Partners' Educational Pairings and Fertility Across Europe

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Abstract:
We provide new evidence on the education-fertility relationship by using EU-SILC panel data on 24 European countries to investigate how couples' educational pairings predict their childbearing behavior. We focus on differences in first, second and third birth rates between couples with varying combinations of partners' education. Our results show that there are important differences in how education relates to parity progressions depending on the education of the partner. First, highly educated homogamous couples show a distinct childbearing behavior in most country clusters. They tend to postpone the first birth most and display the highest second and third birth rates subsequently. Second, contrary to what may be expected based on the New Home Economics, hypergamous couples with a highly educated male and a lower educated female partner display among the lowest second birth transitions. Our findings underscore the relevance of interacting both partners' education for a better understanding of the education-fertility relationship.

Keywords: fertility, education, couples, childbearing, socio-economic resources, family, parity progression, Europe

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Introduction

Educational expansion and changes in childbearing behavior are among the most striking features of the changing demographic landscape since the 1960s (Schofer and Meyer 2005). Women's participation in higher education has surpassed men's in most developed nations (Esteve et al. 2016), highly educated women in particular have increasingly postponed the transition to motherhood, and the traditionally high childlessness among college educated women has persisted and contributed to overall increases in childlessness via educational expansion (Gustafsson 2001; Miettinen et al 2015). The relationship between educational and childbearing trajectories has been well studied, specifically regarding the linkages between tertiary education and women's childbearing behavior. We know that women postpone the transition to parenthood until educational enrolment has ended (Ní Bhrolcháin and Beaujouan 2012), that highly educated women postpone motherhood but have faster subsequent transitions to second births (Kreyenfeld 2002; Gerster et al. 2007), and that childlessness tends to be highest among highly educated women (Nisen et al 2014; Wood, Neels and Kil 2014). Overall, it is accepted knowledge that education plays a crucial role in structuring individuals' life courses, even though the directionality or existence of causal effects often still remains elusive (Stange 2011; Nisen et al, 2013).

Less is known on how education relates to childbearing among men, but recent results suggest that education structures their life courses somewhat differently than women's (Trimarchi and Van Bavel 2017). For instance, among men, childlessness appears to be highest among the low educated in Norway and Finland (Kravdal and Rindfuss 2008; Nisen et al. 2013). Such differential findings for the fertility-education nexus among men and women, and the fact that children are usually born to couples, underscore the relevance for giving center stage to couples in fertility research. In particular, studying whether educational pairings of men and women provide additional information in understanding childbearing behavior appears necessary given their differential education-fertility trajectories. Yet, a research gap on the question of how the education of both partners interacts with respect to childbearing behavior persists. This is despite a few earlier studies which show that interactive processes among partners are relevant for couples' fertility behavior (Corijn et al. 1996; Thomson and Hoem 1998; Testa et al. 2014), and despite the fact that children are born within co-residential unions much more often than not (Perelli-Harris et al. 2012; Lichter et al. 2014)). Our paper addresses this gap by examining whether and how both partners' education matter and interact in predicting first, second, and third parity progressions across Europe.

Extending the existing knowledge on how the education-fertility relationship may systematically vary under consideration of the education of the partner is important and relevant both from a theoretical and empirical perspective. Theoretically speaking, traditional hypergamous unions with a highly educated man and a lower educated woman have long been predicted by Becker's economic family model to be the ideal environment for the production of children, due to the partners' role specialization and lower opportunity costs of childbearing for her (Becker 1993). Oppenheimer (1988, 1994, 1998) conversely, recognizing the increasing importance of women's economic contribution to family economics, argued that the pooling of resources by partners is a vital strategy for ensuring the family's economic well-being. This resource-pooling model implies higher fertility of highly educated homogamous couples compared to couples with only one highly educated partner. Both approaches predict how partners' relative education may relate to their childbearing behavior. No comprehensive study, however, has yet empirically tested whether unions of varying partners' educational pairings indeed display differences in fertility behaviors, particularly in current times of reversed sex ratios in higher education.

Yet, such an empirical test is particularly timely and relevant since there have been major shifts in men's and women's relative levels of educational attainment, not only in the population in general but also on the couple level in particular. Studies have shown that the reversal of the gender gap in education (DiPrete and Buchmann 2013) has undermined the traditional pattern of educational hypergamy (women marrying up) and that hypogamy (women marrying down) has become more prevalent (Esteve et al. 2012; De Hauw et al. 2017). Relatedly, recent studies are directly pointing to a growing diversity among highly educated women in terms of their partners' education (Mäenpää and Jalovaara 2015, Hou and Miles 2008). For instance, highly educated women in Finland are nowadays more likely to be partnered with lower educated men than previously (Mäenpää and Jalovaara 2015). Similarly, in the US and Canada, the proportion of women with 16+ years of education married to a partner with the same educational attainment has steadily decreased, meaning that highly educated women today are partnering with a more diverse pool of men with respect to educational background than previously (Hou and Miles 2008). To date, we still know little about how such changing combinations of her and his education are associated with fertility.

These changing patterns of educational assortative mating likely affect fertility (Van Bavel 2012; Schwartz and Han 2014). One major reason for this expectation is that a shift from hypergamy towards hypogamy may affect who engages as the main breadwinner. Indeed, a recent study by Klesment and Van Bavel (2017) showed that an increase in the share of couples in which a woman is better educated than a man is associated with a higher proportion of families with a woman as the main earner. This, in turn, may affect the decision-making processes related to his and her labor market participation and to fertility (Oppenheimer 1994; 1997).

This study provides insights into how combinations of educational attainment levels of both partners relate to couples' childbearing behaviors across Europe, using the couple as the unit of analysis and following a conditional-sequential approach to fertility decision-making (Bulatao 1981; Namboodiri 1983). To this end, we use longitudinal panel data on 24 European countries, drawn from the European Union Statistics on Income and Living Conditions (EU-SILC). We select married and cohabiting couples who had no, just one, or two children at the time of first interview and estimate how educational pairings are associated with subsequent rates of parity progression. We focus on those who completed at least secondary education ('medium education') since this is the level of compulsory education in most European countries. Those who are unable to graduate from this level may face considerable challenges in raising families and managing their working lives that are qualitatively different from those who obtain at least a high school degree (Vandecasteele 2011). While our models and tables show estimates for all educational pairings (including the low educated), we limit the scope of this paper to couples with partners who have achieved medium or high levels of education[1].

Our analyses consist of three steps. In the first two steps, we pool all countries for a general overview, first testing whether both his and her individual education actually significantly predict birth transitions, and second estimating the linkage between the educational pairings and parity progressions. In the third step, we distinguish groups of countries and fit our models separately by country group because family formation patterns show considerable variation across European regions. Leaning on commonly used classifications (Thevenon 2011), we grouped countries in four clusters: Nordic countries, Western European countries, Southern European Countries, and Eastern European countries.

Our study provides new empirical evidence on how partners' education interacts in parity-specific ways in predicting couples' fertility behavior. The educational attainment of each of the two partners matters for all examined parities, namely first, second and third birth rates, next to the effect of the educational attainment of the other partner. With respect to first

[1] 'Medium' education includes ISCED levels 3 and 4, which corresponds to US high school degrees and associate degrees (including individuals classified in the US as having 'some college' education). ISCED categories 3 and 4 also include the vocational degrees of the occupational apprenticeship system which is widespread in some European countries. 'High' education comprises ISCED levels 5 and 6, corresponding to completed B.A. degrees or post-graduate education.

births, his education is only significant in interaction with her age, hinting at timing differences between the pairings. With respect to second and third births, highly educated homogamous couples display the highest and hypergamous couples among the lowest rates in most countries, contrary to expectations based on conventional economic fertility theory. In sum, we demonstrate that taking only her (or his) education into account is not sufficient for understanding childbearing behaviors, particularly in the contemporary environment characterized by changing gender relations and shifting patterns of educational assortative mating.

Educational Pairings and Fertility

Theoretical Considerations and Hypotheses

We view education as a non-reversible stock resource, which, oftentimes, is acquired before the partners come together, or at least before children are born (Sassler and Goldscheider 2004; Ní Bhrolcháin and Beaujouan 2012). Along with other resources, such as the future income potential inherent in a degree, education will subsequently affect the divisions of paid labor and unpaid domestic work in the couple. Another important resource is income. Income, however, can easily fluctuate, for example in consequence of preference-related decisions made by the partners. Income is hence much more endogenous to the childbearing process than education, and therefore not included in our reasoning and analyses.

Theoretically speaking, this paper employs a conditional-sequential and couple level perspective on fertility decision-making. According to the conditional-sequential perspective, each parity progression is influenced by different motivational, cultural, and family conditions; each birth changes the family conditions under which decisions are made and so affects subsequent parity progression (Bulatao 1981; Namboodiri 1983). A couple-focused perspective is relevant for understanding childbearing behavior for reasons of both family economics and cultural gender roles. Leaning on five major theoretical perspectives, we formulate a set of hypotheses on how educational pairings relate to parity progression on the couple level.

First, from a micro-economic perspective, Becker (1993) argued that the gains to marriage are maximized when one partner specializes in breadwinning and the other in caregiving and household management. While this theory could, in principle, be gender neutral, Becker aligned it with the gender role expectations and unbalanced sex ratios prevailing in education from the mid to late 20th century. His approach implies thus that hypergamous couples will have the highest rates of entry into parenthood and the highest subsequent parity progression rates, as women in these couples will experience lower opportunity costs of parenting.

Hypothesis 1: Hypergamous couples will display the highest rates of entry into parenthood and parity progressions to second and third births compared to all other types of educational pairings (H1).

Next, Becker has argued that for parents "the effective price of children rises with income" due to interactions between the 'quality' and quantity of children (Becker 1993, p.144, Becker and Lewis 1974). Accordingly, adding another child to the family will be increasingly costly for parents the more socio-economic resources they have. This, he argues, is both due to the anticipated larger investments in children by parents with more resources and due to higher opportunity costs for the time that a mother with high human capital will spend away from the labor market while raising an additional child (Becker and Lewis 1974, Becker 1993). Applied to the issue of educational pairings and fertility, this would imply that couples with higher pooled education will be more reluctant to continue childbearing at higher parities.

In addition, quality-quantity considerations could lead to effects on the timing of the first birth. Parents who wish to invest more in the quality of their child may postpone the first birth the most, in order to have time to accumulate resources before the birth. We however do not expect quantity-quality considerations to substantially affect the decision whether to have a first child or not, as most co-residential couples will actually have a first child (or separate) (Jalovaara and Miettinen 2013). Quality-quantity considerations and their effect on first birth timing will depend on both, the resources available to the couple and their preferences and perceptions. We will therefore refrain from formulating a hypothesis on how quality-quantity consideration will affect the first birth timing by educational pairing.

Hypothesis 2: At higher parities, homogamous highly educated couples have lower parity progression rates than other types of educational pairings (H2).

The theory is not explicit, however, about what happens in case of hypogamy, i.e. when the wife has more education than the husband – a situation that has become more prevalent in recent years (Esteve et al. 2012; Grow and Van Bavel 2015; De Hauw et al. 2017), and which is associated with higher relative earnings for women compared to their husbands (Klesment and

Van Bavel 2017). A gender-neutral version of Becker's micro-economic approach would imply a reduced labor market involvement by him to take care of kids while she focuses on gainful employment in case she has higher earning potential. This could imply equal fertility levels for hypogamous compared to hypergamous couples, yet Becker did not explicitly consider this possibility. Instead, he argued that women "have a comparative advantage over men in the household sector" (Becker 1993: 38). Since women do most of the childcare work, they bear most of the opportunity costs of childbearing in terms of income losses. Given that such opportunity costs will weigh particularly high for couples where she has the higher earning potential, hypogamous couples may have the lowest fertility.

Hypothesis 3: Hypogamous couples are expected to have the lowest parity progression rates across all parities (H3).

