

Education and fertility in Europe in the last decade: A review of the literature

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WORKING PAPER

JULY 2022

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ABSTRACT

This paper reviews research on education and childbearing in Europe over the last decade. Early demographic research attributed declining fertility in advanced economies in the second half of the twentieth century to increasing female educational levels. The twenty-first century has witnessed further increases in educational attainment coupled with trend reversals in fertility. The relationship between education and fertility has become more complex, sparking renewed interest in the interplay between the two life domains. We examine how educational enrolment and attainment influence individuals' fertility behaviour – both fertility timing and level– and how the relationship between education and fertility is shaped by contextual factors such as family policies, macro-economic shocks, and normative changes in gender attitudes. We also summarise the recent literature on educational gradients in male fertility, and review methodological developments to address issues of self-selection and unmeasured heterogeneity in the study of education and fertility. Finally, this paper identifies and discusses challenges and important areas for future research.

KEYWORDS

Fertility; Education; Europe; Employment; Gender Roles; Partnership; Recession; Childcare.

EDITORIAL NOTE

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ACKNOWLEDGEMENTS

This research was supported by Economic and Social Research Council grants ES/K007394/1 (ESRC Centre for Population Change) and ES/S009477/1 (Understanding Recent Fertility Trends in the UK and Improving Methodologies for Fertility Forecasting). We are grateful to Dr Joanne Ellison for helpful comments on the earlier draft of this paper.

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Connecting Generations (CG) is a major strategic collaboration between CPC, the Leverhulme Centre for Demographic Research (LCDM) at the University of Oxford, and the Resolution Foundation.

The Centre is funded by the Economic and Social Research Council (ESRC) grant numbers RES-625-28-0001, ES/K007394/1, ES/R009139/1 and ES/W002116/1.

This working paper series publishes independent research, not always funded through the Centre. The views and opinions expressed by authors do not necessarily reflect those of the CPC, CG, ESRC, ONS or NRS.

The ESRC Centre for Population Change Working Paper Series is edited by Teresa McGowan; t.mcgowan@southampton.ac.uk

EDUCATION AND FERTILITY IN EUROPE IN THE LAST DECADE: A REVIEW OF THE LITERATURE

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1. INTRODUCTION

The dramatic expansion of tertiary education, postponement of marriage and childbearing (Sobotka 2004; Van De Kaa 1987), and the emergence of non-standard family trajectories and forms (Elzinga & Liefbroer 2007; Raab & Struffolino 2020) raises new questions about the relationship between education and fertility. Fertility decline to historically low levels by the end of the second decade of the twenty-first century in Northern Europe (Hellstrand et al. 2020), and rapidly changing educational gradients of childlessness have only increased the need to understand how education enrolment and attainment shape fertility patterns in high-income countries (Jalovaara et al. 2019).

Fertility decline in the last decades of the 20th century is often attributed to educational expansion and increased women's labour market participation (Basu 2002; Cleland 2002; Liefbroer & Corijn 1999). However, the first decade of the twenty-first century witnessed a reversal of trends with fertility increasing in many European countries despite another wave of educational expansion. Rising economic uncertainty due to the recession in 2008 was associated with ensuing declines in birth rates in many European countries (Matysiak et al. 2020). Studies report mixed results for the relationship between education and fertility, ranging from negative, positive, and U-shaped (Goldstein et al. 2009; Klesment et al. 2014; Nisén et al. 2020; Sobotka et al. 2017). Thus, the association between fertility and education in Europe is heterogeneous and sensitive to individual and contextual factors. The wide and fragmented nature of the rapidly growing literature on the subject suggest that there is an increasing need to consolidate observations to determine recent developments and discuss future research avenues.

We review recent literature on the association between fertility and education with three aims. First, we condense recent findings from the literature on educational differences in childbearing patterns in Europe in the last decade, distinguishing between studies using educational enrolment and attainment. We examine both fertility timing and quantum, distinguishing the effect of education by birth parity. Second, we review evidence regarding the mechanisms underlying these associations considering income, direct and indirect costs, and social status. Third, we evaluate how contextual factors including family policies, and gender roles shape relationships between education and fertility. Previous research shows significant variation in the relationship between education and fertility across European countries – differences in

welfare provision and institutional context are thus of critical importance. Finally, we also discuss research on education and fertility among men. Much of the available evidence relates to women's childbearing patterns, childbearing among men remains a neglected area of research.

This paper is inspired by the review by Balbo and colleagues (Balbo et al. 2013) published almost a decade ago. They presented a comprehensive review of the literature on fertility determinants but did not examine in detail the association between education and fertility and the mechanisms that connect them. Since their review was published, many studies have examined the link between education and fertility, but each of these have focused on a specific aspect, such as economic inequality (Adserà 2018) or the gender revolution (Goldscheider et al. 2015), paying little (or no) attention to linkages between different factors. Our review makes a number of contributions: First, we review empirical evidence from the past decade, Second, we summarise recent theoretical developments; and third, we discuss methodologies used to uncover the causal mechanisms through which education influences fertility. Finally, we identify the limitations of the current research, and discuss opportunities for future research.

2. EXISTING THEORETICAL FRAMEWORK ON EDUCATION AND FERTILITY

Education is the individual and contextual characteristic most widely used to explain fertility differences. In structural explanations of the demographic transition, education has been used as an indicator of socioeconomic development. More recently, it has been identified as a catalyst of "modernization" in innovation - diffusion theories, in which educated women are usually portrayed as "forerunners" of the fertility transition, that is, as pioneers of smaller families. Given the difficulty of collecting data on income, occupation or social status in demographic surveys, education is typically used as an index of socioeconomic status and as a surrogate for hard-to-measure concepts, such as opportunity costs. Moreover, it is frequently the only available indicator for the concept of women's status, which positions women vis-a-vis men in both the family and society. The wide range of concepts for which education serves as a proxy reflects the multifaceted nature of the educational experience. However, by the mid-1990s, it was understood that a number of different potential mechanisms mediated link between education and childbearing, such as, wealth, attitudes, knowledge about contraception, and female employment.

Micro-economic theories of fertility argue that people derive satisfaction from having children and from their children's well-being and must choose whether to invest in the number of children or increase their expenditure on fewer children to improve child outcomes - the "quality-quantity tradeoff" (Becker 1960). If higher education is a proxy for higher income and social status, highly educated couples with more resources are expected to have more children. However, the observed trend during the 1970s and 1980s was the opposite: educational expansion was generally accompanied by fertility decline in most European countries. This was explained by a "substitution effect"- educated women were more likely to participate in wage-earning labour, earn more, and thus faced increased opportunity costs of childbearing (Becker 1974; Joshi 1990).

Childrearing is thus not only associated with the direct costs of having a child, but also the indirect costs for educated women who must also consider scaling back their commitment to the labour market. These theories highlight key gender differences in traditional family settings: women with higher educational attainment face a high opportunity cost of childbearing due to the substitution effect, while among men, higher education is associated with better resources for having children. We discuss these dynamics later, as the opportunity costs of childbearing will depend on how individuals, particularly mothers with different educational backgrounds, combine paid and unpaid work, which is strongly influenced by social context, particularly gender roles, and family policies.

