Education, other socioeconomic characteristics across the life course and fertility among Finnish men

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1 Introduction

Education may influence childbearing among men in various ways over the life course (Berrington and Pattaro 2014; Thomson et al. 2013). An economic mechanism is among the most commonly discussed ones linking achieved educational level to fertility (Huinink 1995; Kravdal and Rindfuss 2008): after finishing education, higher educational attainment is expected to increase men's fertility through higher income levels and better labour market positions (Becker 1993). However, other mechanisms may also be relevant and the relative importance of different mechanisms may be sensitive to parity and societal context. Number of children can be viewed to result from consecutive decisions in the life course (Kreyenfeld and Konietzka 2008; Thomson et al. 2013): fertility in this study comprises the lifetime number of children and chances of a first, a second and a third birth.

In life-course research on family and fertility, more attention has been called for potential early life influences (Huinink and Feldhaus 2009; Huinink and Kohli 2014). Education plays a central role in the transmission of the socioeconomic standing of the previous generation to

the next one (Breen and Jonsson, 2005) and strongly determines other socioeconomic characteristics in adulthood (Elo 2009; Lynch and Kaplan 2000). Socioeconomic characteristics in early life have been previously linked also with men's fertility (Easterlin 1966; Thornton 1980). This study aims to extent the previous literature by analyzing carefully to what extent educational differences in men's fertility are explained by socioeconomic or other characteristics in early life, or mediated by other socioeconomic characteristics in adulthood. In addition to observed early characteristics, we control for unobserved characteristics shared by brothers. Further, we describe the relationships of socioeconomic characteristics in early life and adulthood with fertility.

Men's fertility is an understudied topic in demographic research (Bledsoe et al. 2000; Forste 2002; Goldscheider and Kaufman 1996; Zhang 2011), but literature addressing men's fertility is accumulating. Educational differentials in fertility are a widely studied topic in demographic research, but most of the previous studies have focused on women (Balbo et al. 2013). This study aims at contributing to the understanding of the relations of education and other socioeconomic characteristics across the life course with fertility among men by utilizing longitudinal data on Finnish male cohorts born in the period 1940–50. The context of childbearing for these birth cohorts implied an increasing popularity of a two-earner family model and government support for families, but still gendered views of the breadwinner and caregiver roles in the society (Ellingsaeter and Leira 2006; Julkunen 1999).

2 Conceptual framework

Several mechanisms may link education to fertility in men, and the relative importance of different mechanism may be sensitive to parity and societal context. The most commonly discussed mechanism builds on the economic approach to fertility, assuming that individuals

behave rationally and the demand for children increases at higher income levels (Becker 1993; Berk and Berk 1983; Pollak and Watkins 1993). This implies that higher acquired educational attainment leads to better chances of providing for a family with a larger number of children through accumulated human capital, higher income levels and better labour market prospects in general. This income effect thus suggests a positive influence of education on fertility that operates through income and labour market position, regardless of parity. Yet at higher income levels also opportunity costs of children increase, e.g., through forgone money and experience following reduced working hours (Becker 1993). In men the positive effect of income is expected to dominate any negative effect of opportunity costs in contexts where men are considered as main providers of the family income.

The strengthening of the women's labour market position is suggested to be followed by men's increasing involvement at home and a continuing change towards more symmetrical gender roles (Goldscheider et al. 2015; Hook 2006). Nordic countries, including Finland, have been forerunners in this respect, with such changes having occurred earlier than elsewhere (Esping-Andersen 2009; Goldscheider et al. 2014). Despite increased expectations towards men's involvement at home from the 1950s onwards, gender roles still remain asymmetrical to some degree even in the Nordic countries (Joshi 1998; Prince Cooke and Baxter 2010). Findings regarding time-trends in socioeconomic differences of fertility do not necessarily indicate weakening expectations for men as economic providers (Hart 2015; Kravdal and Rindfuss 2008; Lappegård et al. 2011; Ravanera and Beaujot 2014; Winkler-Dworak and Toulemon 2007).

The economic approach to fertility has been criticized for its underlying assumption of a gendered division of labour in the household (Esping-Andersen 2009; McDonald 2000;

Oppenheimer 1997). The gender-specialization in the strict sense of the term has not been the reality of industrialized countries in recent decades, but the concepts of income effect and opportunity cost are still relevant. The expected positive influence of men's education on their fertility operating through an income effect could be counterbalanced particularly at higher parities, however, if more highly-educated parents decided to invest more in each of their child, thereby increasing the costs of each child (Becker 1993; Becker and Lewis 1973). This phenomenon refers to the trade-off between quantity and quality of children, with higher income parents potentially preferring to have fewer children with higher quality e.g. regarding children's prospective education and well-being.

Education may also relate to fertility among men through non-economic mechanisms i.e. mechanisms that do not operate via income and position in the labour market. For example, during educational enrollment, the incompatibility of student and parent roles may inhibit childbearing (Corijn and Klijzing 2001; Sigle-Rushton 2005). Yet, given that men are less constrained by the decline in fecundity with age (Billari et al. 2011; Schmidt et al. 2012), men have time to catch up on their childbearing after completing their studies and the effect of enrollment is likely to be indecisive on their lifetime fertility. Any negative effect of long-term enrollment could, however, be expected to be the strongest for the first parity (Kravdal 2007).

Educational level may also reflect life values: post-materialist values more common among the more-highly educated may be linked to weaker preferences for a large number of children and seeking fulfilment in life in alternative ways (Inglehart 1990). On the other hand, the strength of the two-child norm may vary according to educational group, e.g. stronger intentions towards having at least two children were witnessed among highly educated British

men (Berrington and Pattaro 2014). Moreover, men at different educational levels may differ in their knowledge and practice of contraceptive behavior, which may affect fertility, particularly at younger ages and lower parities (Nelson 2004).

Finally, given the scarce evidence, it remains possible, even if perhaps not very likely (Baizán and Martín-García 2006; Martín-García 2009), that the education-fertility association in men is confounded by such early influences that directly influence both education and fertility. Characteristics of the family of origin could confound the association if they influenced preferences and opportunities regarding education and family life (Axinn et al. 1994; Miller 1994; Miller 1992; Thornton 1980). According to economic reasoning, material resources in the family of origin may discourage fertility because of the relatively high consumption aspirations adopted in childhood and adolescence (Easterlin 1966; Thornton 1980). They could be reflected in acquiring education at the cost of childbearing or in limiting the number of children to ensure children's sufficient quality. Additionally, life goals other than family building might be emphasized more in families of higher socioeconomic status (Rijken and Liefbroer 2009; Scott 2004), and the potential influence may extend to behavioural outcomes in the next generation.

The relationship between unions and childbearing is closely related to the extent that any causal claims between the two are ambiguous (Berrington and Pattaro 2014; Huinink 1995; Van Bavel et al. 2012). In the context of this study, union formation and stability could be considered primarily as potential mediators of the education-fertility association. Economic approaches predict that men of better standing in the labour market are more successful in the marriage market (Becker 1993; Oppenheimer et al. 1997; Oppenheimer 1988). If economic resources, as described earlier, are required for having children and men are considered as

important family-income providers, then the more-highly educated men with actual or prospective higher incomes and better positions in the labour market can be expected to be viewed as more attractive partners and potential fathers by women.

Accordingly, besides better changes of marrying, a man's higher education usually predicts also higher marital stability (Lyngstad and Jalovaara 2010; Prince Cooke and Baxter 2010). In Finland, men educated to lower levels have been shown to be disadvantaged both in terms of formation (Finnäs 1995; Jalovaara 2012) and stability (Finnäs 1997; Jalovaara 2003) of marital unions. The experience of divorce is usually associated with lower fertility, but remarrying may increase fertility in men (Van Bavel et al. 2012). Finally, given the tendency of socioeconomic homogamy (Mäenpää 2015; Schwartz and Mare 2005), the effect of a female partner's characteristics for educational differences in men's fertility remains a fruitful area of research (Begall 2013; Jalovaara and Miettinen 2013).

3 Previous findings

In the Nordic countries men educated to higher levels, at least in younger birth cohorts, less often remain childless and have higher numbers of children on average (Fieder and Huber 2007; Goodman and Koupil 2009; Kravdal and Rindfuss 2008; Lappegård et al. 2011; Nikander 1995; Nisén et al. 2014a; Rønsen and Skrede 2010). In other western countries, the corresponding associations vary from positive to flat to negative (Barthold et al. 2012; Hopcroft 2015; Keizer et al. 2008; Kiernan 1989; Kneale and Joshi 2008; Nettle and Pollet 2008; Parr 2010; Ravanera and Beaujot 2014; Skirbekk 2008; Thomson et al. 2013; Toulemon and Lapierre-Adamcyk 2000; Toulemon et al. 2008; Tragaki and Bagavos 2014; Weeden et al. 2006). A recent comparative study reported childlessness at the age of 40-44 to

be more common among men educated to lower levels in 13 out of 19 European countries (Miettinen et al. 2015).

