Parental education, intergenerational educational mobility and higher order births

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Introduction

Education is one of the key factors explaining differences in the timing and progression to higher order births and there is a large body of literature documenting this relationship in various contexts (Bartus, Murinkó, Szalma, & Szél, 2013; Hoem, Prskawetz, & Neyer, 2001; Kravdal, 1992, 2008; Kreyenfeld, 2002; Ní Bhrolcháin, 1993; Rendall & Smallwood, 2003). Yet, when it comes to other fertility dimensions such as timing of first birth (Barber, 2001; Blossfeld & Huinink, 1991; Michael & Tuma, 1985) and number of children (Murphy & Wang, 2001; Rijken & Liefbroer, 2009; Thornton, 1980), it is not only individuals' education which matters but also education of the family of origin. Therefore, not only individuals' own education matters for higher order births but also the education in the family of origin and eventually the consistency or inconsistency between the educational level at origin and the achieved educational level at destination, namely intergenerational educational mobility status. This study brings together three connected determinants of higher order births: individuals' own level of education, parents' level of education and intergenerational educational mobility.

The relationship between parents' educational attainment and their offspring's timing and progression to second and third births could further inform us if the characteristics of the family of origin are important beyond the timing of first birth and the overall number of children. This can enhance our understanding about the role of parents' education for other fertility dimensions over the reproductive life such as spacing between births and parity progression. Hence, if there is an association between parents' education and the first birth and the complete family size, then we are interested to know how these are formed over the reproductive life, treating fertility behaviour as a dynamic process. If certain fertility timing pathways and progression to higher order births are associated with better life outcomes such as career opportunities (e.g. occupational polarization (Ekert-Jaffé, Joshi, & Lynch, 2002)) and those particular fertility pathways are practiced by individuals from better educated

families, over and above their own education, we regard fertility behaviour as a mechanism of transmission of advantage or disadvantage. A strong polarisation in demographic behaviour can lead to 'diverging destinies' with implications not only for one single generation's well-being but also for their children (McLanahan, 2004). Therefore, as career and educational trajectories and demographic events are inter-connected between and within generations, in order to fully understand the transmission of advantage and disadvantage, one needs to pay more attention to the entire milieu of factors that play a role in the reproduction of inequalities.

Moreover, not all individuals achieve the same educational level as their parents but some experience upward or downward intergenerational educational mobility (Breen, Luijkx, Muller, & Pollak, 2009; Pfeffer, 2008; Shavit & Blossfeld, 1993). Given the different educational levels between the family of origin and individual's own level of education together with the experience of mobility *per se*, the fertility behaviour of mobile individuals might differ from the non-mobile in general and from the non-mobile individuals in the educational group of origin and destination in particular. Previous studies tested these arguments mostly focusing on the relationship between intergenerational mobility, measured by male's social class, and number of children (Bean & Swicegood, 1979; Berent, 1952; Blau & Duncan, 1967; Hope, 1971; Sobel, 1985; Westoff, 1981; Zimmer, 1981). However, the findings were mixed and most of the times women were not included. Very few studies if any, investigated the relationship between intergenerational educational mobility- which is not only a stratification dimension worth exploring (De Graaf & Ganzeboom, 1990) but it also facilitates the study of women- and the timing and progression to second and third birth.

The relationship between intergenerational educational mobility and timing and progression to second and third births can bring new insights, other than the overall association between parent's education and respondent's education and number of children. These newly explored dimensions capture the spacing between births and progression to

higher order births and their relationship with the experience and direction of mobility and differences between specific mobility routes. This, in turn, can improve our knowledge about the interplay between the ascribed (here parent's education) and achieved conditions (individual's own education) for each of the mobile educational groups. Recent research emphasises the important link between intergenerational educational mobility and demographic processes, including birth events. It is acknowledged that these processes have become part of the mechanism of reproduction of inequality (Maralani, 2013).

The strong educational and occupational differences in fertility (Ekert-Jaffé et al., 2002; Rendall & Smallwood, 2003; Sigle-Rushton, 2008) together with the configuration of the status attainment process, namely relatively high intergenerational educational mobility (Breen et al., 2009; Pfeffer, 2008) moderate social mobility by social class (Breen, 2004) and low intergenerational mobility by wages (OECD, 2011) make the UK an interesting case to study the relationship between parental education, intergenerational educational mobility and fertility. If there is intergenerational educational mobility but the social class or earnings returns to education depend on social background, fertility differentials by mobility status might be more likely to exits.

Also, social mobility represents a political aim and the UK government pursue a social mobility strategy (HMGovernment, 2011) which adopts a life-cycle approach, crosscutting several dimensions of social stratification. This strategy aims to create equal opportunities and increase intergenerational relative social mobility, emphasising the equality of opportunity as opposed to equality of conditions. However, when it comes to fertility there are no specific policies, excepting the teenage pregnancies. UK is among the countries with relatively high fertility compared to other Western European countries experiencing lower fertility rates (Sigle-Rushton, 2008). However, despite the relatively stable and high fertility, UK displays a strong social polarization of fertility tempo and quantum by occupational class

which is stronger than in other advanced societies such as France, for example (Ekert-Jaffé et al., 2002).

Yet, these characteristics were not identical over time. Therefore, another contextual aspect which can have an important role and generate differences with regard to our relationships of interest is the temporal one. Although the findings about the increase or decrease of educational inequalities over time are mixed (Breen et al., 2009; Pfeffer, 2008; Shavit & Blossfeld, 1993), other changes in education were more visible, such as the various reforms in the UK educational system or the expansion of education during the second half of the twentieth which increased the level of education among children from all social backgrounds (Goldthorpe and Mills, 2004 in Breen Ed.). Also, with regard to fertility, starting with the cohorts of the mid 1940's, there was also a decrease in the fertility rates for all birth orders (Frejka & Sardon, 2007). It seems legitimate to raise questions about the relationship between parental education, intergenerational educational mobility and timing and progression to second and third births not only overall but also across different cohort groups with different fertility, educational and mobility regimes. This can inform us if the relationships of interest are universal or context-specific.

Therefore, this paper contributes to the field by explicitly investigating the relationship between parents' education, intergenerational educational mobility and higher order births. Using detailed fertility histories and event history analysis techniques, this study goes beyond the analysis of the number of children and examines parental background and intergenerational mobility differences in progression and time to second and third births. Further, including both, men and women from different cohort groups covering three quarters of the twentieth century, this research explores gender differences together with changes over time in the strength of the associations under study. Specifically, this study addresses several related questions. Is there a net association between parent's education and the risk of second and third births, over and above respondent's education? Is there a net association between

the existence and direction of intergenerational educational mobility and the risk of second and third births over and above parents' education and respondent's education? Does the risk of second and third births of mobile individuals differ from the non-mobile individuals in the group of destination and the non-mobile individuals in the group of origin? Finally, we ask: how do these vary by gender and cohort groups.

Theoretical framework ***to be revised***

The underlying factors behind the transition to second or higher order births might be different or at least act differently from the determinants of first birth. Yet, the factors influencing the first birth have an indirect influence on the transitions to higher order births given that age at first birth plays an important role for subsequent fertility outcomes (Morgan & Rindfuss, 1999). An important determinant of first birth which has also a direct influence on higher order births is individual's own education. Besides its strong negative relationship with the timing and transition to the first birth, education remains an important factor for subsequent fertility behaviour. Moreover, the education of the family of origin and the experience of intergenerational educational mobility might play an independent role, beyond individuals' own education. Therefore, this section will provide an overview of the main theoretical arguments connecting individuals' education, parents' level of education, intergenerational educational mobility and higher order births.

Higher order births and education

Mechanisms which link education and higher order births refer to educational enrolment, income and childbearing costs, contraceptive norms, family size preferences or finding a partner (Kravdal, 2008). Two opposite directions have been suggested by previous research regarding the relationship between education and the quantum dimension of fertility. First, ideas from family economics such as "opportunity cost" or "quality-quantity trade-off"

(Becker, 1991) which initially were developed in relation to income and fertility have been used to explain the relationship between education and fertility. These two explanations suggest a negative association between education and number of children. The former assumes that individuals with higher educational level are more likely to have other interests which compete with childbearing and implicitly a higher opportunity cost. The latter explanation advances that better educated individuals value children's quality which in turn requires more resources, hence a lower incentive for more children.

Second, others (Kravdal, 2008; Oppenheimer, 1994) argued that a negative association is not always the case and a positive association is also plausible. Relying on richer survey data which provides fertility histories, several studies found a positive association between education and the risk of a second birth in countries such as Britain, United States, Canada, Germany, Norway and Hungary (Bartus et al., 2013; Hoem et al., 2001; Kravdal, 1992, 2008; Kreyenfeld, 2002; Ní Bhrolcháin, 1993; Rendall & Smallwood, 2003). Using data from the 1986-1989 General Household Survey (GHS) in Britain, Ni Bhrolchain (1993) found that education had a positive effect on the progression to second, third and fourth births for any given age at the previous birth. Other research using data from the 1980 Women and Employment Survey in Britain did not find any relationship between education and progression to third births (Wright, Ermisch, Hinde, & Joshi, 1988). Evidence based on the ONS Longitudinal Study, 1954-1958 birth cohorts, showed that despite the fact that they have a first child later, women with higher education tend to accelerate and have not only a quicker transition to the second birth but also a higher probability to experience a second birth compared to their counterparts with lower education, at any given age. The same positive association is reported for third and fourth births as well although it is not as strong as in case of second births. Note that all these associations are net of women's age. However, when using relative measures, highly educated mothers who had a first birth at a later age

were much more likely to have just one child than the lower educated mothers who had a first birth at a later age (Rendall & Smallwood, 2003).

Several explanations have been proposed to account for the positive relationship between education and progression to higher order births. First, an income effect might be at play, given that women with higher education have a higher income which enables them to afford a second birth (Kravdal, 1992). Second, a close spacing between births might reflect both contraceptive confidence and a work accelerated childbearing pattern which suits work-oriented women (NíBhrolcháin, 1986, 1988). Third, a time-squeeze effect was suggested (Kreyenfeld, 2002), namely that the late age at first birth of college graduates restricts their waiting time for a second child and this results in a faster transition. Fourth, a partner effect has been also discussed (Oppenheimer, 1994). This builds on the assumption of homogamy and states that a higher educated partner can make a larger family affordable. Finally, the argument of self-selection has been also proposed. Given that fertility is incompatible with career, those highly educated women who gave up career to have a first child are mostly family-oriented, therefore are self-selected. Evidence based on West German data supports the last two explanations, after controlling for unobserved heterogeneity, education and second birth association becomes strongly negative (Kreyenfeld, 2002). However, other research, such as a recent study based on Hungarian data, does not reinforce the partner effect explanation (Bartus et al., 2013). Kravdal (2007) draws attention that these findings should be interpreted with caution given that different model specifications yield different results.