A second theoretical approach to marriage and family formation, questioning Becker's specialization and trading model, was proposed by Oppenheimer (Oppenheimer 1988, Oppenheimer 1994, Oppenheimer 1997). Considering women's enhanced economic independence, she has argued that couples with two earners will more easily be able to adapt to challenges in the labor market by pooling their resources (Oppenheimer 1997). This, in turn, would mean that couples with two highly educated spouses and thus greater resources and future economic stability may be in a more suitable situation to have a(nother) baby. Also, both economic and emotional opportunity costs of adding another child may be higher in couples with unequal resources. If educational hypogamy implies dependency on her income, then a loss of her full salary after a birth will burden the family more strongly compared to situations where both partners contribute, or have both high potential to contribute, to the family income. Culturally speaking, changing gender roles today imply increased involvement (and desires and expectations thereof) of men in the family (Hook 2006). Men in hypergamous couples may more easily feel overburdened if they are the main breadwinners while at the same time aspiring to spend more time with domestic and care work after the birth of another child. All else being equal, these arguments could imply higher fertility among highly educated homogamous couples.

Hypothesis 4: Highly educated homogamous couples have the highest parity progression rates of all types of educational pairings (H4).

Third, a similar but more nuanced prediction arises when we also consider the role of values and ideology among partners for their childbearing behavior. High education has been associated with more egalitarian gender ideology (Kane 1995; Panayotova and Brayfield 1997). Differences in gender ideology between individuals of different educational background may imply varying degrees of value consensus between partners, which in turn may affect couples' childbearing decision-making. Highly educated men may have more gender egalitarian attitudes and may therefore be more supportive of her pursuing career and motherhood simultaneously when partners are equals in education. In turn, career oriented highly educated women may receive greater support in combining career and family from highly educated partners compared to partners with less education. Ideally, value mismatches of partners will be prevented by the mating market. Yet, individuals have a large array of values, and a complete value consensus in all domains between partners appears unlikely. A recent study shows that with respect to gender ideology, partners are mismatched in about 20-30% among couples with children, depending on the specific item (*Author* forthcoming). We do not know, however, of a study measuring ideology consensus or mismatch by educational pairing, so our argument about differential value mismatch by ideological pairing needs to remain hypothetical.

Hypothesis 5: Homogamous highly educated couples have higher rates of parity progression to first and second births than hypogamous couples with a highly educated woman and a lower educated man (H5).

Additional predictions arise under consideration of the 'bargaining' and 'doing gender' approaches. The New Home Economics and the pooling perspective assume team-decision-making, implying one joint utility function maximized in agreement within the couple unit. The bargaining and 'doing gender' approaches add a layer of complexity by focusing on individuals, their culturally gendered preferences, and interactive processes between the partners.

The bargaining perspective argues that individuals who hold an equal or larger share of the resources in the partnership may have more leverage in negotiating desired outcomes (Blood and Wolf 1960). The majority of family work is still done by women (Dotti 2014, Bianchi et al. 2012), and the division of domestic work becomes more traditional after the birth of a child (Nitsche and Grunow 2016). It has been argued that women with higher resources have more leverage in enlisting their partner's help or outsourcing domestic and care work. Empirical studies show mixed evidence, increases in her absolute or relative income or education have been associated with a larger male share of housework and childcare in some studies (Lewin-Epstein et al 2006) but not others (Nitsche and Grunow 2016). Outsourcing generally is predicted by higher household income (du Ruijter, Treas, and Cohen 2005; Schneider and Hastings 2017), and may thus be particularly relevant for the more highly educated sample we study. However, cleaning, a female task, is increasingly outsourced as her income rises (Treas and de Ruijter 2008), and outsourcing explains a part of the negative association between women's earnings and their time spent with housework (Killewald 2011). Outsourcing does not appear to change the partners' gender divisions of the remaining housework tasks (Gonalons-Pons 2015), yet, it lowers women's daily time spent with housework, and may thus be helpful in combining career and children nonetheless. Thus, women with more or equal resources in hypogamous or homogamous unions may successfully bargain for more support with domestic work, alleviating their disproportional time spent with housework, in particular after the birth of a child. Such negotiations may in turn encourage women to realize the couple's desire for children, in particular a second or higher parity child. This leads to the sixth hypothesis, that bargaining can predict homogamous highly educated couples and hypogamous couples to have an accelerated transition to the next child.

Hypothesis 6: Hypogamous couples with a highly educated woman and a lower educated man, along with homogamous highly educated couples, will display the highest rates of progression rates to all parities (H6).

Additionally, the 'doing gender' framework (West and Zimmermann 1981, 1987) suggests that individuals are guided in their behavior by the expectations of others, and gendered behavior is thus created and reinforced in a process of 'social doing', as individuals act in ways they think others expect of them (West and Zimmermann 1987). The need for such gender display can be more pronounced when individuals are in gender-non-typical situations, such as in a hypogamous couple. These partners could, in order to compensate, behave in ways perceived as more gender typical. This could, for example, get expressed in a more gender-traditional division of domestic work, leading to greater work-family incompatibility for her, and in turn a slower transition to the next child, in line with Hypothesis 3. However, compensating behavior could also come in the form of her larger engagement in mothering and hence an accelerated transition to the next child, consistent with Hypothesis 6. Hence, the doing gender perspective seems not helpful here in formulating a clear hypothesis about fertility as it does not imply a particular direction.

Regional Differences

Family dynamics, social structures, and employment conditions differ across Europe. In light of disparaging fertility-, gender- and work-family-reconciliation regimes, the role of partnership dynamics may therefore vary for childbearing decision-making across contexts. Accordingly, our hypotheses can be differentiated by the social context. In the following, we describe the factors we believe may be most relevant for each of the four clusters in framing the couple-dynamics we examine, these are childcare coverage, economic support for families, and employment conditions.

The Nordic countries feature ample support for work-family reconciliation (Rostgaard 2014). Full-day schools and public high-quality childcare to most children above age one are available (Thevenon 2011, Lappegard 2010, Andersson 2008). Parental leave schemes have high wage replacement rates and designated father months. Yet, child allowances are modest, and taxation of parents versus the childless does not differ, meaning economic support for families with children beyond childcare is moderate (OECD 2017). In an environment with excellent care and leave infrastructure, and a high integration of parents in the labor market (Ellingsaeter 2009), the individual risk for careers and economic well-being, and the time-burden inherent in raising children may be lower than in other contexts. We therefore expect resource pooling, value consensus, or bargaining to play a less pronounced role in the Nordic countries, at least for first and second births, and do expect the smallest differences in parity progression rates between educational pairings involving at least one highly educated partner here. Due to modest financial support for families, resource pooling (H4) may matter for third and higher parity births, though.

Western European countries and the United Kingdom are a more diverse set in terms of work-family policies (Thevenon 2011). The German-speaking countries have a more gender-traditional culture with a male-breadwinner norm. Accordingly, childcare coverage is lower, specifically for children under age 3, and the school day is shorter (Hank et al 2004). Parental leave schemes have traditionally supported extended stays out of the labor market for childrearing combined with low wage replacement rates, although change towards greater gender role equality is occurring, specifically in Germany (Ostner 2010). The French-speaking countries feature public systems in greater support of reconciling work and family life, in particular higher child care enrollment rates of children (Gornick et al 1997). The difference in the net average tax rate between the childless and married employees with children is, on average, largest in this cluster to the advantage of families (OECD 2017). This contextual background implies that couple-level factors may play a more important role for childbearing-decision-making across Western Europe. If homogamous highly educated partners may be able to pool resources and afford private solutions while receiving higher monetary child-related transfers, we specifically would expect to find evidence supporting H4 (pooling) and H5 (values). It is, however, also possible that hypergamous couples may display the highest parity progression rates to first and second births, given widespread acceptance of gender schemas supportive of stay at home moms and part-time working mothers. Hence, we may also expect to find evidence for H1-H3 (NHE).

The Southern European countries have comparatively meager support for work-family reconciliation, traditional attitudes towards women's roles (Matysiak and Węziak-Białowolska 2016, OECD 2017), pronounced first birth postponement, and low TFRs (1.32 in 2013; Sobotka 2015). Strong labor market rigidities are present, which make it difficult for the youth to enter the labor market and maintain employment (Adsera 2005, 2011; Vignoli et al. 2016). In this context, no clear predictions arise and three hypothetical scenarios may apply. First, it is possible that hypergamous couples display the highest progression rates to first and second births, as these couples might engage in traditional gender roles, and opportunity costs of parity progression are low (supporting H1 and H2). Second, highly educated homogamous couples may display the highest parity progression rates, as they may potentially be most successful in securing their positions in the labour market and pooling of resources may also help them to purchase childcare (supporting H3 and H4).

The Central and Eastern European (CEE) countries are characterized by low levels of childlessness (Miettinen et al. 2015) and younger average ages at first birth (between 25-27), but also low transition rates to second births (Zeman et al 2017), overall resulting in low fertility levels (TFR between 37 and 1.65 in 2013). The CEE countries are specific in that they display a negative educational gradient in progressions to second births (Wood and Neels 2014). This country group displays a very specific gender schema: stemming from the era of socialism, women were perceived as the main care providers, yet at the same time expected to work for pay and contribute to the household budgets (Pascal and Manning 2000, Treas and

Widmer 2000). This gender schema is reflected in public policies, which offer long parental leaves and relatively poor childcare provision for the youngest children (Szelewa and Polakowski 2008, Robila 2012). However, there is also considerable variation in family-policies across the countries; for instance, the provision of early childcare and support for gender equality is more common in Slovenia or Estonia (Frejka and Basten 2016). The provision of public childcare for children aged 3+ is already relatively widespread, helping women to return to work (Robila 2012). Households are poorer, on average, than in the rest of the EU. At the same time, adults strive for achieving higher, more Western-like, living standards, which provides strong incentives for both partners to work for pay (Sobotka 2011, Matysiak 2011). In this context, homogamous highly educated couples may display the highest birth progression rates, particularly to second and higher parity births, as they have more resources than other couples (supporting H3 and H4).

Previous Research

While empirical studies have incorporated both partners into investigations of childbearing behavior, only few studies have explicitly examined how the interaction between both partners' educational attainment is associated with fertility behavior. Previous research examining the relationship between relative education and childbearing behavior provides only fragmented knowledge on the topic. First, in terms of the theoretical framing, some studies focus on economic resources, gender roles, and opportunity costs (Wirth 2007, Jalovaara and Miettinen 2013). Others frame around the themes of resource-pooling and work-family compatibility issues (Dribe and Stanfors 2010), or argue in terms of fertility-related preferences of the partners, and power dynamics in the bargaining over fertility which may be affected by relative education and value consensus between partners (Bauer and Jacob 2010, Corijn et al. 1996). Second, available studies focus on different parities: while some investigate the transition to parenthood and the probability of remaining childless (Wirth 2007, Bauer and Jacob 2010, Corijn et al 1996, Jalovaara and Miettinen 2013), others analyze the transition to second and third births (Dribe and Stanfors 2010). Third, they use diverse measures of hypogamy and hypergamy. Some look solely at her and his educational pairings, others combine the information on education with information on occupational status (Osiewalska 20015) or income (Dribe and Stanfors 2010). Next, studies concentrate on different country contexts and time-periods. Finally, and probably partly because of the reasons mentioned above, they present conflicting findings. For instance, Corijn et al (1996) for Flanders and Jalovaara and Miettinen (2013) for Finland found no significant interaction effects between her and his educational attainment on the entry into parenthood, while such effects were found by Wirth (2007), Bauer and Jakob (2010) for Germany or Osiewalska (2015) on the pooled sample. Hypergamous couples appear to remain childless the least often in Germany (Wirth 2007, Bauer and Jacob 2010), homogamous couples higher socio-economic status had the latest entry into parenthood in the pooled sample (Osiewalska 2015), and highly educated homogamous couples had higher second and third birth rates in Sweden (Dribe and Stanfors 2010). In sum, there is only limited knowledge on the linkages between educational pairings and childbearing, and an overview study, which conceptualizes partners' interactive education and links it to childbearing in a consistent and comparative way is still lacking. This paper fills this important gap in our knowledge.