Previous studies show that men enrolled in education have low chances of experiencing a childbirth (e.g. Dribe and Stanfors 2009; Kravdal 2007; Thalberg 2013). A higher level of education in turn, as estimated often net of controls for educational enrollment and few other socioeconomic characteristics in adulthood, has been found to predict both higher (Hart 2015; Lappegård and Rønsen 2013; Winkler-Dworak and Toulemon 2007) and lower (Guzzo and Furstenberg 2007; Liefbroer and Corijn 1999; Martín-García 2009; Özcan et al. 2010) entry rates into fatherhood, and some studies document no differences (Dribe and Stanfors 2009; Huinink 1995; Özcan et al. 2010) or a U-shaped pattern (Tölke and Diewald 2003)[1]. Apart from education, higher income and often a stronger attachment to the labour market tends to associate with higher entry rates into fatherhood (Hart 2015; Huinink 1995; Kravdal 2002; Kreyenfeld and Andersson 2014; Lappegård and Rønsen 2013; Liefbroer and Corijn 1999; Özcan et al. 2010; Pailhé and Solaz 2012; Schmitt 2012; Tölke and Diewald 2003; Winkler-Dworak and Toulemon 2007).

Studies on higher-order birth rates among men suggest mainly positive associations with educational level in the Nordic countries (Duvander and Andersson 2006; Duvander et al. 2010; Kravdal 2007; Kravdal and Rindfuss 2008; Lappegård and Rønsen 2013; Thomson et al. 2013), but not necessarily elsewhere (Bronte-Tinkew et al. 2009; Guzzo and Furstenberg 2007; Oláh 2003). For example in Norway educational level stimulated higher-order births, net of some controls for background and enrollment (Kravdal 2007), or controls for parental

[1] Apart from varying controls variables, these studies differ in the follow-up which may affect the results, i.e. the effect of educational level may be may be more positive if men are followed up to a higher age.

education, educational enrollment and income (Lappegård and Rønsen 2013). In addition, a well-educated male partner tends to increase second birth rates among women (Bartus et al. 2013; Gerster et al. 2007; Kreyenfeld 2002). With respect to male income and labour market attachment, there is evidence of a positive effect on second but not necessarily third births (Andersson and Scott, 2007; Kravdal 2002; Kreyenfeld and Andersson 2014; Lappegård and Rønsen 2013; Pailhé and Solaz 2012).[2]

Studies analyzing educational differences in fertility often control for some family-of-origin characteristics, such as parental education, family type and level of urbanization, with little attention paid to them (e.g. Huinink 1995; Kravdal and Rindfuss 2008; Liefbroer and Corijn 1999; Winkler-Dworak and Toulemon 2007). The literature on early life predictors of childbearing associates a higher socio-economic position of a parent with later entry into parenthood (e.g. Dahlberg 2015; Dribe and Stanfors 2009; Hynes et al. 2008; Thornton 1980) but the respective findings regarding lifetime number of children of men vary (Goodman and Koupil 2009; Murphy and Wang 2001; Parr 2010; Rijken and Liefbroer 2009). Also associations of other than socioeconomic characteristics of the family of origin, such as number of siblings and religiosity, with men's fertility have been found (Kolk 2014; Murphy and Wang 2001; Rijken and Liefbroer 2009).

Some previous studies are suggestive of differences between parities with respect to education (Guzzo and Furstenberg 2007; Kravdal and Rindfuss 2008), e.g. a stronger effect on first than higher-order births was found in Norway (Lappegård and Rønsen 2013). Also

[2] Furthermore, studies motivated by evolutionary theory and measuring both socioeconomic characteristics and the number of children at late reproductive ages do not find education net of income to predict higher fertility, whereas income respectively predicts higher fertility in men (Barthold et al. 2012; Fieder and Huber, 2007; Goodman and Koupil, 2010; Hopcroft 2015; Nettle and Pollet, 2008; Weeden et al. 2006).

the association of other socioeconomic characteristics with fertility in men may depend on parity in question (Kravdal 2002; Kreyenfeld and Andersson 2014; Lappegård and Rønsen 2013; Pailhé and Solaz 2012). Little is known particularly on potential parity differences regarding early life socioeconomic characteristics.

4 Aims and context of the study

The role of education and other socioeconomic characteristics for men's fertility has been addressed in the previous literature, but the mechanisms behind educational differences are still not entirely clear. Economic mechanisms related to income and position in the labour market are the most discussed ones, but alternative mechanisms remain plausible too with potentially varying importance depending on the parity and societal context. We conceptualize occupational position as a more proximate indicator of earning potential and attachment to the labour market than education, whereas income measures actual earnings and is a strong indicator of economic resources overall (Elo 2009; Lynch and Kaplan 2000). To gain both an overview and parity-specific understanding, fertility in this study comprises the lifetime number of children and chances of a first, a second and a third birth. The research questions are:

i. How do level of education, occupational position, income, and early life socioeconomic characteristics associate with fertility in men?

ii. To what extent are educational differences in men's fertility explained by early life socioeconomic or other characteristics shared by brothers?

iii. To what extent are educational differences in men's fertility mediated by occupational position and income in adulthood?

We expect to find positive associations between men's socioeconomic characteristics in adulthood and fertility, but do not hypothesize on the respective associations with early social characteristics (i). Regarding educational differences, we expect any explanatory role of early characteristics to be weaker (ii) than any mediating role of adult characteristics (iii). Parity differences, if any, are expected to show as weaker associations of socioeconomic characteristics with higher-order births. We build on the current literature by studying the role of education in men's childbearing more thoroughly in relation to other socioeconomic characteristics across the life course. The study is based on Finnish population-based register data on birth cohorts 1940–1950 with a detailed non-retrospective measurements of early life characteristics. The unique characteristic of the data set is that it allows a follow-up of the early stages of life up until late reproductive ages, a rich non-retrospective measurement of socioeconomic characteristics in early life, and sibling comparison.

The context of this study is of low living standards in the mid-20th century, but rising levels thereafter (Jäntti et al. 2006). When the men studied here were born, Finland was a poor country at or recovering from war. Later, in the second half of the century, the overall living standards rose rapidly due to economic growth and structural change. At the same time, the publicly provided welfare support for families increased as part of the welfare state expansion (Rønsen 2004), and women and men born in 1940–50 witnessed this increasingly during their prime childbearing years. The Finnish society is often described as one of relatively low social inequality e.g. in terms of income (Jäntti et al. 2006). The Finnish educational system is considered flexible and socially inclusive in international comparison (Orr et al. 2011).

Finland is characterized by a relatively strong dual-earner family model, demonstrated e.g. by separate taxation of a husband and a wife since 1976 (Aarnio and Eriksson 1987). In 1970, 39

percent of married women aged 24 to 54 were housewives, whereas by 1980 the figure had fallen to 10 percent (Julkunen 1999). The labour force participation of women with pre-school children was high already in the 1950s and 1960s and the share of employed mothers working part-time very low even compared to other Nordic countries (Rønsen and Sundstrom 2002). The heavier burden of breadwinning however continued to fall on the shoulders of men, e.g. in 1982 men's earnings comprised over 60 percent of total household earnings among married dual-earner couples (Aarnio and Eriksson 1987). In the studied birth cohorts, men were still educated to higher levels than women (Havén 1999).

Despite the high share of dual-earner families in Finland already in the 1970s, the role of men in homework and childrearing remained limited. From the 1970s, a more equal division of labour between mothers and fathers was facilitated by legislation and Finnish fathers have been eligible to share parental leave with mothers since 1978 (Ellingsaeter and Leira 2006; Haataja 2004). By then, over a half of the male cohort under study had, however, already become fathers (Nisén et al. 2014a). The initial two-week leave that fathers were entitled to was extended later on (Haataja 2004). Finnish fathers' role in childcare still continued to be weak as compared to women: in 1990 fathers took only 2–3 percent of all parental leave days in Finland (Ellingsaeter and Leira 2006; Haataja 2004).

5 Methods

5.1 Data and variables

The data were obtained from a 10 percent sample of households drawn from the 1950 Finnish Census (Statistics Finland 1997). Information on members of the sampled households was subsequently linked to sociodemographic information from quinquennial censuses in 1970–1995 and to the Finnish Population Register for fertility histories. We restricted the data to

the 1940–1950 birth cohorts. The original sample consisted of 411,628 persons, of whom 91,452 were born between 1940 and 1950 and lived in a one- or two-parent family at the time of the census in 1950 (46,782 men). Respondents with missing information on childhood variables or absent from the census at the ages of 30–34 (n = 7,417), lost to follow-up at the ages of 45–49 (n = 2,281), or with an unrealistic age at first birth (n = 2) were excluded. Loss to follow-up was attributable to emigration, mainly to Sweden in the late 1960s and the early 1970s, and to a lesser extent to mortality between 1950 and 1990/1995. The final study sample included 37,082 men. Brothers were identified based on information on place of residence, household, and family collected in 1950. The analysed men came from 27,305 families, of which at least two male siblings were identified in 7,671 families. This identification procedure did not distinguish between biological and non-biological siblings.

Monthly information on live-born biological children was linked to the data from birth records from 1970 to 2009. Children born before 1970 were included, except in cases where they did not live with their fathers around the year 1970 when personal identification codes were introduced. The study participants were 59–69 years old at the end of the follow-up in 2009. In these data, the fertility of men (M 1.81 SD 1.45) was close to that of women in a corresponding sample (M 1.85 SD 1.38) (Nisén et al. 2014b). Thus, we expect bias from unknown paternity to be small. In addition to the total number of children, the likelihood of a first, a second, and a third birth were analysed.

