children after the first one. Some attenuation was witnessed in the estimates when parental education and socioeconomic position were adjusted for. In the fixed effects models associations were not statistically significant but no consistent pattern of change was witnessed in the point estimates as compared to those in the subsample adjusted for measured characteristics.

Parental education and family socioeconomic position may have to some extent influenced women's educational differences in their childbearing behavior through parental

encouragement for educational and occupational achievements relative to other competing activities in life such as having children (Rijken & Liefbroer, 2009; Scott, 2004). Besides, parental economic resources available for the next generation may have enabled continued education and parental economic resources may have encouraged for further education because of consumption aspirations adopted in the parental family environment (Easterlin, 1966; Thornton, 1980). Through these mechanisms family background may have moderately contributed to the lower fertility of the higher educated women in this birth cohort.

Cohort fertility in Finland declined below the replacement level in the female birth cohorts born in the late 1930's and 1940's and the rising level of female education is viewed as one of the factors behind this change (Andersson et al., 2009). This study supports the interpretation that education would have rather causally than because of selection contributed to lower completed fertility of these women. This may be e.g. because longer time spent studying in early adulthood postponed family formation of some women and eventually led them to remain childless, or because childbearing at an early age inhibited others from studying as long or as intensively as their childless peers. An additional analysis suggested that (whatever the direction of causality) the early adult years played a critical role for the determination of educational differences even in women's completed fertility.

To smaller extent some characteristics that women coming from the same families of origin shared may have interacted with the changing social environment, including educational and occupational possibilities opened up in the society, to produce lower completed fertility of the higher educated (see also Skirbekk et al., 2006). Finland developed towards a Scandinavian welfare state country characterized by a high level of gender equality and generous state policies for families with children during the decades that women of the birth cohort under study got their children (Rønsen & Skrede, 2010). In such a welfare state context family background might actually have comparatively little effect on how women end up combining family, educational and occupational life challenges (Billari & Philipov, 2004).

Methodological considerations

The family fixed effects modeling relies on strong assumptions because sisters not only differ with respect to some genetic characteristics but also to life-cycle changes in the family environment (e.g. Holmlund, 2005; Kohler et al., 2010). This kind of characteristics introduce

heterogeneity among sisters that we were unfortunately not able to control for here. Birth order is one of the characteristics determined by family background but one that siblings differ with respect to. Previous studies have found birth order effects on educational outcomes (e.g. Black, Devereux, & Salvanes, 2005; de Haan, 2010) but not on completed number of children (Faurie, Russell, & Lummaa, 2009; Milne & Judge, 2009; Murphy & Knudsen, 2002). In the sample of this study being the eldest child in the household in 1950 (34% of women, without controlling for the number of siblings) was weakly negatively related to completed fertility (year of birth -adjusted RR 0.97 95%CI 0.95, 0.98). However, adjusting for this variable did not influence the estimates of the effect of education on completed number of children (results available on request). Then again similarity in sibling fertility behavior can be reinforced by interaction between siblings throughout life (Lyngstad & Prskawetz, 2010) but we leave this topic for further studies.

A caveat in the fixed effects analysis is that if only a small proportion of the total variation in the explanatory variable is found within families (vs. between families) this contributes to unreliability of the estimates of the analysis (Allison, 2009). In this study 29% of the total variation among the women with at least one female sibling (N=16,204) was found within families (between sisters). Thus we consider the fixed effects approach a feasible statistical tool here. One can further question on the generality of the estimates due to the selection of the estimation sample in the fixed effects analysis as compared to the conventional one especially with respect to the outcome of having any children. However, it can be argued that the subsamples (Models 6–8) included only the most heterogeneous sibling groups: similarity in sibling outcomes likely reflects family background influences on these outcomes as such. The issue of sample selection is also carefully considered in the interpretation of the results.

