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The gendered impacts of delayed parenthood: A dynamic analysis of young adulthood

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ABSTRACT

Young adulthood is a dynamic and demographically dense stage in the life course. This poses a challenge for research on the socioeconomic consequences of parenthood timing, which most often focuses on women. We chart the dynamics of delayed parenthood and its implications for educational and labor market trajectories for young adult women and men using a novel longitudinal analysis approach, the parametric g-formula. This method allows the estimation of both population-averaged effects (among all women and men) and average treatment effects (among mothers and fathers). Based on high-quality data from Finnish registers, we find that later parenthood exacerbates the educational advantage of women in comparison to men and attenuates the income advantage of men in comparison to women across young adult ages. Gender differences in the consequences of delayed parenthood on labor market trajectories are largely not explained by changes in educational trajectories. Moreover, at the time of entering parenthood, delayed parenthood improves the incomes of fathers more than those of mothers, thereby exacerbating existing gender differences. The results provide population-level evidence on how the delay of parenthood has contributed to the strengthening of women's educational position relative to that of men. Further, the findings on greater increases in fathers' than mothers' incomes at the time of entering parenthood, as followed by postponement, may help explain why progress in achieving gender equality in the division of paid and unpaid work in families has been slow.

1. Introduction

Over the last half century, one of the most profound changes in family formation throughout the Western world has been the postponement of parenthood (Kohler, Billari, & Ortega, 2002; Sobotka, 2004). Since the 1970s, the average age at first birth for women in OECD countries has increased by one year every decade (Mills, Rindfuss, McDonald, te Velde, & Eshre Reproduction Society Task Force, 2011). This long-term change is embedded in the broader context of a radical shift in the transition to adulthood (Buchmann & Kriesi, 2011; Corijn & Klijzing, 2001; Furstenberg Jr, 2010). This shift is characterized by delays in leaving the parental home, leaving education, and forming marriages; as well the postponement of parenthood. In addition, the sequence of these events has become less predictable (Fussell and Furstenberg Jr, 2005; Shanahan, 2000). For instance, an increasing share of women in the US continue their education after entering motherhood (Augustine, 2016). These longstanding trends in the transition to adulthood have a substantial gender dimension. Since the 1970s, the young adulthood of women has increasingly resembled that of men and the historic gender imbalance has even switched directions in certain respects. In most high-income countries, women are attaining higher degrees than men (Buchmann, DiPrete, & McDaniel, 2008; Schofer & Meyer, 2005). Women are also increasingly combining parenthood with employment more similar to men than before (Fussell and Furstenberg Jr, 2005; Goldin, 2006).

The timing of parenthood strongly predicts later educational

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attainment (Hofferth, 1984; Sigle-Rushton, 2005) and gender inequalities in the labor market generally are strongly connected to gendered patterns among parents (Barnes, 2015; Maume, 2006; Sanchez & Thomson, 1997). While previous longitudinal studies comparing men and women provide valuable knowledge about how the impact of parenthood timing on educational and labor market outcomes materializes at particular ages or life course stages, research on how the impact of parenthood timing evolves dynamically over the life course remains limited, particularly for men. More evidence on how gender disparities evolve by age has been called for in recent studies – as opposed to estimating effects at a single point in time (Doren & Lin, 2019; Van Winkle & Fasang, 2020). Further, the methodological advancements in the study of the effects of parenthood timing remain strongly focused on women (see Bratti, 2015; Herr, 2016; Picchio, Pigini, Staffolani, & Verashchagina, 2021; Rosenbaum, 2020). Moreover, given the demographically dense character of young adulthood (Buchmann & Kriesi, 2011; Manning, 2020), estimating the role of mediating factors of the impacts of delayed parenthood remains particularly challenging (Amuedo-Dorantes & Kimmel, 2005; Blackburn, Bloom, & Neumark, 1993). Given substantial changes in women's, and to less extent also men's, roles (Bianchi & Milkie, 2010; Goldscheider, Bernhardt, & Lappegård, 2015; Hook, 2006), and debates about how much progress has (not) been made in reducing gender inequalities (Ellingsaeter & Leira, 2006; Esping-Andersen, 2009; Scott, Crompton, & Lyonette, 2010), it is important to provide further evidence on the mechanisms contributing to these (in)equalities over the life course.

The aim of this study is to undertake a dynamic analysis of the gendered impacts of delayed parenthood across the young adult life course. To our knowledge for the first time, we estimate effects of parenthood timing at the population level, and also provide estimates of indirect and direct effects based on time-varying mediation analysis. We set out to answer the following questions. What is the impact of delayed parenthood on educational trajectories in the general population of men and women across young adult ages (Q1)? What is the corresponding impact of delayed parenthood on labor market trajectories (Q2)? To what extent is the impact on labor market trajectories mediated by changes in educational trajectories, and, vice versa (Q3)? How does delayed parenthood change the educational and labor market characteristics of the parents as they enter parenthood (Q4)? To answer these questions, we analyze longitudinal Finnish register data and chart the dynamics of family formation and educational and labor market attainment over young adulthood. The case of Finland is more broadly interesting not least since the age at first birth among women rose similarly to other high-income countries by 3.9 years over four decades, from 24.9 in 1975 – 28.8 in 2015 (THL, 2020), and the increase was remarkably similar among men (OSF, 2017). Finland is also characterized by relatively high employment rates of women, strong institutional support for families with children, and a flexible educational system. We use a novel approach to longitudinal analysis in the field of social sciences based on the parametric g-formula. Building upon recent methodological advancements, our dynamic longitudinal approach allows to model life course processes as they unfold (Bijlsma & Wilson, 2020; Clare, Dobbins, & Mattick, 2018; Keil, Jessie, Richardson, Naimi, & Cole, 2014).

2. Conceptual background

2.1. Gendered transition to parenthood

Previous research shows that the birth of the first child typically leads to gendered responses in families, with the woman's behavior changing more than the man's (Barnes, 2015; Baxter, Hewitt, & Haynes, 2008; Maume, 2006; Sanchez & Thomson, 1997). Parenthood often contributes to substantial decreases in women's earnings and employment (Cools & Strøm, 2016; Gibb, Fergusson, John Horwood, & Boden, 2014; Knoester & Eggebeen, 2006; Loughran & Zissimopoulos, 2009; Lundborg, Plug, & Rasmussen, 2017; Millimet, 2000; Sigle-Rushton & Waldfogel, 2007). The effects of parenthood among men tend to be smaller, and when present, to run in the opposite direction (ibid.). Furthermore, for men as well as women, parenthood at young age in particular can crucially affect other transitions, including finishing their education and entering the labor market (Fussell & Furstenberg Jr, 2005; Shanahan, 2000). These findings have been explained from various theoretical angles, which provide foundations for our hypotheses on the gendered effects of parenthood timing.

While traditional economic models assumed that gendered specialization in the family is necessary for its welfare maximization (Becker, 1993a), alternative economic models view the allocation of time to result from a negotiation, where the power of each partner depends on his/her own economic resources (Bittman, England, Sayer, Folbre, & Matheson, 2003; Brines, 1993; Lundberg, Pollak, & Wales, 1997; Milkie, 2011). Moreover, also normative social roles (Kaufman & Uhlenberg, 2000; Sanchez & Thomson, 1997) and gendered perceptions (Baxter et al., 2008) regarding the right ways to parent may influence the responses to parenthood by women and men, and thus underlie the mechanisms behind the effects of the timing of parenthood on socioeconomic trajectories. Both employment and continued education may be viewed as incompatible with motherhood due to the time investments associated with the role of mother, on the one hand, and the role of employee or student on the other (Lappegård & Rønsen, 2005; Ní Bhrolcháin & Beaujouan, 2012; Presser, 1971; Waite & Moore, 1978), but in the case of education this incompatibility may be stronger, in a normative sense (Blossfeld & Huinink, 1991).

In high-income countries, gender specialization in the family has become less rigid in recent decades, as fathers have become more involved in childcare and housework (Bianchi & Milkie, 2010; Hook, 2006; Goldscheider et al., 2015). However, differences remain in the ways that mothers and fathers engage in different activities within and outside of the family (Cooke & Baxter, 2010; Hook, 2006; Joshi, 1998). Even in countries considered the most gender equal, such as the Nordic countries, men have higher employment rates (OECD, 2019a) and take substantially less parental leave than women (Duvander & Lammi-Taskula, 2011; Salmi & Närvi, 2017). Finland is more traditional than other Nordic countries in the sense that long episodes of low-paid home care of children by mothers remain common (Repo, Sipilä, Rissanen, & Viitasalo, 2010). The continued gender asymmetry leads to the premise that the conflict between education and paid work on one hand, and childcare and other unpaid work on the other, remains stronger among women than men. We note, however, that at least in the context of Finland, characterized by a Nordic flexible educational system (Kilpi, 2008; Orr, Gwość, & Netz, 2011), mothers may combine childcare more easily with continued education than (full-time) paid work.

2.2. Delayed parenthood and educational trajectories

Theoretical frameworks predict that delaying parenthood in young adulthood allows *directly* more time to be invested in higher education, and to avoid the difficulties of combining the student and the parent role (Hofferth & Moore, 1979; Morgan & Rindfuss, 1999; Rindfuss, Bumpass, & St. John, 1980; Rindfuss, St. John, & Bumpass, 1984). The postponement of parenthood may reduce the stress related to the incompatibility of different roles, and allow young adults more time to complete other transitions, including finishing their education (Fussell & Furstenberg Jr, 2005; Shanahan, 2000). To the extent that parenthood remains less compatible with other activities among women than among men, any positive effects of delayed parenthood on educational attainment are likely to remain stronger among women.

Early parenthood may not only make it more difficult for young adults to find the time to pursue an education and establish themselves in the labor market, it could also increase the short-run pressure on them to earn money (Ní Bhrolcháin & Beaujouan, 2012; Thalberg, 2013). Participation in the labor market may thus be one mechanism through which the timing of parenthood *indirectly* affects the educational careers. Delaying parenthood could have an indirect effect on the education, of men at least, by easing the financial pressure on them and providing them with more opportunities to continue their education and postponing their entry into the labor market. In line with this reasoning, research on Finland shows that a short education combined with early labor market entry is common among men who enter parenthood early (Lorentzen, Bäckman, Ilmakunnas, & Kauppinen, 2019).