The socioeconomic characteristics in adulthood comprised level of education, occupational position, and income. These variables were measured at one point in time at the age of 30–34 based on census information from the year 1970, 1975 or 1980. The main explanatory variable, the level of education, was categorized into four classes: basic, lower secondary,

upper secondary, and tertiary (Table 1). The basic level refers to a maximum of nine years of mandatory education. The lower-secondary level refers to brief vocational training (< three years) undertaken in addition to basic education. Upper-secondary education refers to either academic education (matriculation) or vocational training (≥ three years) undertaken in addition to basic education. The tertiary level refers either to a university degree or to vocational training at the highest level (≥ four years after general education). Occupational position was classified as manual worker, lower white collar, upper white collar, farmer/self-employed (64% farmers), or other/unknown. For income, the values from different years of taxable income reported in the census were first converted into income in 2012 (Statistics Finland 2013) and then divided into quintiles. In the sample three percent had no income.

The early life socioeconomic characteristics included parental education, parental occupational position, and measures of overall living conditions. These were measured at one point in time in the 1950 census, when the analysed men were between the ages of zero and 10. The parental level of educational measures the highest qualification achieved by either parent (74% of parents possessed the same level), categorized as less than primary school, primary school, and more than primary school. The parental occupational position was categorized as manual worker, professional or administrative, farmer with < 10 hectares of land, farmer with ≥ 10 hectares of land, and self-employed/other. The variables measuring overall living conditions included parental home ownership (owner, renter, other or unknown), and crowding (number of persons per heated room: < 2, 2 < 3, ≥ 3), and standard of living (poor, modest, good) in childhood. In this approximate measure, the category *poor* referred to households with no modern facilities such as electric light, *modest* to households with one item, and *good* to those with at least two items.

The control variables (year of birth, sibship size, and family type and living area in childhood) were also measured at one point in time in the 1950 census, when the analysed men were between the ages of zero and 10. Family type was categorized as two parents with children, mother and children, and father or children; sibship size was divided into three categories (0, 1–2, 3–). The living area covered five geographical areas: the Helsinki (capital) region, the rest of Uusimaa (the area surrounding the capital region in the south part of Finland), western Finland, and eastern and northern Finland, both of which were mainly agricultural areas in 1950.

Marital history was categorized as never-married, intact-married (first marriage not dissolved due to divorce or the partner's death), divorced/widowed (87% divorced), or remarried. This classification was based on longitudinal information on the formation and dissolution of marital unions until 2009. Marriages that were formed and dissolved before 1970 could not be observed. Longitudinal information on cohabitation was not available, but it was still very uncommon in the birth cohort under study, becoming more common in Finland from the 1970s (Finnäs 1993).

5.2 Statistical analyses

Standard Poisson regression was used to assess the associations of education and other socioeconomic characteristics with the number of children. Standard logistic regression was used to study the associations of these explanatory characteristics with the likelihood of a first, a second, and a third birth. The full sample of men (N = 37,082) was used in the analysis of the number of children and the likelihood of a first birth. The likelihood of a second birth was analysed among fathers (n=29,943) and the likelihood of a third birth among fathers with at least two children (n=23,152).

An alternative to the standard Poisson model specification for analysing the number of children is the negative binomial model, which would have been preferable had there been overdispersion. However, evidence of overdispersion was not found: in the full (corresponding to Model 5 in Table 2) negative binomial model the parameter indicating overdispersion did not differ from zero ($\alpha=2.7x10^{-8}$), and the model gave virtually the same results as the Poisson model. We also considered the zero-inflated Poisson model as an alternative to the standard Poisson model, but preferred the latter based on very few differences in predicted numbers of children between the models and the greater simplicity of the standard Poisson model.

We estimated nested standard regression models of all the four fertility outcomes using the following strategy (Tables 2–5). In Models 0 the year of birth-adjusted associations of socioeconomic characteristics with fertility are estimated (separate model for each socioeconomic characteristic). In Model 1 the education–fertility association was additionally adjusted for other control variables than year of birth: living area and family type in childhood and sibship size. In Model 2 the association was adjusted additionally for socioeconomic characteristics in early life: parental education, occupational position and home ownership, and crowding and standard of living in childhood. Models 3 and 4 add occupational position and income in adulthood respectively. Finally, marital history was added to Model 5.

Conditional sibling fixed-effects (FE) versions of the Poisson and logistic regression models were used to study whether the education-fertility association was confounded by unobserved characteristics shared by brothers (Table 6). This approach uses the family indicator included in the data set to capture unobserved family characteristics and estimates the model

parameters for level of education from the variation between brothers. Thus, the FE models account for the family environment and genetic characteristics to the extent that these are shared by brothers, but at the cost of restricting the sample because those without a brother are excluded. Further, the brother sets in which all brothers had zero children are excluded in the Poisson FE model, and those in which all brothers had the same outcome are excluded in the logistic FE regression models. The analysed brother sets include brothers born between 1940 and 1950, and alive and living in the same household in 1950 census. These FE models were constructed by conditional maximum likelihood estimation (Allison 2009). In addition to the estimates from the FE models, Table 6 shows estimates from Models 0–2 ran in the samples that were employed in the FE analysis to enhance comparability across models.

Throughout the analysis, we accounted for the clustering of brothers within families in the calculation of the confidence intervals and other variance-based measures. We used the bootstrap procedure with cluster resampling in calculating the 95 percent confidence intervals (CI) reported in Tables 2–6, with 1,000 replications and sibling sets as the clusters. The estimates of the Poisson regression models are reported as incidence-rate ratios (IRR) and those of the logistic regression models as odds ratios (OR). The Stata statistical package, Version 14 (StataCorp 2015), was used for the statistical analysis.

6 Results

The men had on average 1.81 (SD 1.45) children in their lifetime, with 81 percent having at least one child. The parity distribution by level of education and other descriptive characteristics of the study population are shown in Table 1. Two was the most common number of children across educational groups (37%), with higher shares among men educated to upper secondary and tertiary levels (42–43%). A large share of the men (45%) was

educated to the basic level in this cohort, and only 14 percent had acquired tertiary education. Most men came from families with parental education at most at the primary level (76%) and from households of poor or modest living standards (75%). Manual worker was clearly the largest occupational group in this male cohort (47%).

[TABLE 1 ABOUT HERE]

Table 2 presents the results on the number of children. A clear positive gradient was apparent, with men educated at the tertiary level having 20 percent and at the upper-secondary level 11 percent more children than those educated at the basic level (Model 0). Other socioeconomic characteristics in adulthood also predicted fertility; men of higher occupational positions, farmers or self-employed, and especially those with higher incomes had a larger number of children on average. Additionally, socioeconomic characteristics in early life predicted fertility; higher parental education and occupational position and less crowded and better-equipped childhood housing associated with higher fertility. The associations with the early characteristics were, however, modest and weaker than the associations with the adult characteristics.

Including additional control variables (living area and family type in childhood and sibship size) (Model 1) did not change the year-of-birth adjusted association between education and fertility. Likewise, adjusting for early socioeconomic characteristics (Model 2) had no effect on these estimates. In turn, adjustments occupational position (Model 3) and income (Model 4) clearly attenuated the differences by education, altogether by 41–68 percent[3]. A weak positive association remained net of all these adjustments, with the tertiary-educated men having eight percent more children than those with basic education. Accounting additionally

[3] Attenuation in percentages is calculated as: $(OR_{Model4}-OR_{Model2})/(OR_{Model2}-1)*100$.

for marital history (Model 5) further reduced the estimates of education with now only the tertiary-educated having four percent more children as compared to basic-educated men.

[TABLE 2 ABOUT HERE]

Table 3 shows the results on the likelihood of a first birth. Higher education, higher occupational position, and especially higher income all clearly predicted a higher likelihood of a first birth in the model adjusted for year of birth only (Model 0). Also favourable socioeconomic characteristics in early life predicted higher chances of a first birth, even if less strongly than characteristics in adulthood. The educational differences in the likelihood of a first birth remained net of adjustments for other control variables (Model 1) and early life socioeconomic characteristics (Model 2). The adjustment for occupational position (Model 3) and income (Model 4) again strongly, altogether by 40-90 percent, attenuated the differences by education. When marital-history differences had been adjusted for (Model 5), no significant differences by education remained.[4]

[TABLE 3 ABOUT HERE]

Education and other socioeconomic characteristics in adulthood also predicted higher chances of a second birth (Table 4), even if less strongly in comparison to first births, in the year of birth-adjusted models (Model 0). Some of the favourable characteristics that predicted higher chances of a first birth had a similar effect on second births. Adjustment for other control variables (Model 1) and socioeconomic characteristics in early life (Model 2) had negligible effect on the estimates of education on the second-birth likelihood, but adjustment for occupational position and income in adulthood (Models 3–4) had a moderate attenuating

[4] The interpretation was the same when a dichotomized indicator of marital history was used (ever vs. never married).

effect between -5 and 41 percent. The adjustment for marital history had a small effect, and the highly educated men were still more likely to experience a second birth (Model 5).