The influence of the family of origin on higher order births

Very few studies addressed the association between parents' socio-economic status (i.e. income, education, occupation) and higher order births (Booth & Kee, 2006; Easterlin, 1976; Murphy & Wang, 2001; Rijken & Liefbroer, 2009; Thornton, 1980). Most of these studies focused on the intergenerational transmission of fertility behaviour and therefore did not treat

parental background as a key variable but rather as a control variable which had the role to rule out the possibility that the relationship between the two generations' fertility is not due to a confounding effect related to intergenerational transmission of social status. As opposed to the relationship between individuals' own education and higher order births, where several dimension of fertility have been examined (i.e. parity progression, birth spacing and completed family size), the few studies on parents' education and higher order births only focused on the number of children. This could only be a consequence of the fact that parental background was mostly a by-product of studies on intergenerational transmission of fertility behaviour where the fertility measures used to assess the intergenerational fertility behaviour has to be the same. Yet, although detailed fertility histories are available for respondents, information on parents' fertility is usually more limited. Consequently, this constrains the fertility measure to whatever is available for both parents and respondents (usually number of siblings as proxy for parent's fertility and completed family size for respondent's fertility). However, fertility is a dynamic process and just as respondent's education matters for parity progression and spacing of births, parent's education might also matter, given its relevance for timing of first birth and number of children. The theoretical mechanisms linking parent's education to number of children (e.g. socialization, social control) could also apply to parity progression and spacing of births. Therefore, examining the role of parents' education beyond the timing of fist birth add the total number of children can bring new insights regarding fertility differentials by parental background.

Previous studies found that the size of the family (i.e. number of children) is positively related between generations, supporting the idea that 'fertility runs in the family'. Yet, net of the intergenerational transmission of fertility, there is also evidence for a direct relationship between parents' status and number of children in the second generation. However, as already mentioned, given the strong association between the social status of the two generations (Goldthorpe & Mills, 2004, de Graaf et al., 2000), a potential confounder

behind the relationship between parental social status and their children's fertility is children's own social status. Therefore we distinguish between a *direct* relationship, net of individuals' social status and an *indirect* relationship which is mediated through social status, where the parents' effect disappears in the presence of individuals' own social status.
Past research provided evidence for the existence of both a direct and an indirect relationship. More specifically, regarding the number of children, Murphy and Wang (2001) found a negative relationship between parent's education and children's number of offspring and this relationship was net of children's education. Distinguishing between mother's and father's social status, Rijken and Liefbroer (2009) found an independent negative association only in the case of mother's education, while the effect of father's education and occupational status was totally mediated through child's educational attainment. Their study shows a direct negative relationship between the statuses of both parents and fertility only in the case of age at first birth. The negative relationship between parental economic status and number of children found by Thornton (1980) was mediated through children's educational achievement.

Among these studies, only the work of Thornton in the U.S. context (1980) and Rijken and Liefbroer in The Netherlands (2009) raised specific research questions and discussed theoretical mechanisms regarding the relationship between parents' income, education, occupation and total number of children. While the indirect relationship is self-explanatory (i.e. the strong association between parent's education and offspring education and at the same time the strong association between offspring's education and number of children), the direct relationship requires more theoretical explanations. In this regard, several theoretical mechanisms have been suggested such as aspiration for material goods, socialization, social control, transmission of values and religious beliefs. It has been argued that individuals develop their material aspirations in the family of origin and those desires and material tastes further influence individuals' fertility behaviour (Easterlin, 1969, 1973). More specifically, Easterlin's hypothesis (1969), claims that the number of children is

inversely related to individuals' aspirations for material consumption and therefore to parental social status. Also, the overall effect of parental education could also operate through the transmission of preferences via socialization or social control. It has been shown that parents' preferences for their child's family size is positively associated with their children's preferences for family size (Axinn & Barber, 2001; Thornton, 1980) and achieved parity (Thornton, 1980).

Thornton (1980) draws attention to the complexity of the relationship between parental background and fertility of children and points to several potential intervening variables other than aspiration for consumption goods, such as taste for non-children, taste for child quality, price of children, fertility regulation. These, in turn, can influence the number of children in the second generation. He also suggests that as long as these potential intervening variables are not explicitly modelled we cannot know exactly what parental background variables (e.g. education, social status) specify, therefore the overall effect of parental social status remains just a sum of these potential influences without revealing the exact mechanism at play.

While we do not deny the importance of 'unpacking' the effect of parental background, here we only focus on its overall effect without addressing all the hidden potential mechanisms which may be encapsulated in it. We do so for at least three reasons. First, we consider that the overall effect of parental education is informative in its own right and it can be seen as an index showing how the overall socio-economic and cultural conditions in the family of origin can influence individuals' fertility behaviour. This overall influence might play a role in the process of social reproduction. Second, given the scarce research on this topic, there are still aspects regarding the overall effect of parental education which were left unanswered, such as the influence on the parity progression and spacing together with the change in the strength of the association over time. Third, we further use the educational level of the parents as social status at origins and compare it with the educational

level at destination to further examine the relationship between intergenerational educational mobility and the risk of second and third births.

Intergenerational educational mobility and higher order births

While the relationship between parental background and number of children has not been treated very often as a separate topic, the relationship between social mobility by social class and number of children has been a topic in itself for many years in the past research. However, social class is only one dimension of social stratification and number of children is just one dimension of fertility. The relationship between them does not provide us with a detailed image about how the relationship between social mobility and fertility is formed over the reproductive life. For this purpose, other dimensions of fertility such as parity progression and spacing are informative and they might bring a different picture than the overall number of children at the end of reproductive life. Yet, to investigate these dimensions which can be visible earlier in the life-course, possibly before acquiring a stable social class, the social mobility measure has to be adjusted accordingly in order to provide an earlier assessment of intergenerational mobility which can, in turn, allow testing outcomes related to earlier behaviours.

Education is one social stratification dimension which has a key role in the status attainment process (Blau & Duncan, 1967), it is valuable in itself (De Graaf & Ganzeboom, 1990) and it can be assessed regardless of the participation in the labour force. In this study we further develop the topic by investigating different dimensions of intergenerational mobility and fertility. Therefore, instead of intergenerational social mobility by social class we look at the intergenerational educational mobility and instead of number of children, we study the timing of and progression to the second and third births. However, we treat education as a proxy for social status and use the theoretical arguments from previous research.

In response to the changes in fertility in developed societies at the beginning of the 20th century, Dumont formulated the "social capillarity" hypothesis (Bejin, 1989) or "luggage hypothesis". This states that for people interested to climb the social ladder, having numerous children represents a burden that slows them down. The competition between fertility and upward mobility has been considered a key factor in explaining fertility decline during the first demographic transition. However, we consider that the relationship between intergenerational mobility and fertility is valuable regardless of its relevance in the first demographic transition context, especially when using intergenerational educational mobility as a measure. As mentioned in the introduction, education and fertility are two domains which have been subject to major changes across the 20th century. More recent changes in fertility in advanced societies have been associated with second demographic transition (SDT) and the ideational factors behind the SDT theory are subject to social stratification, with education being a key dimension. In the U.S. it has been argued that trends associated with second demographic transition show increased disparities in parent's resources with implications for children's well-being (McLanahan, 2004). Also, in the UK there is evidence of strong occupational and educational polarization in fertility behaviour (i.e. timing and spacing of first and higher order births) (Ekert-Jaffe, 2002). Moreover, recent research underlines the importance of fertility behaviour for the reproduction of the social inequalities and in particular for intergenerational educational mobility (Maralani, 2013). Nevertheless, although social mobility is at the core of social stratification and educational groups are not static but are heterogeneous with regard to social background, few studies tested the relationship between social mobility and fertility in more recent populations.

Several studies investigated the relationship between social mobility and the number of children during mid-20th century (Berent, 1952; Blau& Duncan 1967; Hope, 1971; Bean & Swicegood 1979; Zimmer&1981; Westoff, 1981; Stevens, 1981; Sobel, 1985*)*.Various theoretical mechanisms have been proposed to justify the relationship between the experience

of mobility in itself, the direction of the movement (up or down) and fertility: (a) economic explanations such as the *relative economic status* (Easterlin, 1969); this states that if the current social status can support tastes created in the parental home then the association with fertility will be positive, but if not, the fertility will be limited. Another economic explanation proposed was *status enhancement* (Westoff et al., 1961); this concerns subjective factors such as career orientation and aspirations associated with a high degree of rationality which is expected to inhibit fertility; (b) psycho-social mechanisms such as *social isolation* (Blau& Duncan, 1967, Hoffman & Wyatt, 1960) and *stress and disorientation* (Sorokin, 1927, Blau& Duncan, 1967). These two types of explanations are mostly related to emotional support and social capital, fertility being positively associated with mobility in the first case and negatively in the second case. However, the findings were contradictory, mainly because of different methods and measures used to address the topic.

While the previously mentioned explanations referred only to the experience of mobility and its direction, if upward or downward, there are other theoretically relevant aspects which can be captured when examining the relationship between intergenerational mobility and fertility. First, the *mobility rank* or the number of steps the respondent has moved in the educational hierarchy proved to matter in previous research, indicating that mobility effects are more likely to exist when the distance between origin and destination is bigger (Blau & Duncan, 1967; Bean & Swicegood, 1979; Stevens, 1981). Second, given that socialization of values and tastes is often used to explain the relationship between parents' education and fertility or between individuals' education and fertility, we have to acknowledge that the mobile individuals represents a distinct group in this respect. They are the only group who have been exposed to two different educational classes. Therefore, the question is if the mobile group, which is a hybrid group in terms of socialized values and preferences follow the fertility behaviour of the group of origin or of the group at destination. This latter argument is known as *socialization/ acculturation* hypothesis (Blau & Duncan,

1967), and states that mobile individuals are not perfectly integrated in one of the social classes and therefore in general, their behaviour is influenced by both, origin and destination.

All the explanations mentioned above relate to an important methodological debate regarding this topic, namely what to interpret as mobility effect. On the one hand, Duncan (1966), proposed the definition of mobility as a process, to be tested as the association between mobility and fertility after accounting for respondent's social status and parents' social status. This view supports that the mobility effect should be regarded as the process of movement in itself and not just as a combination of fertility behaviour from the class of origin and the class of destination. On the other hand, Sobel (1981, 1985) disagreed with both theoretical and empirical approach proposed by Duncan. First, he considered that the analytical approach proposed by Duncan fails to isolate for a mobility effect as theoretically described. Second, in contrast to Blau & Duncan (1967), Sobel considers that refining the socialization/ acculturation hypothesis is informative in itself and future research should focus on testing various hypotheses related to it instead of focusing exclusively on mobility as a process.

In a comprehensive literature review on the topic, Kasarda & Billy (1985) emphasise that the proposed perspectives regarding the definition of a mobility effect should not be seen as normative and researchers should rather decide for themselves what to accept as evidence for a mobility effect. Therefore, this study builds on previous research and aims to combine the advantages of several perspectives. We consider that it is important to explore several dimensions of mobility: the movement in itself, the direction (if upward or downward) and the distance of mobility, namely how many steps individuals have moved in the educational hierarchy. Furthermore, our interest is to examine fertility differentials by different mobility routes and systematically compare mobile individuals with non-mobile ones in the educational groups of origin and destination across different educational levels. This, together with the dynamic approach of fertility which incorporates both parity progression

and timing of births is meant to provide a more comprehensive image about the relationship between intergenerational educational mobility and fertility.

Intergenerational educational mobility in the UK

In terms of intergenerational educational mobility, the UK appears to be among the countries with relatively high intergenerational educational mobility (Pfeffer, 2008) and relatively small class inequalities in educational attainment (Breen et al., 2009) compared with other advances countries. However, intergenerational educational mobility does not implicitly translate into intergenerational class mobility (Lampard, 2007). When it comes to intergenerational social mobility by social class, Britain is somewhere in the middle (Breen et al., 2004) and with respect to intergenerational social mobility by wage and wages differentials by parental education, the UK appears to be among the OECD countries with the lowest intergenerational mobility by earnings and highest wage inequalities by parental education (OECD, 2011). The configuration of status attainment process suggests that although the intergenerational educational mobility is relatively high, education does not play a dominant role in the chance to experience intergenerational class mobility and that a direct, rather strong influence of the class of origin remains (Golthorpe and Mills, 2004).