The literature on early mothers has shown that they typically end up having below-average educational attainment (Geronimus & Korenman, 1992; Hofferth, Reid, & Mott, 2001; Hoffman, Foster, & Furstenberg, 1993; Hotz, McElroy, & Sanders, 2005; McElroy, 1996; Ribar, 1999). However, the existence of a causal effect has been debated, because women who avoid early motherhood differ from those who do not in many respects, such as socioeconomic background, which explains at least partly the observed associations between early motherhood and educational outcomes. The effect of birth timing on the education of men is likely to be weaker given that they on average mature biologically and enter parenthood later than women, and given their less intensive role in childbearing and childrearing as compared to women (Dearden, Hale, & Woolley, 1995; Kiernan & Diamond, 1983; Sigle-Rushton, 2005; Woodward, Fergusson, & Horwood, 2006). More generally, there is a strong negative relationship, particularly among women, between educational enrollment and entry into parenthood (Dribe & Stanfors, 2009; Kravdal, 2007; Lappegård & Rønsen, 2005). Previous Nordic findings suggest that the age at first birth exerts a negative effect on the final level of education of women (Cohen, Kravdal, & Keilman, 2011; Rosenbaum, 2020).

2.3. Delayed parenthood and labor market trajectories

The postponement of parenthood may influence the labor market trajectories of women and men *indirectly* through changes in their educational careers. While spending more time in education can limit an individual's employment and earnings over the short term, it is likely to be beneficial for career outcomes over the long term (Becker, 1993b). Prior research has shown that increases in human capital partly explain the more favorable labor market outcomes of women who postpone parenthood (Amuedo-Dorantes & Kimmel, 2005; Blackburn et al., 1993) and formal education is amongst the strongest predictors of long-term labor market trajectories of mothers (Damaske & Frech, 2016; Hynes & Clarkberg, 2005; Kahn, García-Manglano, & Bianchi, 2014). Education has the potential to mediate the effects of early fatherhood also in men (Dariotis, Pleck, Astone, & Sonenstein, 2011; Sigle-Rushton, 2005; Weinshenker, 2015). Recent research on Finland shows that early parenthood is associated with less successful school-to-work transitions and relatively strong labor market exclusion among young women – but not among young men (Lorentzen et al., 2019). Net of indirect effects of delayed parenthood as mediated by changes in educational careers, postponement of parenthood can *directly* affect labor market trajectories of women and men (Browning, 1992; Gustafsson, 2001).

The direct effect among women can operate by increasing the pre-birth human capital she accumulates in the labor market, which may affect her labor market behavior after entering parenthood by increasing the cost of withdrawing from work or reducing working hours (Happel, Hill, & Low, 1984). The negative effects of motherhood status, regardless of its timing, may include the slower accumulation of work experience or lower productivity, a preference for trading off higher wages for family-friendly jobs, or discrimination by employers (Budig & England, 2001; Gustafsson, 2001). Delayed motherhood, thus, can be beneficial for labor market trajectories over the life course because any negative effects of motherhood have less time to appear. Further, a higher age at first birth shortens the period at risk of having additional children for women. The effect of the later timing of entering motherhood on women's labor market trajectories may thus operate also through a reduced number of further children (Bratti, 2015; Hofferth, 1984).

Previous studies have mainly shown that, net of differences in formal education, delayed motherhood has positive effects on women's labor market outcomes (Amuedo-Dorantes & Kimmel, 2005; Bratti & Cavalli, 2014; Miller, 2011; Picchio et al., 2021; Taniguchi, 1999; Troske & Voicu, 2013), and strongly predicts long-term labor market trajectories (Florian, 2018; Frühwirth-Schnatter, Pamminger, Weber, & Winter-Ebmer, 2016; García-Manglano, 2015; Hynes & Clarkberg, 2005; Kahn et al., 2014; Van Winkle & Fasang, 2020). An exception is a Swedish study, according to which a later timing of motherhood decreases lifetime earnings (Karimi, 2014), but the unexpected findings may result from the focus on college-educated women who had entered the labor market before first childbirth. A US-based study with a similar design reported positive wage effects among high school and college-educated mothers (Herr, 2016). Some studies on after-birth labor market outcomes, however, also suggest that short-term earnings losses may be larger for mothers who have their first child at ages above 30 (for Denmark, Lundborg et al., 2017, for Germany, Fitzenberger, Sommerfeld, & Steffes, 2013; Putz & Engelhardt, 2014). A recent Danish study stressed that the negative implications of entering motherhood at ages below 25 on employment and earnings may be limited to ages below 30 (Rosenbaum, 2020).

The evidence regarding the effects of parenthood timing on labor market careers of men is generally more inconsistent and limited (Astone, Dariotis, Sonenstein, Pleck, & Hynes, 2010; Chandler, Kamo, & Werbel, 1994; Killewald, 2013; Weinshenker, 2015). Since women and men have become more similar in terms of paid and unpaid work, it is plausible that the effects of parenthood timing among men would nowadays resemble those among women (Dommermuth & Kitterød, 2009; Kreyenfeld, 2015). If men's position in the labor market is compromised by the arrival of children, postponing parenthood might be beneficial for the labor market outcomes of men too. However, in a more traditional setting, delayed parenthood could even have negative effects on men's labor market trajectories. This could occur either because the pressure to provide income for a family is reduced over the short term, or because the pressure to increase income at later ages, when higher levels of family income are more typical, is reduced (Astone et al., 2010; Weinshenker, 2015). Recent studies however suggest that selection into fatherhood may largely explain the differences (in wages) between fathers and childless men, thereby not necessarily pointing towards strong effects of parenthood timing among men (Mari, 2019; Van Winkle & Fasang, 2020).

2.4. Methodological challenges

The estimation of the effects of parenthood timing on educational and labor market trajectories is challenging because the timing of parenthood does not occur at random – rather, reverse causality and unobserved confounding challenge this estimation. An additional challenge is the quantification of direct and indirect effects in a highly time-varying setting of young adulthood (Elwert & Winship, 2014). Given the interest of this study on the dynamic tracking of consequences of parenthood timing, reverse causality in this study context refers to the effects of educational and labor market careers on the timing of a first birth. While a large body of literature points to such effects among women (Dribe & Stanfors, 2009; Kravdal, 1994; Lappegård & Rønsen, 2005; Miettinen & Jalovaara, 2020), the selection into parenthood by socioeconomic characteristics could be even more crucial to take into account in the analyses on men (Mari, 2019; Van Winkle & Fasang, 2020). Moreover, both time-constant and time-varying unobserved confounding are plausible in this study context (Kravdal, 2007; Picchio et al., 2021), the latter referring to individual characteristics that may change over time and confound a relationship at a particular age in the life course (for instance, employment before childbirth may affect both the risk of childbirth as well as employment after childbirth).

Various methodological approaches have been used to tackle the aforementioned challenges. Quasi-experimental designs based on biological fertility shocks, such as miscarriages (Bratti & Cavalli, 2014; Hotz et al., 2005; Karimi, 2014; Miller, 2011; Rosenbaum, 2020), or panel-data based approaches such as fixed effects (Amuedo-Dorantes & Kimmel, 2005; Putz & Engelhardt, 2014; Taniguchi, 1999, for men, see Astone et al., 2010; Weinshenker, 2015), have been common strategies to estimate the effects of the timing of the first childbirth on labor market outcomes. There is also a long line of studies applying sibling fixed effects to study the effects of very early motherhood particularly on education (Geronimus & Korenman, 1992; Hofferth et al., 2001; Hoffman et al., 1993; Ribar, 1999). While these previous contributions are valuable, they also have limitations.[1] For instance, estimates based on subgroups of mothers (e.g. those who experienced a miscarriage or those with siblings) may not be directly generalizable to all women (for discussion, see Bratti, 2015; Holmlund, 2005; Rosenbaum, 2020). Moreover, the previous research on the effects of parenthood timing has placed less attention on time-varying confounding, as opposed to time-constant confounding (see, however, Fitzenberger et al., 2013; Picchio et al., 2021; Troske & Voicu, 2013).

3. Aims and context of the study

3.1. Aims

This study explores how delayed parenthood contributes to changes in the educational and labor market trajectories of women and men in young adulthood. Using high-quality longitudinal data drawn from Finnish registers and dynamic longitudinal models, we analyze how a delay of three years would influence educational attainment and enrollment on the one hand, and employment and income on the other across young adulthood years. We consider a delay of three years in the timing of first parenthood (i.e. a scenario in which the timing of all births occur three years later than we observe in the empirical data) as meaningful at both an individual-level and from a population-level perspective. In young adulthood, three years is a time window during which life course events, such as changes in partnership status (see Billari, Hiekel, & Liefbroer, 2019; Perelli-Harris et al., 2012) or educational attainment (see Cohen et al., 2011; Orr et al., 2011), can be expected to occur. At the population level, a three-year delay would approximate a three-decade change in the age at first birth in an average OECD country in the recent decades (Mills et al., 2011).

In addition to assessing the total effects on educational and labor market trajectories, we investigate to what extent any changes in labor market trajectories result *indirectly* from changes in educational trajectories (as opposed to *directly*, that is net of changes in educational trajectories); and vice versa, to what extend changes in educational trajectories result *indirectly* from changes in labor market trajectories. Throughout the study, we assess how these effects differ by gender by conducting gender-stratified analyses. Among parents, we additionally study the effects of delayed parenthood on their educational and labor market outcomes as they enter parenthood.

Based on our conceptual framework, we hypothesize that delaying parenthood is associated with greater improvements in the educational trajectories of women than men (Q1). We also hypothesize stronger labor market impacts in women, while assuming labor market impacts to be weak to non-existent in men (Q2). We further hypothesize that the indirect effects of delayed parenthood on labor market trajectories as mediated by changes in education will be more similar among women and men than the direct effects (not mediated by changes in education) (Q3). In addition, the indirect effects of delayed parenthood on educational trajectories as mediated by labor market trajectories may be greater for men, and the respective direct effects greater for women. We further hypothesize that as they enter parenthood, the delay will improve the outcomes of first-time parents regardless of gender, with potentially larger effects for mothers (Q4).