This study looked at a relatively old birth cohort: Finland in 1940’s was still a poor country recovering from the Second World War. Reflecting a wider development of the Finnish society, family environments have changed since, female educational level has risen and changes have been witnessed in cohort fertility (Andersson et al., 2009). Thus results of this study may not reflect the fertility behavior of later born cohorts in all aspects but when studying cohort fertility a time lag is unavoidable. Finally, we consider the study to have also several strengths. It is based on an internationally unique data set in its long follow-up, large size and rich content due to the Finnish registers and especially the Population Census

launched in 1950. Unique for such a long follow-up is also that the measured family background variables were not retrospective. The data included very few missing values and reporting bias is likely to be minimal. Lastly, except the study on monozygotic twins by Kohler et al. (2010), we are not aware of previous studies that would have applied family fixed effects modeling for educational differences in completed fertility.

Conclusions

The study aimed at analyzing the role of family background for educational differences in completed fertility among Finnish women born in 1940–1950. Based on this analysis family background moderately contributed to the pattern of higher educated women ending up with a smaller number of children on average in this birth cohort, with this contribution being mainly because of differences in parental socioeconomic position. The larger part of the association seemed to be caused by other reasons such as a causal relationship between education and fertility, for which the early adult years and the transition to motherhood most probably played a critical role.

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Table 1
Own characteristics: Descriptive Statistics (N = 35,222)

Variables	N	%
Level of education		
Basic	16,216	46.0
Lower secondary	9,431	26.8
Upper secondary	5,234	14.9
Tertiary	4,341	12.3
Having any children		
No	5,593	15.9
Yes	29,629	84.1
Variables	**M**	**Var**
Number of children	1.85	1.71
Number of children beyond the first one[a]	1.20	1.26

[a]Among mothers only

Table 2
Family background characteristics: Descriptive Statistics (N = 35,222)

Variables	N	%		N	%
Father's level of education			House ownership		
Less than primary school	7,540	21.4	Owner	21,043	59.7
Primary school	22,973	65.2	Renter	12,114	34.4
More than primary school	2,436	6.9	Other, unknown	2,065	5.90
No father in the family	2,273	6.5	Crowding (n of persons/heated room)		
Mother's level of education			<2	11,385	32.3
Less than primary school	6,730	19.1	2<3	11,572	32.9
Primary school	25,482	72.4	3<4	5,759	16.4
More than primary school	2,763	7.8	≥4	6,506	18.5
No mother in the family	247	0.7	Standard of living		
Occupational status of the family head			Poor	10,100	28.7
Professional/administrative	5,493	15.6	Modest	16,245	46.1
Workers	14,940	42.4	Good	8,877	25.2
Farmers with <10 hectares	8,911	25.3	Language		
Farmers with ≥10 hectares	2,728	7.8	Finnish	33,187	94.2
Self-employed, other, unknown	3,150	8.9	Other	2,035	5.8
Family type			Area of residence		
Two parents with children	32,702	92.9	Helsinki region	2,618	7.4
Mother and children	2,273	6.5	Rest of Uusimaa	2,050	5.8
Father and children	247	0.7	Western Finland	13,946	39.6
Number of children			Eastern Finland	15,097	42.9
1	5,202	14.8	Northern Finland	1,511	4.3
2	9,264	26.3			
3+	20,756	58.9			

Table 3
Number of children by level of education, Poisson regression (RR and 95% CI).