Also, across time there is no evidence that the importance of education increased in the status attainment process but on the contrary, a decline was rather detected (Goldthorpe & Mills, 2004). Examining if educational expansion has contributed to the decrease in the educational inequalities, some studies suggested a decrease of educational inequalities over time (Breen, 2009) while others did not find any change (Shavit and Blossfeld, 1993; Pfeffer, 2008). However, there is no doubt that there were several changes in education across the 20th century such as the various reforms in the UK educational system (e.g. the 1944 Educational Act, the increase of minimum school living age to 15 in 1947 and to 16 in 1972, the 1988 Education Reform act) and the expansion of education during the second half of the twentieth

which increased the level of education among children from all social backgrounds (Goldthorpe & Mills in Breen Ed., 2004).

The status attainment configuration or the social mobility regime could be an important aspect which influences the relationship between intergenerational educational mobility and fertility. If there is intergenerational educational mobility but the social class or earnings returns to education depend on social background, fertility differentials by mobility status might be more salient when compared to the non-mobile at destination. Hence, the social capillarity hypothesis or status enhancement explanation might not hold in such a context, given that the incentives to limit or postpone fertility might be weak. Regarding this aspect, the UK provides an interesting setting.

Data and methods

Data and sample

The data used in this study come from British Household Panel Study (BHPS), a nationally representative random-sample panel survey comprising a total of 9000 households in Britain. Data were collected every year from 1991 to 2008, providing a total of 18 waves. In this study, different variables were gathered from different waves. Given that wave 13(2003, N=16.238) was the only wave collecting information about parents' education, respondents from this wave represented the core group of this analysis. This wave also provides information about other family background characteristics including number of siblings and if respondents lived with both biological parents at the age of 16.

Further variables of interest were merged from the other waves. Data on respondents' highest level of education was updated from the subsequent waves following wave 13, up to wave 18, the last wave of the panel. In the case of respondents who left the panel before wave 18, we use the highest level of education recorded at the last wave when the respondent was interviewed. The date of the last interview comes from the harmonized data file for family

history, the same variable being used for censoring the respondents who did not have a birth until the date of the interview. The harmonised data file for family history is based on retrospective histories and updated from the panel waves including detailed fertility and partnership information. Finally, data about respondents' age of leaving school and further education, where applicable, come from the individual cross-wave file which compiles information from all the waves of the panel. The missing cases were replaced with the median by educational level, by cohort from the available cases. This is used as a compromise to maximize the existing valid information and to avoid external imputation.

In order to allow a reasonable amount of time for respondents to achieve the final level of their education, only respondents who were at least 25 years old at the last interview were kept in the analysis. After selecting this subsample and removing the observations with missing data for key variables, we remain with 11128 respondents. Further, for the second birth models we select only those respondents who had a first birth and for the third birth models, those who had a second birth. Therefore, the final sample for the second birth models consists of 8390 respondents and the sample for the third birth models consists of 6639 respondents, males and females.

Analytical strategy

We use discrete-time hazard models (Allison, 1982; Jenkins, 1995, Steele, 2005) to model the outcome variables, timing of second and third birth separately. Data is reshaped in person-month format and timing of births is measured as a binary indicator taking the value 1 in the month when the births occurred and 0 otherwise (y_{ti}). This represents the probability of a second/third birth of individual *i* occurring during the specified monthly interval *t,* conditional on survival (y_{si}), namely, the fact that it did not occur before time interval *t:* $h_{ti=}\Pr(y_{ti}=1|y_{si}=0, s<t)$. The observation window was limited to the interval between the age at the previous birth and the end of the reproductive period. Therefore, the period of

observation starts in the month when the previous birth occurred and ends either at the date when the second and respectively third child was born or at the date of the interview (right censoring) or when the respondent turns 49, depending on which occurs first. The discrete-time hazard function is defined by a *logit* hazard function:

$$\text{logit}(h_{ti})=\log\,(h_{ti}/1-h_{ti})=\alpha(t)+\beta_k x_{ti},$$

where x_{ti} represent the covariates, which can be time constant or time-varying and $\alpha(t)$ is the baseline logit-hazard. The baseline hazard was specified using different splines; therefore we included dummy variables which group the monthly duration since the previous birth (since first birth for second birth models and since second birth for third birth models) as follows: 1-12 months (reference category), 13-24 months, 25-36 months, 37-48 months, 49-60 months, 31-72 months and 72+ months.

***** Further plans*****

Given that the birth events are not independent but they are rather nested into each other and that women making the progression to the second and third birth might share unobserved characteristics which are not included in the model, a next step in the modelling process is to include a frailty element (random effect at the individual level) and control for unobserved heterogeneity.

Measurement

Respondent's education (destination) is measured as a time-varying covariate, changing every month when a new degree was obtained, up the highest educational qualification obtained at the last interview. A detailed classification of twelve categories of educational qualification s was compressed into three categories: (1) high (first degree and higher), (2) medium (teaching qualifications, other higher qualifications, nursing qualifications, GCE A levels) and (3) low (GCE O levels and below). This variable is used as *destination* measure to further assess the intergenerational educational mobility.

Parent's Education (origin). Only a crude measure of five categories was available in the survey for the parents' education, therefore it was not as detailed as respondent's education. However, we tried to establish equivalence between the two measures classifying parents' education into three categories as follows: (1) high (First degree and Higher), (2) medium (Further educational qualifications e.g. teaching Qf, Other Higher Qf, Nursing Qf *and* parents who *'left school with some qualifications'*) and (3) low (parents who 'left school with no qualifications or 'did not attend school' at all). We define origin as the education of the parent with the highest attained level of education. Unfortunately, the measurement of this variable does not allow distinguishing between those parents with A-levels degrees and O-levels degrees and any classification will result in a misclassification of one group. While we classify them as medium, results related to this must be interpreted with care given that the this group might contain degrees which are below A-levels, which is not the case in the respondents' 'medium' educational group.

Intergenerational educational mobility variable was measured combining the classifications of parents and respondents. Based on this, three different measures of mobility were derived: (1) a two-level mobility measure where only the *experience* of mobility was taken into account with non-mobile (reference category) and mobile; (2) a three-level mobility measure, where we distinguished between the *direction* of mobility, with non-mobile (reference

category), upwardly mobile and downwardly mobile; (3) a nine-level mobility measure based on the interaction between the three-level scheme of respondents' and parents' education. By accounting for all the nine possible combinations, this measure allows testing the *distance of movement*, namely how many steps the mobile respondents have moved in the educational hierarchy. Also, by changing the reference categories, we can test the differences between the mobile groups and the non-mobile groups at origin and destination for each combination of the educational groups. Therefore, we run the same model three times, where the reference category consists of one non-mobile category at a time (i.e. high-high, medium-medium, low-low).

Enrolment in education it is a dichotomous time-varying covariate, indicating for each month if the respondent is enrolled or not in education (no=0, reference category, yes=1).

Union status is also a time-varying covariate, measuring the marital status of respondent in each month, with the following categories: (1) single (reference category), (2) married and (3) cohabiting.

Cohort groups. Based on their year of birth, respondents were classified into four broad categories: (1) 1904-1944 (reference category), (2) 1945-1959, (3) 1960-1970 and (4) 1971-1984.

Respondent lived with biological parents until age 16. Respondents were asked if they lived with both biological mother and biological father from the time they were born until they were 16. The answer categories were: (1) yes (reference category), (2) no and (3) other.

Number of siblings variable is classified into five categories: (1) no siblings (reference category), (2) one sibling, (3) two siblings, (4) three siblings and (5) more than three siblings.

Respondent's age at the previous birth.

The age of first birth was included in the models for second birth and *age at second birth* was used in the models for third births.

Results[1]

Descriptive analysis

Figures A1a and A1b show the survival rates for the second and third births for males and females by respondent's education and parent's education. This provides us with a first picture about the degree of heterogeneity by parental education in each educational group. Note that the survival curves within each educational group are not completely similar, indicating that there is some variation by parental education. However, we do not test the statistical significance of these differences at this stage. Also, although there might be differences across cohort groups, here we do not go in such detail but focus only on the overall differences. In the next section, using multivariate analysis we test for the statistical significance of these differences while controlling for other key factors which are relevant for the second and the third births, including cohort groups and interactions with cohorts.

Proportions surviving the second birth by respondent's education and parent's education

First, when looking at the second births, (figure A1a) at the high educational group we see that respondents with highly educated parents have a lower survival rate than the ones with medium or low educated parents in the same educational category. This tendency is more salient for women than for men. The timing pattern seems to be quite similar but the level at which females make the progression to the second birth seems to diverge relatively early in

[1] At this stage, the current analyses do not use any weights. Therefore, the results presented in the current version of the paper cannot be generalized to the UK population. Further plans are to incorporate either weights or more covariates which were used in constructing the weights (e.g. ethnicity, country etc.) besides variables such as *age, sex, education* which are already included in the models.

the observation window. Highly educated females with highly educated parents have about 10% lower survival rate than their counterparts with different origins.

In the medium educational group, females with medium educated parents appear to have the highest survival rate remaining at around 20% at the end of the observation period, while only around 10% of the medium educated females with high or low educated parents do not progress to a second birth. Also, among males with medium education it seems that those with highly educated parents have the lowest survival rates. Therefore, so far we see a common tendency, namely that having parents with high education enhances the risk of respondents to have a second birth.

However, looking at the differences within the low educational group, we notice a different story. It appears that the ones with highly educated parents no longer display the lowest survival rates, but on the contrary, they appear to have the highest survival rates, followed by respondents with medium and low educated parents. The same holds for both, males and females, with the exception that low educated males with highly educated parents display a wider gap in the second quarter of the observation window after which they converge with those low educated males coming from low and medium educated parents. By the end of the observation time, the low educated males with high origins have the almost the same survival rate as the low educated males with medium educated parent, that is about 20%. Yet, the low educated males with low educated parents show a further decrease in the survival rate by the end of observation time.

Proportions surviving the third birth by respondent's education and parent's education

Looking at the third births, among the highly educated females, those with a medium educated parent are the ones with the lowest survival rate among their educational group, slightly under 60%. Conversely, the highly educated females with low origins are the ones with the highest survival rate. More specifically, 65% of them did not make the transition to a

third child until the end of their reproductive life. Highly educated women with a high educated parent lie in between in terms of both timing and final survival rate. In the case of males with a high level of education, we see a negative gradient by parental education. More than 60% of the highly educated males with a highly educated parent did not have a third child. The survival rate decreases to around 55% for highly educated males with a medium educated parent and slightly above 50% among those with a low educated parent from the same educational group.

Within the medium educational group, we do not notice any major discrepancies by parental education and most of the respondents appear to have a survival rate of around 60%. Yet, medium educated males with high origins tend to differentiate themselves from the rest, having a slightly higher survival rate. Finally, the low educational group shows large variations by parental background, especially due to the differences between the survival rates of the ones with highly educated parents and their counterparts with lower educated parents. However, a strong gender difference emerged. While low educated males with high education parents have the highest survival rates in their educational group of about 60%, females with the same origins and destination have the lowest survival rate in their educational group, slightly above 20 %. The low educated respondents with medium and low educated parents display a similar timing pattern and survival rates for both males and females, with those having medium educated parents showing a slightly higher survival rate than the ones with low educated parents and that is between 50-55%.