[TABLE 4 ABOUT HERE]

Differences by education in the likelihood of a third birth were small (Table 5): in the year of birth-adjusted model the fertility of the lowest and highest educated was at the same level, and that of men in the middle categories slightly lower (Model 0). Occupational position had a weak positive association, whereas men in the lowest income quintile were more likely to experience a third birth than two-child fathers with higher incomes. Adjusted for year of birth only, most of those favourable socioeconomic characteristics in early life that predicted higher chances of a first, and to some extent, a second birth, had a null or weak negative association with the likelihood of a third birth. The adjustment for control and early life socioeconomic characteristics had no effect on the estimates of education (Models 1–2), adjustment for occupational position and income even slightly increased some of the estimates (Models 3–4), and the adjustment for marital history had marginal effect (Model 5).

[TABLE 5 ABOUT HERE]

Additionally, we note that staying unmarried was expectedly a strong proximate determinant of low fertility (Tables 2–5), whereas men remarried men showed the highest numbers of children and the highest chances of a first and a third birth. Divorced or widowed men had lower numbers of children and were less likely to have a first or a second birth than men in intact marriages. To elaborate on the role of marital history, we also note that the differences by occupational position and income in the number of children (Table 2) and the first-birth likelihood (Table 3) were greatly attenuated by the inclusion of marital history (Model 5), but significant differences by still remained. The respective attenuation regarding subsequent

births was marginal. An additional analysis (not shown) showed that when marital history was added to Model 2 before adjustments for occupational position and income, differences by educational level in the number of children and the first-birth likelihood attenuated by more than two thirds, whereas the respective attenuation in subsequent births was again small.

[TABLE 6 ABOUT HERE]

Table 6 shows the results from the sibling FE analysis. In standard models (Models 0–2) of the different fertility outcomes ran in the subsamples used for the FE estimation, the estimates of education were mainly similar as in the whole study population. The estimates of education on the number of children were similar in the FE model and in Model 2 and thus showed no evidence of that characteristics shared by brothers would confound the estimates. Also the FE models on the likelihood of a first and a second birth indicated that among brothers a higher level of education predicted higher chances of a first and, to a smaller extent, a second birth. Significant educational differences in the third-birth likelihood were found neither in Model 2 nor in the FE model, but the point estimates were quite similar as in Table 5.

7 Discussion

7.1 Main interpretations

This study assessed to what extent the association between men's education and their fertility was explained by early socioeconomic or other characteristics or mediated by later socioeconomic characteristics. Another aim was to analyze how the socioeconomic characteristics of men across the life course associated with fertility among men. Fertility comprised the lifetime number of children and chances of a first, a second, and a third birth.

The study takes the previous literature further by showing that socioeconomic advantage across the life course associates with fertility in men: among Finnish men born in the period 1940–50, lower numbers of children were found among men from socioeconomically less-advantaged families, and with a lower educational level, occupational position and income level. Also further evidence concerning parity-related differences was found: education and several other characteristics in early life and adulthood related more strongly to the likelihood of a first than a second and, particularly, a third birth.

As for number of children overall and for first births, the results are in line with previous studies from Nordic countries (e.g. Kravdal and Rindfuss 2008; Lappegård et al. 2011; Lappegård and Rønsen 2013), showing that a higher number of children and first birth rates are associated with educational and other socioeconomic advantage in adulthood in men. Similarity between the two fertility outcomes is expected: in a previous Finnish study the educational gradient in the number of children was mostly due to different first-birth chances (Nisén et al. 2014a). Varying results outside the Nordic countries (e.g. Miettinen et al. 2015) may reflect measurement issues but also to true contextual influences. Our results regarding early socioeconomic characteristics differ from a recent Swedish study (Dahlberg 2015) which found no differences in the first-birth likelihood by parental education among men, with the discrepancy potentially attributable e.g. to different study periods.

Second births were also predicted by higher educational levels and by other indicators of socioeconomic advantage, but to a smaller extent than first births. These findings bear resemblance to earlier studies in similar institutional settings which mainly find positive effects of a father's education on higher-order birth rates (Duvander and Andersson 2006; Duvander et al. 2010; Kravdal 2007; Kravdal and Rindfuss 2008; Lappegård and Rønsen

2013; Oláh 2003; Thomson et al. 2013). Similar to the present study, few previous studies also report weaker effects of income (Lappegård and Rønsen 2013) and unemployment (Kravdal 2002) on higher-order than first births among men. In Denmark, unemployment more strongly depressed first birth rates at older ages than second birth rates overall (Kreyenfeld and Andersson 2014). As compared to entering parenthood, the transition to the second child may be characterized less by questions of affording another child and more by factors such as following the two-child norm (Bacci 2001; Goldstein et al. 2003). In Finland, a two-child family corresponds to the cultural ideal and is the most typical realized family size across cohorts also among men (Miettinen 2015).

The picture regarding third births is different: small differences were found overall, and in some cases favourable socioeconomic characteristics associated even with slightly lower chances of a birth. These findings bear resemblance to earlier Nordic studies showing that two-child fathers with weak labour market attachment (Andersson and Scott 2007; Kravdal 2002; Kreyenfeld and Andersson 2014) and low-earning couples were more likely to have a third child (Duvander and Andersson 2006; Duvander et al. 2010). The present study indicated a small positive effect of tertiary education only after controls for other socioeconomic characteristics. However, our findings suggest that other than socioeconomic characteristics – such as family-related values, partnership context or the gender of previous children (Ruokolainen and Notkola 2002) – could be more important determinants of third births overall.

A novel finding of this study was that the educational gradient in fertility in men was neither explained by early life socioeconomic nor by other characteristics shared by brothers. These results reinforce the prevailing understanding according to which mechanisms in later phases

of the life course are more relevant in explaining the educational differences in men's fertility. Indeed, men's occupational position and income mediated approximately half of the association between education and number of children. Differences in first births were particularly strongly mediated by such factors. The corresponding mediation was more modest for second births and only small differences by education existed in the third-birth-chance to begin with.

Education is a major determinant of one's future position in the labour market and one's income (Elo 2009; Lynch and Kaplan 2000). In comparison to educational level, income and occupational position are more proximate measures of economic standing, earning potential and attachment to the labour market. A plausible interpretation therefore is that economic considerations may be more important for creating differences between educational groups in the chance of having a first birth than in the chances of subsequent births. Economic considerations related to men's role as main financial providers of the family may be more central in the process of entering parenthood than in continuing childbearing. A similar interpretation may be valid for results from another Nordic country, Norway, with similar institutional settings (Lappegård and Rønsen 2013). Together these findings lend support to the traditional argument that men's economic potential is an important condition for couples to have children (Becker 1993). However, income may not increase fertility regardless of parity.

It is important to note, however, that a less decisive division of labour in families was present in Finland than in many other western countries in the 1960s and 1970s during the prime childbearing years for men in the studied birth cohorts. A dual-earner family model was increasingly common in Finland after the 1950s and wife's income, often from full-time

work, contributed an important share to the family income (Julkunen 1999). Still, a larger share of family income was earned by men also in most dual-earner families (Aarnio and Eriksson 1987), and gender roles also remained asymmetrical with respect to household and caring responsibilities, e.g. in the 1980s less than 5 percent of Finnish men used their right to parental leave (Ellingsaeter and Leira 2006). Among Finnish women born in 1940–50, educational level associated negatively with their lifetime fertility (Nisén et al. 2014b). The different associations among men and women may indicate gendered views of the breadwinner and caregiver roles in the society, but also other issues such as a stronger effect educational enrollment among women (Dribe and Stanfors 2009; Kravdal 2007).

We view unions primarily as potential mediators in the association between education and fertility despite the highly interrelated nature of unions and childbearing. Union experiences were measured by marital history: in the studied birth cohorts marriage was still the normative context of childbearing (Finnäs 1993). Remarried men had highest numbers of children (see also Van Bavel et al. 2012), but expectedly the largest fertility differences lay between the never-married and other men. Marital history mediated in particular the chance of a first birth, whereas its inclusion had marginal effect in models of subsequent births. Given marital history and other socioeconomic characteristics, the tertiary-educated had only five percent more children as compared to the basic-educated and there was no difference in the first-birth chance. Along the lines of economic reasoning, men's economic provider potential is important for setting up an independent household (Oppenheimer et al. 1997; Oppenheimer 1988) and having children (Becker 1993). Therefore women view men with actual or prospective higher incomes and better labour market positions as more attractive

partners and potential fathers of their future children.[5] Thereby, union formation is likely to contribute to the educational differences in men's fertility with the most significance for entering parenthood.

An important concern regarding the interpretation of the parity-specific analysis is the selection of men into the risk group of a subsequent birth. Given that entering the first and to a lesser extent the second parity is selective on socioeconomic characteristics, the population at risk of a second or a third birth is not representative of the whole male population. For example, low-income men enter parenthood at a lower rate than high-income men but those low-income men who do so may be a select group with other characteristics that make them particularly attractive as partners and suitable as fathers. This may affect the results concerning subsequent parities, e.g. by making some of the gradients less positive. A previous study used simultaneous modeling of first, second and third birth rates in order to tackle the problem of selection but documented that this only marginally affected the estimates of education on men's second and third births (Kravdal 2007). It thus appears likely that such selection does not drive the results we see.