To contribute to the existing literature on the socioeconomic effects of parenthood timing, this study builds on recent methodological advancements and employs dynamic longitudinal models, i.e., the parametric g-formula. This novel methodological approach in the field of social sciences allows us to account for reverse causality, and to the extent that register data permits, for time-constant and time-variant confounding, as well as time-varying mediation, when assessing the total, direct, and indirect affects in the general population of young women and men. To our knowledge, this study is among the first applications of this method to the effects of parenthood.

3.2. Finnish context

Finland can be considered a Nordic welfare state that promotes gender and social equality (Ellingsaeter & Leira, 2006; Esping-Andersen, 2009). Accordingly, the Finnish educational system is characterized by a high degree of social inclusiveness and flexibility (Blossing, Imsen, & Moos, 2014; Kilpi, 2008), and education is free of charge (Orr et al., 2011). Typical age at finishing compulsory education is 16 (OECD, 2018). At higher levels, the system allows re-entry and generally wide possibilities to continue from the secondary to higher level, and interruptions in educational careers are usual (Orr et al., 2011). Students are eligible to public non-repayable support and repayable loans, but still part-time work among students is common (Hämäläinen, 2004). Graduation ages are high in international comparison: the typical age at finishing the first tertiary-level degree (3–4 years) is 23–26 (Orr et al., 2011). In 2017, 50% of women and 33% of men aged 25–34 were educated to the tertiary level, indicating a comparatively large gender gap (OECD, 2019c).

In Finland, comprehensive benefits are provided to parents for balancing work and family. After childbirth, Finnish parents are eligible to take parental leave at an income replacement level of approximately 70% of previous earnings (Duvander & Lammi-Taskula, 2011; Salmi, 2012). The statutory parental leave ends when the child is approximately nine months old. From this age onwards until school age the public childcare is available for all children. However, families also have the option to continue take care of their child at home while receiving a home care allowance until the child turns three. Overall, Finnish mothers make use of the available public schemes to stay relatively long periods at home: mothers rarely (~10%) work before their child turns one and 40% of mothers of two-year-olds were still on leave in 2015 (Nieminen, 2013; Salmi & Närvi, 2017). Men's investments in unpaid family work in Finland have been on the increase despite their low level among the Nordics: the share of all subsidized leave days that men took increased from 5% in 2003 (Ellingsaeter & Leira, 2006) to 10% in 2015 (Salmi & Närvi, 2017).

Typical to Nordic societies, Finland is characterized by relatively low overall income inequality (Jäntti, Saari, & Vartiainen, 2006). Still, men continue to earn more than women also in Finland (Sauli, 2013). Despite an early established dual-earner family model, as illustrated for instance by the separate taxation of the husband and wife since 1976 (Aarnio & Eriksson, 1987), the gender difference in earnings continues to persist particularly in couples with children, where women make up 40% of household income on average (Sauli, 2013). This gap is not attributable to women's part-time work, which is not a common strategy to accommodate family and work responsibilities in Finland (OECD, 2019b; Rønsen & Sundstrom, 2002). Gender gap in overall employment rate is relatively small, given particularly women's high employment: female employment rate in 2017 was 69%, compared the OECD average

[1] Several other methodological approaches have been applied too, including simultaneous modeling of labor market and fertility transitions (Troske & Voicu, 2013), matching (Fitzenberger et al., 2013), simulation (Cohen et al., 2011) and clustering (Frühwirth-Schnatter et al., 2016) techniques, as well as the exploitation of a rich set of observed covariates in a regression framework (Chandler et al., 1994; Herr, 2016).

of 60% (OECD, 2019a), and the male employment rate in 2017 was 71%, compared to the OECD average of 75% (OECD, 2019a).

The period from the mid-1990s until 2009 in Finland was characterized by economic growth and thus most parents born in the mid-1970s entered parenthood during an economically sound period (Comolli, 2018). The mean age at entering parenthood has increased since the mid-1970s: it reached 27.6 among women and 30.0 among men in 2000 (OSF, 2017), and respectively 29.7 and 31.6 in 2020 (OSF, 2020). The average annual increase in the age at first birth in 1990–2016 was around 0.1 years, with similar increase among men (OSF, 2017). Since the early 1990s, the first birth rate at ages 20–24 has been declining, albeit at slower pace in the 2000s, illustrating the postponement of parenthood. The first birth rate at ages 25–29 decreased in 1990–1998, and has later shown a pro-cyclical response to economic trends (Comolli, 2018). The trend towards higher age at entering parenthood has been remarkably similar across social groups in Finland – like in all Nordic countries (Andersson et al., 2009).

4. Data and method

4.1. Data

4.1.1. Study sample

The study is based on a 10-percent random sample of households and institutionalized persons in the 1975 census in Finland (N = 471,738). This sample is linked to register-based annual information available in 1987–2007. We analyze (index) persons born in Finland in 1974–1975 (n = 12,830), who were living in a two-parent (86.1%) or a mother-only (4.5%) household in their childhood in 1975, and for whom the birth history of their mothers as well as their time-constant socioeconomic background characteristics at age 15 could be derived from non-retrospective register-based information (n = 11,341).[2] The identification of the mother of the index person is based on co-residence with her in 1975 and her birth history. The identification of the father of the index person is based on co-residence between the two as well as with the mother of the index person in 1975. The sample consists of 5,472 female and 5,863 male (index) persons who were present at the beginning of the study follow-up. The follow-up period runs from age 16 (calendar year 1990/1991) to age 32 (calendar year 2006/2007), with right-censoring of 477 individuals due to death or emigration. The study includes 189,042 person-years. All measured variables are listed in Table 1. The measurement of these variables is based on various linked register sources (and in part the 1975 census) and none of the measures are self-reported. All analyses were conducted separately for women and men.

4.1.2. Time-varying variables

The main life course processes studied are education, labor market status, independent living, partnership, and childbearing. Except for independent living and partnership, these processes are modeled with several variables, as indicated in Table 1. Living arrangements and partnership are included in the analysis due to their central role in the young adult life course and their close connections to childbearing and socioeconomic attainment (Buchmann & Kriesi, 2011; Corijn & Klijzing, 2001; Furstenberg Jr, 2010).

Education is measured by educational attainment (primary, secondary, lower tertiary, and higher tertiary; corresponding to ISCED 2011 categories 0–2, 3–4, 5–6, and 7–8, respectively), enrollment (yes or no), the cumulative number of years enrolled, and the number of times the person entered education. A person can be enrolled and employed simultaneously. Our primary educational variables of interest are annual enrollment and whether a person has a tertiary-level degree. We show the results for the lower and higher tertiary groups combined as "tertiary".

Labor market status is measured with indicators of employment and income. Employment is measured first with a binary variable indicating whether a person is employed for at least nine months in a year. A month on parental leave or as a recipient of home care allowance accounts as a month not employed.[3] Additionally, a measure for unemployment, indicating whether a person is unemployed for at least one month in a year, and the cumulative number of years in which person is employed at least nine months per each year are included. Income is measured by annual personal income, annual household income, and cumulative personal income (in thousands of euros). Income measures all personal taxable income (with top-coding of the 3% earning the most). Household income measures all taxable income of the individuals living in the

Table 1
List of the time-constant and time-varying variables of the study.

Time-constant variables	**Categorization/Range**
Age of the mother at the birth of her first child	15.3–44.6
The number of siblings	0–14
The birth order (of the index person)	1–15
Parents married at the birth (of the index person)	yes, no
Level of urbanization of living area at age 15	rural, semi-urban, urban
Family type at age 15 (living with)	parents, single parent, cohabiting parent, married parent
Parental home ownership at age 15	yes, no, other or unknown
Parental level of education at age 15	primary, secondary, lower tertiary, higher tertiary
Parental unemployment at age 15	yes, no
Parental household income at 15	quintiles
Time-varying variables	**Categorization/Range**
Education	
Educational attainment	primary, secondary, lower tertiary, higher tertiary
Enrollment	yes, no
Cumulative number of years enrolled[a]	0–17
Number of times entered into education[a]	0–16
Labor market	
Employment	yes, no
Cumulative number of years employed[a]	0–17
Unemployment	yes, no
Income (1000 euros)[b]	0–77.1
Cumulative income (1000 euros)[a]	0–928.5
Household income	0–150.8
Childbearing	
First birth	yes, no
Parenthood[a]	yes, no
Time since first birth[a]	0–18
Other variables	
Independent living	with parents, tenant, homeowner, other
Partnership	single, cohabiting, married
Age	16–19, 20–23, 24–27, 28–30, 31–32

[a] Deterministically determined by other time-varying variables.
[b] The highest 3% of incomes are top-coded.

[2] 0.6% of the children were living in a father-only family and the living arrangement of 8.75% of children could not be identified. This non-response arises largely from households with children born close to the end of 1975 and is somewhat selective e.g. on low age at first birth and educational level.

[3] The calculation of a parental leave month is based on parental leave days (25.3 days per month) (Miettunen, 2008). The usual maximum length of leave for a mother (incl. maternity leave) is 10 months. A father can use approximately six of these months, plus another 18 days. In 2003–2007, fathers were entitled to an additional month. For ages 16–20/21, our employment measure does not cover parental leave. After the leave, either parent can stay home until the child's third birthday while receiving on a monthly flat-rate benefit. The amount of the allowance depends on the family's demographic and socioeconomic characteristics. A proximate measure was used, taking into account annual index changes in the allowance.

same household. Income also includes income transfers such as unemployment benefits. Inflation is taken into account in all income measures calculated in 2012 euros (Official Statistics Finland (OSF), 2013). Among the variables indicating labor market status, the variables of primary interest are annual employment and personal income.

Independent living is measured by a categorical variable indicating a person's current living arrangements (with parents, as a tenant, as a homeowner, or as other). Partnership is also categorical variable (single, cohabiting, or married). Identification of cohabitation is based on the coresidence of an opposite-sex person of a similar age for at least three months, and other criteria defined by Statistics Finland. Age is included in all models as a categorical variable (age 16–19, 20–23, 24–27, 28–30, 31–32).