In the twenty-first century, theoretical perspectives have focused on the fertility response to increased economic uncertainty, including uncertainty related to globalisation (Alderotti et al. 2021; Comolli & Vignoli 2021; Kreyenfeld et al. 2012; Mills & Blossfeld 2013; Vignoli et al. 2020). Theorists have highlighted how the impact of recession, including increased unemployment, differentially affects direct and indirect costs of childbearing by level of education. For example, while unemployment during recession may be an opportunity for low-educated women to enter parenthood, similar conditions may not encourage childbearing among highly educated men and women, as seen in Denmark and Germany (Kreyenfeld & Andersson 2014).

Also, highly educated women are more likely to have liberal attitudes towards household labour and fertility decisions (McDonald 2000, 2006). Second Demographic Transition theory

(SDT) posits the rise of higher-order needs within post-materialist settings (Inglehart 2009). Highly educated individuals are seen to pursue self-actualization, individual autonomy, and hold views that question traditional values focused on childbearing and family roles (Lesthaeghe 2014; Merz & Liefbroer 2012). Thus, highly educated women have fewer children due to competing goals and interests (Lesthaeghe 2010). Moreover, according to SDT, increased educational attainment is associated with higher status-seeking. Status-seeking highly educated individuals wait until they have a stable career and key material prerequisites prior to family formation, leading to fertility postponement or a reduction in completed fertility (Billingsley 2010; Liefbroer & Corijn 1999; Martin 2000; Ní Bhrolcháin & Beaujouan 2012; Oppenheimer 1988; Rindfuss et al. 1980). Status can also be sought through partnership; assortative mating preferences may lead highly educated women to wait for a highly educated partner to start a family. These preferences create a ‘marriage squeeze’ for women due to the lack of suitable partners, which might have important implications for fertility and is understudied in the empirical literature (Huber & Fieder 2011; Van Bavel 2013). Status seeking through “high quality” children leads highly educated parents toward the “quality” trade off, investing more in fewer children to maintain their social status (Mortimer et al. 2017).

For men, educational attainment is linked positively with union formation (Trimarchi & Van Bavel 2017), while low education and job instability are linked to childlessness among young men, operating through non-marriage (Berrington & Pattaro 2014). At the same time, the ‘pooling resource’ model (Oppenheimer 1994), with domestic and labour market contributions from both sexes, might cause highly educated men to postpone family formation as highly educated women do (Huinink & Kohli 2014; Jalovaara & Fasang 2017). Finally, the weakening of the educational gradient of fertility in the past few decades has been attributed to the enhanced bargaining power of educated women, such that men might have to increasingly participate in household labour and childcare in Western societies (Esping-Andersen & Billari 2015; Goldscheider et al. 2015; Jalovaara et al. 2019).

Several authors have put forward theories as to how macro-level factors including institutional frameworks (such as family and welfare policies) and social norms (such as gender attitudes) moderate the association between education and fertility (Esping-Andersen 2018; McDonald 2000; Neyer et al. 2017; Thévenon 2011). Family policy changes such as subsidized childcare services, maternity-leave policies, provision to return to work following maternity leave, may mitigate the challenges of role incompatibility faced by women (Rendall et al. 2010).

Supportive family welfare policies are theorised to be particularly beneficial for highly educated women in stable jobs and less helpful to less educated women who may have a more precarious relationship with the labour market, leading to a reversal in the educational gradient of fertility (Jalovaara et al. 2019). However, the effectiveness of family policies for educated women is observed to be dependent on other factors, such as gender equality. While family welfare policies with high gender equality both in the public and private spheres seem effective in Nordic countries, in countries such as Germany and Austria, where the male-breadwinner model was prevalent until recently, there are wide educational differentials in fertility because women are expected to take long leaves for childcare and childcare services are limited (Neyer & Andersson 2008). Thus, the ideas of gender norms and men's share of domestic work are gaining significance as factors which encourage childbearing.

2.1. MEASURING EDUCATION AND FERTILITY

It is useful to distinguish between educational enrolment and educational attainment as different mechanisms through which education affects childbearing. Educational enrolment characterises individuals according to whether they are currently studying (Blossfeld & Huinink 1991), and sometimes the field and method of study (Van Bavel 2010). Some analysts have investigated those who have double status, working and studying part-time (Spéder & Bartus 2017). Recently, the effect of technological advancements in education on fertility such as online learning has also been examined (Andersson 2019; Cowen & Tabarrok 2014). The age at leaving full-time education has become the main factor used to explain fertility timing in the last decade, sometimes explaining as much as 80 percent of the increase in the mean age at first birth (Beaujouan & Berghammer 2019; Neels et al. 2014; Ní Bhrolcháin & Beaujouan 2012).

Educational attainment, or the highest level of education completed by a respondent, is commonly used in individual studies due to its ease of self-report and/or recording in administrative systems. While country specific studies differ in the categorization used, educational attainment is often divided into 'low', 'medium' and 'high', using the International Standard Classification of Education (ISCED), enabling cross-national comparability. 'Low' refers to primary and lower secondary attainment (ISCED 0-2). 'Medium' refers to upper-secondary and post-secondary education (ISCED 3-4). 'High' refers to the attainment of tertiary education (ISCED 5-6) (UNESCO Institute for Statistics 2012).

Studies that examine the effect of education on childbearing face several challenges. Firstly, while educational enrolment and attainment can influence individuals' childbearing decisions, childbearing can also impact their opportunities and choices for further education. For example, Cohen and colleagues show how Norwegian women who enter motherhood early are less likely to pursue long educational tracks (Cohen et al. 2011). Similarly, Gerster and colleagues (2014) found that dropping out of education among Danish women was partly attributable to women giving birth while enrolled in education.

Secondly, information on educational attainment is often collected with retrospective fertility histories in cross-sectional surveys. In many countries, surveys do not always collect information on educational histories, (e.g. data on the age or time of leaving education) making it difficult to identify the direction of causality. Some authors attempt to resolve this problem by using educational attainment up to the age of exposure (Kravdal 2007). However, prospective data on educational level are difficult to procure when compared to retrospective histories and are less commonly used. Also, male education is often overlooked in fertility research - despite men's higher levels of education, autonomy, and their important role in childbearing decisions - largely due to data limitations. Many surveys ask limited questions on male fertility, and it is often difficult to link birth information from vital registration to fathers. For instance, for unmarried couples in the UK, if the child was born before 1 July 2006, and the parents were not married, all references to a parent are references to the mother only unless the child's birth was legitimated by the parent's subsequent marriage. It is also difficult to link registered birth data to fathers. The latest studies have overcome these hurdles by using longitudinal data to understand the association between male educational attainment and family size. Thirdly, educational attainment is confounded with numerous unobservable characteristics such as orientation to work and family attitudes (Tavares 2016), or genetic factors (Branigan et al. 2013; Mills & Tropf 2015; Tropf & Mandemakers 2017) which are correlated to both education and fertility. Twin studies, for example using Finnish register data, suggest that observed family characteristics can only partly explain the relationship between education and fertility (about 3-28 percent) (Nisén et al. 2013).