Data and Method

Data and Sample

Data

The data for the analyses come from the EU-SILC, an ongoing household panel launched in 2003, with nearly all EU member states participating by 2005. It provides a household roster and collects detailed information on all household members aged 16 and above. It is a rotational panel by design, consisting of four subsamples which are interviewed in parallel for four consecutive years (except for a 8-year observation period for Norway and France), but each subsample enters the panel at another point in time (for details see European Commission 2010). We use EU-SILC data because it provides full household rosters, detailed information on educational attainment and enrollment of all household members, has a longitudinal panel design, covers a wide array of European countries, and is current and ongoing, hence depicting the current family situation in Europe. But the data also has disadvantages. These are the short observation duration and the lack of retrospective information on non-resident children and fertility-, partnership- and education-histories. In consequence, we reconstruct the number of children a couple has from the household roster, using information on relationship statuses among household members, and their birth years. Thus, our definition of parity refers to the parity of the couple, and equals the number of children living with the couple. This means we cannot exclude that the couple or either partner may have had children before who are not living in the household anymore, especially in case these children were born early in life and left the home already, implying the possibility of left-censoring. In order to minimize the risk of underestimating the true parity we decided to observe women up to the age of 40. Given that our focus is on the highly educated subset of the population who on average have the latest ages at parenthood (Rendall et al. 2005) setting a lower age limit is not very likely to prevent us from misclassification bias, but may result in substantial loss of information on higher order births to highly educated women. We have, however, estimated alternative models using a variety of younger age cut-offs in order to test for a possible left-censoring bias (models not shown but available upon request). The findings are very consistent with the findings we obtained from the model with the age limit set at 40, which we take as evidence that misclassification bias, if present, does not meaningfully alter out results.

Analytic Samples

We constructed three analytic event history sub-samples, namely for the transition to first births, second births, and third or higher order births, and limit our analysis to cohabiting and married couples in which women were 18-40 in all three samples. All couples are at risk for childbearing until that event occurred, until union disruption or until the date of the exit from the panel, whichever came first. We allow both partners to re-enter the sample in case of re-partnering.

Couples who are childless at the start of the panel are at risk of conceiving the first child. It is important to note that the women in this sub-sample of couples are quite heterogeneous in terms of age (observed), union duration, and time since graduation (unobserved), i.e. with respect to the life course stages in which they are observed at risk for first childbirth. For instance, the majority of childless women observed at age 25 will eventually become a mother, while this cannot be said about childless women at age 35+. As a result, age effects on the transition to parenthood will not only reflect age-related processes but also selection effects. Our data does not allow us to take union duration or time since completing education into account, hence we cannot control for this selectivity in the analyses.

We limit the samples of couples at risk of second, third or higher order to those whose youngest child is aged 5 or younger. Couples with older children are less likely to have another child because of either their preferences or health conditions or union quality. In fact, 80% of second births and 70% of thirds births observed in our pooled sample occurred within 5 years after the birth of the previous child. Moreover, including longer birth intervals would make it more likely that the current partner is a new partner, and not the biological parent of the older sibling(s) (Kreyenfeld and Heinz-Martin 2015). We estimated additional models without this restriction, and the results do not differ (models not shown).

Mid 2016, the EU-SILC panel was available for 30 European countries, 24 of which are included in our sample. We excluded data from Germany due to quota sampling and data from Spain and Ireland due to non-response substitution for households that dropped out which subsequently affected the sample representativeness (Iacovou, Kaminska and Levy 2012). In addition, we found unrealistically low numbers of births by exposure time in Cyprus, Malta, and Romania when compared to the period TFR and therefore excluded these countries from the sample too.

We conducted analyses on 1) a sample that pooled all countries, and 2) four sub-samples of country groups. The Nordic country group includes Denmark, Finland, Norway and Sweden; the Western group comprises Austria, Belgium, France, Luxembourg, the Netherlands, and the UK; the Southern group consists of Greece, Italy, and Portugal; and the Eastern European group includes Bulgaria, the Czech Republic, Estonia, Croatia, Hungary, Lithuania, Latvia, Poland, Slovenia, and Slovakia. Table one shows information on exposure-observations and numbers of events in each of the sample in the four clusters.

Table 1 about here

Models and Covariates

Dependent Process, Models, and Educational Pairings

As our data are measured annually, we estimate random-effect logit models, separately for the transitions to first, second, and third and higher order births. We perform our analysis stepwise. First, we test how her education affects parity progressions. Second, we add his education to test the role of both partners' own education. Third, we interact his and her education to test whether the effect of her or his education varies with changes in the education of the partner. We measure his and her education in three main groups: low (ISECD-97 0-2: lower secondary or second stage of basic education at most), medium (ISCED-97 3-5: upper secondary and post-secondary non-tertiary), and high (ISCED-97 5-6: first and second stage of tertiary) education. Fully interacting all categories implies that we have nine educational pairing combinations (she high/he high, she high/he medium and so forth). Fourth, we estimate the interacted models again, but now simplify the educational pairing groups. Since only few couples feature a combination of a high and a low educated partner, we group couples with a high educated man and a lower educated woman (medium and low education) as hypergamous and couples with a high educated woman and a lower educated man (medium or low education) as hypogamous[2]. We still differentiate between homogamous highly educated, homogamous medium educated, and homogamous low educated couples (graphs omit pairings with low/low and low/medium combinations). Hence, the four pairing-categories which are of main interest for our analyses are: both highly educated (shorthanded as 'both high); both medium educated ('both medium'), she highly educated and his education lower than hers ('she high he lower'), and he highly educated and her education lower than his ('he high she lower'). In the two latter categorizations, 'lower' refers to all partners with medium or low education. The distribution of educational pairings differs strongly across countries, as shown in Table 2. The grouping with both partners having medium education is on average the most prevalent, and serves as the reference category in all models. Highly educated homogamous couples are most frequent in the North and West (ca. 25-30 percent of couples). It is noteworthy that the distribution of hypogamous couples varies across parities and clusters. In Southern Europe, hypogamous couples are about as prevalent as homogamous highly educated couples, while they are a smaller group relative to homogamous highly educated couples in the other parts of Europe. The educational pairing variable is introduced in all models in step four. The models for first births additionally feature an interaction between the educational pairings and her age to account for the fact that highly educated women start their childbearing careers later due to longer participation in education. The BIC advised against including interactions between educational pairings and the time elapsed since the previous birth in the pooled and country-cluster models for second and third-and higher order births. For these births, we present coefficients for educational pairings that are not interacted with time[3]. No weights have been used for the analyses.

In order to interpret our findings we rely on predicted probabilities instead of odds ratios. It has been shown that odds ratios should not be interpreted across various countries or

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[2] This decision is supported by empirical tests from the interacted models in tables 3b. There are no statistically significant differences between pairings with a highly educated woman and a medium educated man vs. a low educated man, or a high educated man and a medium educated woman vs. a low educated woman on the second birth rate (p>chi2=.09, p>chi2=.48) or the third birth rate (p>chi2=.84, p>chi2=.13).

[3] Similarly, the likelihood ratio test advised against the time-interactions for third and higher parity births (chi2=14.48, p=.2711). Yet, it supported the time-interacted model for second birth progressions in the pooled model (chi2=33.43,p=.001). However, when testing time-interacted models by country cluster, this support for the age-interacted model was present only for the Southern countries (chi2=21.14, p=.048).This cluster actually features our weakest findings for second birth progressions in the final model which is not time-interacted. The interacted model for the South (model not shown, available upon request) indicates stronger birth rate differences between the educational pairings of interest in the first years after the first birth (with the highest rate among highly educated homogamous couples). With time passing, hypergamous and hypogamous couples seem to catch up on the second birth rate with homogamous highly educated couples. Since the non-time-interacted model is more appropriate for all third birth progressions and second birth progressions in the other clusters, we settled on non-age-interacted specifications for all second and third birth models. They are more parsimonious and allow for clearer and consistent presentation of the results. Our findings and conclusions are not affected by this and remain unchanged if we added the time-interaction to the second birth progression model in the Southern cluster.

samples; instead, it has been recommended to compare predicted probabilities (see for instance Mood 2010, Wooldridge 2002). We compute such probabilities and their standard errors by the woman's age for first births, and by years elapsed since the birth of the previous child for second and higher order births. We compute first birth probabilities for women aged 23 to 40 years because there are few couples that include a highly educated partner under the ages of 23. The probabilities are estimated for all co-residential couples regardless of their marital status, as the proportion of married couples varies strongly across clusters and parity, as can be seen in table 2, yet while holding the values of the other covariates constant at their mean or modal values. Next, in order to draw conclusions on how birth probabilities differ across education pairings, we compare the birth probabilities for all considered educational pairings with the birth probability computed for highly educated homogenous couples. We test differences between the probabilities using standard significance tests. Figures 1-3 graph the predicted probabilities. The differences between homogamous highly educated couples and all remaining couple types were marked as significant if the p-value was smaller than 0.1.

Control Variables

We estimate the relationship between educational pairing and first birth risks net of her and his enrolment in education, her age, the absolute difference between his and her age, marital status (married vs. cohabitation), and year dummies to control for period effects. In the EU-SILC, enrolment is defined as being currently enrolled in the formal education system, meaning either primary, secondary, or tertiary schooling. Vocational training activities outside of the formal education system do not qualify as enrolment. Enrollment and education are not coded in a mutually exclusive way. Each couple is assigned an educational pairing value in one variable, and two other variables indicate whether either of the partners is enrolled in education. We treat both educational enrolment and attainment as time-varying covariates, and allow for entry in and exit from enrolment as well as educational upgrading of either partner. Enrolment and attainment level are lagged by one year as we are interested in the relative educational pairing at the time of the conception instead of at the time of birth.

We modeled her age using a quadratic polynomial to allow for a curved shape of the age effect. We also estimated alternative models with a more flexible age specification using dummies for each year of age (or 5 years groups), but the predicted probabilities by age were very similar to those from the more parsimonious specification with the continuous terms. In the models for second and higher parities, we additionally control for her age at first birth and the age of the youngest child.

Table 2 gives summary statistics for all explanatory and control variables and for each of our analytical samples.

Table 2 about here

Limitations

For proper interpretation of our results, we need to mention the limitations of our empirical approach at the outset. First, our data span only a small episode of couples' life courses, precluding us from distinguishing between timing and quantum effects. In other words, we are unable to verify whether couples who did not have a (next) child within three years eventually had one later on. Hence, the differences in the birth rates we find might be entirely due to a closer spacing of births among certain types of couples and not translate into quantum differences. Second, when modelling the progression to second and higher order births, the analytical sample necessarily consists of those couples who completed the transition to lower birth orders. The latter may be a selective sub-sample of the complete population of couples with given educational pairings. We are unable to control for such selection effect. For example, couples' parity progression will depend on the stability of their unions. Since the risk of separation may vary by educational pairing, our sample of unions of a given pairing type might be selected on stability. Birth rates might hence be higher among certain couples simply by virtue of higher union stability and the resulting longer exposure time to the 'risk' of conception. Third, we are not able to control for fertility preferences of the couples since our data does not contain this information and the short observation window precludes the possibility to estimate models which control for unobserved characteristics. Finally, despite extensive checks, we cannot fully exclude the possibility of left-censoring. As a result, couples with children who are not present in the household will be classified as having one child fewer than they actually have. Our analyses show that highly educated homogamous couples have the latest first births, suggesting that other couples may be more at risk of such parity misclassification. If such bias were present, the difference in second and third birth rates between highly educated homogamous couples and the other couples may be overestimated. It appears unlikely, though, that misclassification is so unequally distributed across groups or that it would be large enough to disturb our highly robust findings.