Finally, childbearing is measured by the variable "first birth," which is one in the year an individual has his/her first child, and is zero otherwise; the variable "parenthood," which is zero before an individual has his/her first child, and is one afterwards; and the variable "time since first birth," which counts the number of years since the first birth. The reliability of the measurement of births of first children also for men in these register data is high, which can be considered an asset of this study (see Rendall, Clarke, Elizabeth Peters, Ranjit, & Verropoulou, 1999).

4.1.3. Time-constant variables

A number of time-constant baseline variables are included in the regression models to account for potential time-constant confounding of the studied relationships of birth timing with educational and labor market trajectories by socioeconomic and -demographic family background characteristics. Parental background may influence preferences and intentions regarding the timing of events in young adulthood, but also the individual and structural opportunities to realize intentions (Billari et al., 2019). For instance, parents' childbearing history and socioeconomic status may influence their children's preferences for timing of childbearing and educational careers (Allison & Ralston, 2018; Nisén, Myrskylä, Silventoinen, & Martikainen, 2014). The measured variables include the age of the index person's mother at the birth of her first child, number of siblings and birth order of the person, measured as continuous variables. A binary variable indicating whether the person's parents were married when s/he was born (as measured in 1975 census) is included as well.

Categorical variables indicate circumstances when the person was aged 15: the level of urbanization of the municipality (rural, semi-urban, and urban); the type of family (single parent, cohabiting parents, married parents, without a parent, or unknown); whether the respondent's parents owned the family's home; highest level of education of either parent; parental unemployment indicating whether either parent experienced unemployment for a total of more than 12 months over two subsequent years over a five-year period; and, household income (in quintiles) measuring the mean income over a five-year period.

4.2. Method

4.2.1. G-formula

In order to estimate the effects of delayed parenthood, as well as the factors that mediate these effects, we make use of the parametric g-formula. Similar to other causal inference approaches, the g-formula relies upon counterfactual theories of causality to enable researchers to estimate the effects of a cause (De Stavola, Daniel, Ploubidis & Micali, 2014). The effects of causes can be estimated using other approaches, but many of these approaches are best suited to answering research questions about single causes with respect to narrow subsections of the population (e.g. compliers with an instrumental variable) (Moffitt, 2005). The g-formula that estimates jointly the interrelated effects of correlated (endogenous) processes on each other is particularly useful when studying the interactions between multiple mediating causes over the life course in the presence of time-varying confounding and mediation (Robins, 1986), or when estimating the effects not only among the compliers but also for the total population.

The design of our study building on the g-formula is illustrated in the DAG (Directed Acyclic Graph) shown in Fig. 1 (for a simplified conceptual DAG, see Appendix A). Following the DAG, we allow all the studied life course processes (education, labor market, independent living, partnership, and childbearing) to function simultaneously as outcomes, exposures, mediators, and confounders. This DAG essentially assumes a Markov process, but this assumption is relaxed by the inclusion of cumulative measures (see Table 1). The g-formula as applied in this study rests on the following key assumptions: sequential exchangeability (no unmeasured confounding, at any time point), positivity (everyone who we intervene on must be able to actually be intervened on in the real world), and the stable-unit-treatment-value assumption (SUTVA, which is sometimes referred to as a combination of the 'no interference' and 'consistency' assumptions) (Hernán & Robins, 2020). Arguably the most important of these is the assumption of sequential exchangeability. We conducted extensive sensitivity analysis to explore the robustness of our results to this assumption (see Appendix B). All analysis in this study was carried out with user-written R programs (available as Supplementary material).

4.2.2. Total effect estimation

For women and men separately, we estimate the effect of postponing the first childbirth by three years on the time-varying covariates, with a focus on the variables of primary interest (enrollment, tertiary attainment, employment, and income).[4] Using counterfactual notation, our parameter of interest θ_t^h is defined as as $\theta_t^h = \mathrm{E}\left[V_t^h(\bar{v}^f) - V_t^h(v^f)\right]$, where V_t^h represents the time-varying variables with h an index for a particular outcome (such as enrollment), v^f represents first birth under empirically observed circumstances (also known as the natural course), and $\bar{v}^f$ the counterfactual scenario where first birth has been postponed. Given that we estimate the effects of the delay using the parametric g-formula, we allow for the interdependency between all measured variables, including adjusting for intermediate and time-varying confounding (De Stavola et al., 2014; Keil et al., 2014; Robins, 1986). The g-formula is applied through a series of steps that we perform separately for women and men:

1. Randomly draw individuals from the data with replacement (n_{female} = 5,472, n_{male} = 5,863).

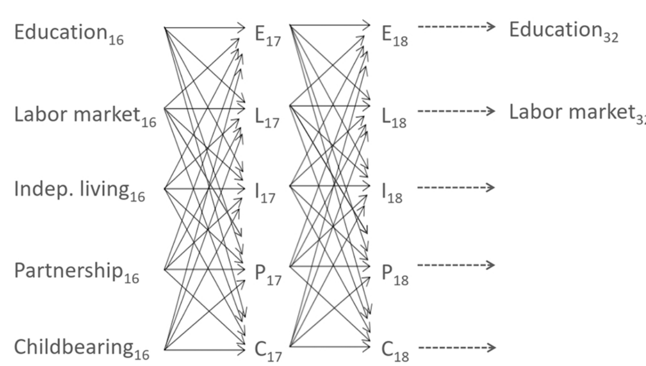

Fig. 1. DAG (Directed acyclic graph) of the study design representing the time-varying characteristics. The figure excludes the effects of time-invariant characteristics and interactions with age. Women and men are modeled separately. Indep. living = Independent living.

[4] We note that the estimated total population-level effects were proportionally similar with delays of other lengths (delays of 1 and 5 years were tested), but effects of a one-year delay were occasionally not statistically significant.

2. To the randomly drawn sample (step 1), fit parametric models for covariates at time *t* as a function of covariate history at time *t* (arrows from *t-1* to *t* in the DAG in Fig. 1). Please see below for the detailed description of this model.
3. Take observations from the first year of follow-up (from the step 1 sample), and, using the models (step 2), simulate observations for the second year of follow-up. Then use those (simulated) observations to simulate observations in the next year, and so on until the end of the follow-up.
4. Save the simulated outcomes (from step 3) for the time-varying covariates (these represent the "natural course scenario").
5. Perform step 3 a second time, but instead of allowing childbirth when it occurs, postpone it counterfactually by three years for everyone. Re-simulate the observations from the moment childbirth would have occurred until the end of the follow-up.
6. Save the simulated outcomes (step 5) for the time-varying covariates (these represent the "counterfactual scenario").
7. Calculate the difference in outcomes between the natural course and counterfactual scenarios, and save these differences.
8. Perform steps 1–7 500 times. The distribution of the effect estimates (step 7) is used to derive the mean effect, and the 2.5% and 97.5% quantiles are used to determine 95% bootstrap confidence intervals for the effect.

Step 1 and step 8 are performed to allow us to produce bootstrap confidence intervals (Efron & Tibshirani, 1993). Note that we also perform steps 3 and 5 multiple times within a bootstrap iteration, and take averages over them to reduce the Monte Carlo error.

In step 2, the estimated models are specified as follows:

$$g\{E(V^h{}_t)\} = \eta^h + \boldsymbol{A}_{t-1}\boldsymbol{\alpha}^h + \boldsymbol{B}\boldsymbol{\beta}^h + \boldsymbol{V}_{t-1}\boldsymbol{\mu}^h + \boldsymbol{D}_{t-1}\boldsymbol{\delta}^h + \boldsymbol{L}_{t-1}\boldsymbol{\lambda}^h$$

"where **V** denotes time-varying variables (birth, attainment, enrollment, partnership, employment, unemployment, personal income, household income, housing), h is an index for members of set H, which contains the time-varying variables (the models are estimated for every V^h) modeled using the corresponding link function (g) (identity link for continuous V^h, logit link for binomial V^h, and multinomial for a categorical V^h), and t denotes time in calendar years. **A** contains the dummy variables for age, **B** contains the time-constant variables, and **D** denotes variables that are a cumulative function of the time-varying variables in **V** (for example, cumulative number of years enrolled). These variables enable us to relax the Markov assumption by allowing us to include information on the time-varying variables from years prior to t-1. Finally, **L** contains a series of interaction terms: age with education level, enrollment, and cumulative enrollment; and age with parenthood. Equation 1 is estimated for all the time-varying variables in ***V***, with two exceptions. First, when modeling household income, personal income in the same year is additionally included as a covariate, as current household income is directly dependent on current personal income.[5] Second, when modeling educational attainment, enrollment in the same year is additionally included as a covariate. By using lagged variables in the multivariable models we are more certain about the direction of causality as the temporal order is established; only anticipation effects might bias such relations. The estimated altogether 17 generalized linear models are not shown but are available on request. For the g-formula equation see Appendix C. We report population-averaged effects (PAE) which are as expected smaller than the average treatment effects among the treated (ATT), i.e., those who became parents by age 32, presented in Appendix D.

We also analyze the effects of the delay of parenthood among parents as they enter parenthood. This is done by subtracting the values of the time-varying variables in ***V*** and ***D*** in the natural course (step 4) at the time of first birth from the respective values in ***V*** and ***D*** at the time of first birth in the intervention scenario (three calendar years later). Because of the one-year lag in the models, estimates in the current year are not affected by the birth in this year. These effects, calculated as average treatment effects among the treated (ATT) and shown in Fig. 8, are only calculated for those individuals who had a child at or before age 29 in the natural course, as the simulation does not age individuals beyond the empirically observed maximum age of 32.