Multivariate analysis

Tables A3a and A3b show the discrete-time hazard models for second and third births for females and focus on the effect of parental education. These models are nested into each other. We start with a basic model where the gross effect of parent's education is estimated and we further add respondent and family background characteristics, introducing one

covariate at a time. This approach allows us to tell if the association between parent's education and respondent's timing and progression to the second and third birth exists net of the other characteristics included in the model, particularly, net of respondent's education. Also, it shows how the magnitude of the parent's education is changing when introducing other key covariates. While we found a gross and a net significant association in the case of females for both second and third births, we did not detect any significant association in the case of males, not even a gross effect and this holds for both second and third births.

Education and the risk of second and third births

Regarding the relationship between respondent's own education and higher order births, our results suggest a negative linear association for the second births and a 'U' shaped relationship for the third births, and this holds for both males and females. More specifically, in the case of second births, both medium and high educated respondents display significantly lower risk of a second birth. This is in line with previous studies finding a positive association between respondent's education and second births. When it comes to third births, only medium educated respondents seem to have significantly lower risk than highly educated ones while the low educated ones do not appear to differ significantly from the highly educated respondents.

Parent's education and the risk of second births

Model 1 from Table A3a shows the gross association between parent's education and the risk of a second birth while accounting for the cohort group. This yields that women with a medium or low educated parent have 23 % and 20 % respectively lower risk of a second birth (significant at a 0.01 level) when compared to respondents with highly educated parents. However, in model 2 where we control for respondent's education a net effect of parent's education remains only in the case of medium educated parents. Yet, the magnitude of this is

reduced from 23% as shown in the previous model to 16 % lower odds than the respondents with a highly educated parent. We interpret the 7% change in the gross effect as the variation which was explained by respondent's own education. Once we control for educational enrolment we see that the parental effect becomes slightly more negative (i.e. 18.5% lower risk) but when we introduce marital status it becomes slightly less negative, namely 17.5 % and it stays around that level until the last model. The family characteristics introduced in models 5 and 6, more specifically family type and number of siblings, does not seem to explain too much of the association between medium educated parents and the risk of second birth. Yet, those female respondents coming from a family with more than three siblings seem to have about 13% higher risk of a second birth than those with no siblings, and this association is net of parent's education and all the other variables that we account for in the model.

Therefore, we found a negative association between medium educated parents and the risk of a second birth among females and this indicates the same negative direction displayed by respondent's own education. However, while in the case of medium educated parents we found this association to be net of respondent's education and other characteristics, in the case of female respondents with low educated parents, we only found a gross significant negative association which was fully explained by respondent's own education, therefore, there was no net effect. We also investigated changes in the association between parents' education and risk of second birth across cohort groups but we only found a significant negative association in the case of females with medium educated parents in the second cohort group, namely, those born between1945-1959.

Parent's education and the risk of third birth

When it comes to the association between parent's education and the risk of third birth (see Table A3b), we see a similar pattern as in the case of the second births. Although a gross

negative effect is found among both, females with medium educated parents and females with low educated parents (significant at a 0.05 level), a net effect (i.e. independent of respondent's own education) remains only in the case of female respondents with medium educated parents. Therefore, from the first model (Table A3b) we learn that female respondents with a medium and low educated parent have 24.2 % and 20.8% respectively lower risk of a third birth when compared to females with a highly educated parent. Further, model 2 shows that although 2.3% of the gross effect is explained by respondent's own level of education in the case of females with medium educated parents, there is still a significant net effect of parent's education. This shows that regardless of their own education, females with medium educated parents still have 22% lower risk of a third birth than those females with highly educated parents. However, when it comes to the females with low educated parents, the association loses its significance once we control for respondent's level of education. Therefore, based on model 2 we can tell that having a low educated parent does not yield a significantly different risk of a third birth -over and above respondent's education- compared to female respondents with a highly educated parent.

The next models in table A3b introduce respondent's enrolment in education, marital status and the family type until the age of 16 but they show only minor changes in the magnitude of our covariate of interest. However, the last model which adds the number of siblings shows a reversal in the association between parent's education and the risk of a third birth. Based on model 6, we can tell that once we account for the respondent's number of siblings, parent's medium education loses its significance and parent's low education becomes significant instead, indicating 22.4 % lower risk of a third birth than their counterparts with a highly educated parent. A similar change appears when we look at respondent's own education in the same model. The association between low educated females and the risk of third births becomes significant only in the last model, when we

control for the number of siblings. However, in this case, the significant association shown for medium educated females remains from the first model to the last one.

The association between number of siblings and the risk of a third birth reveals that females with three or more siblings have 43% and 60 % respectively higher risk of a third birth, regardless of parent's and respondent's education and other variables in the model. On the other hand, with respect to parent's education it seems that when we keep the number of siblings and everything else constant it is the females with a low educated parent who have a significantly lower risk of a first birth compared to the ones with highly educated parents.

Intergenerational educational mobility and the risk of second and third births

Table A4a and A4b show the odds ratios for two measures of intergenerational educational mobility. The measure in table A4a tests if the experience of any kind of mobility, therefore the movement *per se*, is associated with the risk of second and third births. The other measure in table A4b takes into account the direction of mobility, if it was upward or downward. Further in tables A5a and A5b we present an expanded version of mobility measure, which takes into account the ranking, therefore, the number of steps the respondent has moved into the educational hierarchy compared to his parents. Here, we compare the risk of second and third births of those who experienced a certain type of mobility with those who were non-mobile at destination and those who remained non-mobile at origin.

Intergenerational educational mobility and the risk of second birth

Although none of the first two mobility measures seem to yield statistically significant associations for males and females, when we look at table A5a or more intuitively to figure A2, we see several distinctions between mobile groups. A first finding is that the risk of a second birth for those mobile does not appear to be significantly different from those non-mobile at destination, in the educational group where they moved. In other words, it seems

that once respondents achieved a certain level of education, their fertility behaviour is not different from the non-mobile group at destination with the same educational level across the two generations.

Conversely, when compared to the risk of second birth of those who remained non-mobile in the group of origin, most of the mobile respondents are significantly different from the group of origin. However, this seems to depend on the direction of the mobility, if the movement was upward or downward.

For example, both upwardly mobile males and females who achieved a high level of education but had low educated parents show 27% higher risk of a second birth in the case of males and 43% higher risk of a second birth in the case of females when compared to the group of origin with a low level of education across both generations, parents and offspring. However, the downwardly mobile males and females who only achieved a low level of education but had highly educated parents do not differ significantly from the group of origin. Still, neither do they differ significantly from the group of destination.

Also, among those upwardly mobile into the high educational group with medium educated parents, males appear to have 30% higher risk of a second birth and females 23% higher risk when compared to the non-mobile at origin with a medium level of education. Finally, among those who moved upward into the medium educational groups, female respondents seems to have 14% higher risk of a second birth than the non-mobile in the low educational group. Yet, this association is not significant in the case of male respondents. Instead, males who move downward from the medium educational group into the low educational group have 14% significantly lower risk of a second birth than the non-mobile group of origin.

Therefore, while most of those who moved upward seem to display different risk of second births compared to the non-mobile at origin, those who moved downward do not show differences from the non-mobile group at origin. Given the very low incidence of

downward mobility and at the same time, the fact that significance is very sensitive to the sample size, it could be that the sample of those downwardly mobile is too small to reach statistical significance. Or, it is actually the case that those who experience intergenerational educational mobility are more likely to adopt the fertility behaviour of the better off group.

Intergenerational educational mobility and the risk of third birth

When it comes to the risk of third birth we found significant differences by mobility direction for females. Although simply experiencing mobility does not seem to be significantly associated with a decrease or an increase in the risk of a third birth, it appears that keeping respondent's and parent's education constant, together with all the other variables included in the model, the risk of a third birth for upwardly mobile females is 54 % higher than the risk of their non-mobile counterparts. On the contrary, the risk of third birth for females experiencing downward mobility is around 40% lower than the females who do not experience any kind of mobility. Note that the non-mobile category here consists of all the non-mobile respondents from all the three educational groups. Therefore, it seems that in the case of third birth, females experiencing upward mobility have a higher risk and those experiencing downward mobility a lower risk than the non-mobile females. However, this does not hold for males. We did not find any significant associations between the experience and direction of mobility and male's risk of a third birth.

Finally, we turn now to differences between specific mobile groups and their non-mobile counterparts in the educational group of origin and destination. As in the case of second birth, in general, males and females experiencing downward or upward mobility do not differ significantly from the non-mobile in the destination educational group. An exception is the case of downwardly mobile females from high education to low education, whose risk of a third birth is 1.78 higher than the risk of the low educated non-mobile respondents, in the group of destination.

Nonetheless, when compared to the non-mobile from the group of origin, several mobility routes appear to be distinct. Again, as in the case of second birth, the direction of movement, if up or down, seems to matter. While most of the upwardly mobile males and females show a different risk of a third birth from their group of origin this is not the case for those who moved downward. Therefore, the risk of a third birth for upwardly mobile females with high education and medium origins is 1.6 times higher than those medium educated non-mobile females, the group of origin. However, both males and females experiencing upward mobility from low into medium educational group have a significantly lower risk of a third birth compared to their group of origin, namely the low educated group with no mobility.

Conclusion and discussion

Our first aim in this study was to establish if there is a net association, over and above respondent's own education, between parental education and timing and progression to second and third births, two fertility dimensions which were not explored by previous studies testing this relationship. We found an independent relationship between parent's education and the risk of second and third births only for females. In the case of males, there was not even a significant gross association between parent's education and second and third births. Among females, the gross association indicated a significantly lower risk of a second and third birth for respondents with medium and low educated parents compared to their counterparts with highly educated parents. However, after including respondent's own education, a significant net effect remained only for females with medium educated parents. In the case of second births, this finding does not totally resemble the findings for respondent's own education where both medium and low educated males and females showed a significantly lower risk of a second birth, regardless of parental background. Surprisingly, the gross relationship between parent's low education and second births, which appeared to be significant for females, was fully explained by the intergenerational

transmission of educational attainment and therefore there is only an indirect association but not a direct one.

Interestingly, in the case of the third births, once we accounted for the respondent's number of siblings, the significant association shown by medium educated parents became non-significant and the association between low educated parents and the risk of a third birth became significant instead. It appears that females' number of siblings plays an important role not only in itself but also for the relationship between parents' education and female offspring's third births. This is plausible given that the number of siblings is a proxy for parents' completed family size and given its strong association with parent's education and at the same time the association between parent's and offspring's number of children (Murphy & Wang, 2001; Rijken& Liefbroer, 2009). Therefore, after keeping the number of siblings constant, it seems that actually respondents with low educated parents are the ones who have significantly lower risk of a third birth than their counterparts with highly educated parents. Still, respondents with a medium educated parent do not show a significant difference. Yet, we should not over-interpret this reversal in statistical significance given that parent's medium education is still close to the conventional threshold of significance, 0.05, as it was the case of low educated parents in the previous models.