Results

Her, His, and Their Education: Testing Model Fit

Tables 3a and 3b present stepwise models, evaluating model fit for the models with her education only, her and his education additively, and her and his education interacted. High education serves as the reference category. The likelihood-ratio tests indicate that each subsequent model fits the data better than the previous one for first births ($\chi 2$=24.45, p.004 and $\chi 2$=16.5, p=.0029) and third births ($\chi 2$=27.27,p=.000 and $\chi 2$=11.82, p=.019). Note that the first birth models feature age interactions, since tests from our main models (step four) have shown that age interacted models fit the data significantly better. Testing stepwise models without age interactions leads to the misleading conclusion that adding his education does not improve model fit for first births. Hence, in the first birth context, educational pairings differ specifically with respect to her age and hence birth timing. Education thus relates to first birth progressions in a complex way, as it is contingent on both the partner's education and age.

For second birth progressions, the model with her and his education fits the data significantly better than the one with her education only (chi2=27.47, p=.000), but the interacted model does not improve the model further (chi2=5.15, p=.272). However, some of the educational pairings are significantly different from each other as shown in Table 3b, namely those involving one or two highly educated partners. This again highlights the importance of evaluating how education affects parity progression contingent on the education of the partner also for second births, particularly for the highly educated. In sum, we present strong evidence for the relevance of both partners' education for all three birth progression. Moreover, modeling interaction effects of both partners' education is needed to fully understand first and third and higher parity progressions, and enhances our understanding of progressions to second births among more highly educated couples.

Tables 3a and 3b about here

Educational Pairings and Birth Progressions

Tables 4, 5, and 6 show full model results with the final simplified educational pairing specifications. Couples with two medium educated partners serve as the reference category, coefficient p-values indicate differences between homogamous medium educated couples and the other pairings. We also tested the pairing-coefficients against each other, those test statistics and p-values are listed underneath the model-tables (for couples including a highly educated partner). For reasons explained in the method section, we rely on predicted probabilities, derived from the shown models, while interpreting our findings. These probabilities are presented on Figures 1-3. The figures show four lines each, representing the educational pairings of our main interest, namely: both highly educated, she is highly educated and he has lower education, he is highly educated and she has lower education, and both have medium education. Lines colored in black indicate significant differences in birth rates of the represented pairing compared to the pairing of homogamous highly educated couples (this paring is always represented by a black and solid line). Grey lines, or line portions, indicate non-significant differences in the prediction of this group compared to the predicted birth rate of highly educated homogamous couples.

Figure 1 about here

First Births

Figure 1 plots predicted first birth rates by woman's age. The first panel shows the results from the pooled model, subsequent panels showing the results by regions. The lines for different educational pairings cross, indicating that the association between these pairings and first birth rates depends on age. There are significant differences in transition to parenthood rates within her education by his education, and vice versa. In the pooled model, couples with two highly educated partners have higher predicted hazards of becoming parents at later ages (30-37), while the hypergamous as well as hypogamous couples with only one highly educated partner experience the first birth significantly more often between her ages of 23-26. This pattern holds for the Nordic and Western grouping. In the Nordic countries, difference between the pairings involving at least on highly educated partner are not as pronounced and only significant between the ages of 23-25 and 30-33. In Western Europe, homogamous highly educated couples have much lower first birth than hypogamous or hypergamous couples until the age of 26. After her age 30, birth rates of homogamous highly educated couples are significantly higher than the rate of hypergamous couples throughout, and higher than that of hypogamous couples between her ages of 31-34. In Eastern Europe, the timing of first births is generally shifted to younger ages across all pairings. Interestingly, hypogamous couples have the highest birth rates throughout all ages. They have significantly higher birth rates than homogamous highly educated couples at age 23 and age 35, otherwise the differences between these two pairings are not significant. Southern Europe does not show any statistically significant differences in first birth rates across educational pairings.

Figure 2 about here

Second and Third Births

The most interesting findings emerge from the analyses of second and third birth transitions. In the pooled models, highly educated homogamous couples have the highest second and third birth rates (Figures 2 and 3). Their rates are significantly higher than those of medium educated homogamous couples as well as those of hypergamous or hypogamous couples with one highly educated partner only. Thus, there is a clear differentiation in second and third birth rates within her or his high education conditional on the education of the partner.

For second birth rates, when differentiated by country group, this general pattern is prevalent in Western and Eastern Europe. In the Nordic and the Southern groups there are no significant differences between highly educated homogamous and hypogamous couples with a highly educated woman. Here, her education seems to be predicting second birth rates regardless of his education. Yet, highly educated homogamous couples have higher second birth rates in these two country groups than hypergamous couples with a highly educated man and a lower educated woman.

Third birth rates of highly educated homogamous couples are significantly higher than for the other depicted pairings in Western European. In Eastern and Northern Europe, homogamous highly educated couples also have the highest third birth rates, yet only the difference with hypogamous couples is significant, not the one with hypergamous couples. In Southern Europe there are no significant differences between homogamous highly educated couples and hypergamous or hypogamous couples[4].

Figure 3 about here

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[4] The predicted values of the second and third birth rates for Eastern Europe are lower than expected based on period fertility rates for the late 2000s. This appears to be due to attrition issues in the EU-SILC in some countries, particularly in the Eastern European sub-sample (Dasre and Greulich 2017). It has, however, been shown that this attrition is not dependent on socio-economic status, therefore, our results contrasting birth rates of educational pairings should be consistent and valid, even though overall birth rates are too low (ibid).

Discussion of Hypotheses

The associations described in this paper shed light on the validity, at least in contemporary European societies, of six specific hypotheses we have derived from five theoretical approaches. Hypotheses 1-3 represent the main arguments of the Beckerian economic model of the family. They predict that hypergamous couples have the highest (H1) and hypogamous couples the lowest (H3) parity progression rates, while homogamous couples were expected to have lower progression rates than other couples at higher parities (H2). Our pooled results clearly run against these three hypotheses. Hypergamous couples have significantly lower parity progressions to second and third births compared to homogamous highly educated couples. This contradicts H1 and H3. Parity progressions to second as well as third and higher order births are highest for homogamous highly educated couples, compared to all other groups, also the lower educated groups not shown in the results. This contradicts H2. While hypogamous couples have significantly lower progression rates to second and third births than homogamous highly educated couples, they do not differ from hypergamous couples. Testing their hazard rates against each other (Tables 5 and 6) shows no significant differences at the .1 level. Hence, our evidence does not support H2. Overall, our findings from the pooled models are not in line with the predictions we derived from the Beckerian economic model of the family. Our findings suggest that theoretical approaches beyond the New Home Economics are needed in order to fully understand current childbearing behavior across Europe, even though Becker's approach may still be applicable to third births progressions in Nordic and Eastern European countries.

Instead, our findings are consistent with hypotheses H4 (pooling) and H5 (value consensus). Leaning on Oppenheimer, H4 predicts highest parity progression rates for homogamous highly educated couples due to a pooling effect of both partners' resources to a collaborative partnership. More precisely, H5 predicts higher parity progression rates for those 'power' couples than for hypogamous couples with a highly educated woman and lower educated man, based on the idea that value consensus in these couples implies his support for her combining of career and childrearing. Our findings provide evidence in support of H4 and H5 regarding second and third and higher parity progression rates, echoing previous results for Sweden of higher second and third childbearing rates for these couples (Dribe and Stanfors 2010). The evidence regarding entry into parenthood is more nuanced as the differences between pairings depend on her age, suggesting timing effects. These 'power'- couples do display significantly higher rates of first births after her age of 29 than the other couples. This result confirms that highly educated homogamous couples make the transition to parenthood later than all other types of couples. Corijn et al. (1996) have also found slower first birth transitions for homogamous highly educated couples in Flanders and the Netherlands. Their sample, however, only included couples with women until age 30, enabling them to capture the initial postponement, yet not their higher rates at later ages. While we find that both partners' educational attainment and their interactions are important for predicting first birth timing, it remains unclear why some couples postpone the first birth more than others. Next to different ages at union formation and diverse career pathways, varying preferences regarding the investment couples want to make into their children (i.e., quality-quantity considerations) could also guide the extent of postponement. For instance, highly educated homogamous couples may postpone the first birth the most in order to accumulate more resources before becoming parents. If this was the case, Becker's quality-quantity reasoning may be partly supported by our findings, at least with respect to first birth timing. Further research will need to explore these aspects behind postponement differentials as well as the extent to which it may affect the probability of becoming parents at all between the pairings.

The third mentioned theoretical framework, the bargaining perspective, is overall not supported by results from the pooled models, at least not in the way we specified it. From a broadened perspective, however, bargaining may still take place among partners in ways that affect fertility, beyond what we specified in H6 (bargaining). For instance, highly educated women in hypogamous couples may be more successful in bargaining greater focus on and investments in their careers (such as enforcing geographical mobility of the couple for a career advancement). Such employment involvement and investments may in consequence lead to the postponement (or forgoing) of a second child. From the men's perspective, it may be 'easier' to bargain for a larger family involvement of the female partner when he has at least as much education and earning potential as she, hence, higher birth risks could be expected in hypergamous or homogamous highly educated couples as opposed to hypogamous couples. Ultimately, more detailed data allowing empirical exploration of such nuanced bargaining channels and deeper discussion and specification of the bargaining concept are called for to explore this further in future research. That said, the findings for second parity progressions in the Nordic and Southern European countries are actually consistent with H6 (bargaining), which predicts that hypogamous along with homogamous highly educated couples have highest parity progression rates. Bargaining may thus be taking place, or a mix of both pooling and bargaining may facilitate the decision to have a second child (sooner) for couples in these country groups. In the Nordic cluster, third birth rates are, however, lower among hypogamous couples compared to homogamous highly educated and hypergamous couples.

Couple-dynamics hence seem to matter in the North of Europe, especially beyond the first birth. We had expected couple dynamics to matter least in the Nordic system of high public support for families for first and second births. This seems to be confirmed for the transition to parenthood, but not for second or higher parities. This finding may hint at the importance of economic conditions for continued childbearing, and underscores the need for further research to investigate more deeply into the underlying mechanisms driving the differential birth progressions by educational pairings, specifically in a comparative perspective.

In the Southern countries, first birth progressions are similar among all couples with one or two highly educated partners, and second birth progressions are predicted by her educational attainment, again supporting H6 (bargaining). Thus, bargaining and pooling may take place in these countries with very little public support for work-family reconciliation. Interestingly, pooling resources in this scenario may facilitate the reconciliation between paid work and family life (Mencarini and Vignoli 2017), specifically among highly educated women who may successfully bargain for more support with domestic work. Yet, we do not find significant partner effects for third birth progressions in the South.

In Western-European countries, differences between homogamous highly educated and the other couples are largest. As expected, we find strong evidence for H4 and H5 (pooling, values) regarding second and third parity progressions. Pooling or value consensus thus appear to play a role particularly for considerations of adding children to the family after the first birth has occurred in this setting with medium level support for work-family reconciliation.

Eastern Europe shows some evidence for what may be a distinct pattern for entry into parenthood. Hypogamous couples have the highest transition rates across all ages, even though differences with highly educated homogamous couples are not significant at other ages than women's mid 20s and their mid 30s. One possible interpretation is that women's earning potential may matter more for family formation in Eastern Europe than in the other contexts, perhaps due to longer histories of women's labor force participation and institutionalized acceptance of women as income providers (e.g., Matysiak and Vignoli 2013). Furthermore, we find clear evidence for H4 and H5 (pooling, values) regarding second and third birth progressions. This is in line with our expectations, as dual earning in Eastern Europe may matter more for maintaining families, achieving higher living standards, and purchasing childcare in low public provision settings than in the old EU member states. Additionally, the third birth progression rate for hypergamous couples is on par with homogamous highly educated couples. Perhaps some selected, for instance more affluent, couples may realize higher family sizes by adhering to traditional division of labor, in particular in a setting when combination of paid work and family is poorly supported by the state and women are still perceived as main care providers.