4.2.3. Direct and indirect effect estimation

To gain more insight into the mechanisms behind the total effects, we perform a labor market mediation analysis and an education mediation analysis (Lin, Young, Logan, Tchetgen Tchetgen, & VanderWeele, 2017; Wang & Arah, 2015), following the logic of direct-indirect decomposition (Nguyen, Schmid, & Stuart, 2021). The labor market mediation analysis is identical to the total effect estimation, except that in the counterfactual scenario the labor variables ν^l (employment, cumulative employment, unemployment, income, and cumulative income) are kept at the levels observed in the natural course scenario. As the delay of parenthood cannot affect these variables, all the effects that are estimated occur outside of the pathways involving labor market variables. The total effect minus this direct effect then becomes the indirect effect mediated by the labor market variables (Robins, 1992; VanderWeele, 2011; Wang & Arah, 2015). In the education mediation analysis, we instead keep the education variables ν^e (attainment, enrollment, cumulative enrollment, and number of entries into education) at the respective natural course levels. Writing this in counterfactual notation, the direct effect not via the labor variables ν^l can be written as, $E[V_t^h(\overline{\nu}^f,\nu^l) - V_t^h(\nu^f,\nu^l)]$, and not via the education variables ν^e as $E[V_t^h(\overline{\nu}^f,\nu^e) - V_t^h(\nu^f,\nu^e)]$, where we expand the notation to explicitly denote that a subset of variables is kept at the natural course levels. Subtracting these quantities from the total effect θ_t^h results in the indirect effects via the labor and education variables respectively. We note that, as in the case of total effect estimation, the correct estimation of direct and indirect effects rests upon the critical assumption of no sequential exchangeability (unobserved confounding, but at all time points). This mediation analysis also adjusts for intermediate confounding, sometimes referred to as exposure-induced confounding (Nguyen et al., 2021), to the extent that is captured by the observed variables.

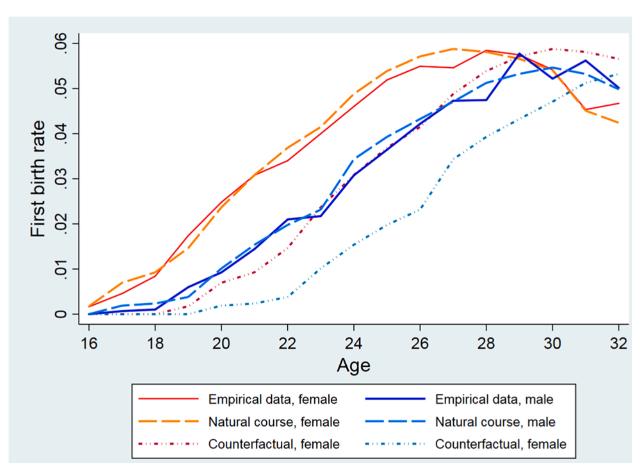

Fig. 2. First birth rate: Empirical data, natural course, and counterfactual scenario (three-year-postponement intervention) among women and men.

[5] Controlling for own income effectively means that we model household income net of own income. The results would not change if we directly modeled household income other than own income.

5. Results

5.1. Natural course and total effects among women and men

Fig. 2 shows the first birth rate as empirically observed, as simulated in the natural course scenario, and as simulated in the counterfactual scenario (where parenthood has been postponed by three years). The natural course scenario closely tracks the empirical data. This is desirable, as deviations from the empirical data would indicate flaws in the model. Men entered parenthood later than women: in the natural course, 65% of women and 51% of men had entered parenthood by age 32, while in the counterfactual scenario these shares were 51% and 35% (not shown).

The natural course estimates also for educational and labor market trajectories correspond closely with the underlying empirical data (Fig. 3). For tertiary educational attainment, there is a small underestimation of the empirical data. Because the bias especially at younger ages is minor, it is unlikely to substantially affect our effect estimation. Inaccurate estimation of the natural course at younger ages would cumulatively cause more error in effect estimates at higher ages. Women had higher enrollment rates than men in their late teens and early twenties. One reason for the gender difference here is mandatory military service which delays men's entry into higher education. Thus, women began tertiary education earlier and remained more likely to earn a tertiary degree. In turn, men had higher employment rates and higher earnings than women starting in their early twenties. While the gender gap in employment widened until age 27 and stayed constant thereafter, gender difference in income grew continuously. The empirical data, natural course scenario, as well as the counterfactual scenario of the outcome trajectories are shown in the Appendix E.

The delay of parenthood was estimated to increase enrollment in education (Fig. 4). Among women, a positive effect on enrollment was present from the late teens until the late twenties, and reached a peak of 1.6%-points at age 23. There was also an increase among men, but it was less pronounced at young ages, and peaked at a later age (0.9%-points at age 27). The share of individuals who had earned a tertiary degree was estimated to increase cumulatively by age as a consequence of the delay of parenthood: among women, it increased from the early twenties onward; and among men, it increased from the mid-twenties onward. The cumulative effect was estimated to reach 2.4%-points among women and 1.1%-points among men by age 32.

The likelihood of being employed at least nine months a year was estimated to increase strongly among women as a consequence of the delay of parenthood: the effect increased from the early twenties onward and peaked at 3.8%-points at age 27, but decreased quickly thereafter, and was no longer significant at age 32 (Fig. 5). Among men, the corresponding increase in employment was small. The annual income level of women also was subject to considerable increases in the counterfactual scenario, with the peak occurring later than in the case of employment. Increases were observed throughout the twenties and early thirties, reaching a peak of 800 euros at age 30. Among men, there was retrospectively a relatively small but increasing positive effect from age 26 onward, reaching a peak of 265 euros at age 32.

5.2. Direct and indirect effects among women and men

The total effects of the delay of parenthood on educational trajectories were estimated to be direct; i.e., were not mediated by changes in

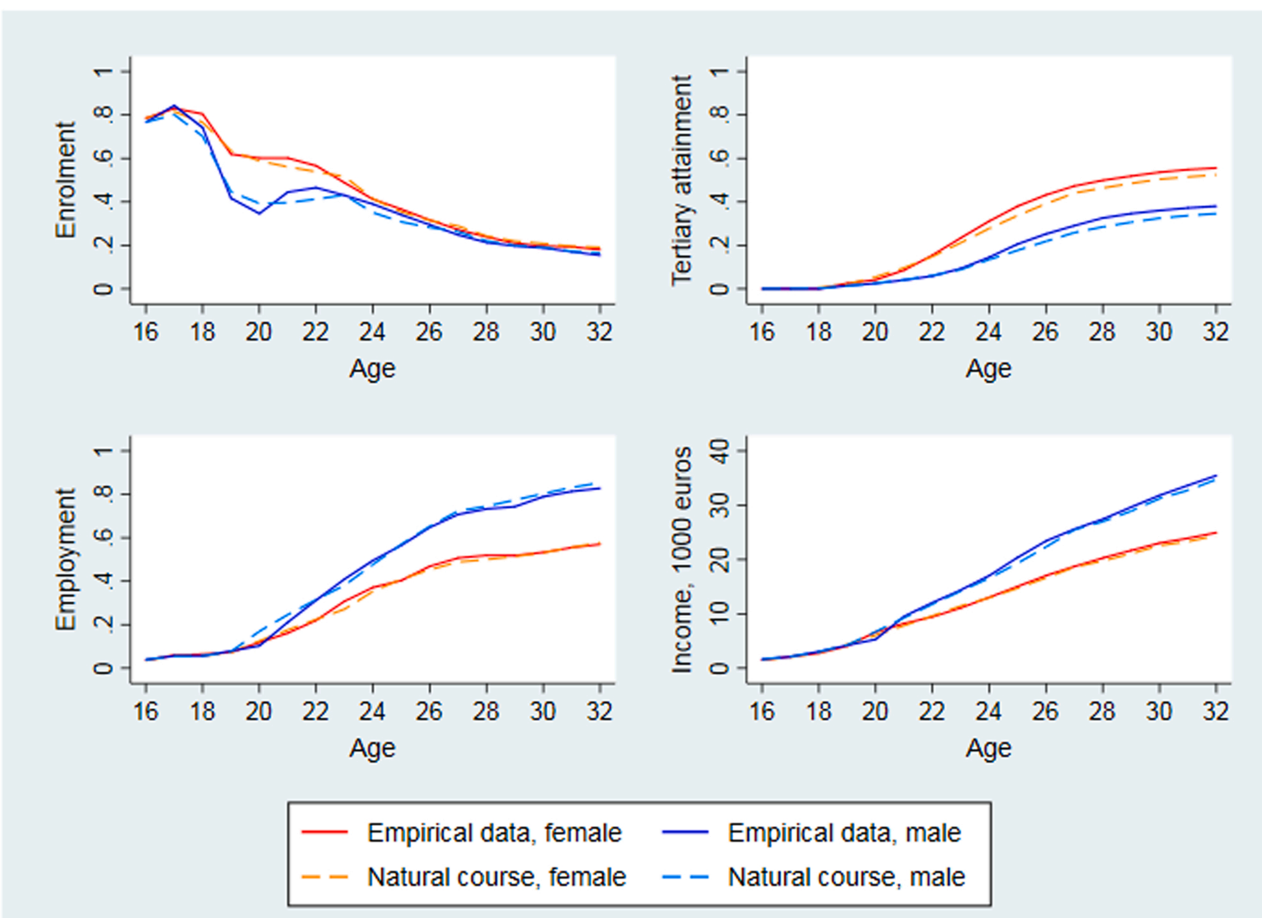

Fig. 3. Educational and labor market trajectories: Empirical data and natural course among women and men.