Another consideration in the interpretation of our results is related to children's quality as opposed to their quantity (Becker 1993; Becker and Lewis 1973). It is possible that couples with more resources restrict their subsequent fertility in order to guarantee sufficient resources for their earlier born children. This could potentially contribute to some of the parity-specific results that we witnessed. We do not rule out this possibility but would consider the trade-off at least of less importance than direct financial considerations of

[5] Female partners' characteristics could contribute to some of the observed differences. Analysing partner's characteristics requires a different empirical approach as the one taken here e.g. the sample of analysis would need to exclude men without partners (see Begall 2013; Jalovaara and Miettinen 2013).

whether couples can afford children. Above all, we do not witness any strongly negative gradients by income or other socioeconomic characteristics in any fertility outcome.

Finally, men's socioeconomic characteristics may also reflect characteristics such as health or problem-solving skills, which are correlated with education and may affect also fertility directly, but which could not be measured here. The comparison of brothers was an attempt to come closer to a causal research design: brothers partly share their social environment and genetic make-up. We find that neither observed nor unobserved characteristics shared by brothers explained the association between education and fertility in men, but brothers may still differ in relevant ways that are not captured here (Holmlund 2005; Kohler et al. 2011). More research on the relative importance of different mechanism in explaining educational differences in men's fertility is definitely welcomed.

7.2 Methodological considerations

We consider the strengths of this study to include the large set of non-retrospectively measured socioeconomic variables from early life and the longitudinal measurement of men's fertility based on administrative registers. Additionally, we view the sibling comparison as an innovative approach in the research on men's fertility. Limitations of this methodological approach should be acknowledged too, however. The method does not capture genetic or environmental endowments unshared by brothers, e.g. siblings may be exposed differentially to the family environment due to effects of birth order and birth interval length (Kohler et al. 2011).

The study sample was limited in that men who died or emigrated between 1950 and 1970 or 1970 and 1985/90/95 were left out. The men left out of the sample prior to 1970 were more often born before 1945 or came from lower socioeconomic backgrounds, mother only

families or from Lapland (Elo et al. 2014). These differences were, however, not large and thus unlikely to bias our main findings.

Children born before 1970 were registered only if co-residing with their fathers in the 1970 census. This may introduce a selective bias in our sample (Nelson, 2004). In our data, among women born in the early 1940s, living alone with children in 1970 was more common for those educated at a low level. In the period 1966–70, however, only five percent of children have been reported to have been born out of wedlock in Finland (Finnäs 1993).

Our measurement of socioeconomic characteristics in adulthood is compromised by its non-time-varying nature. As a large share of fertility had occurred by the measurement at the age of 30–34, we face the risks of anticipatory analysis (Hoem and Kreyenfeld 2006). However, men's later timing of and less intensive role in childbearing make children less likely to interfere with their educational careers as compared to women (Woodward et al. 2006). The reverse causality, however, remains plausible particularly for income, e.g., due to incentives to support a family (Gupta et al. 2007; Lundberg and Rose 2002). In a sensitivity analysis using income measured at the age of 40–44 instead of income at the age of 30–34 the main results were changed only marginally, suggesting that the variable used reflects long-term income.

7.3 Conclusion

Having higher education and other favourable socioeconomic characteristics across the life course associated positively with the lifetime number of children among Finnish men born in 1940–1950 in a context where a dual-earner family model was increasingly dominant but where men's role as breadwinners still remained relatively strong. The findings further showed that early life socioeconomic or other characteristics shared by brothers do not

explain the association of education with fertility in men. In turn, income and position in the labour market appear as substantial mediators of the association of education with the chance of a first birth. Educational differences regarding second births were smaller and the respective mediating role of other characteristics weaker. Third births were marked by small differentiation by education and other socioeconomic characteristics. The findings indicate that considerations related to affording children are more decisive for entering parenthood than for continuing childbearing and are major determinants of educational differentials in the number of children. It appears that early life socioeconomic circumstances are not insignificant even for men's lifetime fertility, but education and other characteristics in adulthood are more important. Overall, education is positively associated with fertility among men net of controls for early socioeconomic and other characteristics shared by brothers. To conclude, economic mechanisms may contribute to educational differentials in fertility among men particularly through the entry into parenthood.

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Table 1 : Descriptive statistics of the study population: Finnish men, N = 37,082

Parity distribution by level of education (%)

	Parity													
Level of education	0	95% CI	1	95% CI	2	95% CI	3	95% CI	4	95% CI	5+	95% CI	Total	N
Basic	23.8	23.1-24.5	18.7	18.1-19.3	33.6	32.9-34.3	15.9	15.3-16.4	5.4	5.1-5.8	2.6	2.4-2.9	100.0	16,561
Lower secondary	18.0	17.2-18.7	19.7	18.9-20.5	38.3	37.3-39.2	16.7	16.0-17.4	5.2	4.8-5.6	2.2	1.9-2.5	100.0	10,275
Upper secondary	14.3	13.3-15.3	17.8	16.7-18.8	43.2	41.9-44.6	17.8	16.8-18.9	5.0	4.4-5.6	2.0	1.6-2.4	100.0	5,073
Tertiary	12.1	11.2-13.0	14.8	13.8-15.8	42.1	40.8-43.5	22.4	21.3-23.6	6.1	5.4-6.8	2.5	2.1-3.0	100.0	5,173
Total	19.3	18.8-19.7	18.3	17.9-18.7	37.4	36.9-37.9	17.3	16.9-17.7	5.4	5.2-5.6	2.4	2.2-2.6	100.0	37,082
N	7,139		6,791		13,865		6,407		1,997		883		37,082	

Distribution of explanatory variables (%) and number of children accordingly (M, SD)

Living area in childhood	%	*M*	*SD*	Parental level of education	%	*M*	*SD*	Level of education	%	*M*	*SD*
Helsinki region	8.0	1.76	1.23	Less than primary	13.5	1.75	1.70	Basic	44.7	1.71	1.50
Rest of Uusimaa	5.7	1.75	1.30	Primary school	75.6	1.81	1.42	Lower secondary	27.7	1.80	1.31
Western Finland	39.6	1.83	1.34	More than primary	10.9	1.90	1.30	Upper secondary	13.7	1.90	1.30
Eastern Finland	42.3	1.81	1.58	Parental occupational position				Tertiary	14.0	2.06	1.35
Northern Finland	4.4	1.86	1.66	Worker	42.5	1.76	1.40	Occupational position			
Family type in childhood				Professional/administrative	16.0	1.84	1.31	Manual worker	47.0	1.73	1.39
Two parents and children	93.0	1.82	1.46	Farmer, <10 hect.	24.7	1.82	1.62	Lower white collar	18.5	1.91	1.23
Mother and children	6.2	1.72	1.33	Farmer, ≥10 hect.	7.8	1.94	1.50	Upper white collar	16.2	2.07	1.30
Father and children	0.8	1.61	1.34	Self-employed / other / unknown	9.0	1.87	1.39	Farmer / self-employed	10.3	2.04	1.60
Sibship size								Other / unknown	8.1	1.26	1.47
0	15.3	1.72	1.25	Parental home ownership				Income			
1-2	48.1	1.81	1.37	Owner	59.3	1.82	1.48	1st quintile	20.0	1.47	1.54
3-	36.6	1.85	1.63	Renter	34.7	1.79	1.34	2nd quintile	20.0	1.82	1.29
Year of birth				Other, unknown	6.1	1.80	1.75	3rd quintile	20.0	1.87	1.38
1940	6.3	1.84	1.28	Crowding in childhood				4th quintile	20.0	1.87	1.31
1941	8.7	1.86	1.33	< 2	32.9	1.84	1.29	5th quintile	20.0	2.03	1.29
1942	6.1	1.81	1.34	2 < 3	32.5	1.81	1.48	Marital history			
1943	7.4	1.83	1.36	≥ 3	34.6	1.78	1.57	Never-married	17.5	0.53	1.04
1944	7.9	1.83	1.33	Standard of living childhood				Intact-married	51.9	2.09	1.38
1945	9.6	1.82	1.30	Poor	28.2	1.78	1.60	Divorced/widowed	19.7	1.92	1.15
1946	11.1	1.79	1.30	Modest	46.4	1.81	1.45	Remarried	10.9	2.36	1.34
1947	11.2	1.78	1.35	Good	25.4	1.85	1.27				
1948	11.0	1.78	1.36								
1949	10.5	1.82	1.44								
1950	10.3	1.82	1.44								

Table 2 : Incidence rate ratios (IRR) of the number of children among Finnish men, N = 37,082