Further, departing from the theoretical arguments such as social isolation, stress and disorientation (Blau & Duncan, 1967) and the fact that the experience of mobility per se can create alienation or abnormal strain (Sorokin, 1927; Durkheim, 1987; Bean & Swicegood, 1979) which can inhibit or enhance fertility behaviour, our aim was to test if there is any relationship between the process of mobility in itself and the timing and progression to the second and third birth. For this purpose, we employed a simple measure of mobility which contrasted mobility to non-mobility while accounting for respondent's and parent's education. We did not find any evidence that the experience of mobility in itself is associated with the risk of a second or third birth. Some scholars have argued that mobility effects are less likely

to exist when the experience of mobility is common (Blau and Duncan, 1967; Goldthorpe, 1980).

We also tested the relationship between mobility and higher order births across cohort groups but with only one exception we did not find any differences The exception was represented by mobile females born between 1960 and 1970 who displayed significantly lower risk of a third birth compared to non-mobile females. This particular cohort group appeared to have the highest rates of upward mobility into the high educational group, the lowest downward mobility from high origins and at the same time the highest rates of immobility in the high educational group. Also, it appears that in their cohort group, there was more upward mobility than downward mobility. Those generations of females benefited of educational expansion and downward mobility was really uncommon. When looking at the direction of the mobility in this particular cohort we found a significant lower risk only for the downwardly mobile respondents. This finding supports the explanation that mobility effects are more likely to occur in a context where mobility is rare (Goldthorpe, 1980). Yet, we saw that this explanations can be refined and extended to a certain type of mobility not only to mobility overall, in our case downward mobility in a context of misbalanced ratio between upward and downward mobility.

Further, we investigated if there is any association between the direction of the mobility and higher order births. This aim was motivated by mechanisms such as Easterlin's hypothesis, suggesting that a achieving a higher status than one's parents is expected to enhance fertility, while attaining a lower status is expected to inhibit fertility and *status enhancement* explanation (Kasarda and Billy, 1985) proposing that the upwardly mobile are expected to be status orientated and therefore limit their fertility while the downwardly mobile display the opposite behaviour. Also, Dumont's *social capillarity* argument proposed that fertility limitation could be one strategy for individuals to achieve upward mobility. Therefore, we distinguished between upward mobility and downward mobility. We found

that regardless of their own education and their parent's education, females experiencing upward mobility have significantly higher risk while those experiencing downward mobility have significantly lower risk of a third birth compared to a general group of non-mobile female respondents. Our finding seems to be rather in line with Easterlin's *relative status* hypothesis than with the *social capillarity* or *status enhancement* explanations. However this finding holds only for the risk of third birth among females. We did not find the same association for males. We did not find a significant association for the second births either.

Looking across cohort groups, we found that the direction of the relationship is consistent across first two cohort groups with an increased magnitude in the second cohort, while in the third cohort group only the association with downwardly mobile appears to be significant. Yet, in the last cohort group, the direction of mobility is not significant anymore. The third cohort group is the cohort where the magnitude of downward mobility is the most pronounced. We discussed above that this was the only group where mobility as a process mattered.

Finally, guided by *socialization-acculturation* arguments (Blau & Duncan, 1967) we compared the second and third births risks of respondents who experienced intergenerational educational mobility to respondents who remained non-mobile in the group of destination and the group of origin. First, we found that none of the upwardly mobile groups differed significantly from the non-mobile at destination but most of them differed from the non-mobile of origin. However, this latter finding varied by the direction of mobility. While most of the upwardly mobile groups had significantly higher risk of a second and third birth than the non-mobile at origin, the downwardly mobile males and females were not significantly different from the group of origin. However there were two exceptions. First, downwardly mobile males from medium to low seemed to have significantly lower risk of a second birth than the non-mobile at origin in the medium educational group. Second, downwardly mobile females into low educational group from highly educated parents have significantly higher

risk of a third birth than the non-mobile group at destination, therefore the low education group. This shows a tendency for high education either at origin or destination to be associated with a higher risk of a second or third birth.

Generally, given the significantly different fertility behaviour of the mobile individuals from the non-mobile at origin and the non-significant differences from the non-mobile at destination, we interpret our findings as acculturation being stronger than socialization, with the exception of the downwardly mobile who were not different from their group at origin. However, we cannot answer exactly how much the fertility behaviour of the mobile respondents resembled the non-mobile at destination and how much it resembled the non-mobile at origin, in a relative manner. For this purpose, diagonal models proposed by Sobel (1981, 1985) are more appropriate.

Overall, this study showed that there is a net association between parents with medium education and their offspring's risk of second and third births indicating a significantly lower risk. Yet, these findings only apply to women not to men. Also, we showed that mobility effects were visible within a mobile group when a type of mobility was not common, as was the case of downwardly mobile females and third births in the 1960-1970 cohort group. Regarding the risk of a third birth, we showed that the direction of mobility mattered, with upwardly mobile having a higher risk and downwardly mobile a lower risk of a third birth. The Easterlin hypothesis might be a potential explanation but we did not test specifically if indeed the capability to satisfy the material tastes socialized in the parental home led to a higher or lower risk to have a third birth. What we noticed more clearly was a positive association when either origin or destination was higher. This underlines the importance of parental education for the risk to second and third births. Yet, we brought evidence that the overall influence of parental education is visible only in the case of females.

So far, most of the explanations for timing of second and third births focused on individuals' own education but this study shows that at least for females, parental background exerts an independent influence beyond respondent's own education. However, this influence does not seem to create significant differences within the educational groups at destination. Yet, the timing of second and third birth was between origin and destination in most of the educational groups. Still, our approach did not allow us to further test the relative influence of origin and destination and answer if the fertility behaviour of the mobile is much closer to origin or destination. Finally, this study showed that in some cases, mobility, direction of mobility and specific mobility routes matter for fertility behaviour, especially for females' fertility. Further research should investigate what are the female-specific factors behind these associations.

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Table A1a Outflow percentages for males by cohort group (sample for the second birth)

	Parent's Education (origin)	Respondent's Education (destination)			
Cohort		**High**	**Medium**	**Low**	**Total**
1904/1944	**High**	9	8	4	21
		42.9%	38.1%	19.0%	100.0%
	Medium	31	85	117	233
		13.3%	36.5%	50.2%	100.0%
	Low	54	260	625	939
		5.8%	27.7%	66.6%	100.0%
	Total	94	353	746	1193
		7.9%	29.6%	62.5%	100.0%
1945/1959	**High**	18	18	3	39
		46.2%	46.2%	7.7%	100.0%
	Medium	48	139	50	237
		20.3%	58.6%	21.1%	100.0%
	Low	102	352	308	762
		13.4%	46.2%	40.4%	100.0%
	Total	168	509	361	1038
		16.2%	49.0%	34.8%	100.0%
1960/1970	**High**	41	31	5	77
		53.2%	40.3%	6.5%	100.0%
	Medium	74	148	69	291
		25.4%	50.9%	23.7%	100.0%
	Low	76	236	175	487
		15.6%	48.5%	35.9%	100.0%
	Total	191	415	249	855
		22.3%	48.5%	29.1%	100.0%
1971/1984	**High**	25	24	4	53
		47.2%	45.3%	7.5%	100.0%
	Medium	22	94	40	156
		14.1%	60.3%	25.6%	100.0%
	Low	34	135	77	246
		13.8%	54.9%	31.3%	100.0%
	Total	81	253	121	455
		17.8%	55.6%	26.6%	100.0%
Total	**High**	93	81	16	190
		48.9%	42.6%	8.4%	100.0%
	Medium	175	466	276	917
		19.1%	50.8%	30.1%	100.0%
	Low	266	983	1185	2434
		10.9%	40.4%	48.7%	100.0%
	Total	534	1530	1477	3541
		15.1%	43.2%	41.7%	100.0%

Table A1b Outflow percentages for females by cohort (sample for the second birth)

	Parent's Education (origin)	Respondent's Education (destination)			
Cohort		**High**	**Medium**	**Low**	**Total**
1904/1944	**High**	8	13	12	33
		24.2%	39.4%	36.4%	100.0%
	Medium	16	89	183	288
		5.6%	30.9%	63.5%	100.0%
	Low	24	231	947	1202
		2.0%	19.2%	78.8%	100.0%
	Total	48	333	1142	1523
		3.2%	21.9%	75.0%	100.0%
1945/1959	**High**	37	30	5	72
		51.4%	41.7%	6.9%	100.0%
	Medium	51	156	138	345
		14.8%	45.2%	40.0%	100.0%
	Low	85	353	492	930
		9.1%	38.0%	52.9%	100.0%
	Total	173	539	635	1347
		12.8%	40.0%	47.1%	100.0%
1960/1970	**High**	53	39	4	96
		55.2%	40.6%	4.2%	100.0%
	Medium	106	199	115	420
		25.2%	47.4%	27.4%	100.0%
	Low	79	313	301	693
		11.4%	45.2%	43.4%	100.0%
	Total	238	551	420	1209
		19.7%	45.6%	34.7%	100.0%
1971/1984	**High**	52	33	4	89
		58.4%	37.1%	4.5%	100.0%
	Medium	55	155	69	279
		19.7%	55.6%	24.7%	100.0%
	Low	44	194	164	402
		10.9%	48.3%	40.8%	100.0%
	Total	151	382	237	770
		19.6%	49.6%	30.8%	100.0%
Total	**High**	150	115	25	290
		51.7%	39.7%	8.6%	100.0%
	Medium	228	599	505	1332
		17.1%	45.0%	37.9%	100.0%
	Low	232	1091	1904	3227
		7.2%	33.8%	59.0%	100.0%
	Total	610	1805	2434	4849
		12.6%	37.2%	50.2%	100.0%

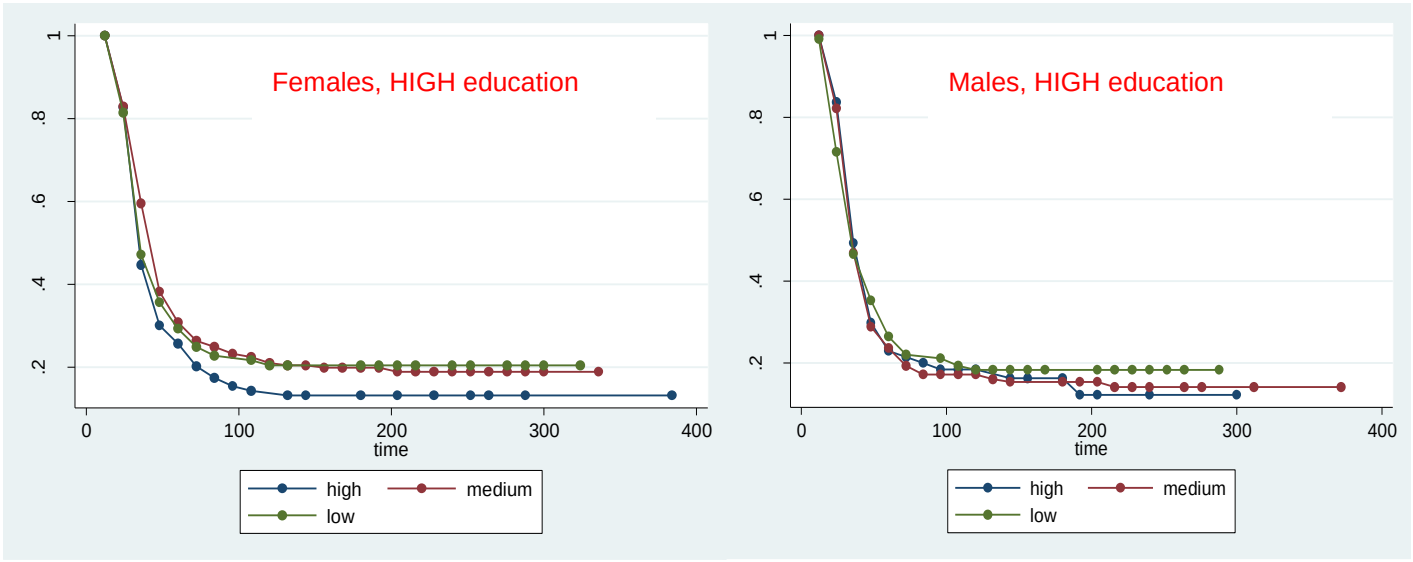
Table A1c Outflow percentages for males by cohort group (sample for the third birth)