There are also issues in relation to how fertility is measured. Some studies analyse educational gradients by quantum whereas others focus on fertility timing or tempo, for example, analysing age at first childbearing, or birth intervals. We separately consider educational gradients in

tempo and quantum, noting that timing-quantum interactions mean that the postponement of fertility may lead to a reduction in completed fertility (Berrington et al. 2015; Kohler et al. 2002). Completed family size and parity distributions are measures of fertility quantum which are usually calculated for cohorts who have reached the end of their reproductive years. Comparisons of period measures of fertility, like Age Specific Fertility Rates, and the Total Fertility Rate (TFR) are affected by both tempo and quantum. Thus, if births are being postponed differentially by education, then period measures of fertility will yield misleading findings regarding educational gradients in childbearing. A potential bias that needs to be noted here is that women's second and higher-order birth propensities differ from those who are entering motherhood, and this selection bias needs to be addressed while comparing childbearing behaviours by parity within educational categories.

3. EDUCATION ENROLMENT AND FERTILITY

3.1. EDUCATIONAL ENROLMENT AND FERTILITY TIMING

European countries have witnessed a surge in educational enrolment over the last decades, in terms of the number of people who opt for higher education as well as the number of years enrolled in education (OECD 2011). This enrolment affects the timing and quantum of fertility both directly due to role incompatibility and indirectly due to its impact on other life-course transitions. The direct effect of role incompatibility, where being a student is not seen as compatible with being a parent (Blossfeld & Huinink 1991), was estimated to account for a third of the postponement of entry to motherhood in the UK, Belgium, and France (Neels et al. 2017). Indirectly, enrolment is noted to affect the timing of parenthood by influencing life transitions such as finding a job, attaining financial independence, and partnership formation. This 'sequencing effect' is estimated to account for a fourth of the increase in the mean age at entry into motherhood (Neels et al. 2017). In addition, prolonged enrolment in education, which often involves living in the parental home, can influence individuals' attitudes, for example, related to living alone, or living in a house share, which may delay family formation (Berrington & Diamond 2000).

The literature on enrolment effects on childbearing has been extended to encompass the field of education and dual-status positions. Scientific and technological jobs tend to have higher starting wages which can reflect higher opportunity costs of having a child early in a career. In

contrast, graduates from female dominated fields are linked with lower starting salaries, working in occupations where conservative attitudes towards family roles persist, and they tend to have a shorter waiting time to first birth (Van Bavel 2010). However, identifying the causal effect of field of study is difficult because choice of field and ideas regarding family formation, are likely to both be related to some underlying unobservable characteristics, e.g. preferences (Trimarchi & Van Bavel 2020).

A new area of research explores the effect of enrolment in online distance education (ODE) on fertility. Increasing access to education through online means might reduce parenting costs compared to face-to-face learning (Andersson 2019; Allen & Seaman 2010; Cowen & Tabarrok 2014). In alignment, studying Swedish women from 2004 -2014, Andersson (2019) notes a lower first birth rate for those enrolled on campus compared to those in ODE. This research has been further extended to account for dual-status positions. Research shows that first birth rates are higher for those who are enrolled in education and employed at the same time, compared to those solely enrolled in education, possibly due to increased wages, or the lack of normative expectations mitigating the sequencing effects of enrolment (Spéder & Bartus 2017). Findings are consistent with Begall & Mills' (2013) work in which they observe higher first births in family-friendly fields.

Another advancement in understanding enrolment at the macro level is the measurement of age at leaving full-time education. Studies have disentangled the effect of timing from quantum effects and note that the expansion of education can explain almost three-fifths of postponement effects in the last two decades of the twentieth century in Britain and almost four-fifths in France. However, research using this method mostly focused on fertility tempo and could not account for quantum effects. In addition, there is a shortage of long-run panel datasets for internationally comparable causal examination (Ní Bhrolcháin & Beaujouan 2012).

The last decade has seen increased discussion as to whether the observed association between educational enrolment and fertility represents a causal relationship due to issues of self-selection and endogeneity. Family oriented respondents can self-select into a field of education conducive for family formation (Begall & Mills 2013) and personality and attitudes towards motherhood are interconnected with educational choices (Tavares 2016). Recent studies use exogenous changes in schooling policies and employ regression discontinuities or instrumental variables to address these constraints, such as changes in age-at-school-entry in Germany

(McCrary & Royer 2011), minimum school-leaving age in the UK (Fort et al. 2014, Geruso & Royer 2018), the extension of compulsory schooling by a year in Germany (Cygan-Rehm & Maeder 2013), extended duration of vocational education in Sweden (Grönqvist & Hall 2013), and compulsory schooling reform across Europe (Braakmann 2011; Fort et al. 2014). Alternatively, Amin & Behrman (2014) study identical twins in the US to establish the direction of causality. Tropf & Mandemakers (2017) using data on twins, illustrate how family background factors explain educational differences in the UK, further showing the difficulty of establishing causality in the relationship between educational enrolment and age at first birth. The impact of the family environment can lead to an overestimation of effect size, highlighting the role of unobserved characteristics in jointly determining fertility and educational choices. Given the rarity of twin studies, it is difficult to know the true extent to which educational enrolment has a causal effect on fertility.

3.2. EDUCATIONAL ENROLMENT AND FERTILITY QUANTUM

There are very few studies focusing specifically on the association between educational participation and fertility quantum, although some of them include the analysis as a part of other questions. Studies noting a positive association between educational enrolment and childlessness include those of Northern Europe (Rønsen & Skrede 2010), Western Europe (De Wachter & Neels 2011), and Southern Europe (Bagavos 2010). Their work mostly discusses how education either operates through economic processes, such as the opportunity costs of a career, or through cultural changes, such as the SDT and changes in attitudes. However, the influence of the financial burden of educational enrolment, and the age at leaving full-time education remain important but understudied channels that can potentially impact fertility and family formation (Blossfeld & Huinink 1991; Oppenheimer 1994). So far, longer enrolment periods have generally been associated with the postponement of entry into motherhood for women, which also shortens the reproductive window for higher order births (Neels & De Wachter 2010; Ni Bhrolchain and Beaujouan 2012), but do not address whether postponement adversely affects family size, or if shorter subsequent birth intervals compensate for those having births at later ages. Thalberg (2013) notes in her thesis that maternal enrolment has a stronger negative impact than paternal enrolment in Sweden and explains this using the Swedish earnings-related parental leave benefits that are favourable for those with strong labour market connections. She further notes that leaves for childcare may be more “voluntary” for men than women and are associated with a higher-propensity of third births among enrolled

young adult fathers. It is also possible that this is due to a selection effect where men who are more family-oriented than career-oriented choose to enrol in education even though they have children. Despite these results and the emergence of literature studying the nexus between male educational attainment and fertility in the last decade (discussed in section 5), there is limited research on male enrolment and fertility.