Model	0[a,b]		1	2	3	4		5	
	IRR	95% CI	IRR	IRR	IRR	IRR	95% CI	IRR	95% CI
Level of education									
Basic (ref.)	1		1	1	1	1		1	
Lower secondary	1.05	(1.04-1.07)	1.06*	1.06*	1.05*	1.03	(1.02-1.05)	0.99	(0.98-1.01)
Upper secondary	1.11	(1.09-1.13)	1.12*	1.12*	1.07*	1.04	(1.01-1.07)	1.01	(0.98-1.03)
Tertiary	1.20	(1.18-1.23)	1.22*	1.22*	1.13*	1.08	(1.05-1.12)	1.05	(1.02-1.08)
Living area in childhood									
Helsinki region	0.96	(0.94-0.99)	0.95*	0.96*	0.96*	0.95	(0.93-0.99)	0.96	(0.93-0.98)
Rest of Uusimaa	0.96	(0.93-0.99)	0.97	0.97*	0.96*	0.96	(0.93-0.99)	0.97	(0.94-1.00)
Western Finland (ref.)	1		1	1	1	1		1	
Eastern Finland	0.99	(0.98-1.01)	0.99	1.00	1.00	1.01	(0.99-1.02)	1.02	(1.01-1.04)
Northern Finland	1.02	(0.97-1.07)	1.01	1.03	1.04	1.04	(1.00-1.09)	1.07	(1.03-1.12)
Family type in childhood									
Two parents and children (ref.)	1		1	1	1	1		1	
Mother and children	0.94	(0.91-0.97)	0.96*	0.96*	0.97	0.98	(0.95-1.01)	1.01	(0.98-1.03)
Father and children	0.88	(0.79-0.97)	0.90*	0.91*	0.92	0.92	(0.83-1.01)	0.93	(0.86-1.02)
Sibship size									
0 (ref.)	1		1	1	1	1		1	
1-2	1.05	(1.03-1.08)	1.05*	1.05*	1.05*	1.04	(1.02-1.07)	1.04	(1.02-1.06)
3-	1.07	(1.04-1.10)	1.09*	1.08*	1.09*	1.08	(1.05-1.11)	1.08	(1.05-1.10)
Parental level of education									
Less than primary (ref.)	1			1	1	1		1	
Primary school	1.03	(1.01-1.06)		1.02	1.01	1.00	(0.98-1.03)	0.99	(0.97-1.02)
More than primary	1.09	(1.05-1.12)		1.04	1.03	1.03	(0.99-1.07)	1.01	(0.98-1.05)
Parental occupational position									
Worker (ref.)	1			1	1	1		1	
Professional/administrative	1.04	(1.02-1.07)		0.97*	0.96*	0.97	(0.94-0.99)	0.97	(0.95-0.99)
Farmer, <10 hect.	1.03	(1.01-1.05)		1.03*	1.01	1.02	(0.99-1.04)	1.03	(1.01-1.05)
Farmer, ≥10 hect.	1.10	(1.07-1.14)		1.07*	1.03	1.04	(1.01-1.07)	1.05	(1.02-1.08)
Self-employed/other/unkown	1.06	(1.03-1.09)		1.04*	1.03*	1.04	(1.01-1.07)	1.03	(1.00-1.06)
Parental home ownership									
Owner (ref.)	1			1	1	1		1	
Renter	0.98	(0.97-1.00)		0.99	1.00	1.00	(0.98-1.02)	1.00	(0.98-1.02)
Other/unknown	0.99	(0.94-1.03)		1.00	1.00	1.00	(0.96-1.04)	1.00	(0.97-1.04)
Crowding in childhood									
< 2 (ref.)	1			1	1	1		1	
2 < 3	0.98	(0.97-1.00)		1.00	1.00	1.00	(0.98-1.03)	1.01	(0.99-1.03)
≥ 3	0.97	(0.95-0.99)		1.00	1.01	1.01	(0.99-1.04)	1.01	(0.99-1.04)
Standard of living in childhood									
Poor (ref.)	1			1	1	1		1	
Modest	1.02	(0.99-1.04)		1.02	1.01	1.00	(0.98-1.03)	0.99	(0.97-1.01)
Good	1.04	(1.01-1.06)		1.02	1.01	1.00	(0.97-1.03)	0.98	(0.96-1.01)
Occupational position									
Manual worker (ref.)	1				1	1		1	
Lower white collar	1.11	(1.09-1.13)			1.09*	1.07	(1.05-1.10)	1.02	(1.00-1.04)
Upper white collar	1.20	(1.18-1.22)			1.13*	1.09	(1.06-1.13)	1.04	(1.01-1.07)
Farmer/self-employed	1.18	(1.15-1.21)			1.17*	1.24	(1.20-1.27)	1.20	(1.17-1.23)
Other/unknown	0.73	(0.70-0.76)			0.73*	0.82	(0.78-0.86)	0.92	(0.89-0.96)
Income									
1st quintile	0.77	(0.75-0.80)				0.80	(0.78-0.83)	0.93	(0.91-0.96)
2nd quintile	0.94	(0.92-0.97)				0.97	(0.95-0.99)	0.98	(0.95-1.00)
3rd quintile (ref.)	1					1		1	
4th quintile	1.03	(1.01-1.06)				1.03	(1.01-1.06)	1.00	(0.97-1.02)
5th quintile	1.13	(1.10-1.15)				1.09	(1.06-1.11)	1.03	(1.01-1.05)
Marital history									
Never-married	0.25	(0.24-0.27)						0.26	(0.25-0.28)
Intact-married (ref.)	1							1	
Divorced/widowed	0.92	(0.90-0.93)						0.94	(0.92-0.96)
Remarried	1.13	(1.11-1.15)						1.16	(1.14-1.18)

Model 0: explanatory variable + year of birth. Calculated separately for each explanatory variable.
Model 1: level of education + control variables
Model 2: Model 1 + socioeconomic characteristics in early life
Model 3: Model 2 + occupational position
Model 4: Model 3 + income
Model 5: Model 4 + marital history

[a] In Models 0-5: year of birth is included as a continuous variable but the coefficient is not shown.
[b] The 95% CIs are not shown for Models 1-4 but an asterisk indicates when the 95% CI does not include 1.

Table 3 : Odds ratios (OR) of the likelihood of a first birth among Finnish men, N=37,082

Model	0[a,b]		1	2	3	4		5	
	OR	95% CI	OR	OR	OR	OR	95% CI	OR	95% CI
Level of education									
Basic (ref.)	1		1	1	1	1		1	
Lower secondary	1.45	(1.37-1.55)	1.44*	1.42*	1.35*	1.25	(1.18-1.35)	1.07	(0.99-1.17)
Upper secondary	1.90	(1.74-2.07)	1.87*	1.84*	1.34*	1.19	(1.08-1.32)	1.00	(0.87-1.14)
Tertiary	2.28	(2.09-2.51)	2.24*	2.22*	1.41*	1.13	(0.98-1.30)	0.90	(0.77-1.07)
Living area in childhood									
Helsinki region	0.99	(0.90-1.10)	0.91	0.90	0.90	0.85	(0.76-0.96)	0.84	(0.72-0.96)
Rest of Uusimaa	0.96	(0.85-1.07)	0.99	0.97	0.95	0.91	(0.80-1.03)	1.00	(0.84-1.19)
Western Finland (ref.)	1		1	1	1	1		1	
Eastern Finland	0.83	(0.79-0.88)	0.86*	0.91*	0.92*	0.93	(0.87-0.99)	1.00	(0.92-1.08)
Northern Finland	0.86	(0.75-0.97)	0.88*	0.95	1.00	1.05	(0.91-1.21)	1.27	(1.08-1.54)
Family type in childhood									
Two parents and children (ref.)	1		1	1	1	1		1	
Mother and children	0.80	(0.73-0.90)	0.83*	0.84*	0.86*	0.87	(0.78-0.98)	1.01	(0.89-1.16)
Father and children	0.65	(0.50-0.87)	0.69*	0.72*	0.75*	0.76	(0.57-1.01)	0.77	(0.54-1.12)
Sibship size									
0 (ref.)	1		1	1	1	1		1	
1-2	1.07	(1.00-1.17)	1.07	1.08	1.08	1.05	(0.97-1.14)	1.03	(0.93-1.14)
3-	0.92	(0.86-1.01)	1.01	1.09	1.10	1.07	(0.98-1.18)	1.10	(0.97-1.23)
Parental level of education									
Less than primary (ref.)	1			1	1	1		1	
Primary school	1.37	(1.27-1.47)		1.20*	1.17*	1.13	(1.04-1.21)	1.12	(1.02-1.24)
More than primary	1.66	(1.50-1.85)		1.10	1.12	1.10	(0.97-1.28)	1.06	(0.90-1.26)
Parental occupational position									
Worker (ref.)	1			1	1	1		1	
Professional/administrative	1.16	(1.07-1.26)		0.86*	0.83*	0.84	(0.76-0.93)	0.81	(0.72-0.90)
Farmer, <10 hect.	0.85	(0.80-0.91)		0.91*	0.90*	0.93	(0.86-1.01)	0.96	(0.87-1.06)
Farmer, ≥10 hect.	1.03	(0.93-1.15)		0.94	0.92	0.93	(0.83-1.05)	0.99	(0.87-1.15)
Self-employed/other/unkown	1.09	(0.99-1.21)		1.04	1.04	1.06	(0.95-1.18)	1.06	(0.92-1.19)
Parental home ownership									
Owner (ref.)	1			1	1	1		1	
Renter	1.15	(1.09-1.22)		1.01	1.01	1.01	(0.94-1.08)	1.04	(0.94-1.13)
Other/unknown	0.96	(0.85-1.08)		0.97	0.97	0.97	(0.86-1.10)	0.98	(0.85-1.15)
Crowding in childhood									
< 2 (ref.)	1			1	1	1		1	
2 < 3	0.92	(0.86-0.98)		1.00	0.99	0.99	(0.92-1.07)	1.00	(0.91-1.10)
≥ 3	0.77	(0.71-0.82)		0.92	0.94	0.95	(0.87-1.03)	0.94	(0.85-1.03)
Standard of living in childhood									
Poor (ref.)	1			1	1	1		1	
Modest	1.27	(1.19-1.35)		1.19*	1.09*	1.05	(0.97-1.13)	0.98	(0.89-1.07)
Good	1.49	(1.38-1.60)		1.16*	1.13*	1.10	(0.98-1.21)	0.99	(0.88-1.12)
Occupational position									
Manual worker (ref.)	1				1	1		1	
Lower white collar	1.82	(1.68-1.97)			1.62*	1.51	(1.37-1.65)	1.23	(1.09-1.38)
Upper white collar	2.25	(2.05-2.45)			1.85*	1.56	(1.34-1.77)	1.27	(1.06-1.48)
Farmer/self-employed	1.08	(0.98-1.18)			1.08	1.48	(1.34-1.63)	1.46	(1.30-1.64)
Other/unknown	0.34	(0.31-0.37)			0.33*	0.59	(0.54-0.64)	0.76	(0.68-0.85)
Income									
1st quintile	0.30	(0.27-0.32)				0.37	(0.34-0.40)	0.49	(0.44-0.54)
2nd quintile	0.82	(0.75-0.89)				0.91	(0.83-1.00)	0.91	(0.80-1.02)
3rd quintile (ref.)	1					1		1	
4th quintile	1.28	(1.17-1.41)				1.24	(1.13-1.37)	1.06	(0.95-1.18)
5th quintile	2.01	(1.81-2.22)				1.72	(1.55-1.90)	1.38	(1.23-1.55)
Marital history									
Never-married	0.03	(0.03-0.03)						0.04	(0.03-0.04)
Intact-married (ref.)	1							1	
Divorced/widowed	0.74	(0.67-0.80)						0.83	(0.75-0.90)
Remarried	1.17	(1.01-1.33)						1.24	(1.08-1.43)