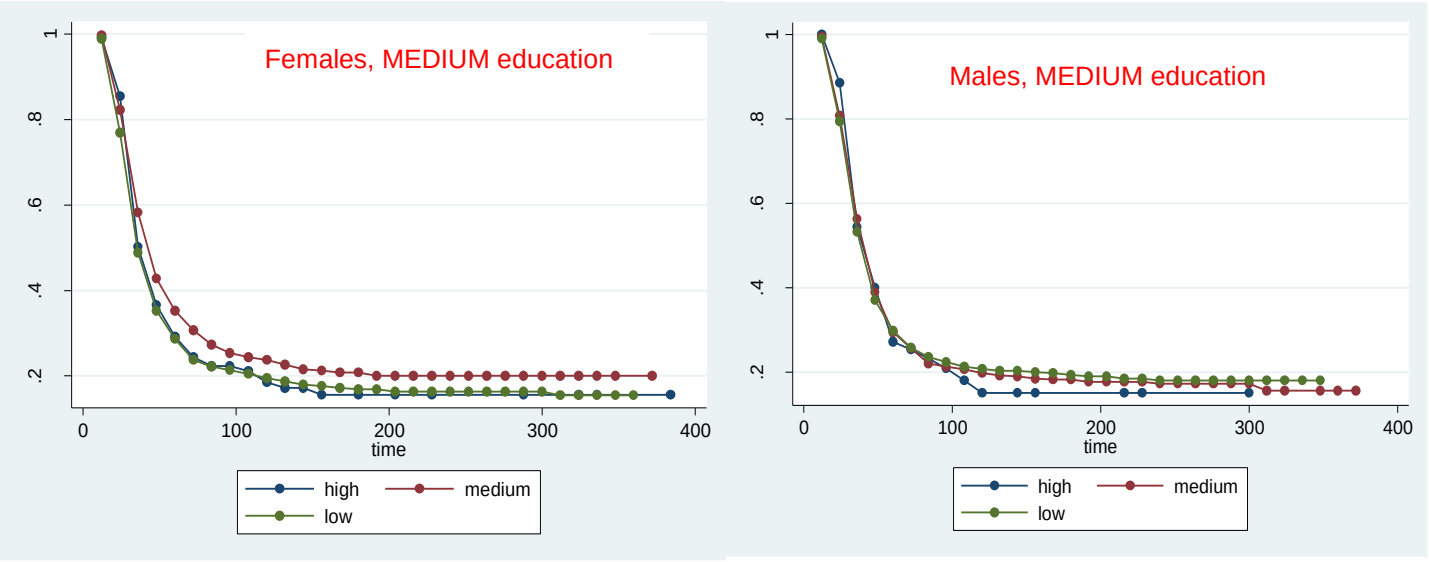
	Parent's Education (origin)	Respondent's Education (destination)			
Cohort		**High**	**Medium**	**Low**	**Total**
1904/1944	**High**	7 38.9%	8 44.4%	3 16.7%	18 100.0%
	Medium	27 14.0%	71 36.8%	95 49.2%	193 100.0%
	Low	44 5.8%	211 27.8%	503 66.4%	758 100.0%
	Total	78 8.0%	290 29.9%	601 62.0%	969 100.0%
1945/1959	**High**	14 43.8%	16 50.0%	2 6.3%	32 100.0%
	Medium	41 20.7%	114 57.6%	43 21.7%	198 100.0%
	Low	85 13.5%	292 46.3%	254 40.3%	631 100.0%
	Total	140 16.3%	422 49.0%	299 34.7%	861 100.0%
1960/1970	**High**	33 58.9%	20 35.7%	3 5.4%	56 100.0%
	Medium	52 24.3%	111 51.9%	51 23.8%	214 100.0%
	Low	63 15.9%	186 47.0%	147 37.1%	396 100.0%
	Total	148 22.2%	317 47.6%	201 30.2%	666 100.0%
1971/1984	**High**	13 44.8%	14 48.3%	2 6.9%	29 100.0%
	Medium	17 17.2%	58 58.6%	24 24.2%	99 100.0%
	Low	21 12.9%	89 54.6%	53 32.5%	163 100.0%
	Total	51 17.5%	161 55.3%	79 27.1%	291 100.0%
Total	**High**	67 49.6%	58 43.0%	10 7.4%	135 100.0%
	Medium	137 19.5%	354 50.3%	213 30.3%	704 100.0%
	Low	213 10.9%	778 39.9%	957 49.1%	1948 100.0%
	Total	417 15.0%	1190 42.7%	1180 42.3%	2787 100.0%

Table A1d Outflow percentages for females by cohort group (sample for the third birth)

	Parent's Education (origin)	Respondent's Education (destination)			
Cohort		**High**	**Medium**	**Low**	**Total**
1904/1944	**High**	5	12	11	28
		17.9%	42.9%	39.3%	100.0%
	Medium	12	78	149	239
		5.0%	32.6%	62.3%	100.0%
	Low	22	181	772	975
		2.3%	18.6%	79.2%	100.0%
	Total	39	271	932	1242
		3.1%	21.8%	75.0%	100.0%
1945/1959	**High**	32	29	4	65
		49.2%	44.6%	6.2%	100.0%
	Medium	40	1 19	109	268
		14.9%	44.4%	40.7%	100.0%
	Low	68	311	412	791
		8.6%	39.3%	52.1%	100.0%
	Total	140	459	525	1124
		12.5%	40.8%	46.7%	100.0%
1960/1970	**High**	45	28	3	76
		59.2%	36.8%	3.9%	100.0%
	Medium	80	154	89	323
		24.8%	47.7%	27.6%	100.0%
	Low	62	245	260	567
		10.9%	43.2%	45.9%	100.0%
	Total	187	427	352	966
		19.4%	44.2%	36.4%	100.0%
1971/1984	**High**	27	24	4	55
		49.1%	43.6%	7.3%	100.0%
	Medium	36	90	47	173
		20.8%	52.0%	27.2%	100.0%
	Low	26	140	126	292
		8.9%	47.9%	43.2%	100.0%
	Total	89	254	177	520
		17.1%	48.8%	34.0%	100.0%
Total	**High**	109	93	22	224
		48.7%	41.5%	9.8%	100.0%
	Medium	168	441	394	1003
		16.7%	44.0%	39.3%	100.0%
	Low	178	877	1570	2625
		6.8%	33.4%	59.8%	100.0%
	Total	455	1411	1986	3852
		11.8%	36.6%	51.6%	100.0%

Figure A1a Proportion surviving the second births for males and females by respondent's education and parent's education





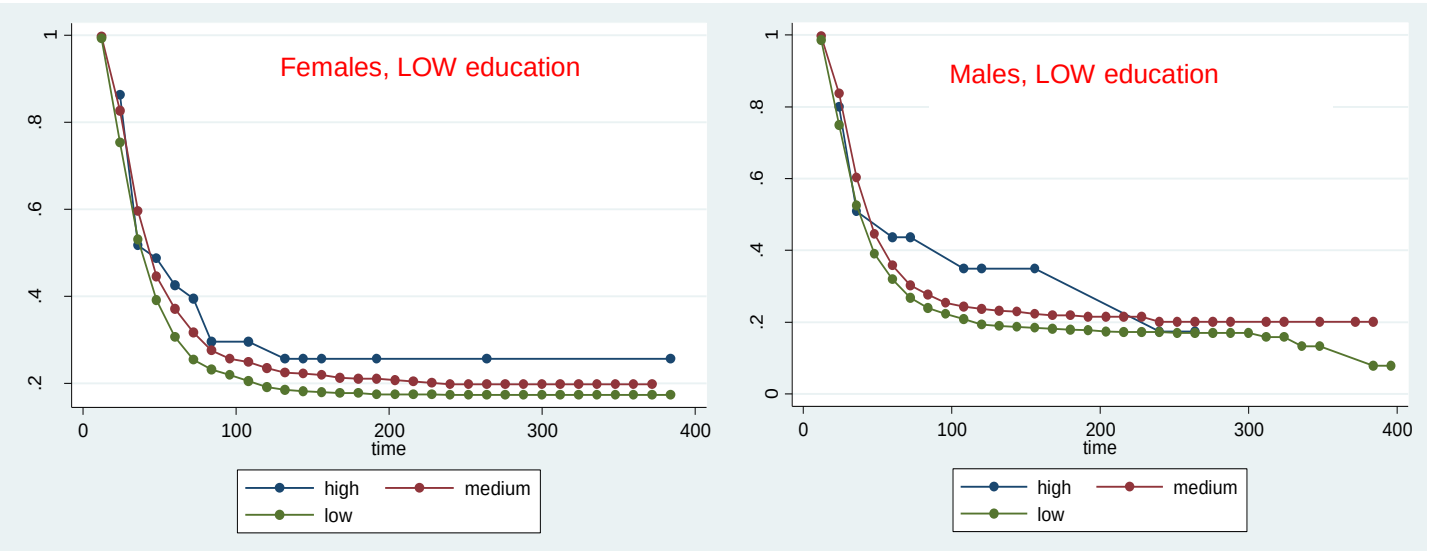


Figure A1b Proportion surviving the third births for males and females by respondent's education and parent's education