Conclusions

In light of rapidly changing sex ratios in higher education, changing gendered structures of labor markets, and the relevance of the couple-context for childbearing decision-making, we argue that it is important to extend the literature on the fertility-education relationship by investigating whether there are significant differences in how individuals' educational attainment relates to childbearing behavior conditional on the education of their partner. While a handful of mostly single country studies have previously investigated this question, mostly with respect to the transition to parenthood, no representative multi-country study covering a broad array of country clusters yet exists on how partners' educational pairings relate to parity-specific birth transitions. Our study starts closing this gap by using data from the EU-SILC to estimate how partners' educational pairings predict parity-specific transitions to first, second and third and higher order births in 24 European countries, pooled as well as differentiated by country group. We have estimated transition rates for all combinations of couples with low, medium and high education of each partner. Yet, we focused on the results for couples that include partners with at least medium-level education, being particularly interested in differences by partner's education among highly educated women and men.

Two major findings have come to the fore. First, we show that both her and his education significantly predict first, second and third birth rates, hence suggesting that both partners' education needs to be considered when examining fertility. In some context, modeling partners' educational pairings, beyond modeling his and her education additively, further improves model fit, namely for first and third and higher parity birth progressions. While this does not apply to second birth progressions, we nonetheless find significant interaction effects between the partners' education among couples with at least one highly educated partner in the second birth models. Second, highly educated homogamous couples display significantly higher second and third birth rates than hypogamous or hypergamous couples (involving at least one highly educated partner) or medium educated homogamous couples, at least in the pooled model. In addition, highly educated homogamous couples make the transition to parenthood later than these other couple-types. That highly educated women have their first child late is no surprise, but the finding that the timing also depends on the educational level of the male partner is novel.

Our results add complexity to our understanding of first births, as educational pairings only significantly differ contingent on the woman's age. All these findings are robust to several robustness checks, including different age specifications, single country models, and checks for left-censoring by lowering the age limits from 40 to 33.

Overall, our results for second birth progressions are most in line with Oppenheimer's pooling hypothesis and with the hypothesis that values and ideology of the partners play a role for childbearing decision-making. They do not support predictions derived from Becker's family model. The evidence for third births is similar but more nuanced, as Becker's hypotheses may still partly apply in the Nordic countries and Eastern Europe. Goldscheider et al. (2015) argue that the emerging pattern of two-breadwinner families with two adults contributing to house- and care work will lead to increases in fertility, marking the 'second part' of the gender revolution (ibid.). Ultimately, such developments may even lead to a reversal in the educational gradient in fertility, others have hypothesized (Esping-Andersen and Billari 2015). At first sight, our results appear to support these claims, as couples with two highly educated partners often display the highest second and third birth hazards, and, as our findings appear to indicate such a reversal, at least from a period perspective. We want to stress that these hunches are not necessarily supported by our results. Population level fertility rates and education gradients in completed fertility represent a final outcome, which emerges based on various puzzle pieces coming together on the micro- and meso levels, such as (gendered) education distributions, partnering behaviors, assortative educational mating, differentials in union stability, etc. Much of the macro level educational gradient in women's fertility is due to education differentials in childlessness (Beaujouan, Brzozowska, and Zeman 2015). The lack of a stable partnership has been cited as one of the chief reasons for foregoing motherhood (Tanturri and Mencarini 2008), the effect of which may be exacerbated among the highly educated due to limiting fertility more strictly when a stable partner is not present (Musick et al 2009). The couple level dynamics we have uncovered are certainly an important additional factor in shaping macro level fertility rates, and deserve more prominence in modeling and forecasting fertility behaviors. However, our findings are on co-residential couples only. This puzzle piece of educational pairing differentials for second and third births may counterbalance, but likely not outweigh, other factors, such as selections into parenthood, stable unions, or into parenthood, in producing macro level fertility gradients. We find that highly educated homogamous couples postpone the first birth the most, yet again, we cannot say whether this may imply a quantum effect, thus, higher rates of forgoing parenthood altogether, compared to other couples. If yes, it may imply higher rates of childlessness among partnered women in such unions and offer an additional pathway into childlessness among the highly educated, and future research is needed to explore this connection.

Additionally, we would like to note that our findings may imply that low educated individuals and couples, which were not in the focus of our analyses, may emerge as a particularly disadvantaged group in family formation processes. If highly educated individuals are more attractive in the mating market, and highly educated couples display higher fertility, possibly due to being better positioned to combine gainful employment and childrearing, then couples with low combined educational attainment may today be the ones with the greatest social and economic barriers to realizing their fertility desires. The focus in the couple-centered literature has to date rather been on the more highly educated segment; we suggest that it would be worthwhile to have a closer look at how couples with low combined levels of educational attainment fare.

As mentioned, our study has its limitations. We are not able to tell timing from quantum effects. This means that we are able to assess significant differences in parity progressions between the educational pairings, but we cannot know whether these will translate into higher completed fertility or are due to higher tempo, or both. Possible timing effects of first births may hinge upon a systematically different timing of union formation across the educational pairings, as we are unable to control for relationship duration with the EU-SILC data. Possible timing effects of second and higher parity births may be based upon the effect of the differential first birth timing which then perhaps gets carried on by specific educational pairings into those parity progressions. In other words, homogamous highly educated couples who postpone the first birth may eventually progress to second and/or third births faster, as they have fewer fertile years left to have additional children. This would, in turn, imply that such time squeeze effect occurs in a more differentiated way than previously known, as it may apply specifically to homogamous highly educated couples who appear to postpone the first birth most. Furthermore, the high second or higher order birth rates among highly educated homogamous couples might be a result of the selection of family-oriented highly educated partners into the group of parents or stable unions. Previous research has suggested that such a selection of family oriented women into parenthood indeed inflates second birth transition rates among highly educated women (Kravdal 2001; Kreyenfeld 2002; Gottard et al. 2015). In this vein, our findings could hinge on differential fertility preferences of her and him by education or by educational pairing of the couple. Finally, the regional context and region-specific hypotheses we offered remain purely descriptive and interpretational. More research and more complex modeling will need to address which of the structural macro-level factors we mentioned actually significantly relate to the regional differences in educational-pairing specific progression rates.

The picture of educational pairings and parity-specific fertility provided in this study yields new insights that should stimulate future studies with more detailed data with more completed cohort fertility information. Ideally, such data should also contain in-depth measures on couple-dynamics, including partnership histories together with characteristics of previous partners and measurements on relationship conflict and satisfaction, as well as fertility preferences of both partners. Such data would allow us to verify whether our findings are based on timing, quantum, or selection effects, and what the mechanisms behind those patterns are. Mechanisms behind our findings could be rooted in differential fertility preferences or differential experiences with childrearing between the educational pairings. For instance, little is known to date on differences in fertility preferences by education, especially with regard to fertility desires early in the life course (and subsequent education), and changes in fertility desires over time and with changing educational attainment. Existing studies suggest no gradient in the desired number of children early in the life course by subsequent educational attainment (Musick et al. 2009, Berrington and Pattaro 2014), but one study finds a positive educational gradient on fertility intentions using cross-sectional data (Testa 2014). Furthermore, fertility desires and intentions can change during the life course. Specifically, the parenting experience of the first (and second) child could affect upward- or downward adjustments in the future desired number of children; for instance, a recent study suggests that parental well-being surrounding the first birth is a determinant of further parity progression (Margolis and Myrskylä 2015). Hence, if couples with two highly educated partners have a more positive parenting experience with the first (and second) child, perhaps due to better access to resources relevant for childrearing, they may in turn develop a stronger desire for having more future children than couples with less positive experiences. While our findings are novel and in support of certain hypotheses but not others, we ultimately cannot test or speak to the underlying mechanisms. These will need to be examined by future research. Unfortunately, the data needed to address all of our limitations are currently not available for a broad set of (European) countries. This hinders cross-country comparisons and thus precludes the understanding of how structural social context may affect the relationship between partners' socio-economic resources and childbearing.

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Online Resources:

Online Resource 1: http://introengelsk.cappelendamm.no/c35047/artikkel/vis.html?tid=35515

Online Resource 2:

https://www.forsakringskassan.se/privatpers/foralder/nar_barnet_ar_fott/barnbidrag/!ut/p/z0/fYzLDoIwEAC_puctqNwJKD4OxpAo9tIUKaRKtmW7IX6-6Ad4m0kmAwoaUGhmNxh2Hs24-F1ler0vi6Qq5Om8qUuZZ4dLcq236S5dQW0RjqD-R8vFPadJ5aAeHtm-GZofIEerycbgMbrZChnIzYaDpShk78mMnSUh0ZBuDaFlvVDvmYX8eus6MgOEV3X7AGdh2ls!/

Online Resource 3: http://www.kela.fi/web/en/child-benefit-amount-and-payment

TABLES AND FIGURES

Table 3A: Log Odds of Progression to First Birth by Her and His Education

	First Births					
	Her Educ Only		***Her and His Educ***		***Her*His Educ***	
	Estimate	*SE*	*Estimate*	*SE*	*Estimate*	*SE*
Her Education						
high	ref		ref			
medium	-0.336***	0.071	-0.298***	0.078	-0.038	0.114
low	-0.636***	0.124	-0.628***	0.135	-0.240	0.325
His Education						
high			ref			
medium			-0.103	0.078	0.021	0.088
low			0.002	0.119	0.143	0.179
Age Interactions						
her medium*her age	-0.096***	0.014	-0.075***	0.015	-0.076***	0.015
her medium*her age2	0.006***	0.003	0.004***	0.003	0.004	0.003
her low*her age	-0.136***	0.019	-0.102***	0.021	-0.104***	0.021
her low*her age2	0.012***	0.003	0.011***	0.004	0.012***	0.004
his medium*her age			-0.051***	0.015	-0.058***	0.015
his medium*her age2			0.008***	0.003	0.010	0.003
his low*her age			-0.076***	0.021	-0.080***	0.021
his low*her age2			0.001	0.004	0.001***	0.004
Education Interactions						
she high he high					ref	
she high he medium					(see he medium)	
she high he low					(see he low)	
she medium he high					(see she medium)	
she medium he medium					-0.373***	0.129
she medium he low					-0.461**	0.217
she low he high					(see she low)	
she low he medium					-0.726**	0.351
she low he low					-0.358	0.374
Age						
Her age	0.020*	0.011	0.048***	0.014	0.054***	0.014
Her age2	-0.019***	0.002	-0.023***	0.003	-0.024***	0.003
Tests						

AIC	17202.43	17189.97		17181.92	
BIC	17569.82	17606.35		17630.96	
LRTEST(against her educ)		24.45	0.0004	40.51	0
LRTEST(against her + his educ)				16.05	0.0029

Table 3B: Log Odds of Progression to Second and Third+ Births by Her and His Education

	Second BIrths						**Third and Higher Parity Births**					
	Her Educ Only		***Her and His Educ***		***Her*His Educ***		***Her Educ Only***		***Her and His Educ***		***Her*His Educ***	
Her Educ	*Estimate*	*SE*	*Estimate*	*SE*	*Estimate*	*SE*	*Estimate*	*SE*	*Estimate*	*SE*	*Estimate*	*SE*
high	**ref**		ref				ref		ref			
medium	-0.433***	0.054	-0.347***	0.057	-0.410***	0.099	-0.253***	0.064	-0.161**	0.069	-0.288***	0.112
low	-0.626***	0.086	-0.452***	0.092	-0.930***	0.307	0.010	0.085	0.053	0.094	-0.234	0.258
His Educ												
high			ref						ref			
medium			-0.190***	0.058	-0.259***	0.074			-0.320***	0.068	-0.442	0.097
low			-0.435***	0.086	-0.376**	0.164			-0.063	0.091	-0.135***	0.196
Interactions												
she high he high					ref						ref	
she high he medium					(see he medium)						(see he medium)	
she high he low					(see he low)						(see he low)	
she medium he high					(see she medium)						(see she medium)	
she medium he medium					0.136	0.120					0.191	0.146
she medium he low					-0.088	0.204					0.300	0.235
she low he high					(see she low)						(see she low)	
she low he medium					0.523	0.328					0.556**	0.284
she low he low					0.445	0.355					0.210	0.330
Tests												
AIC	18518.79		18495.32		18498.18		12684.36		12661.09		12657.28	
BIC	18861.62		18854.47		18889.98		13050.45		13044.62		13075.67	