4. EDUCATIONAL ATTAINMENT AND FERTILITY

4.1. EDUCATIONAL ATTAINMENT AND FERTILITY TIMING

The negative relationship between educational attainment and the timing of entry into childbearing is well documented (Berrington et al. 2015; Billingsley 2010; Kohler et al. 2002). Across Europe, women with low education are more likely to experience early motherhood. Highly educated women often delay their births until their thirties and recent contributions show some women from younger cohorts delaying their first childbirths to extremely late ages (48+ years) pushing the age limits of biological fertility (Beaujouan 2020). Despite this enormous body of evidence, surprisingly few studies have been able to quantify the precise mechanisms of the relationship.

The positive educational gradient of age at motherhood is commonly attributed to a greater desire for career advancement among those with higher levels of education (Ní Bhrolcháin & Beaujouan 2012; Nitsche et al. 2018; Tanturri et al. 2015). Highly educated women are likely to have steeper earnings trajectory than less educated women and thus the opportunity costs of childbearing early in a career are greater (Mills et al. 2011). They also tend to delay childbearing until they are well-established in their occupations. While at times, postponement need not be due to conscious decision-making (Rijken & Knijn 2009), highly-educated parents in Netherlands did not consider having children seriously until they had completed their education and worked for a few years.

Early childbearing among lower educated women has been explained by the lack of opportunities for advancement in the US context e.g., in careers (in other words there are fewer advantages to postponement) and the fact that children are a key “meaning making” aspect of their lives (Edin & Kafalas 2005). Similarly in the UK, educational disparities have persisted, especially for the least educated women. Almost a quarter of the women born between 1960

and 1969 entered motherhood before reaching twenty years of age (Berrington et al. 2015), and though teenage childbearing is still high in the UK when compared to rest of the Europe, some authors argue that motherhood can be a positive life course event for teenagers (Duncan 2007). However, the dominant discourse remains that early childbearing is a response to education leading to low aspirations, and sometimes also to lack of knowledge concerning contraception (Arai 2003; van de Kaa 1987; Lesthaeghe 2010; Silles 2011). This argument also means that highly educated women often have other life goals apart from childbearing.

Other studies have focused on the role that delayed partnership formation plays in delaying entry into motherhood. Increased educational attainment delays partnership formation in part because of increased search time (Van Bavel 2013), need for households to pool resources from both sexes (Oppenheimer 1994), and the increased participation of men in household labour (Esping-Andersen & Billari 2015). Additionally, a new branch of partnership literature has emerged showing the progression of studies from traditional ideas of educational heterogamy to homogamy and hypogamy. Educational homogamy is associated with a lower average age at first marriage. And both homogamy and hypogamy are associated with lower fertility among highly educated women in comparison to couples with low female education, emphasizing the need to alleviate domestic burdens on highly educated women through better public services and gender-equity. An area of research which still requires more understanding is why educational differences in the timing of childbearing are very large in some countries such as the UK, but less in others such as France and Norway (Rendall *et al.* 2005). We return to this question in Section 6 where we examine the role of contextual factors in moderating the relationship between education and fertility.

The past decade has seen an increased availability of European longitudinal data used to understand life course trajectories in male childlessness (Kreyenfeld & Konietzka 2017). Generally, there is a strong and positive association between male educational attainment and family size, most commonly through a positive income effect (Burkimsher & Zeman 2017; Nisén et al. 2013; Trimarchi 2016; Trimarchi & Van Bavel 2017). Existing literature on the educational gradient of male fertility is sparse (Balbo et al. 2013). Demographic studies have also established a pro-cyclical relationship between male fertility postponement and male employment, across educational categories (Neels *et al.* 2013; Pailhe' & Solaz 2012; Schmitt 2012), wherein highly educated men increasingly delay first births due to a sense of economic insecurity during educational pursuit. This association is pronounced for young men with low

education who are particularly vulnerable to economic shocks, and typically more pronounced in countries that adhere to male breadwinning gender norms (Kreyenfeld & Andersson 2014)

4.1.1. EDUCATIONAL ATTAINMENT AND FERTILITY QUANTUM

4.1.1.1. *FIRST BIRTHS AND CHILDLINESS*

Recent literature has widely observed a positive relationship between educational attainment and ultimate childlessness (Cygan-Rehm & Maeder 2013; Guzzo & Hayford 2020; Kalwij 2010; Requena & Salazar 2014; Wood et al. 2014). Postponement for higher educational attainment not only influences fertility timing but is also associated with childlessness and is negatively linked to the realization of fertility intentions (Berrington & Pattaro 2014; Morgan & Rackin 2010). As well as biological age limitations to having a child in later years, prolonged postponement is associated with increased chances of sterility and subfecundity (Te Velde et al. 2012).

Declines in fertility rates during the last decades of the 20th century in Europe were associated with persistent educational differences in childlessness (Wood et al. 2014). In some countries, such as Norway and Belgium, the educational gradient remained fairly constant across cohorts born 1940-1961, whereas in others such as Spain, the Netherlands, and UK, the educational gradient strengthened over time (Wood et al. 2014). Women with high education on average had 0.8 fewer children than those with low education levels, in a study of births during 2007-2017 (Requena 2021). Among the 1958 British cohort, one quarter of women with a university degree remained childless compared to 12 percent of those without any qualifications (Berrington & Pattaro 2014). Over 20 percent of highly educated women forgo having children in Switzerland (Sobotka et al. 2011), whilst every additional year of education increases the odds of childlessness by at least two percentage points and decreases births by more than 0.1 children for women in Germany (Cygan-Rehm & Maeder 2013). These educational differentials are usually explained by difficulties for highly educated women combining motherhood with a career, i.e. higher motherhood penalties, especially in German-speaking countries characterised by the persistence of traditional gender roles and a conservative welfare regime (Hanappi et al. 2017; Gangl & Ziefle 2009).

Over the past decade, however, evidence suggests that educational differentials in childlessness may be narrowing (Beaujouan et al. 2016; Jalovaara et al. 2019). For the Nordic countries, it seems that this convergence is not so much due to reductions in the proportion of the childless among the highly-educated but due to higher decline in cohort total fertility for the low-educated women in Denmark and stabilization in Sweden and Norway (Jalovaara et al. 2019). The fertility gaps between the medium and highly educated people have reduced to a great extent for the youngest female cohort.

Postponement should have less impact on the completed fertility of men compared with women, due to men's longer reproductive windows. Despite this, childlessness ranges from 20-25% among educated men in Austria, Germany, Bulgaria, Netherlands, UK, and Nordic countries (Chudnovskaya 2019; Jalovaara et al. 2017; Miettinen et al. 2015) calling for further investigation into the underlying reasons, especially as educational levels continue to rise (Berrington & Pattaro 2014; Jalovaara et al. 2017; Keizer 2009). Union differences explain some of the educational differences in male childlessness. While in some countries more educated men face difficulty in finding a matching partner (Berrington 2017; Miettinen 2010; Miettinen et al. 2015; Trimarchi & Van Bavel 2017), in France, less-educated men find it difficult to partner and are more likely to be childless (Kreyenfeld & Konietzka 2017). Beyond the marriage squeeze effects for low educated men, there are relevant unobserved effects. Socioeconomic resources have a greater influence on fatherhood, even more than educational prestige, defined as higher degree attainment and attainment of the degree from reputed universities (Chudnovskaya 2019). Work-family conflicts that lead to increased childlessness among highly educated women do not influence male childlessness.