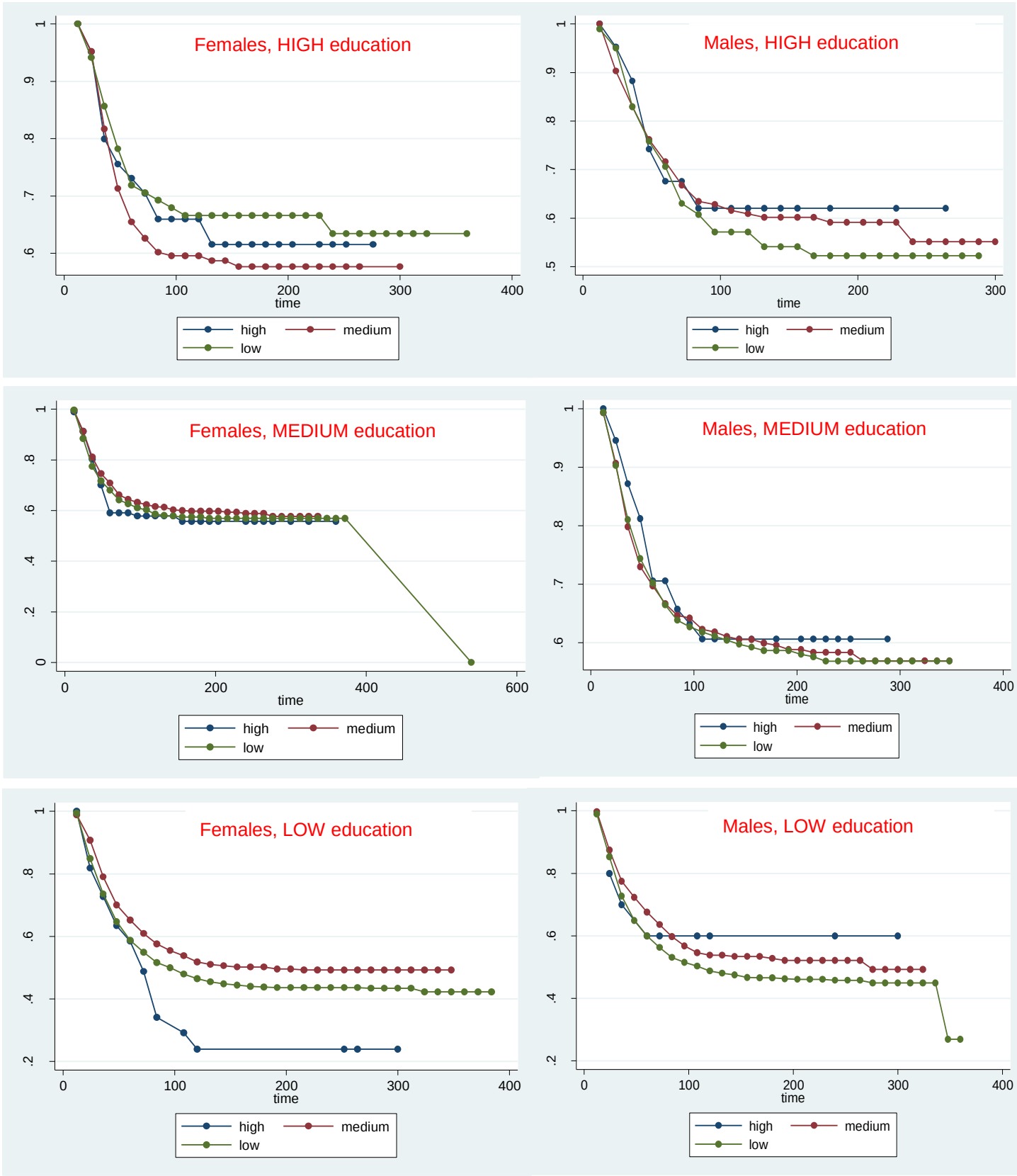


Table A3a Discrete-time hazard models for timing of second birth (female respondents)

			A. Respondent's characteristics		B. Family characteristics	
	(1)	(2)	(3)	(4)	(5)	(6)
	Parents' education + cohort group	Respondent's education	Enrollment in education	Marital status	Family type (monoparental /intact)	Number of siblings
Parents' education						
Medium	0.769**	0.834*	0.815**	0.823**	0.823**	0.821**
	(0.056)	(0.062)	(0.061)	(0.062)	(0.062)	(0.062)
Low	0.797**	0.886	0.865+	0.885	0.884	0.869+
	(0.059)	(0.068)	(0.067)	(0.069)	(0.069)	(0.068)
Cohort group						
1945-1959	0.996	0.966	0.966	1.034	1.034	1.035
	(0.042)	(0.042)	(0.042)	(0.045)	(0.045)	(0.045)
1960-1970	0.970	0.928	0.927	1.021	1.022	1.032
	(0.044)	(0.044)	(0.044)	(0.049)	(0.050)	(0.050)
1971-1984	0.839**	0.800**	0.793**	0.878*	0.881*	0.895+
	(0.048)	(0.047)	(0.046)	(0.054)	(0.054)	(0.056)
Respondent's education						
Medium		0.798**	0.808**	0.815**	0.815**	0.816**
		(0.048)	(0.048)	(0.049)	(0.049)	(0.049)
Low		0.747**	0.741**	0.754**	0.754**	0.744**
		(0.047)	(0.046)	(0.047)	(0.047)	(0.047)
Enrollment in education						
Enrolled			0.552**	0.557**	0.559**	0.559**
			(0.083)	(0.084)	(0.085)	(0.085)
Marital status						
Marriage				1.413**	1.411**	1.427**
				(0.051)	(0.051)	(0.052)

Cohabitation				1.106	1.108	1.124
				(0.082)	(0.082)	(0.083)
Family type						
Non-intact					0.975	0.981
					(0.044)	(0.044)
Other					1.465	1.503
					(0.415)	(0.426)
Number of siblings						
One						0.957
						(0.062)
Two						1.033
						(0.068)
Three						1.033
						(0.072)
More than three						1.137*
						(0.073)
N	331899	331899	331899	331899	331899	331899
ll	-1.90e+04	-1.90e+04	-1.90e+04	-1.89e+04	-1.89e+04	-1.89e+04
df_m	12.000	14.000	15.000	17.000	19.000	23.000
chi2	3992.393	4013.381	4031.774	4126.751	4128.723	4142.795
AIC	38023.586	38006.598	37990.205	37899.228	37901.256	37895.184
BIC	38162.850	38167.287	38161.607	38092.055	38115.508	38152.286

Note. Exponentiated coefficients; Standard errors in parentheses + p<.10, * p<.05, ** p<.01

Table A3b Discrete-time hazard models for timing of third birth (female respondents)

	A. Respondent's characteristics				B. Family characteristics	
	(1)	(2)	(3)	(4)	(5)	(6)
	Parents' education + cohort group	Respondent's education	Enrollment in education	Marital status	Family type (monoparental /intact)	Number of siblings
Parents' education						
Medium	0.758*	0.781*	0.781*	0.779*	0.779*	0.793+
	(0.087)	(0.093)	(0.093)	(0.092)	(0.092)	(0.094)
Low	0.792*	0.802+	0.802+	0.796+	0.796+	0.776*
	(0.091)	(0.096)	(0.096)	(0.096)	(0.096)	(0.093)
Cohort group						
1945-1959	0.683**	0.700**	0.700**	0.691**	0.695**	0.671**
	(0.041)	(0.043)	(0.043)	(0.042)	(0.043)	(0.042)
1960-1970	0.814**	0.835**	0.835**	0.819**	0.813**	0.805**
	(0.053)	(0.056)	(0.056)	(0.056)	(0.056)	(0.055)
1971-1984	0.711**	0.739**	0.739**	0.725**	0.716**	0.724**
	(0.063)	(0.067)	(0.067)	(0.069)	(0.068)	(0.069)
Respondent's education						
Medium		0.725**	0.725**	0.724**	0.726**	0.721**
		(0.071)	(0.071)	(0.071)	(0.071)	(0.071)
Low		0.876	0.876	0.874	0.874	0.821*
		(0.087)	(0.087)	(0.086)	(0.086)	(0.082)
Enrollment in education						
Enrolled			1.028	1.031	0.994	0.977
			(0.394)	(0.395)	(0.381)	(0.375)
Marital status						
Marriage				0.916+	0.916+	0.941
				(0.047)	(0.047)	(0.048)
Cohabitation				0.996	0.970	0.987

				(0.122)	(0.119)	(0.121)
Family type						
Non-intact					1.187**	1.232**
					(0.074)	(0.078)
Other					0.530	0.522
					(0.307)	(0.303)
Number of siblings						
One						1.006
						(0.103)
Two						1.189+
						(0.120)
Three						1.432**
						(0.150)
More than three						1.597**
						(0.154)
N	460992	460992	460992	460992	460992	460992
ll	-1.05e+04	-1.05e+04	-1.05e+04	-1.05e+04	-1.05e+04	-1.05e+04
df_m	12.000	14.000	15.000	17.000	19.000	23.000
chi2	2106.403	2124.084	2124.089	2127.159	2136.135	2194.778
AIC	21021.335	21007.655	21009.649	21010.579	21005.604	20954.960
BIC	21164.870	21173.272	21186.307	21209.320	21226.426	21219.948

Note. Exponentiated coefficients; Standard errors in parentheses + p<.10, * p<.05, ** p<.01

Table A4a Intergenerational educational mobility (mobility defined as mobility vs. non-mobility) and second and third births (males and females). Selected results from four separate discrete-time hazard models, odds ratio metric

	2nd births		3rd birth	
	Males	**Females**	**Males**	**Females**
Mobility	0.931+	1.036	0.914	0.958
	(0.038)	(0.036)	(0.058)	(0.050)
N	227394	331899	317116	460992
ll	-1.36e+04	-1.89e+04	-7189.375	-1.05e+04
df_m	24.000	24.000	24.000	24.000
chi2	2847.162	4143.861	1189.290	2195.459
AIC	27286.497	37896.118	14428.750	20956.280
BIC	27544.858	38163.933	14695.426	21232.308

Note. Exponentiated coefficients; Standard errors in parentheses + p<.10, * p<.05, ** p<.01
Other variables included in the model: respondent's education (time varying covariate-TVC), educational enrolment (TVC), parent's education, cohort, marital status (TVC), number of siblings and if respondent lived with both biological parents until the age of 16, age at first birth and baseline hazard.
Ref. non-mobility

Table A4b Intergenerational educational mobility (mobility defined as upward mobility and downward mobility vs. non-mobility) and second and third births (males and females). Selected results from four separate discrete-time hazard models, odds ratio metric

	2nd births		3rd birth	
	Males	**Females**	**Males**	**Females**
Upward mobility	0.963	1.026	0.808	1.541*
	(0.123)	(0.131)	(0.163)	(0.299)
Downward mobility	0.900	1.047	1.031	0.602**
	(0.115)	(0.131)	(0.203)	(0.116)
N	227394	331899	317116	460992
ll	-1.36e+04	-1.89e+04	-7189.169	-1.04e+04
df_m	25.000	25.000	25.000	25.000
chi2	2847.239	4143.868	1189.703	2201.972
AIC	27288.419	37898.111	14430.337	20951.767
BIC	27557.114	38176.638	14707.680	21238.836

Note. Exponentiated coefficients; Standard errors in parentheses + p<.10, * p<.05, ** p<.01
Other variables included in the model: respondent's education (time varying covariate-TVC), educational enrolment (TVC), parent's education, cohort, marital status (TVC), number of siblings and if respondent lived with both biological parents until the age of 16, age at first birth and baseline hazard
Ref. non-mobility

Table A5a Comparison of the risk of a second birth between mobile respondents and non-mobile respondents at origin and non-mobile respondents at destination. Selected results from two hazard models (separate models for males and females, mobility measured as interaction between respondent's education and parent's education, different reference categories, odds ratios metric)

Non-mobile vs. Mobile 2nd births	Males	Females
A. Non-mobile: High-High (ref.)		
*Mobile **into** High*		
-Upwardly mobile into High from Medium	1.014	0.811
-Upwardly mobile into High from Low	0.954	0.917
*Mobile **from** High*		
-Downwardly mobile from High to Medium	0.835	0.796
-Downwardly mobile from High to Low	0.634	0.838
B. Non-mobile: Medium-Medium (ref.)		
*Mobile **into** Medium*		
-Upwardly mobile into Medium from Low	0.938	1.102+
-Downwardly mobile into Medium from High	1.07	1.204+
*Mobile **from** Medium*		
-Upwardly mobile from Medium into High	1.299**	1.227**
-Downwardly mobile from Medium into Low	0.860*	0.95
C. Non-mobile: Low-Low (ref.)		
*Mobile **into** Low*		
-Downwardly mobile into Low from High	0.847	1.311
-Downwardly mobile into Low from Medium	0.897+	0.982
*Mobile **from** Low*		
-Upwardly mobile from Low into High	1.276*	1.435**
-Upwardly mobile from Low into Medium	0.978	1.140*

Note. Exponentiated coefficients; + p<.10, * p<.05, ** p<.01
Other variables included in the model: respondent's education (time varying covariate-TVC), educational enrolment (TVC), parent's education, cohort, marital status (TVC), number of siblings and if respondent lived with both biological parents until the age of 16, age at first birth and baseline hazard.