LRTEST(against her educ)	27.47	0	32.62	0	27.27	0	39.08	0
LRTEST(against her + his educ)			5.15	0.2724			11.82	0.0188

Models control for: Her enrolment, his enrolment, age difference of partners, country indicators, calendar year indicators, marital status. Second and third birth models only: age at first birth, age of youngest child, age of youngest child squared.
***p<=.01 ** p<=.05 *p<=.1

TABLE 1: Sample description: couple years at risk and number of events by parity

	1st births		**2nd births**		**3rd births**	
	exposure	events	exposure	events	exposure	events
Nordic	5,447	626	3,665	805	9,472	396
Western	8,173	1,010	5,859	1,286	13,238	605
Southern	3,813	677	4,778	595	6,792	172
Eastern	5,604	622	8,268	799	14,303	332
Total	23,037	2,935	22,570	3,485	43,805	1,505

Table 2: Descriptive Sample Statistics by Country Group

Country group	% enrolled	% both high	% both medium	% she high, he lower	% he high, she lower	% both low	% she medium, he low	% she low, he medium	% cohabiting	mean age	mean relative age	mean age at first birth	mean age of the first child
1st Birth													
Nordic	21.24	25.13	32.47	18.38	9.58	3.03	6.37	5.04	71.61	28.39	2.67		
Western	5.62	31.46	26.03	19.31	10.29	3.91	5.35	3.66	56.79	29.64	3.24		
Southern	2.85	12.43	30.33	13.47	5.68	15.97	14.32	7.8	20.9	31.88	3.65		
Eastern	7.44	18.97	43.75	17.3	8.29	3.89	4.18	3.63	43.57	28.93	3.29		
Total	9.23	23.69	32.53	17.6	8.85	5.78	6.86	4.69	50.88	29.57	3.19		
2nd Birth													
Nordic	8.7	30	26.15	23.49	8.48	2.82	4.94	4.12	53.03	30.46	2.54	28.67	2.40
Western	1.37	28.19	26.72	17.97	10.12	5.68	6.76	4.56	35.66	31.05	3.06	29.06	2.49
Southern	0.71	10.92	29.07	12.02	5.88	19.52	15.37	7.2	11.15	32.06	3.53	29.54	2.76
Eastern	2.24	17.3	45.17	18.09	6.11	4.14	5.4	3.78	22.41	28.82	2.94	26.60	2.84
Total	2.79	21.15	33.53	17.73	7.57	7.51	7.75	4.76	28.97	30.38	3.02	28.23	2.65

3rd Birth													
Nordic	4.64	28.24	26.65	21.48	9.68	2.78	6	5.17	32.23	33.68	2.57	26.34	2.80
Western	0.57	26.03	26.76	14.05	10.64	8.94	6.85	6.73	19.81	33.80	2.86	26.70	2.79
Southern	0.24	9.74	25.4	9.66	5.64	26.21	14.65	8.7	5.82	34.32	3.93	26.52	2.89
Eastern	0.51	14.64	47.55	12.82	5.94	6.62	5.96	6.47	15.63	32.41	2.97	23.79	2.90
Total	1.39	20.33	33.24	14.6	8.14	9.5	7.57	6.61	19.01	33.41	3.00	25.65	2.84

TABLE 4. First Birth Transitions, All Countries Pooled and by Country Group

First Birth Hazards	**Pooled**		**Northern**		**West & Austria**		**Southern**		**Eastern**	
	Estimate	*SE*	*Estimate*	*SE*	*Estimate*	*SE*	*Estimate*	*SE*	*Estimate*	*SE*
Both high	0.550***	0.093	0.950***	0.215	0.268*	0.137	0.232	0.226	0.902***	0.280
She high he lower	0.380***	0.100	0.710***	0.226	0.165	0.154	-0.013	0.227	0.842***	0.289
He high she lower	0.235*	0.132	0.606**	0.295	0.008	0.196	0.360	0.312	0.193	0.389
Both medium					*Ref. [also in the interactions with age]*					
Both low	-0.295*	0.163	-1.140*	0.692	-0.154	0.315	-0.391*	0.231	-0.305	0.691
She medium he low	-0.035	0.149	-0.014	0.409	0.035	0.270	-0.121	0.226	-1.425	0.926
She low he medium	-0.564***	0.191	-0.545	0.453	-0.608*	0.347	-0.545*	0.314	-0.784	0.717
Both high * age	0.125***	0.019	0.128***	0.047	0.165***	0.028	0.027	0.061	0.022	0.063
She high he lower * age	0.046**	0.018	0.068	0.046	0.050*	0.026	0.034	0.052	0.075	0.052
He high she lower * age	0.007	0.023	0.050	0.056	-0.031	0.039	0.023	0.070	0.047	0.074
Both low * age	-0.012	0.024	-0.130	0.190	-0.099*	0.057	-0.040	0.036	-0.156	0.156
She medium he low * age	-0.022	0.027	-0.050	0.111	-0.042	0.047	-0.074*	0.041	-0.474	0.349
She low he medium * age	-0.017	0.028	0.054	0.079	-0.028	0.048	-0.087*	0.050	0.018	0.099
Both high * age2	-0.018***	0.004	-0.019**	0.009	-0.018***	0.005	0.000	0.012	-0.035***	0.013
She high he lower * age2	-0.001	0.003	-0.002	0.008	0.001	0.005	0.001	0.010	-0.001	0.010
He high she lower * age2	-0.005	0.004	-0.011	0.010	-0.008	0.007	-0.004	0.013	0.005	0.011
Both low * age2	0.007*	0.004	-0.001	0.018	-0.006	0.008	0.017***	0.006	-0.006	0.015
She medium he low * age2	-0.006	0.004	-0.013	0.015	-0.011	0.008	0.008	0.007	-0.048	0.037
She low he medium * age2	0.008*	0.004	0.011	0.010	0.007	0.007	0.012	0.009	0.016	0.013
Age	-0.099***	0.012	-0.110***	0.035	-0.090***	0.018	-0.053**	0.024	-0.173***	0.033
Age2	-0.011***	0.002	-0.019***	0.005	-0.009***	0.003	-0.015***	0.005	-0.012**	0.005
Enrolled	-0.725***	0.114	-0.481***	0.162	-1.239***	0.268	-0.666*	0.370	-0.851**	0.342
Partner enrolled	-0.869***	0.173	-0.731***	0.224	-0.781**	0.351	-1.169	0.885	-1.605**	0.671
Relative age	-0.033***	0.006	-0.021	0.014	-0.035***	0.009	-0.042***	0.013	-0.033*	0.018

Cohabiting	-0.939***	0.064	-0.657***	0.127	-0.818***	0.091	-1.103***	0.176	-1.595***	0.205
Constant	-1.414***	0.107	-1.584***	0.238	-1.770***	0.178	-1.301***	0.197	-2.605***	0.301
N (no of couple years)	*25,960*		*6,072*		*9,181*		*4,489*		*6,218*	

Models control for year and country dummies

TABLE 5. Second Birth Transitions, All Countries Pooled and by Country Group

Second Birth Hazards	**Pooled**		**Northern**		**West & Austria**		**Southern**		**Eastern**	
	Estimate	*SE*	*Estimate*	*SE*	*Estimate*	*SE*	*Estimate*	*SE*	*Estimate*	*SE*
Both high	0.543***	0.069	0.303*	0.171	0.504***	0.101	0.656***	0.187	0.860***	0.177
She high he lower	0.265***	0.070	0.325*	0.173	0.137	0.110	0.414**	0.174	0.329**	0.168
He high she lower	0.083	0.092	-0.157	0.246	0.033	0.129	0.224	0.226	0.224	0.249
Both medium					*Ref. [also in the interactions with age]*					
Both low	-0.320***	0.105	-1.344***	0.468	-0.218	0.173	-0.193	0.160	0.036	0.332
She medium he low	-0.324***	0.099	-0.654**	0.316	-0.421***	0.162	-0.249	0.172	0.088	0.264
She low he medium	-0.121	0.115	-0.006	0.309	-0.312*	0.188	-0.148	0.223	0.225	0.299
Age of youngest child	2.327***	0.114	3.190***	0.329	2.688***	0.178	1.616***	0.227	2.103***	0.270
Age of youngest child squared	-0.330***	0.017	-0.452***	0.048	-0.409***	0.028	-0.212***	0.034	-0.277***	0.039
Age at First Birth	-0.064***	0.006	-0.109***	0.019	-0.051***	0.009	-0.037***	0.014	-0.084***	0.017
Enrolled	-0.348**	0.144	-0.543**	0.227	-0.544*	0.328	-0.337	0.673	-0.017	0.382
Relative Age	-0.017***	0.006	-0.039**	0.016	-0.026***	0.008	0.002	0.012	-0.002	0.014
Cohabiting	-0.395***	0.058	-0.464***	0.129	-0.299***	0.079	-0.468**	0.195	-0.781***	0.174
Constant	-3.712***	0.274	-2.375***	0.633	-3.593***	0.384	-3.907***	0.615	-4.514***	0.670
N (no of couple years)	*26,045*		*4,469*		*7,143*		*5,373*		*9,060*	

Test Results:
Pooled: both high-she high he lower=0 chi2=15.06 (p=.0001), both high-he high she lower=0 chi2=23 (p=.0000), she high he lower-he high she lower=0 chi=3.42 (p=.0643)
Nordic: both high-she high he lower=0 chi2 =.02 (p=.8910), both high-he high she lower=0 chi2=3.48 (p=.0622), she high he lower-he high she lower=0 chi=3.68 (p=.0552)
Western: both high-she high he lower=0 chi2=12 (p=.0005), both high-he high she lower=0 chi2=13.47 (p=.0002), she high he lower-he high she lower=0 chi=.58 (p=.4475)
Southern: both high-she high he lower=0 chi2=1.42 (p=.2333), both high-he high she lower=0 chi2=2.94 (p=.0866), she high he lower-he high she lower=0 chi=.59 (p=.4427)
Eastern: both high-she high he lower=0 chi2=7.75 (p=.0054), both high-he high she lower=0 chi2=5.46 (p=.0195), she high he lower-he high she lower=0 chi=.15 (p=.6969)

Models control for year and country dummies

TABLE 6. Third and Higher Parity Birth Transitions, All Countries Pooled and by Country Group