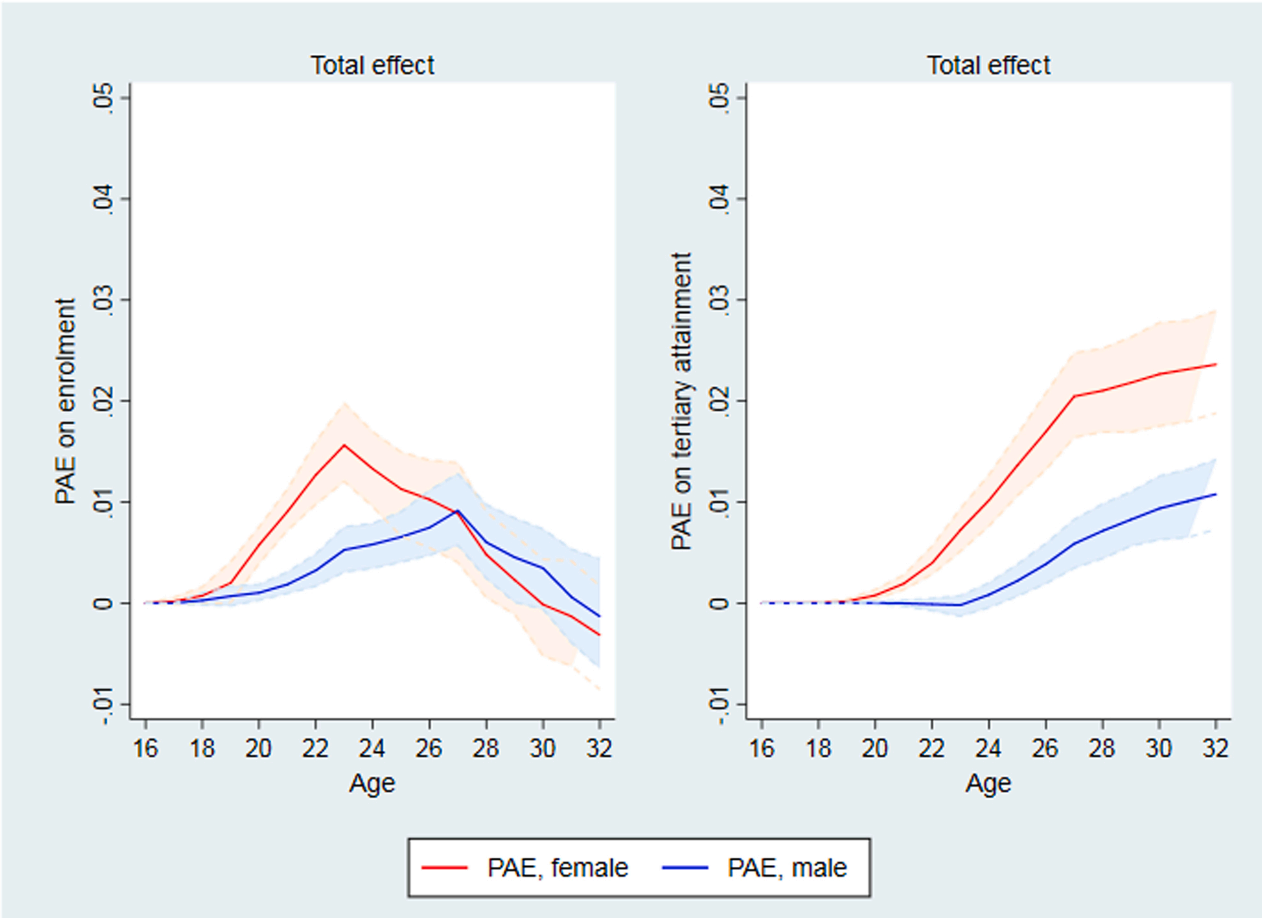

Fig. 4. Educational trajectories: Total population-averaged effect (PAE) with 95% confidence interval of the three-year birth postponement intervention among women and men.

labor market trajectories (Fig. 6). The indirect effects were estimated to remain at or close to zero throughout the follow-up. Correspondingly, the direct effects tended to be stronger in women than men. This suggests that delaying the responsibility of caring for a child enables young adults, and women in particular, to continue their education, either by continuing their previous enrollment or embarking on a new degree (our analysis does not distinguish between these two). However, changes in employment or income caused by delayed parenthood seem not to be responsible for changes in education among women nor men.

There was a strong gender imbalance in the estimated direct effects of delayed parenthood on labor market trajectories, meaning that women and men were estimated to strongly differ in the effects that were not mediated by educational trajectories (Fig. 7). Among women, the estimated direct effects of the delayed first birth largely followed the pattern of the corresponding total effects: they were strong and significant at most ages, but the employment effect was temporary, as it decreased quickly after peaking at age 27. Among women, the direct effect mainly accounted for the total employment effect, but the indirect effect contributed moderately yet increasingly at higher ages to the total income effect. Among men, in turn, the small total increase in employment resulted from a direct effect. For men's income, there was evidence of a small positive direct effect at higher ages (significant at ages 26–28) as well as of a small yet increasing indirect effect at higher ages similar to women (significant at age 32).

5.3. *Effects at the time of entering parenthood among mothers and fathers*

The three-year delay in the timing of entering parenthood was estimated to leave both first-time mothers and fathers to enter parenthood socioeconomically better equipped (Fig. 8). In the year they had their first child, mothers and fathers were, respectively, 6.0%- and 4.9%-points less likely to be enrolled in education and 9.9%- and 7.7%-points more likely to have attained a tertiary degree. Additionally, mothers and fathers were, respectively, 9.7%- and 12.5%-points more likely to be employed at least nine months per year and were earning, respectively, 4,685 and 6,829 euros more per year. This effect on income was clearly stronger among fathers than mothers. Further results indicate that these effects were estimated to be to a large extent direct (not shown).

6. Discussion

6.1. *Main findings*

The aim of this study was to undertake a dynamic analysis of the total, direct, and indirect effects of delayed parenthood on educational and labor market trajectories of women and men in young adulthood. We focused on Finland, a Nordic country with relatively high levels of gender equality and public support for families, as well as a flexible educational system, which means that gender differences may be smaller than in most other countries (see Cukrowska-Torzewska & Matysiak, 2020; Sigle-Rushton & Waldfogel, 2007). Novel in the field of social sciences, we made use of longitudinal data, counterfactual modeling, and mediation analysis to investigate the dynamic interplay between childbearing and different trajectories. Our results show that delayed parenthood has an impact on women and men, but the effects are not uniform. Among women, delays in parenthood led to clear

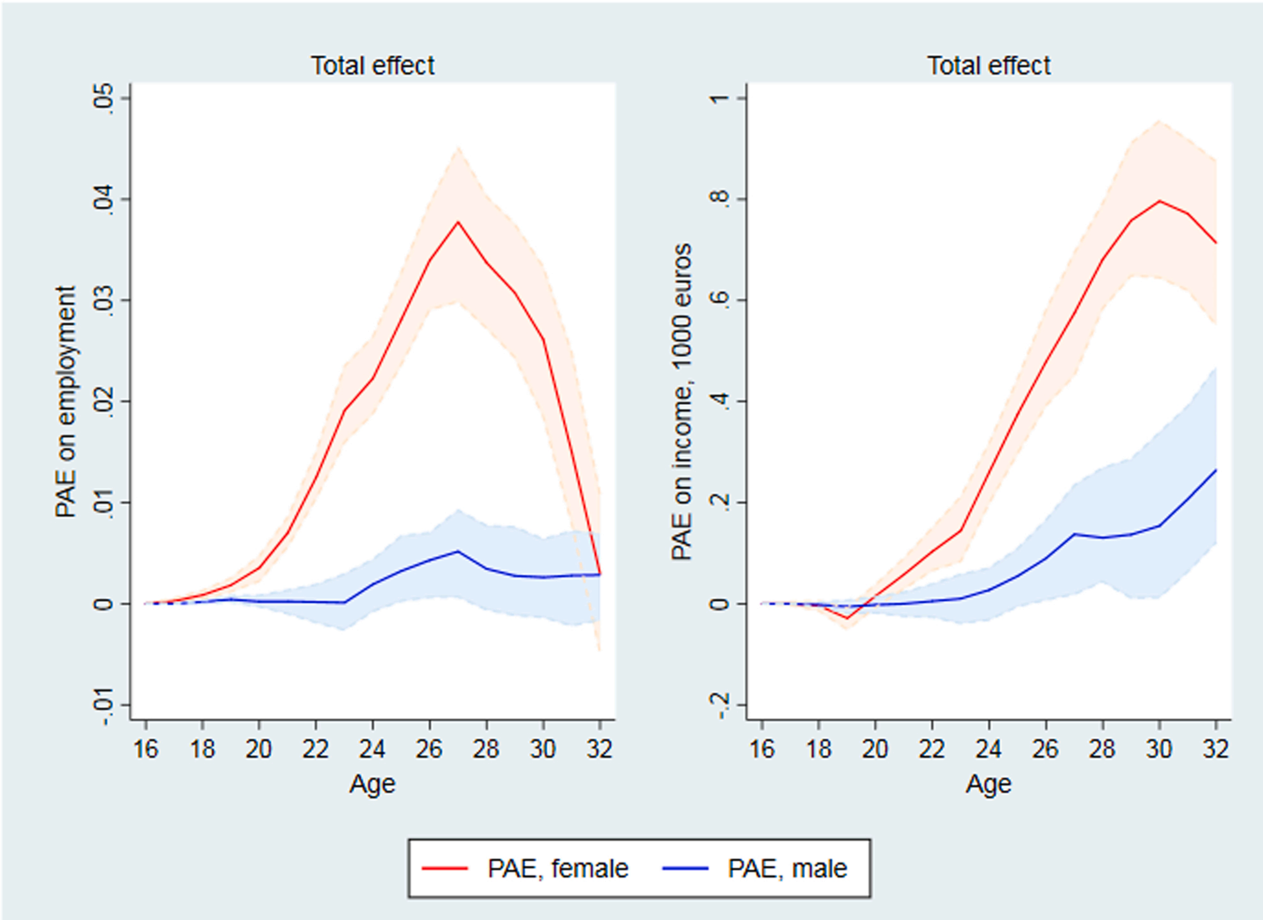

Fig. 5. Labor market trajectories: Total population-averaged effect (PAE) with 95% confidence interval of the three-year birth postponement intervention among women and men.

improvements in educational and labor market trajectories across young adulthood; the corresponding changes among men were modest. Nonetheless, delayed parenthood had a strong positive impact on the socioeconomic standing of both fathers and mothers as they entered parenthood. These results illustrate how estimated effects of parenthood timing can differ depending on how the effects are evaluated. The difference between effects observed here – evaluated across young adulthood or at the time of entering parenthood – is partly explained by the fact that the effects when entering parenthood combine resource accumulation over age and the dynamic effect arising from postponement. We also note that the stronger impact of delayed parenthood on women's educational and labor market trajectories may result partly from their generally earlier timing of entering parenthood as compared to men, which is more likely to interfere with the accomplishment of higher degrees and getting a foothold in the labor market – a point warranting closer investigation in future empirical studies.