In addition, recent investigations present abundant evidence that educational differences impact fertility outcomes through partnership choices (Perelli-Harris et al. 2010; Perelli-Harris & Gerber 2011; Van Winkle 2018; Vitali et al. 2015; Wright 2019). For example, there are lower chances of first births within cohabitation than for those who directly marry (Mikolai et al. 2018), and this is particularly evident for highly-educated cohabiting couples relative to those with low education in Europe and the US (Perelli-Harris et al. 2010). These effects are not uniform across Europe underlining the relevance of contextual analysis while studying partnerships and fertility, and although there is a negative association between education and first births in the UK and Netherlands, they find a positive gradient in Norway, Romania, Russia, Sweden, and the Czech Republic, and a curvilinear relationship in Italy. Further delving

into variations in marital status, divorced highly educated women have a higher likelihood of a birth in Belgium compared to low-educated women, while there are hardly any educational differences for men in Flanders (Vanassche et al. 2015).

4.1.1.2. *SECOND BIRTHS*

Regional differences persist in the relationships between education and second births across Europe. For instance, Southern European countries evidence a negative educational gradient for transitions to second births, but in Nordic countries, highly educated women who delay motherhood are able to catch up with second births (Klesment et al. 2014). Further, using discrete-time event history models, Klesment and colleagues (2014) find a positive effect of female education on transitions to second births. But more recent research has evidence to show that educational differences in parity progression may be narrowing with a convergence of fertility across educational levels towards the two-child family ideal (Beaujouan 2020; Le Moglie et al. 2019; Sobotka & Beaujouan 2014). For example, Van Bavel and colleagues (2018) studying fertility in 14 European countries and the US, observe a flattening educational gradient in fertility quantum. Reher and Requena (2019) observe an increasing convergence in fertility outcomes between women with low education and medium education in Spain. These patterns differ by parities across educational levels, that is, for Swedish and Finnish cohorts born in 1940-1973/78, Jalovaara et al. (2021) finds that highly educated men and women are more likely to have two children while for the low and medium educated, she notes a rise in both childlessness and higher-order births.

Further, educational differences are complicated by the usage of hazard models conflating both timing and quantum. Event history analyses often show higher second birth rates for highly educated women (Klesment et al. 2014; Wood et al. 2014). Also, higher rates of second birth among more educated women might be a result of a “time squeeze” effect and may not necessarily indicate higher completed fertility. Literature suggests two reasons for such time-squeeze effects. Firstly, since highly educated women delay their entry into motherhood, they proceed to subsequent births with shorter intervals to avoid biological age constraints on fertility. Secondly, they are more likely to opt for shorter birth intervals to minimize the loss of wages, job market opportunities, and reduce the time spent away from work in childcare (Cigno & Ermish, 1989).

4.1.1.3. *HIGHER ORDER BIRTHS*

In more recent times, with the onset of extremely late first births, second and subsequent births are likely to be foregone (Beaujouan 2020). Central and Eastern European (CEE) countries show negative educational gradients for the likelihood of third births, despite strong pronatalist policies. However, educational patterns of the likelihood of third births are also context-dependent (Wood et al. 2014), and Norway, France, and Belgium display a U-shaped relationship between educational attainment and the likelihood of a third birth, possibly due to their supportive family policies (for women with high education) and income protection (for women with low education). One possible driver of higher-order births that is often overlooked is the desire to have a certain sex composition among children (i.e. children of each sex). Highly educated couples with a child of either sex are the least likely to have additional births in certain demographic groups (Sandström & Vikström 2015; Hank & Kohler 2000). Observations like these necessitate the study of births by parity, and separately from completed fertility, as the birth spacing and timing decisions, particularly higher-order births, are conditional on the previous births or upbringing experiences and childrens' characteristics (such as gender in the case presented above).

Further, while interpreting the associations between education and higher-order births, one needs to account for selection bias. For instance, Kravdal (1992) shows a positive relationship between education and progression to third births, possibly because higher education is associated with better financial circumstances, enabling individuals to have a larger family. However, it is also possible that the odds of having a third birth are higher due to selection and unobservable characteristics (Kravdal 2001) such as wealth or simply better health that can be linked to gaining a good education, financial stability, and the decision to have more children, to just state some of the difficulties in unmasking the mechanisms that govern higher-order fertility decision-making.

Another reason noted for a decline in higher-order births is the unmet 'fertility gap' between intended and actual number of children, which is highest among the most educated women (Beaujouan & Berghammer 2019). The fertility gap is stronger for women with high educational attainment in high-income countries who do not desire fewer children than those with low education, but who nonetheless generally end up having fewer children on average

(Berrington & Pattaro 2014; Testa 2014). These associations differ by the country's policies, their economic circumstances, and socio-cultural perspectives which we will explore ahead.

5. CONTEXTUAL MODERATORS OF EDUCATIONAL DIFFERENCES IN FERTILITY

Recent fertility research highlights the importance of macro-level contextual factors on the association between education and fertility. We categorize the contextual moderators of educational differences in fertility within and across the groups into three: family welfare policies, changing gender norms, and macroeconomic moderators such as economic recessions and uncertainty.

5.1. FAMILY WELFARE POLICIES AND GENDER EQUITY

The influence of family policies on fertility has been studied over the last decades of the twentieth century (Hoem 1990; Andersson 1999; Gauthier & Hatzius, 1997). Existing research established that education could moderate the influence of family policies on fertility through individuals' ties to the labour market and included variables for educational attainment in their models. However, they seldom delved deeply into educational differences in fertility in response to policies. Studies from the last decade have examined whether and to what extent welfare policies can have an impact on the affordability of children by increasing household income; supporting the paid work of parents, thus reducing the opportunity costs of having a child; and influencing the gendered labour divisions across educational groups. For instance, in Nordic countries and France where there are policies that promote work-family balance among mothers, fertility is generally higher and educational differences smaller, while fertility is lower in countries with weak institutional and family-friendly policy support (McDonald 2013).

These family-friendly policies are categorized by Neyer (2003) into three groups: (a) childcare services and education for children that is available and affordable; (b) tax benefits and financial transfers that incentivize having and raising children; (c) better workplace policies, such as paid family leaves, accommodating workspaces, and flexible working hours. Recent research has focused mostly on (a) and (c) and further shown that inadvertent policy modifications may influence education and fertility, such as policies targeted towards labour markets, housing, and education with the potential to influence fertility timing (Rindfuss &

Brauner-Otto 2008). The implementation of policies varies by welfare state: while liberal economies largely targeted fertility through market-based systems via fiscal policies and financial benefits, social democratic economies used taxes to finance the provision of formal services (McDonald & Moyle 2010).