Model	1			2			3			4			5		
	RR	95%CI		RR	95%CI		RR	95%CI		RR	95%CI		RR	95%CI	
Level of education															
Basic (ref.)	1.00			1.00			1.00			1.00			1.00		
Lower secondary	0.95	0.93	0.96	0.95	0.93	0.96	0.95	0.93	0.97	0.95	0.93	0.97	0.95	0.93	0.97
Upper secondary	0.89	0.87	0.92	0.91	0.89	0.93	0.91	0.89	0.93	0.92	0.90	0.94	0.92	0.90	0.94
Tertiary	0.89	0.87	0.91	0.91	0.89	0.94	0.92	0.89	0.94	0.93	0.90	0.95	0.92	0.90	0.95
Father's level of education															
Less than primary school	1.00			1.00			1.00			1.00			1.00		
Primary school	0.94	0.92	0.96	0.97	0.95	0.99	0.98	0.95	1.00	0.99	0.97	1.01	0.99	0.97	1.02
More than primary school	0.89	0.86	0.92	0.98	0.94	1.03	0.99	0.94	1.03	1.01	0.96	1.06	1.02	0.97	1.07
No father in the family	0.94	0.91	0.97	0.96	0.93	1.00	0.98	0.95	1.02	0.99	0.96	1.03	0.99	0.96	1.03
Mother's level of education															
Less than primary school	1.00			1.00			1.00			1.00			1.00		
Primary school	0.95	0.93	0.97	0.98	0.96	1.01	0.98	0.96	1.01	0.99	0.97	1.02	1.00	0.97	1.02
More than primary school	0.89	0.86	0.92	0.98	0.94	1.02	0.99	0.94	1.02	1.00	0.96	1.04	1.00	0.96	1.04
No mother in the family	0.94	0.84	1.05	0.95	0.86	1.08	0.98	0.87	1.08	0.96	0.87	1.09	0.96	0.87	1.09
Occupational status of the family head															
Professional/administrative	1.00			1.00			1.00			1.00			1.00		
Workers	1.07	1.04	1.10	1.03	1.00	1.06	1.03	1.00	1.06	1.01	0.99	1.06	1.01	0.99	1.04
Farmers with <10 hectares	1.12	1.09	1.15	1.07	1.04	1.10	1.06	1.03	1.09	1.02	1.00	1.09	1.02	0.99	1.06
Farmers with ≥10 hectares	1.10	1.06	1.14	1.08	1.04	1.12	1.06	1.03	1.11	1.04	0.99	1.06	1.04	1.00	1.09
Self-employed, other, unknown	1.07	1.03	1.10	1.04	1.01	1.08	1.04	1.00	1.07	1.02	0.98	1.03	1.02	0.99	1.06
Number of children															
1	1.00						1.00			1.00			1.00		
2	1.01	0.98	1.03				1.01	0.98	1.03	1.00	0.98	1.03	1.00	0.98	1.03
3+	1.09	1.07	1.11				1.07	1.04	1.09	1.05	1.03	1.08	1.05	1.02	1.07
House ownership															
Owner	1.00									1.00			1.00		
Renter	0.93	0.91	0.94							0.96	0.94	0.98	0.97	0.95	0.99
Other, unknown	0.97	0.94	1.01							0.98	0.94	1.01	0.98	0.94	1.01

Table 3 continues

Model	1			4			5		
	RR	95%CI		RR	95%CI		RR	95%CI	
Crowding (n of persons/heated room)									
<2	1.00			1.00			1.00		
2<3	1.03	1.01	1.04	1.00	0.978	1.02	1.00	0.98	1.02
3<4	1.06	1.04	1.09	1.02	0.99	1.04	1.02	0.99	1.04
≥4	1.10	1.07	1.12	1.04	1.01	1.07	1.04	1.01	1.07
Standard of living									
Poor	1.00			1.00			1.00		
Modest	0.95	0.93	0.97	0.98	0.96	1.00	0.99	0.97	1.01
Good	0.89	0.87	0.91	0.95	0.93	0.98	0.97	0.95	1.00
Area of residence									
Helsinki region	1.00						1.00		
Rest of Uusimaa	1.06	1.01	1.10				1.02	0.98	1.06
Western Finland	1.10	1.07	1.13				1.06	1.02	1.09
Eastern Finland	1.14	1.10	1.17				1.07	1.04	1.11
Northern Finland	1.21	1.16	1.27				1.14	1.09	1.20

Model	6			7			8		
	RR	95%CI		RR	95%CI		RR	95%CI	
Level of education									
Basic (ref.)	1.00			1.00			1.00		
Lower secondary	0.95	0.92	0.97	0.95	0.92	0.97	0.97	0.94	1.00
Upper secondary	0.92	0.89	0.96	0.95	0.91	0.99	0.96	0.92	1.01
Tertiary	0.94	0.90	0.98	0.97	0.93	1.02	0.98	0.92	1.05

Model 1: variable + year of birth
Model 2: level of education + year of birth + parental education and occupational status of the family head
Model 3: Model 2 + number of children in the family
Model 4: Model 3 + home ownership, crowding, standard of living
Model 5: Model 4 + area of residence
Models 1-5 use the whole sample of women, N=35,222.