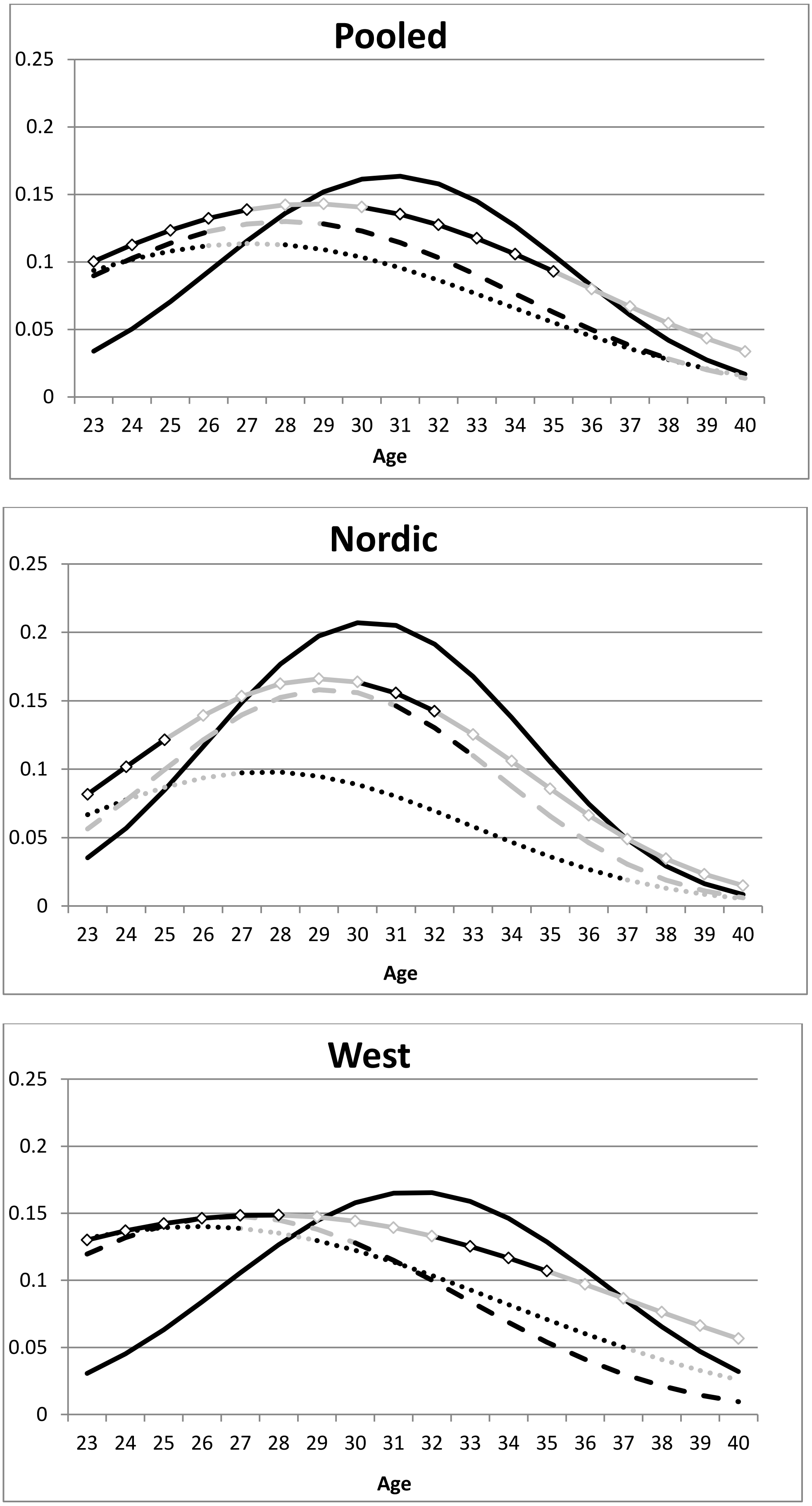
Third Births Hazards	**Pooled**		**Northern**		**West & Austria**		**Southern**		**Eastern**	
	Estimate	*SE*	*Estimate*	*SE*	*Estimate*	*SE*	*Estimate*	*SE*	*Estimate*	*SE*
Both high	0.539***	0.081	0.288*	0.150	0.581***	0.134	0.697**	0.301	0.631***	0.177
She high he lower	0.136	0.093	0.033	0.161	0.049	0.166	0.293	0.321	0.106	0.206
He high she lower	0.254**	0.106	0.284	0.190	0.140	0.174	0.133	0.399	0.392	0.245
Both medium					*Reference*					
Both low	0.378***	0.106	-0.920*	0.471	0.279	0.179	0.292	0.246	0.993***	0.220
She medium he low	0.430***	0.104	0.480**	0.202	0.229	0.188	0.106	0.284	0.685***	0.222
She low he medium	0.426***	0.107	-0.064	0.255	0.357*	0.187	0.238	0.321	1.080***	0.192
Age of youngest child	1.378***	0.108	1.360***	0.211	1.587***	0.185	1.041***	0.334	1.134***	0.236
Age of youngest child squared	-0.211***	0.018	-0.210***	0.034	-0.246***	0.030	-0.145***	0.052	-0.169***	0.037
Relative Age	0.006	0.006	0.017	0.013	-0.015	0.011	0.001	0.019	0.020	0.012
Enrolled	0.062	0.204	-0.088	0.251	-0.061	0.525	1.723	0.847	0.612	0.604
Age at first birth	-0.046***	0.007	-0.038***	0.014	-0.080***	0.013	-0.044**	0.022	0.004	0.017
Cohabiting	-0.077	0.070	-0.051	0.117	-0.219	0.119	-0.540	0.439	-0.028	0.157
Constant	-4.577***	0.288	-3.965***	0.501	-3.042***	0.443	-4.545***	0.913	-5.803***	0.649
N (no of couple years)	*45,296*		*9,865*		*12,202*		*6,964*		*14,626*	

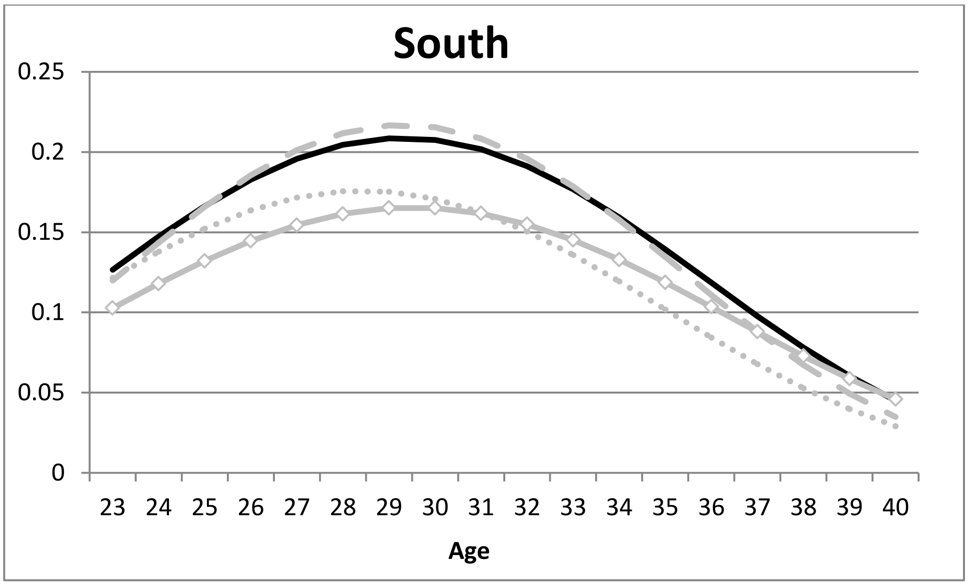
Test Results:

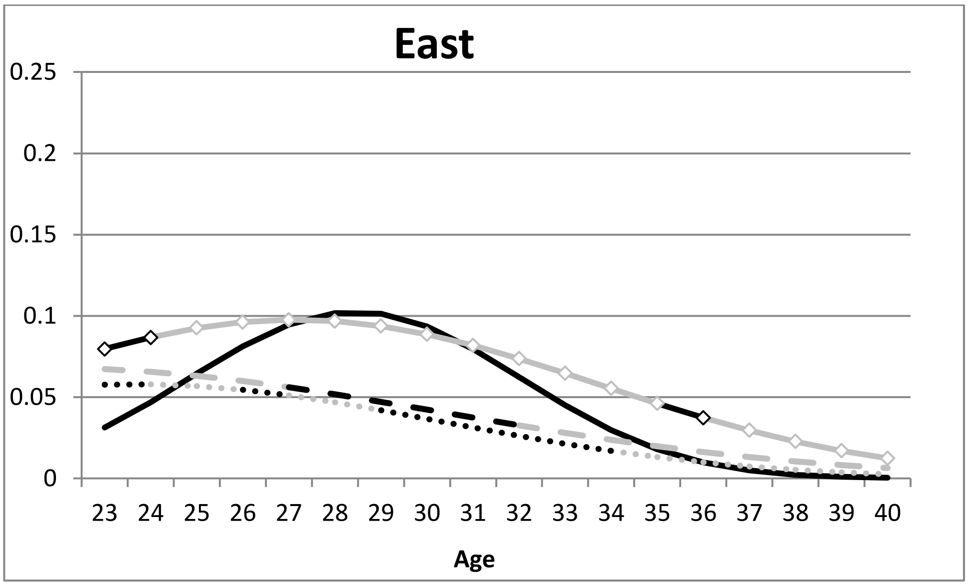
Pooled: both high-she high he lower=0 chi2=19.37 (p=.0000), both high-he high she lower=0 chi2=7.19 (p=.0073), she high he lower-he high she lower=0 chi=1.01 (p=.3147)
Nordic: both high-she high he lower=0 chi2=2.77 (p=.0959), both high-he high she lower=0 chi2=0.00 (p=.9823), she high he lower-he high she lower=0 chi=1.60 (p=.2056)
Western: both high-she high he lower=0 chi2=11.72 (p=.0006), both high-he high she lower=0 chi2=6.92 (p=.0085), she high he lower-he high she lower=0 chi=0.22 (p=.6399)
Southern: both high-she high he lower=0 chi2=1.31 (p=.2515), both high-he high she lower=0 chi2=1,72 (p=.1894), she high he lower-he high she lower=0 chi=0.13 (p=.7181)
Eastern: both high-she high he lower=0 chi2=5.71 (p=.0169), both high-he high she lower=0 chi2=0.82 (p=.3643), she high he lower-he high she lower=0 chi=1.01 (p=.3149)

Models control for year and country dummies

Figure1: Predicted first birth rates







Legend:

homogamous highly educated

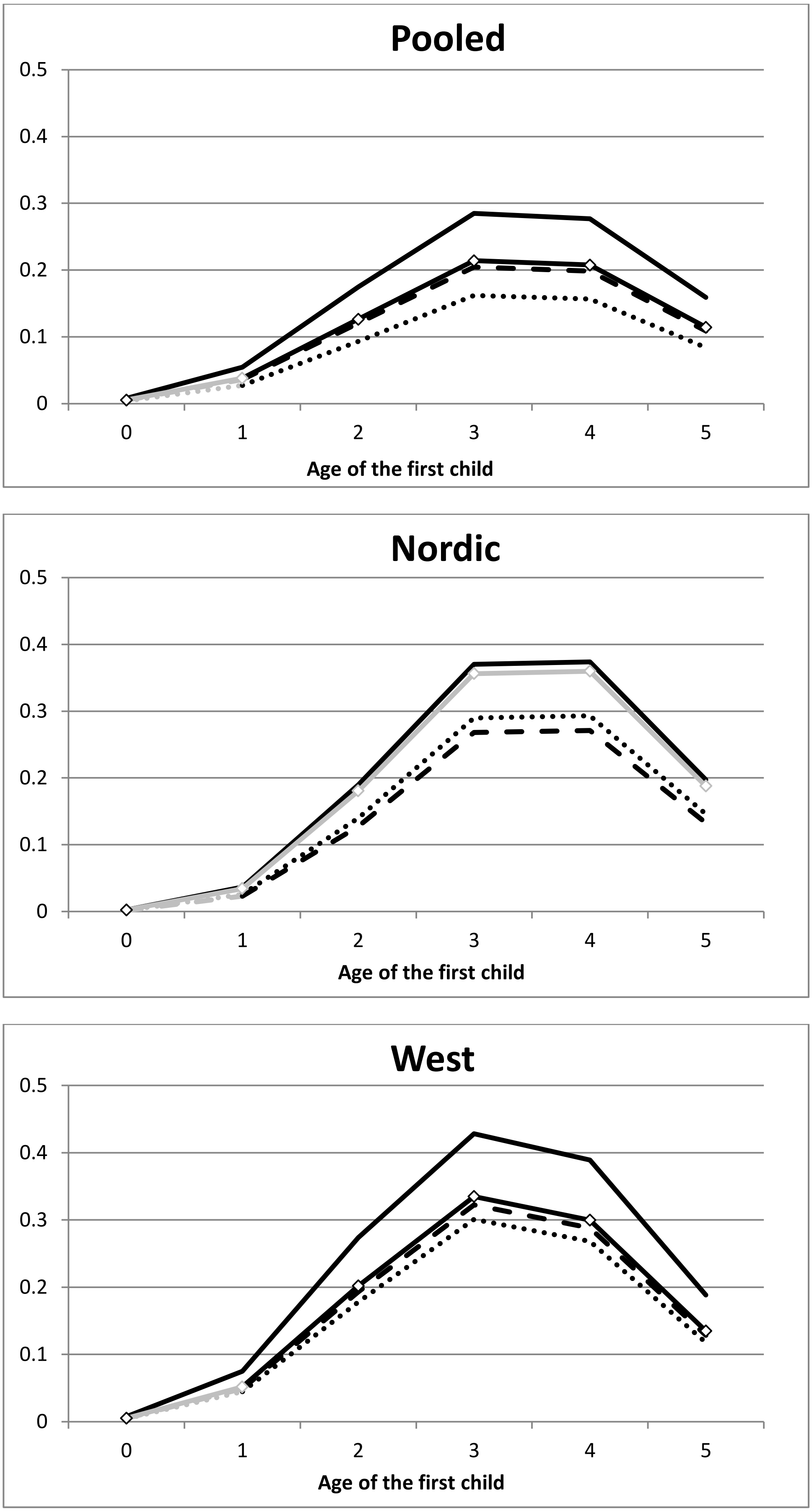
homogamous medium educated

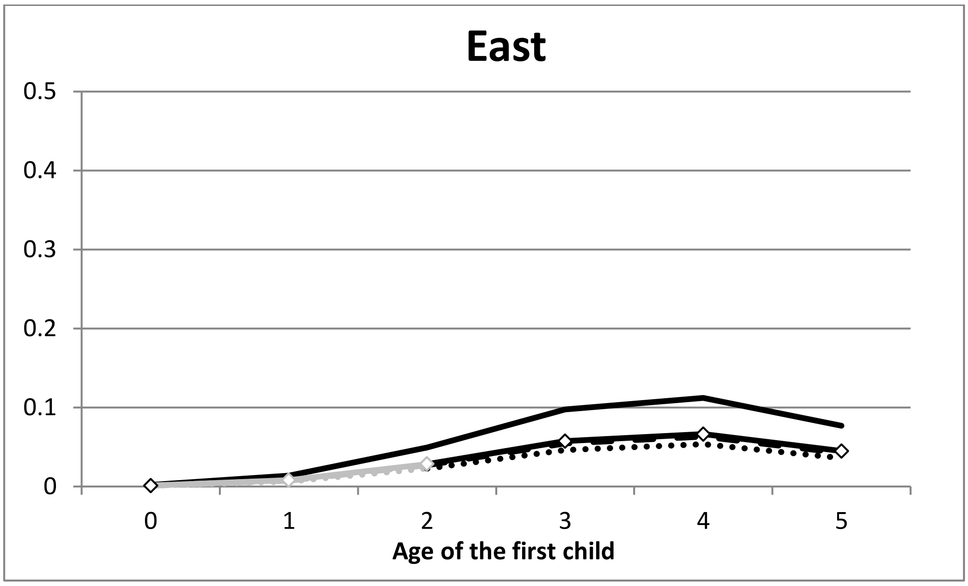
hypergamous with highly educated man

hypogamous with highly educated woman

Note: Homogamous highly educated couple is the reference category and always colored in black. Remaining lines are in black if the difference between birth rate of the represented pairing and highly educated homogamous couples is significant at p<0.1; they are colored in grey if it is not significant.

Figure 2: Second Birth Predictions





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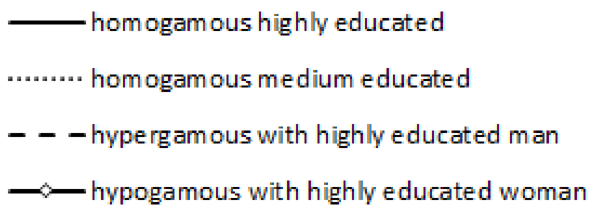
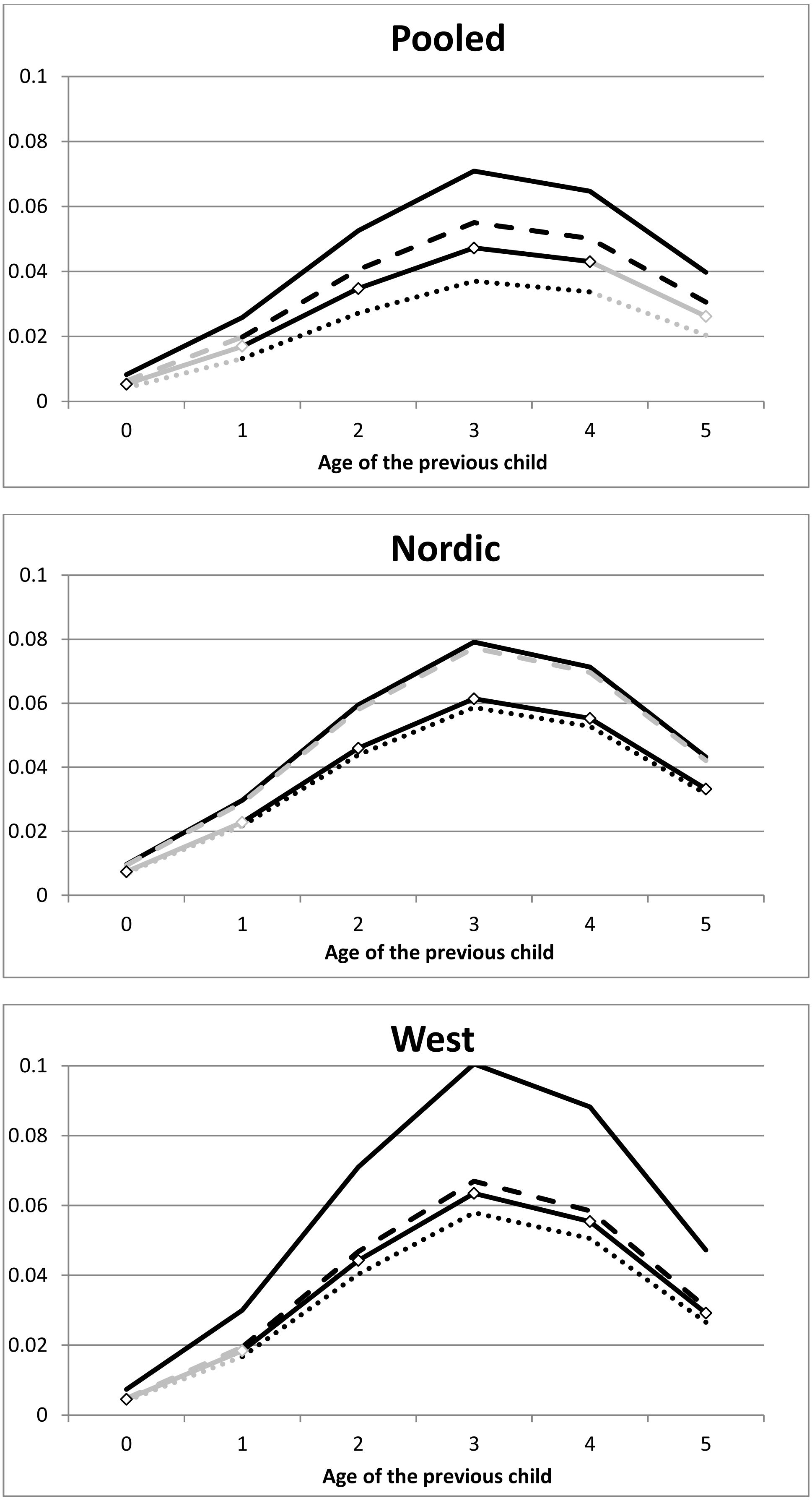
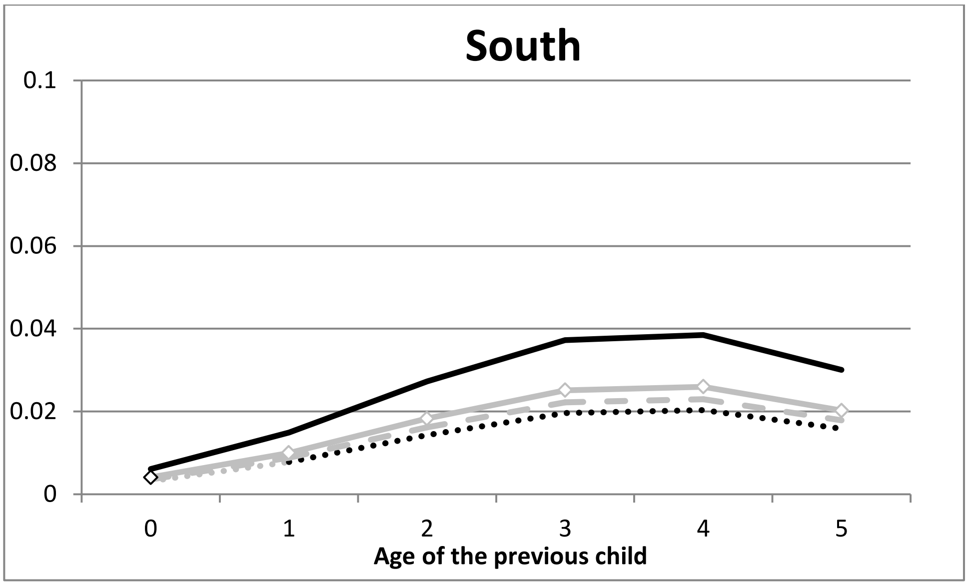
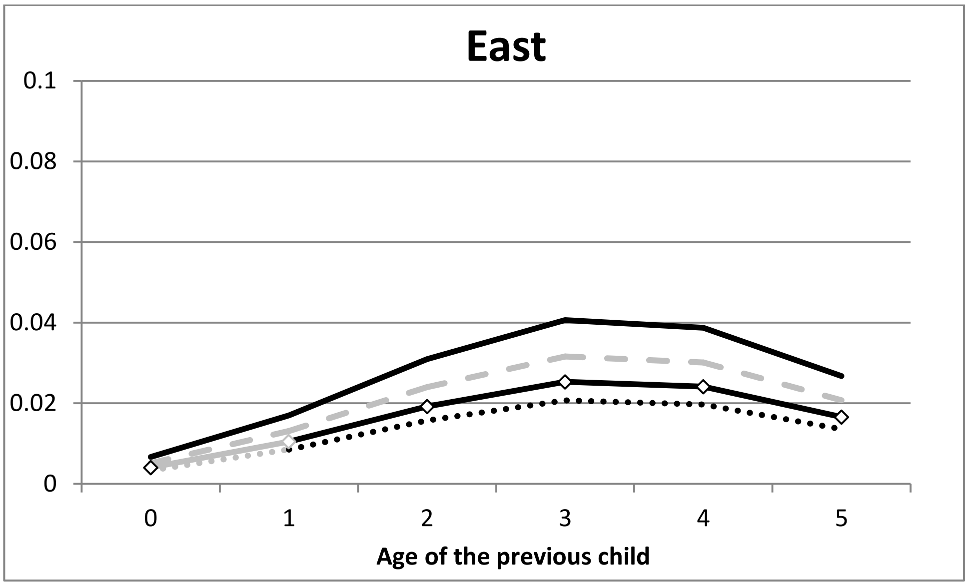


Note: Homogamous highly educated couple is the reference category and always colored in black. Remaining lines are in black if the difference between birth rate of the represented pairing and highly educated homogamous couples is significant at $p<0.1$; they are colored in grey if it is not significant.

Figure 3: Third Birth Predicted Values







Legend:

homogamous highly educated

homogamous medium educated

hypergamous with highly educated man

hypogamous with highly educated woman

Note: Homogamous highly educated couple is the reference category and always colored in black. Remaining lines are in black if the difference between birth rate of the represented pairing and highly educated homogamous couples is significant at p<0.1; they are colored in grey if it is not significant.