Though family policies influenced fertility choices across educational levels, research in recent years indicates policies are especially relevant for highly educated women who have stronger ties to the labour markets. However, the evidence from comparative studies investigating the relationship between female educational expansion and completed fertility at the macro-level in Europe suggests that there are no universal effects even in similar regimes, and that the influence of policies is neither uniform across countries, nor across birth parities. Findings for the Mediterranean countries (Spain, Cyprus, Portugal) which are characterized by poor availability of public childcare facilities and strong adherence to traditional gender roles, align with theories on the “substitution effects” and note a negative educational gradient associated with the number of children (Berrington et al. 2015).

This relationship weakens in social democratic welfare states, including the Nordic and Post-Soviet economies (Russia, Ukraine, Estonia, Latvia) (Merz & Liefbroer 2018). Post-Communist economies (Bulgaria, Hungary, Poland, Romania, Slovakia, Slovenia) are exceptional, and unlike the Post-Soviet countries, show a negative association between education and fertility (Muresan & Hoem 2010; Brzozowskab 2015; Merz & Liefbroer 2018). In contrast, Merz & Liefbroer (2018) find little differences in the completed fertility of highly educated individuals in Nordic countries when compared to those with low education. Brzozowskab (2015) studying Eastern European countries, observed a convergence in fertility by educational levels in the Czech Republic, Slovakia, and Slovenia, stable trends in Poland and Hungary, and persistent disparities in Romania. She notes that while fertility continued to increase for those living in countries with strong family policies, the increase is possibly offset by growing educational attainment. She also observed that persistent differences in education, access to modern contraception, and lifestyle variations could have all contributed to the sustained disparities in Romania. Between the years 1989 and 2012, Brzozowskaa (2015) finds that Poland’s gross enrolment for tertiary education rose from 20% to 73% during the period of economic transition. But, despite the regime changes, the fertility of highly educated women remained lower than those with low education. Even in the Nordic context, researchers note that similar welfare state regimes can produce different fertility outcomes, particularly for

second births, when comparing Denmark and Norway and that there is a need to integrate individual analysis with contextual information.

Specifically, though the US has higher fertility than Europe, it is driven by teenage fertility and unintended pregnancies among low educated groups, while in contrast, family policies and gender equality drive higher fertility in France (Berrington & Pattaro 2014; Hoem 2008). While the fertility levels might be similar, they have varied implications by individual characteristics. In a cross-national study, Rendall et al. (2010) found that age at first motherhood was more heterogeneous in the UK than in other European countries. They showed that over time, the likelihood of teenage motherhood was unchanged among low-educated women in the UK and Spain and Italy, whereas it decreased in Norway and France. Moreover, a higher proportion of highly educated women in Norway and France enter motherhood before age 35 as compared to the UK and Southern European countries. One possible explanation relates to the role of welfare contexts in supporting young mothers. Some countries demand previous employment experience before welfare support for mothers becomes available, encouraging a delay to childbearing among the least educated, whereas in other countries such as the UK this is not the case (Rendall et al. 2010).

Low education is, however, associated with reduced childbearing intentions across 10 countries in Europe, maybe due to economic insecurity, and shows that strong family-friendly policies reduce the perceived costs of entry into motherhood (Fahlén 2013). In Southern European countries, where the availability of formal childcare is limited, individuals rely on grandparental support for their children (Aassve et al. 2012). While informal care is a flexible form of childcare from a trustworthy source, there are inequalities in its access, making it an efficient safety net only for those who can access it rather than as a replacement for formal childcare for families (Kaptijn et al. 2010; Thomese & Liefbroer 2013).

For instance, recent changes to the institutional facilities and improved availability of formal childcare in Germany are associated with reduced costs of childbearing, and fertility increase among the highly educated (Neels & de Wachter 2010; Riphahn & Wijnck 2017; Cornelissen et al. 2018). These align with the findings from Neels and de Wachter (2010) who note a positive association between educational attainment and fertility with institutional reforms for formal childcare access in Belgium. More generous childcare leaves of up to 1 year and monetary benefits for parents (Dearing 2016) coupled with increased workplace and office

hours flexibility (Beaujouan & Berghammer 2019) have been shown to reduce the opportunity costs of employment and economic uncertainties on childbearing for women. Similarly, a comparative study of Polish and Italian women showed that the former enjoy more generous paid childcare leaves and can afford to stay away from the labour market longer, thus experiencing lower opportunity costs of fertility (Matysiak & Vignoli 2013). And among Italian women, those who postponed or deferred employment on the completion of their education enter motherhood faster and were more likely to pursue a second birth than those who pursued employment.

Klesment and Puur (2010) find a positive relationship between female education and second births in Northern and Western Europe with small differences, and a negative relationship in CEE countries, except for Estonia, where it is positive possibly due to a well-developed institutional framework that reduces the costs of childbearing on women. But they also add that this relationship is not positive among German-speaking countries both due to differences in gender equity and employment policies. Though there are arguments against leveraging public policies to increase fertility outcomes in the long run (Demeny 2003; Gauthier 2007), research increasingly suggests that accommodating family and welfare policies coupled with a commitment to gender-egalitarian policymaking helps meet fertility targets of policy makers and individuals (Adserà 2011; Beaujouan & Berghammer 2019; Esping-Andersen 2018; Luci-Greulich & Thévenon 2013; Ní Bhrolcháin & Beaujouan 2012; OECD 2011). For instance, it has been observed that cash transfers are positively connected to fertility, especially in the case of highly educated women in Western societies with persistent work-family conflict (Luci-Greulich & Thévenon, 2013). However, while studies agree that family policies influence the postponement and timing of births for individuals, they are still mixed on their influence on the quantum of fertility.

Recent literature argues that policy effectiveness largely depends on the compatibility of family policies with the social and cultural norms of a region. For instance, despite the shortage of early childcare facilities, the cultural and gender norms in Turkey prevent mothers from utilizing childcare when they do become available. Women stay out of the labour force to focus on home care and this is identified as one of the reasons for the strong negative educational gradient in fertility for career-oriented women (Abbasoğlu Özgören et al. 2018). These findings highlight the need for gender reforms along with structural transformation to improve the effectiveness of welfare policies. Furthermore, different educational groups may react

differently to policies that aim to promote gender equality. Highly educated individuals respond more to such policies and their gender equal belief systems are then adopted by those with lower educational attainment, partly explaining the fertility convergence recently observed across educational levels (Baizan et al. 2016; Esping-Andersen 2018).

Researchers argue that well-structured childcare facilities along with short-term leaves and workspace flexibility can increase fertility (Beaujouan & Berghammer 2019). However, one needs to be cautious while interpreting the findings due to the interplay between family policies, gender contexts, education, and fertility. There are methodological difficulties in isolating the impact of a single policy and its timing on fertility timing or quantum. Multiple policies may have been passed around the same time, especially in the context of studying pro-natalist and welfare-oriented countries, which makes identifying the impact of any one policy challenging. Models may capture lagged effects of earlier policies and over report the influence or underestimate the policy effects if there are long lags in the time taken for a policy to impact people. Researchers further face the problem of reverse causality, that is, policies themselves may be a reaction to fertility levels instead of shifts in the fertility timing or quantum. For instance, while one may argue that the availability of easily accessible childcare support in a region can influence fertility behaviour for an educational group, it is possible that childcare is more available in regions with high fertility levels (Hoem 2008).