Model 6: year of birth
Model 7: Model 6 + measured family background characteristics
Model 8: Model 6 + family fixed effects
Models 6-8 use a sample of only groups with at least two sisters of whom at least one had any children, N=15,749.

Table 4
Having any children by level of education, logistic regression analysis (OR and 95% CI).

Model	1			2			3			4			5		
	RR	95%CI		RR	95%CI		RR	95%CI		RR	95%CI		RR	95%CI	
Level of education															
Basic (ref.)	1.00			1.00			1.00			1..00			1.00		
Lower secondary	0.89	0.84	0.96	0.90	0.84	0.96	0.90	0.84	0.96	0.90	0.84	0.96	0.89	0.83	0.96
Upper secondary	0.71	0.65	0.78	0.74	0.67	0.81	0.74	0.68	0.81	0.75	0.68	0.81	0.74	0.68	0.81
Tertiary	0.59	0.55	0.64	0.63	0.58	0.70	0.64	0.58	0.71	0.64	0.58	0.71	0.63	0.58	0.71
Father's level of education															
Less than primary school	1.00			1.00			1.00			1.00			1.00		
Primary school	0.92	0.86	0.99	0.98	0.90	1.07	0.98	0.90	1.08	0.99	0.91	1.09	1.00	0.91	1.09
More than primary school	0.66	0.59	0.75	0.93	0.80	1.12	0.94	0.80	1.12	0.96	0.82	1.16	0.98	0.84	1.18
No father in the family	0.92	0.81	1.06	0.97	0.84	1.11	0.99	0.86	1.15	1.00	0.87	1.16	1.01	0.87	1.17
Mother's level of education															
Less than primary school	1.00			1.00			1.00			1.00			1.00		
Primary school	0.95	0.89	1.04	1.03	0.94	1.13	1.03	0.94	1.13	1.04	0.95	1.14	1.04	0.95	1.14
More than primary school	0.67	0.60	0.76	0.93	0.80	1.08	0.93	0.80	1.08	0.94	0.81	1.09	0.96	0.82	1.11
No mother in the family	0.71	0.52	1.02	0.73	0.54	1.05	0.75	0.55	1.08	0.75	0.55	1.08	0.75	0.55	1.07
Occupational status of the family head															
Professional/administrative	1.00			1.00			1.00			1.00			1.00		
Workers	1.36	1.26	1.48	1.11	1.01	1.23	1.11	1.01	1.23	1.10	1.00	1.22	1.10	0.99	1.22
Farmers with <10 hectares	1.34	1.23	1.47	1.09	0.98	1.22	1.08	0.97	1.21	1.04	0.92	1.18	1.03	0.91	1.17
Farmers with ≥10 hectares	1.21	1.08	1.38	1.05	0.93	1.20	1.04	0.92	1.19	1.01	0.88	1.16	1.00	0.87	1.14
Self-employed, other, unknown	1.25	1.12	1.41	1.09	0.96	1.24	1.09	0.96	1.24	1.07	0.94	1.21	1.07	0.94	1.21
Number of children															
1	1.00						1.00			1.00			1.00		
2	1.08	0.99	1.18				1.08	0.99	1.19	1.08	0.99	1.20	1.07	0.98	1.19
3+	1.16	1.07	1.26				1.10	1.01	1.21	1.10	1.01	1.22	1.09	1.00	1.20
House ownership															
Owner	1.00									1.00			1.00		
Renter	0.89	0.83	0.95							0.97	0.89	1.04	0.97	0.90	1.05
Other, unknown	0.97	0.85	1.12							0.98	0.86	1.14	0.98	0.86	1.14