Model 0: explanatory variable + year of birth. Calculated separately for each explanatory variable.
Model 1: level of education + control variables
Model 2: Model 1 + socioeconomic characteristics in early life
Model 3: Model 2 + occupational position
Model 4: Model 3 + income
Model 5: Model 4 + marital history

[a] In Models 0-5: year of birth is included as a continuous variable but the coefficient is not shown.
[b] The 95% CIs are not shown for Models 1-4 but an asterisk indicates when the 95% CI does not include 1.

Table 4 : Odds ratios (OR) of the likelihood of a second birth among Finnish fathers, n=29,943

Model	0[a,b]		1	2	3	4		5	
	OR	95% CI	OR	OR	OR	OR	95% CI	OR	95% CI
Level of education									
Basic (ref.)	1		1	1	1	1		1	
Lower secondary	1.04	(0.97-1.10)	1.04	1.04	1.05	1.04	(0.97-1.11)	1.02	(0.95-1.09)
Upper secondary	1.25	(1.15-1.36)	1.29*	1.27*	1.21*	1.18	(1.07-1.29)	1.15	(1.05-1.27)
Tertiary	1.61	(1.47-1.78)	1.68*	1.63*	1.45*	1.37	(1.22-1.56)	1.33	(1.18-1.51)
Living area in childhood									
Helsinki region	0.85	(0.77-0.96)	0.82*	0.86*	0.86*	0.84	(0.75-0.95)	0.85	(0.76-0.96)
Rest of Uusimaa	0.99	(0.87-1.11)	1.01	1.02	1.02	1.01	(0.89-1.14)	1.03	(0.90-1.15)
Western Finland (ref.)	1		1	1	1	1		1	
Eastern Finland	0.99	(0.93-1.06)	1.00	1.02	1.01	1.01	(0.94-1.08)	1.03	(0.95-1.09)
Northern Finland	1.10	(0.97-1.28)	1.08	1.12	1.13	1.13	(0.99-1.33)	1.16	(1.02-1.35)
Family type in childhood									
Two parents and children (ref.)	1		1	1	1	1		1	
Mother and children	0.94	(0.85-1.06)	1.02	1.01	1.03	1.04	(0.93-1.17)	1.04	(0.94-1.18)
Father and children	0.90	(0.64-1.25)	0.96	0.96	0.96	0.97	(0.69-1.36)	0.95	(0.69-1.34)
Sibship size									
0 (ref.)	1		1	1	1	1		1	
1-2	1.15	(1.07-1.25)	1.16*	1.16*	1.17*	1.16	(1.07-1.27)	1.16	(1.07-1.26)
3-	1.21	(1.11-1.30)	1.25*	1.23*	1.25*	1.25	(1.14-1.36)	1.24	(1.14-1.36)
Parental level of education									
Less than primary (ref.)	1			1	1	1		1	
Primary school	1.04	(0.96-1.13)		1.03	1.02	1.01	(0.93-1.10)	1.01	(0.93-1.10)
More than primary	1.24	(1.10-1.39)		1.07	1.06	1.05	(0.90-1.22)	1.05	(0.90-1.21)
Parental occupational position									
Worker (ref.)	1			1	1	1		1	
Professional/administrative	1.25	(1.16-1.36)		1.03	1.01	1.02	(0.92-1.12)	1.01	(0.92-1.11)
Farmer, <10 hect.	1.27	(1.17-1.36)		1.21*	1.15*	1.15	(1.06-1.25)	1.15	(1.05-1.25)
Farmer, ≥10 hect.	1.60	(1.42-1.79)		1.44*	1.30*	1.30	(1.15-1.49)	1.29	(1.13-1.48)
Self-employed/other/unkown	1.28	(1.16-1.42)		1.20*	1.16*	1.17	(1.05-1.30)	1.17	(1.05-1.30)
Parental home ownership									
Owner (ref.)	1			1	1	1		1	
Renter	0.88	(0.83-0.93)		0.96	0.96	0.96	(0.90-1.04)	0.98	(0.91-1.05)
Other/unknown	0.86	(0.77-0.97)		0.89*	0.89	0.89	(0.79-1.00)	0.89	(0.79-1.00)
Crowding in childhood									
< 2 (ref.)	1			1					
2 < 3	0.87	(0.81-0.92)		0.92*	0.93	0.93	(0.86-1.00)	0.94	(0.86-1.01)
≥ 3	0.85	(0.79-0.91)		0.93	0.96	0.96	(0.89-1.05)	0.97	(0.89-1.06)
Standard of living in childhood									
Poor (ref.)	1			1					
Modest	0.95	(0.88-1.01)		0.97	0.97	0.96	(0.89-1.04)	0.96	(0.88-1.03)
Good	1.05	(0.97-1.13)		1.04	1.02	1.02	(0.91-1.12)	1.01	(0.91-1.12)
Occupational position									
Manual worker (ref.)	1				1	1		1	
Lower white collar	1.23	(1.15-1.33)			1.14*	1.13	(1.04-1.22)	1.11	(1.02-1.20)
Upper white collar	1.62	(1.50-1.78)			1.28*	1.22	(1.08-1.37)	1.19	(1.06-1.34)
Farmer/self-employed	1.88	(1.71-2.08)			1.73*	1.77	(1.59-1.96)	1.74	(1.57-1.94)
Other/unknown	0.82	(0.74-0.94)			0.78*	0.84	(0.75-0.97)	0.86	(0.77-0.99)
Income									
1st quintile	0.90	(0.83-0.99)				0.91	(0.84-1.01)	0.94	(0.86-1.04)
2nd quintile	0.88	(0.81-0.96)				0.95	(0.87-1.03)	0.95	(0.87-1.03)
3rd quintile (ref.)	1					1		1	
4th quintile	1.05	(0.97-1.15)				1.07	(0.98-1.17)	1.05	(0.97-1.15)
5th quintile	1.36	(1.24-1.49)				1.23	(1.12-1.36)	1.20	(1.09-1.32)
Marital history									
Never-married	0.42	(0.38-0.47)						0.45	(0.40-0.50)
Intact-married (ref.)	1							1	
Divorced/widowed	0.67	(0.63-0.72)						0.73	(0.68-0.78)
Remarried	1.03	(0.94-1.13)						1.10	(1.00-1.20)

Model 0: explanatory variable + year of birth. Calculated separately for each explanatory variable.
Model 1: level of education + control variables
Model 2: Model 1 + socioeconomic characteristics in early life
Model 3: Model 2 + occupational position
Model 4: Model 3 + income
Model 5: Model 4 + marital history

[a] In Models 0-5: year of birth is included as a continuous variable but the coefficient is not shown.
[b] The 95% CIs are not shown for Models 1-4 but an asterisk indicates when the 95% CI does not include 1.