5.2. EDUCATION, FERTILITY AND GENDER EQUITY

Demographic research traditionally explained the decline of fertility by focusing on the opportunity costs of motherhood. Higher education results in an increase in the labour force participation and earning potential of women, driving the opportunity costs of marriage and motherhood higher, leading to a higher risk of income or wage penalty (Becker 1981; Cigno & Ermisch 1989; Happel *et al.* 1984; Joshi 1990; Kravdal 1992). However, this strand of literature assumes females are the primary caregivers and must choose between their wages or caring for their children. Hakim (2003) divides women into three categories based on their preference to focus on work, family life, and the balance between them both. However, though highly educated women have a relatively higher preference for working, they do not desire fewer children. Consequentially, we conclude by noting that women respond to structural gender inequality with low fertility or childlessness (McDonald, 2013).

Traditionally, male fertility has been accepted to have a positive relationship with education, where the least educated have the lowest fertility and display high postponement of entry into parenthood, mainly because more educated men are more likely to partner (Jalovaara & Fasang 2015; Trimarchi & Van Bavel 2017). For women, the combination of being able to work while pursuing a family life led to a gender revolution (Goldscheider *et al.* 2015), and the past few decades have seen more complexity in how gender affects the education and fertility relationship. Instead of placing the dual burden of work and care-taking on women, contemporary research indicates that more egalitarian gender relations may increase fertility levels (Esping-Anderson & Billari 2015; Goldscheider *et al.* 2015; Jalovaara *et al.* 2019; Neyer *et al.* 2013; Nitsche *et al.* 2018). While highly educated fathers are contributing more to household labour and childcare, spearheading a fertility increase within some-low fertility settings (Sullivan *et al.* 2014), the need for men to share these duties may also lead to increased pressure on them (Huinink & Kohli 2014; McDonald 2000) and may be a contributing factor for high childlessness among highly educated men (Jalovaara & Fasang 2017). There is little research that considers the education of both partners simultaneously, and there is a need for further exploration into the mechanisms that drive their results.

Recently, there is no longer a negative association between female education and total fertility in Nordic countries such as Denmark, Norway, and Sweden, with the exception of Finland. Female childlessness has increased among the least educated and remained stable for the remaining population (Jalovaara 2019). Further to this, Bagavos & Tragaki (2017) find that the Greek fertility decline during 2000-2014 can largely be attributed to reduced employability among men following the economic crisis in Greece. While employment is positively associated with fertility among medium and highly educated women, this differs from the experiences of women with poor education. They attribute the divergence in these findings to the gender expectations in Greece where a job is seen as an option for women and those with better socioeconomic resources can choose not to work, but men are the primary breadwinners. Abbasoğlu Özgören *et al.* (2018) find similar gender roles in Turkey during the economic recessions in 1994, 2001, and 2008-09. Though women tend to enter the labour market as their husbands lose employment, these changes are only temporary.

5.3. ECONOMIC RECESSIONS AND UNEMPLOYMENT

Fertility is a sensitive indicator of macroeconomic shocks, to the extent that in some countries fertility decline precedes and is possibly predictive of recessions (Buckles *et al.* 2021). Fertility is also expected to decline after economic downturns due to the income effect, as some researchers note, following the 2008 recession (Ananat *et al.* 2013; Cherlin *et al.* 2013; Currie & Schwandt 2014; Schneider 2015; Schneider & Gemmil 2016). Since this recession, fertility research has widely explored the effect of macroeconomic contexts on childbearing trends, with education as an explanatory variable as it directly impacts the labour market potential of an individual and has implications on their income and expected earnings (Matysiak *et al.* 2020; Sobotka *et al.* 2011). However, the association between economic shocks, education, and fertility seems to vary significantly by individual's level of educational and gender, driven by the differences in costs levied on each stratum and the expectation of future uncertainties.

Researchers identify several reasons for childlessness and fertility postponement in the wake of recessions among the low educated: youth unemployment (Goldstein *et al.* 2013), economic insecurity (Berrington & Pattaro 2014), the difficulty of finding a partner (Sabater *et al.* 2019), diminished ability to purchase a house (Xu *et al.* 2015), uncertainties stemming from temporary or short-term employment contracts (Adserà 2011), and debts from student loans (Min & Taylor 2018). Also, it can be noted that unemployment is more prevalent and experienced for longer spells among low educated women relative to the highly educated (Hoynes *et al.* 2012; Sobotka *et al.* 2011). During recessions, unemployed women with low educational attainment face a higher risk of losing a job, dropping out, and joining the “motherhood track” earlier than those with higher education (Kreyenfeld 2010; Neels *et al.* 2013; Schmitt 2012). Also, Schneider (2017) reasons that during the Great Recession, women with low educational attainment had a lower likelihood of contraceptive use, compared to those with higher education and those enrolled in school had a higher likelihood of using contraception, further emphasizing the educational differences in how recession influences fertility.

Also, highly educated women tend to withdraw from jobs for at least a short period to have children, which could increase the opportunity costs of having children during times of economic uncertainty (Adserà 2011; Levy *et al.* 2006). Job loss or the possibility of it may also create financial uncertainties for more educated women, causing them to have fewer children (Adserà 2011; Comolli 2017; Schneider and Hastings 2015) or postpone childbearing to later ages (Lundström & Andersson 2012; Matysiak & Vignoli 2010; Pailhé & Solaz 2012; Seltzer

2019). To name a few countries, research shows that in Denmark, Hungary, and Sweden, countries characterized by strong family policies, both the low educated and unemployed women postpone childbirth in response to economic shocks until they have a job (Fahlen 2013).

The implications of unemployment for fertility also depend on life course stage, such as the age and parity of an individual. Prior to the introduction of family-friendly policy reforms in Germany, economic shocks decreased the likelihood of second and higher-order births for older and highly educated mothers while young, educated women entered the “motherhood track” (Kreyenfeld 2010). However, Adserà (2011) argues that economic instabilities have stronger adverse impact on the labour markets for women with lower than secondary education when compared to those with higher education and that this variation might be the cause of the strong negative association between second births and economic shocks in Europe. Studying fertility by age and parity in 31 European countries, Comolli (2017) notes that women with medium level education had a strong negative fertility response to the Great Recession. Recessions reduce first births among those below 30 years of age (Neels *et al.* 2013) and are associated with an increase in childlessness for women in their late thirties (Comolli & Bernardi 2015).