Table 4 continues

Model	1						4			5		
	RR	95%CI					RR	95%CI		RR	95%CI	
Crowding (n of persons/heated room)												
<2	1.00						1.00			1.00		
2<3	1.10	1.02	1.18				0.96	0.89	1.04	0.97	0.90	1.05
3<4	1.12	1.02	1.22				0.94	0.85	1.03	0.95	0.86	1.04
≥4	1.22	1.12	1.33				0.99	0.89	1.09	1.00	0.90	1.10
Standard of living												
Poor	1.00						1.00			1.00		
Modest	0.93	0.87	1.01				0.98	0.91	1.06	0.98	0.91	1.07
Good	0.77	0.72	0.84				0.92	0.85	1.03	0.94	0.86	1.06
Area of residence												
Helsinki region	1.00									1.00		
Rest of Uusimaa	1.26	1.06	1.45							1.12	0.94	1.31
Western Finland	1.33	1.19	1.48							1.20	1.07	1.35
Eastern Finland	1.32	1.19	1.47							1.15	1.02	1.31
Northern Finland	1.59	1.32	1.89							1.39	1.15	1.69

Model	6			7			8		
	RR	95%CI		RR	95%CI		RR	95%CI	
Level of education									
Basic (ref.)	1.00			1.00			1.00		
Lower secondary	0.90	0.79	1.02	0.91	0.80	1.04	0.91	0.78	1.07
Upper secondary	0.79	0.67	0.91	0.82	0.69	0.95	0.83	0.67	0.99
Tertiary	0.85	0.72	0.99	0.89	0.76	1.07	0.86	0.65	1.09

Model 1: variable + year of birth
Model 2: level of education + year of birth + parental education and occupational status of the family head
Model 3: Model 2 + number of children in the family
Model 4: Model 3 + home ownership, crowding, standard of living
Model 5: Model 4 + area of residence
Models 1-5 use the whole sample of women, N=35,222.

Model 6: year of birth
Model 7: Model 6 + all measured family background characteristics
Model 8: Model 6 + family fixed effects
Models 6-8 use a sample of only groups with at least two sisters and variation in fertility outcome (having any children), N=4,494.

Table 5
Number of children beyond the first one among mothers only by level of education, Poisson regression (RR and 95% CI).