Table 5 : Odds ratios (OR) of the likelihood of a third birth among Finnish fathers of at least two children, n=23,152

Model	0[a,b]		1	2	3	4		5	
	OR	95% CI	OR	OR	OR	OR	95% CI	OR	95% CI
Level of education									
Basic (ref.)	1		1	1	1	1		1	
Lower secondary	0.88	(0.82-0.94)	0.89*	0.89*	0.92*	0.93	(0.86-0.99)	0.93	(0.87-0.99)
Upper secondary	0.80	(0.74-0.87)	0.82*	0.83*	0.91*	0.92	(0.84-1.03)	0.92	(0.84-1.03)
Tertiary	1.03	(0.96-1.12)	1.07	1.07	1.14*	1.17	(1.06-1.32)	1.20	(1.08-1.36)
Living area in childhood									
Helsinki region	1.00	(0.90-1.10)	1.02	1.05	1.05	1.06	(0.95-1.18)	1.01	(0.91-1.13)
Rest of Uusimaa	0.84	(0.74-0.94)	0.84*	0.84*	0.84*	0.85	(0.75-0.96)	0.84	(0.74-0.95)
Western Finland (ref.)	1		1	1	1	1		1	
Eastern Finland	1.09	(1.03-1.15)	1.06*	1.06	1.06	1.06	(1.00-1.13)	1.06	(1.00-1.13)
Northern Finland	1.18	(1.03-1.35)	1.15*	1.14	1.14	1.13	(0.99-1.29)	1.14	(1.00-1.31)
Family type in childhood									
Two parents and children (ref.)	1		1	1	1	1		1	
Mother and children	0.92	(0.83-1.02)	0.98	0.96	0.98	0.98	(0.87-1.09)	0.97	(0.86-1.08)
Father and children	0.81	(0.58-1.12)	0.85	0.83	0.83	0.82	(0.59-1.14)	0.77	(0.55-1.07)
Sibship size									
0 (ref.)	1		1	1	1	1		1	
1-2	1.14	(1.05-1.23)	1.13*	1.13*	1.13*	1.14	(1.05-1.23)	1.14	(1.05-1.24)
3-	1.33	(1.22-1.44)	1.30*	1.24*	1.25*	1.26	(1.14-1.38)	1.27	(1.15-1.40)
Parental level of education									
Less than primary (ref.)	1			1	1	1		1	
Primary school	0.87	(0.81-0.95)		0.93	0.93	0.94	(0.86-1.03)	0.94	(0.86-1.03)
More than primary	0.98	(0.87-1.08)		1.15*	1.14	1.15	(0.99-1.31)	1.13	(0.98-1.28)
Parental occupational position									
Worker (ref.)	1			1	1	1		1	
Professional/administrative	1.00	(0.93-1.09)		0.94	0.93	0.93	(0.85-1.03)	0.92	(0.84-1.02)
Farmer, <10 hect.	1.15	(1.08-1.24)		1.10*	1.06	1.05	(0.97-1.13)	1.08	(1.00-1.16)
Farmer, ≥10 hect.	1.23	(1.12-1.36)		1.23*	1.11	1.11	(0.99-1.23)	1.16	(1.03-1.28)
Self-employed/other/unkown	1.11	(1.01-1.23)		1.11*	1.08	1.08	(0.98-1.20)	1.08	(0.98-1.20)
Parental home ownership									
Owner (ref.)	1			1	1	1		1	
Renter	0.90	(0.85-0.95)		0.99	1.00	1.00	(0.94-1.08)	0.99	(0.92-1.06)
Other/unknown	0.96	(0.86-1.09)		0.98	0.99	0.99	(0.87-1.12)	0.98	(0.87-1.12)
Crowding in childhood									
< 2 (ref.)	1			1	1	1		1	
2 < 3	0.99	(0.93-1.06)		0.98	0.99	0.99	(0.92-1.06)	0.99	(0.92-1.06)
≥ 3	1.12	(1.05-1.19)		1.07	1.09*	1.08	(1.00-1.18)	1.08	(1.00-1.18)
Standard of living in childhood									
Poor (ref.)	1			1	1	1		1	
Modest	0.92	(0.86-0.98)		1.02	1.02	1.02	(0.94-1.09)	1.02	(0.94-1.09)
Good	0.87	(0.81-0.93)		0.96	0.94	0.95	(0.86-1.04)	0.94	(0.86-1.03)
Occupational position									
Manual worker (ref.)	1				1	1		1	
Lower white collar	0.89	(0.83-0.96)			0.94	0.94	(0.87-1.02)	0.93	(0.86-1.01)
Upper white collar	1.08	(1.00-1.16)			1.02	1.03	(0.93-1.15)	1.01	(0.90-1.12)
Farmer/self-employed	1.55	(1.42-1.68)			1.54*	1.45	(1.32-1.59)	1.48	(1.35-1.63)
Other/unknown	1.36	(1.22-1.54)			1.34*	1.19	(1.06-1.37)	1.13	(1.00-1.30)
Income									
1st quintile	1.40	(1.29-1.53)				1.27	(1.15-1.39)	1.28	(1.16-1.40)
2nd quintile	0.97	(0.89-1.06)				0.97	(0.89-1.06)	0.98	(0.90-1.07)
3rd quintile (ref.)	1					1		1	
4th quintile	0.92	(0.85-0.99)				0.94	(0.87-1.02)	0.94	(0.87-1.02)
5th quintile	0.95	(0.88-1.03)				0.94	(0.86-1.02)	0.93	(0.86-1.01)
Marital history									
Never-married	0.91	(0.81-1.03)						0.89	(0.78-1.01)
Intact-married (ref.)	1							1	
Divorced/widowed	1.03	(0.96-1.09)						1.04	(0.97-1.11)
Remarried	2.04	(1.89-2.21)						2.16	(2.00-2.35)

Model 0: explanatory variable + year of birth. Calculated separately for each explanatory variable.
Model 1: level of education + control variables
Model 2: Model 1 + socioeconomic characteristics in early life
Model 3: Model 2 + occupational position
Model 4: Model 3 + income
Model 5: Model 4 + marital history

[a] In Models 0-5: year of birth is included as a continuous variable but the coefficient is not shown.
[b] The 95% CIs are not shown for Models 1-4 but an asterisk indicates when the 95% CI does not include 1.

Table 6: Estimates from standard and sibling fixed-effects (FE) regression models in the sub-samples of Finnish men used in the FE-estimation

Poisson regression model of the number of children n=16,691[a]

Model	0		1		2		FE	
	IRR[b]	95% CI	IRR	95% CI	IRR	95% CI	IRR	95% CI
Level of education								
Basic (ref.)	1		1		1		1	
Lower secondary	1.03	(1.00-1.06)	1.03	(1.00-1.06)	1.03	(1.00-1.06)	1.07	(1.03-1.11)
Upper secondary	1.10	(1.07-1.14)	1.11	(1.08-1.15)	1.12	(1.08-1.16)	1.11	(1.06-1.17)
Tertiary	1.17	(1.13-1.21)	1.18	(1.14-1.22)	1.19	(1.15-1.24)	1.19	(1.12-1.25)

Logistic regression model of the likelihood of a first birth, n=5,875[a]

Model	0		1		2		FE	
	OR[c]	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Level of education								
Basic (ref.)	1		1		1		1	
Lower secondary	1.36	(1.21-1.51)	1.38	(1.23-1.54)	1.40	(1.24-1.57)	1.54	(1.34-1.74)
Upper secondary	1.51	(1.30-1.81)	1.57	(1.35-1.90)	1.69	(1.41-2.03)	1.97	(1.62-2.44)
Tertiary	1.65	(1.41-1.91)	1.75	(1.50-2.03)	1.97	(1.64-2.38)	2.44	(1.90-3.07)

Logistic regression model of the likelihood of a second birth, n=4,417[a]

Model	0		1		2		FE	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Level of education								
Basic (ref.)	1		1		1		1	
Lower secondary	1.12	(0.98-1.28)	1.14	(0.99-1.30)	1.16	(1.01-1.32)	1.17	(1.00-1.38)
Upper secondary	1.24	(1.03-1.47)	1.29	(1.06-1.53)	1.35	(1.09-1.61)	1.41	(1.12-1.73)
Tertiary	1.36	(1.14-1.60)	1.43	(1.20-1.69)	1.55	(1.27-1.88)	1.65	(1.27-2.12)

Logistic regression model of the likelihood of a third birth, n=4,141[a]

Model	0		1		2		FE	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Level of education								
Basic (ref.)	1		1		1		1	
Lower secondary	0.93	(0.80-1.07)	0.93	(0.80-1.07)	0.93	(0.80-1.07)	0.90	(0.76-1.06)
Upper secondary	0.91	(0.77-1.09)	0.91	(0.77-1.09)	0.91	(0.76-1.11)	0.87	(0.71-1.10)
Tertiary	1.03	(0.89-1.19)	1.03	(0.89-1.21)	1.04	(0.87-1.24)	1.03	(0.82-1.32)

Model 0: level of education + year of birth
Model 1: level of education + control variables
Model 2: Model 1 + socioeconomic characteristics in early life
FE Model: level of education + year of birth + unobserved fixed family characteristics
[a] Estimates of other explanatory variables than education are not shown. In Models 0-2 explanatory variables are included as in Tables 2-5: all variables except year of birth are included as categorical variables.
[b] IRR = incidence rate ratio
[c] OR = odds ratio