This occurs not only due to labour market shocks from the recession but is also transmitted through prevailing economic and financial insecurities in the market (Comolli 2017). There is a reduction in both planned and unplanned pregnancies among young women with low education, particularly unmarried women during economic downturns in some countries (Su 2019; Schneider & Hastings 2015), and partnership contexts further change this relationship. For example, in Finland, Germany, Netherlands, Poland, and the UK, fertility is strongly associated with unemployment for women with employed partners, although unemployment itself is linked negatively with finding a partner for low-educated women employed in unstable jobs (Fahlen 2013; Sabater *et al.* 2019). It must be noted that informal care or institutional and support can influence the time spent away from work, and on childbearing for women. Using German panel data, Billari *et al.* (2019) observe that for highly educated women between the ages of 25-35, broadband connectivity is positively related to fertility, as it helps women balance family and career better due to improved access to working from home. Thus, upcoming research may explore the association between recessions and work-related constraints, influencing the realization of fertility intentions, with resources such as broadband connectivity and remote jobs enabling more flexible working arrangements.

6. DISCUSSION

This paper is motivated by the dramatic expansion in educational enrolment and attainment and the fertility fluctuations observed in Europe over the last few decades, along with the onset of key societal changes, such as the gender revolution and economic recessions. While a plethora of literature investigated the connection between education and fertility in different European countries, there is a need to consolidate their major findings to indicate the direction of these associations and examine patterns that have evolved in the past decade. We categorize education into measures of educational enrolment and attainment to examine them by parity and note that apart from the direct association between an individual's education and fertility, contextual changes have played a key role in influencing the association between education and childbearing in recent years. We identify the advancements to be linked with family-friendly work policies and welfare regimes, changes in labour market opportunities due to economic shocks, second demographic transition, and the gender revolution.

Recent work attempted to causally link maternal educational enrolment and the postponement of births in Europe utilizing changes in schooling policies in countries and twin births. Nevertheless, there is persistence of methodological biases stemming from unobserved characteristics such as the family background and environment that remain unaddressed. Although there has been noteworthy progress in understanding the association between fertility and fields of study, types of enrolment, and dual-status positions; this strand of work focused on the timing of entry to motherhood and seldom studied the quantum effects of enrolment on fertility, particularly for higher-order births. There is also a research gap in understanding the association between enrolment and childbearing in the context of men and couples.

While the timing effects of higher educational attainment on fertility is negative, the quantum effects are not uniform. Studies using educational levels observe an increasing postponement of motherhood to later ages for the highly educated women driven by either the actual or perceived costs of education on childbearing among other reasons discussed in sections 3 and 6, and these costs are moderated by contextual factors. The educational gaps within and across the groups converged or diverged, depending on country's context. Latest work also contributed by adding novel research on couples and men. Most of the research indicates a positive educational gradient for entry to fatherhood, and a procyclical attachment of male fertility and education to labour markets, particularly in Nordic countries and Southern Europe

(Neels et al. 2013; Pailhe´ & Solaz 2012; Schmitt 2012). Conversely, there are increasing numbers of highly educated males who opt for childlessness that researchers in the last decade have tried, to an extent, to attribute to lack of partner (Berrington 2017; Kreyenfeld & Konietzka 2017; Miettinen 2010; Trimarchi & Van Bavel 2017). A remaining key gap in this research is the association between education and male fertility for higher-order births, not limited to childlessness.

Studies provided evidence that family policies such as childcare provisions (Beaujouan & Berghammer 2019), paid family leaves, and monetary transfers have a positive influence on fertility for highly educated working parents (Luci-Greulich & Thévenon 2013). Although Nordic countries with higher educational attainment among women are characterized by family-friendly policies, liberal views, and reduced fertility costs for educated women, there are nevertheless widening disparities in fertility outcomes across educational levels. Countries classified by their weak family welfare policies and traditional gender roles such as Southern European countries, and Turkey, have failed to support educated women to realize their fertility goals (Merz & Liefbroer 2018). Considering the Great Recession of 2008, a large body of literature studies the resulting income shocks and heterogeneity in each country's response to the economic shock and observes that generous childcare, leave, and family policies are directly needed by low educated people who are the most affected, to enable them to afford to have children. Most of the recent work continues to be focused on the micro-level, delving more into individual choices over macroeconomic frameworks, due to data considerations, with insufficient empirical information for researchers to work on categorical educational differences.

The association between childbearing and education is thus strongly linked with labour market opportunities, and family-friendly work policies and welfare regimes moderate this association. Several studies continue to establish the prevalence of work-family conflicts in female fertility decision making and add that gender-egalitarian family-supportive policies can reduce opportunity costs of having children, enabling highly educated women to have higher fertility in Nordic countries and France (McDonald 2013). Overall, highly educated women face the largest conflict between family and work, and this burden can be reduced with supportive family welfare policies. Concurrently, McDonald (2013) has stated the need for institutional and family support to promote gender equity and reduce women's costs of career progression in the realization of their fertility goals. Further, liberal attitudes empower educated women to

make decisions associated with household labour and fertility, and higher education enables them to question traditional roles (McDonald 2000, 2006).

SDT and movement towards self-actualizing value systems in rejection of traditional ones are all linked to higher educational attainment and to the postponement of births (Kreyenfeld et al. 2012; Neels & De Wachter 2010; Ní Bhrolcháin and Beaujouan 2012). The erosion of traditional gender norms has increased the opportunities for reconciling work and childbearing for couples. Men contribute more to household labour and subsequently, changing attitudes toward gender roles are linked to the better formation of family support mechanisms that can help highly educated men and women in reaching their fertility targets. This review paper potentially understudies highly educated individuals who are likely to choose parenting at later ages, as demographic literature on education and fertility overlooks the association between education and the usage of assisted reproductive technology (ART), and adoption. Further, due to the length constraints, this study does not cover research on migration, regional effects, and housing policies and refrains from delving deeply into fertility intentions.

A few major questions that still need to be answered by recent research include how the costs of education in different European countries influence fertility, particularly, for young adults who receive student financial aid or are enrolled in free education in comparison to those who do not. There are differences between the countries (e.g. the UK vs the continent) and within the countries (state funded students vs fee paying students). Further, while there is a rich literature on educational attainment, there is limited research studying the educational attainments of partners simultaneously. There is also a noteworthy gap in literature studying the association between education and the fertility timing of higher-order births, especially as a large section only investigates the entry to parenthood in discussions on fertility timing. Considering the recent pandemic, future research has a multitude of novel questions to explore about fertility and education that interplay with contextual moderators, such as the effect of the wide-spread usage of new forms of ODE enrolment, flexibility in the workspace and work hours, and limited availability of childcare.

While the last decade of research on the association between unemployment and fertility largely focused on responses to the recession of 2008 and the role of labour markets in explaining fertility differences across educational groups, a possible direction for future research is to understand the relationship between pandemic related job loss and fertility, the

duration of the impact, and if there are short-term or long-term influences of recessions on fertility timing and quantum (see Berrington *et al.* 2021). This is particularly crucial in understanding childbearing behaviour of low-educated young individuals who are highly vulnerable to economic shocks across Europe, including the Nordic countries despite their strong family policies. However, the most essential caveat in understanding the association between education and fertility in the recent decade remains the need for revised (or even new) theoretical frameworks to interpret the emerging empirical works in changing socio-economic contexts.

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ISSN 2042-4116