Our results illustrate that further delays in parenthood would exacerbate the educational advantages of women in comparison to men (Q1). In the context of Finland, the two first decades of the 21st century witnessed further delay of entry into parenthood (OSF, 2020), as well as increases in educational levels particularly among women (Kailaheimo-Lönqvist, Kilpi-Jakonen, Niemelä, & Prix, 2020). We estimated that the population-level effects of a three-year delay in parenthood for the Finnish cohort born in the mid-1970 s amounted to a 2.4%-point increase in the educational attainment for women and 1.1 for men. In light of long-run trends in education and the timing of parenthood, we can interpret these effects as non-negligible. In the 1998–2017 period, the share of the population aged 25–34 with a tertiary degree across the OECD countries increased by 1.1%-points annually (OECD, 2019c), with increases of 1.4%- and 0.8%-points among women and men, respectively. Given the study context, for instance in terms of the flexibility of the Finnish educational system, we would argue these effect sizes to be conservative expectations for similar estimates in other countries with less flexible educational systems. Young women are already more highly educated than young men in almost all OECD countries (OECD, 2019c), and this gap will have repercussions in many areas of society, not only with respect to the labor market, but to marriage markets and family formation patterns (Buchmann et al., 2008; Van Bavel, 2012).

For labor market trajectories, delayed parenthood resulted in increased employment and income levels across young adulthood among women, amounting at most to 3.8%-points and 800 euros annually among all women (Q2). Among men, there was hardly any increase in employment and a weak increase in income from age 26 onward. These gendered effects which attenuate the existing advantage of men are largely compatible with prior Nordic findings (e.g., Leung, Groes, & Santaeulalia-Llopis, 2016; Lundborg et al., 2017; Rosenbaum, 2020, however, see Karimi, 2014), yet notable in a country considered advanced in support for work-family reconciliation. Potential reasons for these findings may include a Nordic parental leave system which supports relatively long family leaves taken predominantly by mothers. Finland-specific features may also play a role for our findings. The Finnish home care allowance scheme enables long absences of mothers from the labor market, and perhaps also the lack of part-time work opportunities could create further incentives to postpone return to work among mothers of small children. These notions are consistent with recent findings showing that, in the Nordic context, the labor market

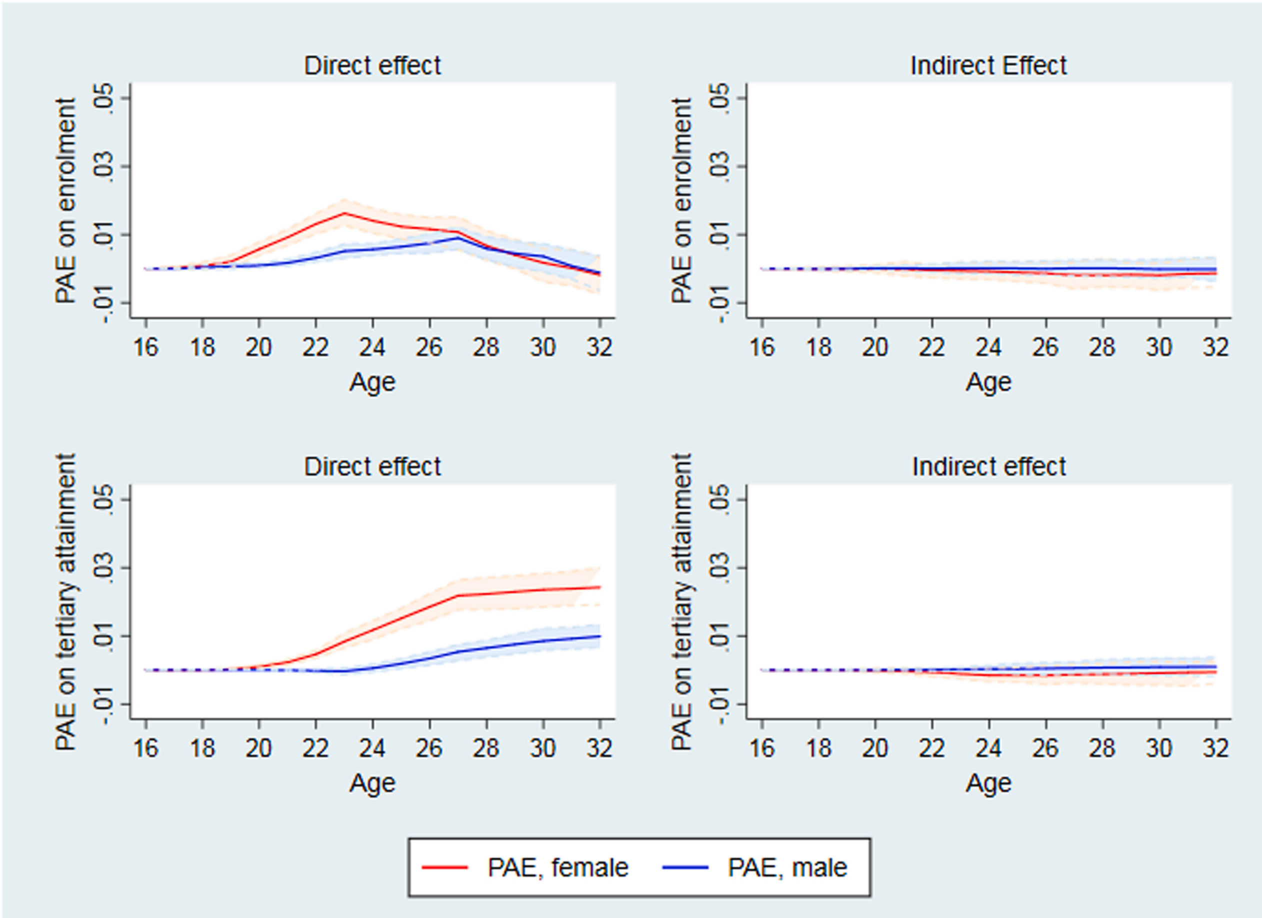

Fig. 6. Educational trajectories: Direct (i.e., not mediated by labor market career) and indirect (i.e., mediated by labor market career) population-averaged effect (PAE) with 95% confidence interval of the three-year birth postponement intervention among women and men.

exclusion of early mothers is relatively strong in Finland (Lorentzen et al., 2019). While we believe that the gender patterns we observe are robust, the exact magnitude of effects across different countries call for comparative research.

Furthermore, we found a small direct positive effect of delayed parenthood on men's incomes. In line with recent Nordic findings (Cools & Strøm, 2016; Lundborg et al., 2017), this indicates that Finnish men's incomes are not entirely immune to any negative effects of fatherhood, or that their income increases following fatherhood may be temporary (Gupta, Smith, & Stratton, 2007). The current findings would also not be inconsistent with notions according to which the gender gaps in the labor market are largely driven by changes caused by motherhood among mothers, while socioeconomic selection into fatherhood may explain previously documented fatherhood premia in income (Mari, 2019; Van Winkle & Fasang, 2020).

Our hypothesis of greater similarity in indirect rather than direct effects on labor market trajectories of women and men was largely confirmed (Q3). In contrast to stark differences in the level of direct effects, which occurred net of changes in educational careers, women and men were similar in terms of indirect effects, i.e. those mediated by changes in educational careers. The aforementioned features of the Finnish welfare state may help explain the gender divergence in direct effects of later timing of parenthood on employment and earnings in young adulthood. Our findings further suggest that later timing of fatherhood modestly improves income levels among men as well, by allowing increases in their human capital. Future studies could investigate whether the indirect effect in men gains importance as compared to women at ages beyond 32 to explain potentially increasing gender disparities in earnings by age (see Dariotis et al., 2011; Doren & Lin, 2019). Counter to our hypothesis, the educational trajectories of men did not improve due to changes in their labor market trajectories. This finding suggests that delaying fatherhood may not lead men to focus on studying instead of providing for a family.

A further aim was to assess whether the delay of parenthood changes the socioeconomic standing of first-time mothers or fathers at the point in time when they enter parenthood. Our results here based on the treated sub-sample of those who entered parenthood during the follow-up show that a three-year-delay would strongly improve the socioeconomic circumstances of both genders at this critical stage in life (Q4). Our expectation of stronger effects for first-time mothers was confirmed only with regard to educational enrollment and attainment; the improvement in employment and income was surprisingly larger for first-time fathers. Notably, such gendered effects strengthen existing gender inequalities within households, whereby fathers earn more and mothers are more highly educated. In an exchange-bargaining perspective, strong increases in first-time fathers' incomes just before they embark on fatherhood can contribute to the persistence of gendered division of paid and unpaid work. This is because the more strongly increased income levels of new fathers weaken the bargaining position of new mothers at a critical moment when the amount of unpaid work increases due to the arrival of the first child. This could even reinforce traditional division of labor by strengthening the comparative advantage of men in paid work. In this way, the postponement of parenthood may in fact, unexpectedly, reinforce gendered responses to parenthood and moderate labor market gains of delayed motherhood. Future studies capturing ages across the 30 s are needed to find out especially whether