Model	1			2			3			4			5		
	RR	95%CI		RR	95%CI		RR	95%CI		RR	95%CI		RR	95%CI	
Level of education															
Basic (ref.)	1.00			1.00				1.00		1.00			1.00		
Lower secondary	0.93	0.91	0.95	0.93	0.91	0.96	0.93	0.91	0.96	0.94	0.92	0.96	0.93	0.91	0.96
Upper secondary	0.90	0.87	0.93	0.91	0.88	0.94	0.92	0.89	0.95	0.93	0.90	0.97	0.93	0.90	0.96
Tertiary	0.96	0.93	1.00	0.98	0.94	1.02	0.99	0.95	1.03	1.00	0.97	1.04	1.00	0.96	1.04
Father's level of education															
Less than primary school	1.00			1.00			1.00			1.00			1.00		
Primary school	0.92	0.89	0.94	0.96	0.92	0.99	0.97	0.93	1.00	0.98	0.95	1.02	0.99	0.95	1.02
More than primary school	0.92	0.88	0.96	0.99	0.93	1.05	1.00	0.93	1.06	1.03	0.97	1.09	1.04	0.97	1.10
No father in the family	0.91	0.87	0.96	0.94	0.89	0.99	0.97	0.92	1.02	0.98	0.93	1.03	0.99	0.94	1.04
Mother's level of education															
Less than primary school	1.00			1.00			1.00			1.00			1.00		
Primary school	0.93	0.90	0.96	0.96	0.93	1.00	0.97	0.94	1.01	0.98	0.95	1.02	0.98	0.95	1.02
More than primary school	0.92	0.88	0.97	0.98	0.93	1.05	0.99	0.93	1.05	1.02	0.96	1.08	1.03	0.97	1.09
No mother in the family	0.99	0.85	1.16	1.00	0.86	1.17	1.02	0.88	1.20	1.03	0.89	1.21	1.03	0.88	1.20
Occupational status of the family head															
Professional/administrative	1.00			1.00			1.00			1.00			1.00		
Workers	1.03	0.99	1.06	1.02	0.98	1.06	1.02	0.98	1.06	0.99	0.95	1.03	0.99	0.95	1.04
Farmers with <10 hectares	1.12	1.08	1.16	1.10	1.05	1.15	1.08	1.04	1.14	1.02	0.97	1.08	1.03	0.98	1.08
Farmers with ≥10 hectares	1.12	1.06	1.17	1.12	1.06	1.18	1.10	1.04	1.16	1.07	1.00	1.13	1.08	1.01	1.14
Self-employed, other, unknown	1.04	1.00	1.10	1.04	0.99	1.10	1.04	0.99	1.10	1.01	0.96	1.07	1.02	0.97	1.08
Number of children															
1	1.00						1.00			1.00			1.00		
2	0.99	0.96	1.03				0.99	0.96	1.02	0.98	0.95	1.02	0.98	0.95	1.02
3+	1.12	1.09	1.16				1.09	1.06	1.13	1.07	1.03	1.10	1.06	1.03	1.10
House ownership															
Owner	1.00									1.00			1.00		
Renter	0.90	0.88	0.92							0.94	0.92	0.97	0.95	0.92	0.98
Other, unknown	0.96	0.91	1.01							0.96	0.92	1.01	0.96	0.92	1.01

Table 5 continues

Model	1			4			5		
	RR	95%CI		RR	95%CI		RR	95%CI	
Crowding (n of persons/heated room)									
<2	1.00			1.00			1.00		
2<3	1.02	0.99	1.04	1.01	0.98	1.04	1.01	0.98	1.04
3<4	1.08	1.05	1.12	1.05	1.01	1.09	1.05	1.01	1.09
≥4	1.11	1.07	1.15	1.08	1.04	1.12	1.08	1.03	1.12
Standard of living									
Poor	1.00			1.00			1.00		
Modest	0.92	0.90	0.95	0.97	0.94	1.00	0.99	0.96	1.02
Good	0.87	0.85	0.90	0.94	0.91	0.98	0.97	0.93	1.01
Area of residence									
Helsinki region	1.00						1.00		
Rest of Uusimaa	1.03	0.97	1.09				1.00	0.93	1.06
Western Finland	1.09	1.04	1.14				1.04	0.99	1.09
Eastern Finland	1.16	1.11	1.21				1.09	1.03	1.14
Northern Finland	1.24	1.15	1.32				1.15	1.07	1.23

Model	6			7			8		
	RR	95%CI		RR	95%CI		RR	95%CI	
Level of education									
Basic (ref.)	1.00			1.00			1.00		
Lower secondary	0.94	0.90	0.98	0.94	0.91	0.98	0.97	0.92	1.03
Upper secondary	0.94	0.89	1.00	0.98	0.92	1.04	0.97	0.91	1.05
Tertiary	1.00	0.94	1.07	1.05	0.97	1.14	1.01	0.92	1.11

Model 1: variable + year of birth
Model 2: level of education + year of birth + parental education and occupational status of the family head
Model 3: Model 2 + number of children in the family
Model 4: Model 3 + living conditions
Model 5: Model 4 + living area
Models 1-5 use the sample of mothers only, N=29,629

Model 6: year of birth
Model 7: Model 6 + all measured family background characteristics
Model 8: Model 6 + family fixed effects
Models 6-8 use a sample of only groups with at least two sisters of whom all were mothers and at least one had a child beyond the first one, N=11,571.