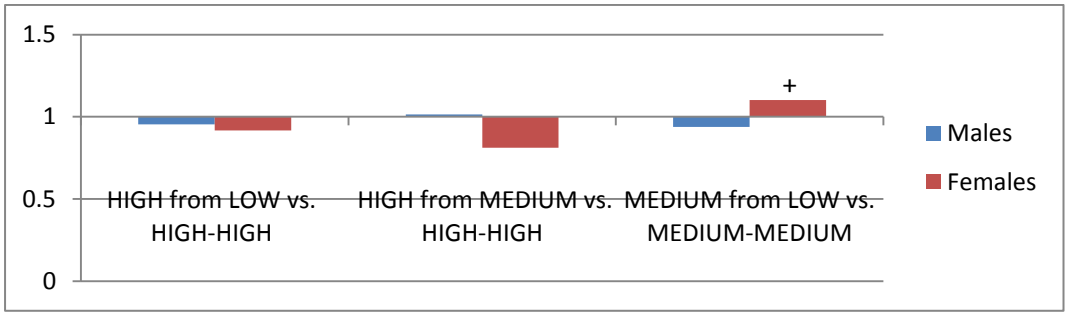
Table A5b Comparison of the risk of a third birth between mobile respondents and non-mobile respondents at origin and non-mobile respondents at destination. Selected results from two hazard models (separate models for males and females, mobility measured as interaction between respondent's education and parent's education, different reference categories, odds ratios metric)

Non-mobile vs. Mobile 3rd births	Males	Females
A. Non-mobile: High-High (ref.)		
*Mobile **into** High*		
-Upwardly mobile into High from Medium	1.031	1.009
-Upwardly mobile into High from Low	1.119	0.618+
*Mobile **from** High*		
-Downwardly mobile from High to Medium	0.835	0.74
-Downwardly mobile from High to Low	0.886	1.247
B. Non-mobile: Medium-Medium (ref.)		
*Mobile **into** Medium*		
-Upwardly mobile into Medium from Low	0.877	0.944
-Downwardly mobile into Medium from High	0.986	1.176
*Mobile **from** Medium*		
-Upwardly mobile from Medium into High	1.218	1.603**
-Downwardly mobile from Medium into Low	1.071	1.054
C. Non-mobile: Low-Low (ref.)		
*Mobile **into** Low*		
-Downwardly mobile into Low from High	0.904	1.781*
-Downwardly mobile into Low from Medium	0.925	0.948
*Mobile **from** Low*		
-Upwardly mobile from Low into High	1.142	0.882
-Upwardly mobile from Low into Medium	0.757**	0.849*

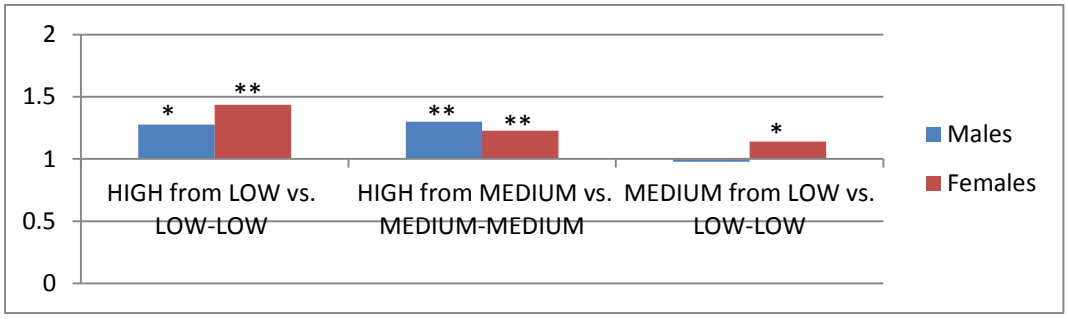
Note. Exponentiated coefficients; + p<.10, * p<.05, ** p<.01
Other variables included in the model: respondent's education (time varying covariate-TVC), educational enrolment (TVC), parent's education, cohort, marital status (TVC), number of siblings and if respondent lived with both biological parents until the age of 16, age at second birth, baseline hazard.

Figure A2 Comparison of odds ratios of mobile respondents vs. non-mobile respondents in the group of origin and non-mobile respondents in the group of destination (illustration based on Table A5a, odds ratio metric) for second births

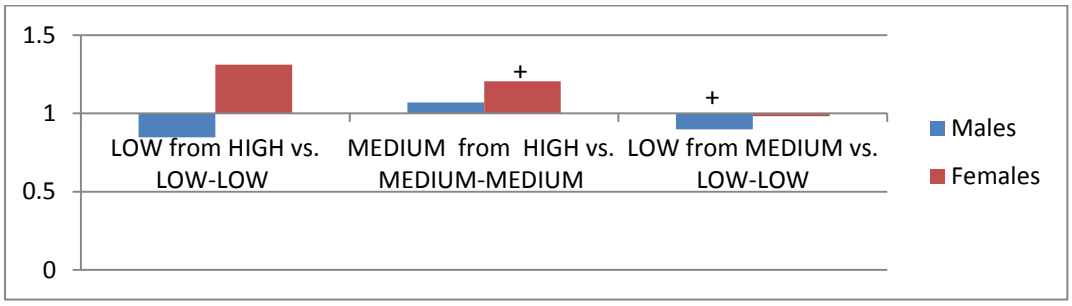
a. Upward mobility trajectories vs. non-mobile at destination



b. Upward mobility trajectories vs. non-mobile at origin



c. Downward mobility trajectories vs. non-mobile at destination



d. Downward mobility trajectories vs. non-mobile at origin

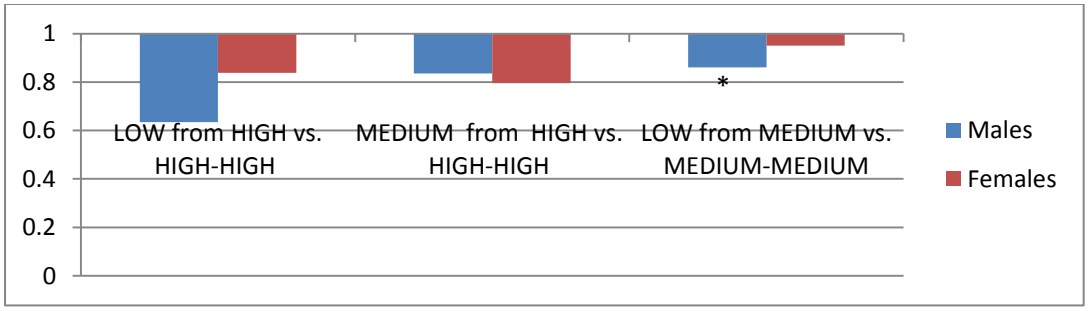
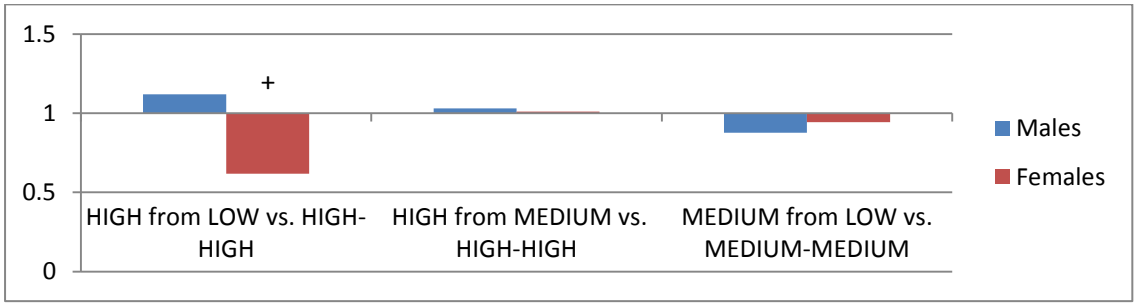
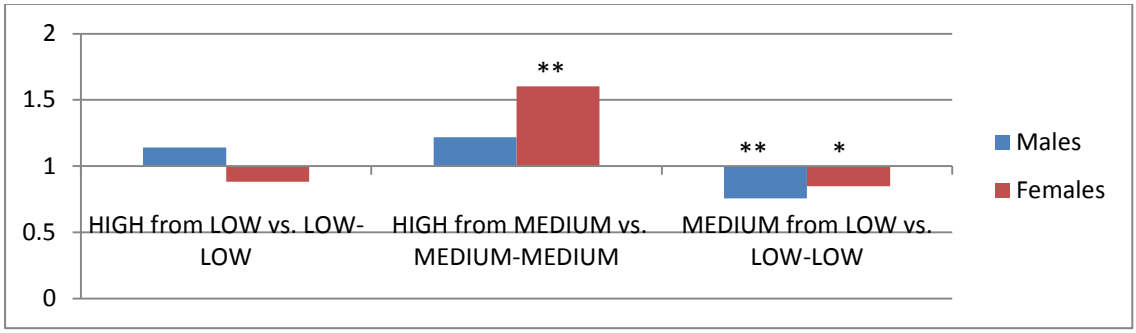


Figure A3 Comparison of odds ratios of mobile respondents vs. non-mobile respondents in the group of origin and non-mobile respondents in the group of destination (illustration based on Table A5b, odds ratio metric) for third births

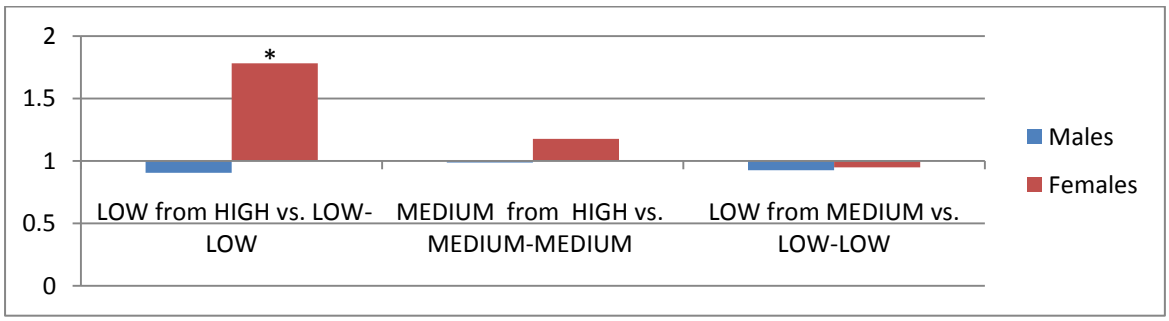
a. Upward mobility trajectories vs. non-mobile at destination



b. Upward mobility trajectories vs. non-mobile at origin



c. Downward mobility trajectories vs. non-mobile at destination



d. Downward mobility trajectories vs. non-mobile at origin