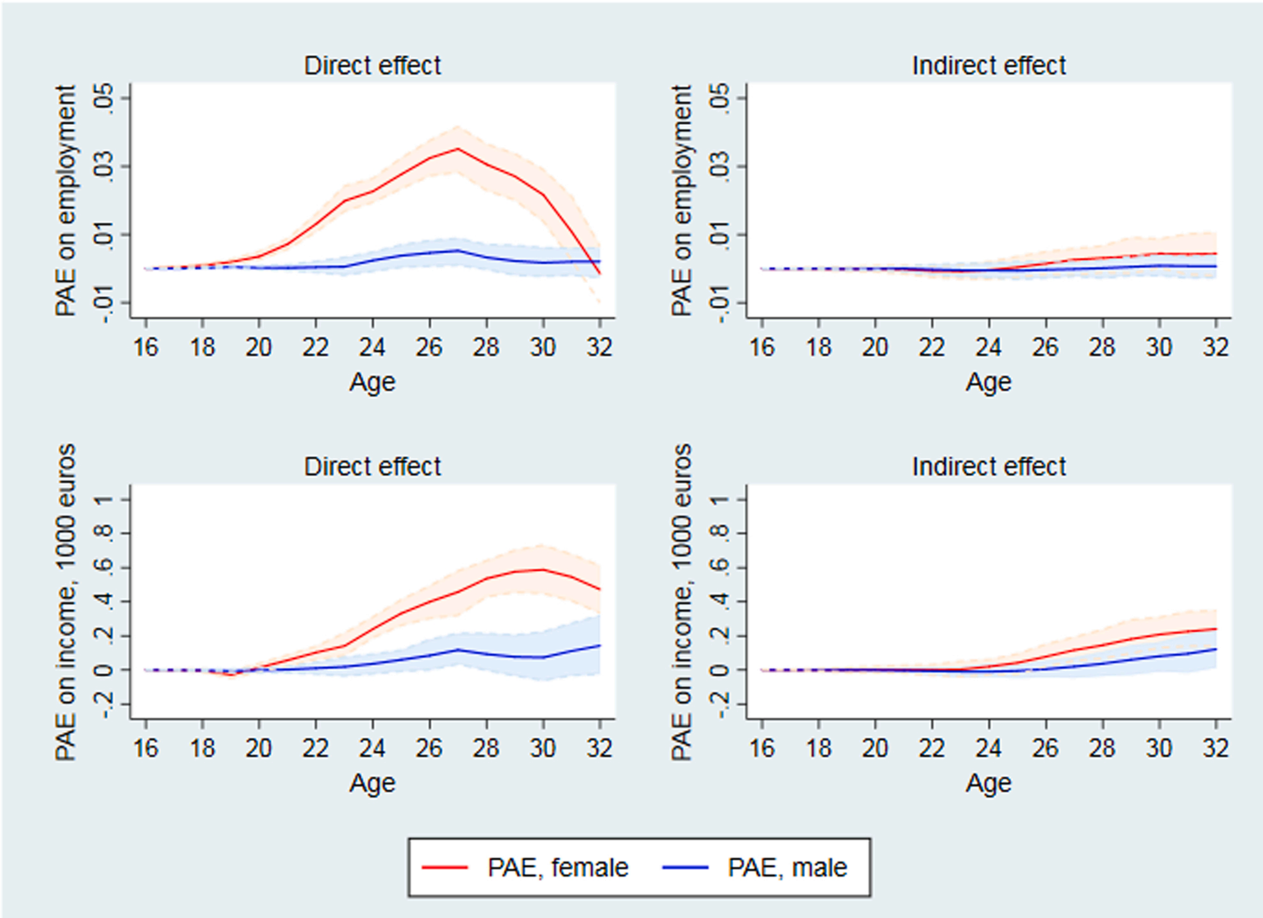

Fig. 7. Labor market trajectories: Direct (i.e., not mediated by educational career) and indirect (i.e., mediated by educational career) population-averaged effect (PAE) with 95% confidence interval of the three-year birth postponement intervention among women and men.

this intriguing finding is generalizable to the timing of parenthood overall.

6.2. Limitations

Limitations of the study should be acknowledged. Overall, the causal interpretations of our estimates - including those of the total, direct, and indirect effects – rest upon the assumptions that we outline in the section on methods (4.2). This includes the assumptions about causal pathways that are illustrated by our DAG. One main assumption of effect estimation based on the G-formula is the lack of unobserved time-constant, time-varying and intermediate confounding, at all times points. Despite a large number of time-constant and time-varying confounders included in the models, it remains possible that unmeasured confounding causes bias to the estimated effects. For instance, direct measures of preferences remain outside the scope of register data, and could plausible cause bias to the effect estimates (see Allison & Ralston, 2018). To test the presence of unobserved time-constant confounding, we carried out a sensitivity analysis in which a simulated hypothetical confounder, intended to capture risk for early parenthood and low career orientation, was included in the model. This confounder strongly decreased the probability of educational enrollment and strongly increased the first birth risk. In this hypothetical sensitivity test, shown in Appendix B, the effect of the delayed parenthood on tertiary attainment was reduced only modestly (<20%), however, regardless of gender. Finally, we note that measurement error in the analysis is minimal, due to high-quality annual register-based measurements that are not subject to recall bias or selective attrition.

This study focused on the timing of parenthood and its effects in early adulthood, as measured here until age 32. Future studies should investigate the effects of parenthood timing beyond the early adulthood life phase, firstly in order to document the long-term effects rising from postponement in early adulthood, and secondly to see if postponement at later ages has different impacts as compared to earlier ages. For instance, little impact on education would be expected of postponement at ages above 32, but expectations on effects on employment and earnings are not as straightforward. Recent Nordic evidence provides associational evidence for smaller gains on lifetime earnings of postponement at later ages (Leung et al., 2016), but indicates potentially larger short-term earnings losses after childbirth among those who enter motherhood later (Karimi, 2014; Lundborg et al., 2017). Moreover, the contributions of indirect and direct effects may also crucially differ depending on age at postponement and age at the outcome. For instance, the indirect effects of parenthood timing via education on labor market outcomes may take more time to accumulate than the direct labor market effects and thus gain relevance at later ages. Future studies could also broaden our understanding on the topic by studying the dynamic effects of postponement in couples, using couple-level data and including partner's characteristics in the analysis.

6.3. Conclusion

This study demonstrates how the longitudinal g-formula can be used to model the effects of family-demographic changes on gender gaps. Delayed parenthood remains even in a Nordic country a clear pathway to strengthened educational and labor market trajectories of women in

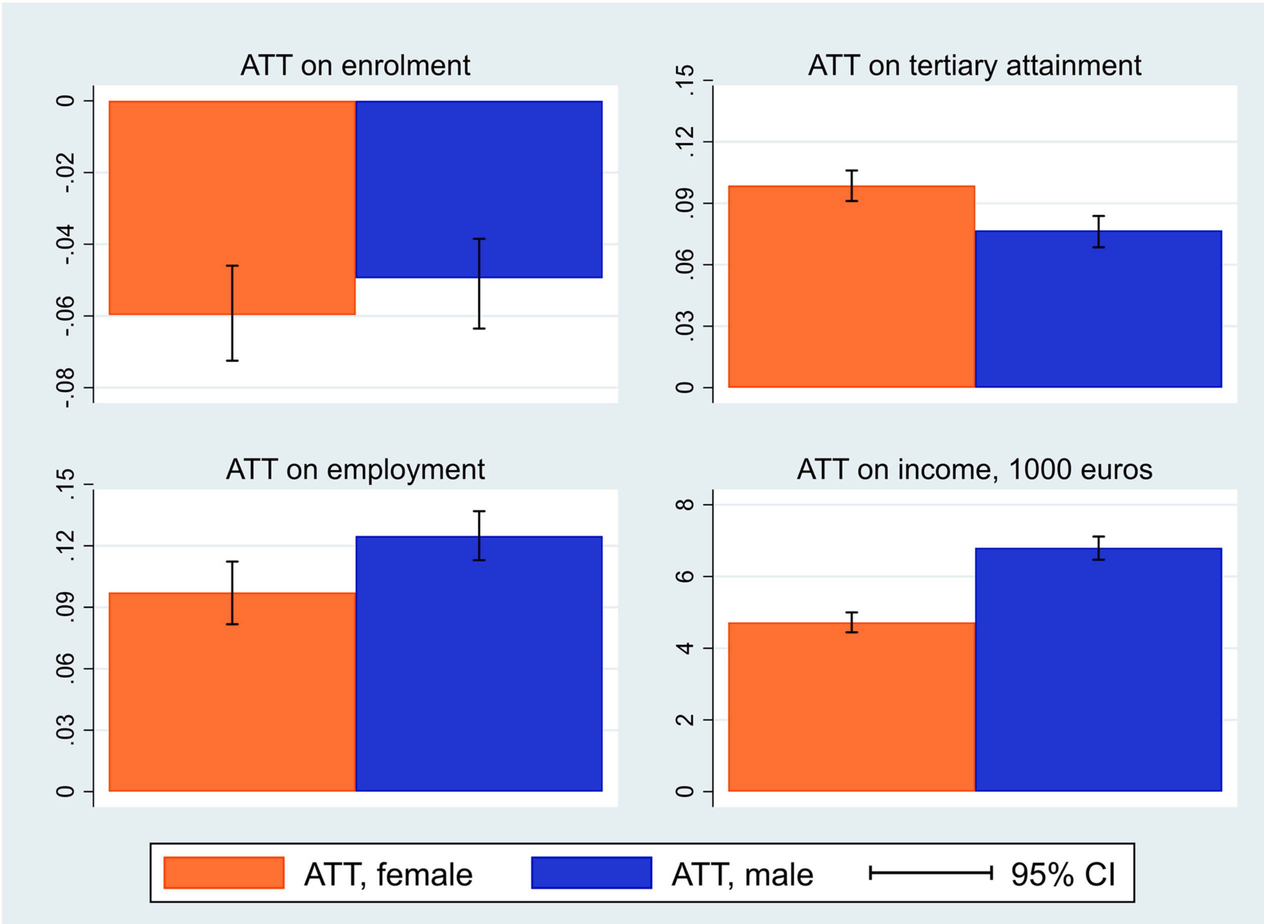

Fig. 8. Educational and labor market outcomes at the time of entering parenthood: the total average effects among the treated (ATT) of the three-year birth postponement intervention among mothers and fathers.

early adulthood. The timing of parenthood also affects men's educational trajectories – albeit to a lesser extent – and, thus, their income levels. The results provide population-level evidence on how the delay of parenthood has contributed to the long-term strengthening of women's educational position relative to that of men, as observed across high-income countries. Further, we find novel evidence on greater increases in fathers' than mothers' incomes at the time of entering parenthood, as followed by postponement, which may help explain why progress in achieving gender equality in the division of paid and unpaid work in families has been slow. In more traditional gender contexts than Finland these effects may be more pertinent and drive labor market divergence between women and men even more strongly.

Declarations of interest

None.

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Appendix. Supplementary material

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.alcr.2022.100496.

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