

RESEARCH ARTICLE

Is precarious union formation making it more difficult for women with low educational attainment to enter parenthood?

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ABSTRACT Women’s educational attainment has usually been associated with higher childlessness, but the negative educational gradient in fertility seems to have shifted in some countries. One reason for this finding could be the increasing marginalisation of lower educated women in the partnering market. We investigate whether women with lower educational qualifications are less likely to have a first child due to changes in the educational gradient in union formation. We apply logistic regressions to recent European Social Survey data from 28 countries, grouped into four regions, that include women born between 1955 and 1985. For western, southern and eastern Europe, we find a negative association between education and fertility, which narrows at older ages in the western region. The association is positive but insignificant in the Nordic region. We also find an emerging positive educational gradient in union formation for western and southern Europe that partly mediates the association between education and fertility.

KEYWORDS Fertility • Childlessness • Parenthood • Union formation • Educational gradient in fertility • Europe

Introduction

In the past, the decline of fertility below the replacement level was, to a large extent, explained by the increasing participation of women in higher education and the labour market (Mills et al., 2011; Neels et al., 2017). In recent cohorts, however, the negative educational gradient – higher education associated with lower fertility – seems to have shifted. In the Nordic countries, childlessness is now highest among the least educated women (Jalovaara et al., 2019). In France, higher educated women tend to catch up on fertility, while lower educated women more often remain childless (Compans, 2021). In the UK, women with education below the degree level have experienced a larger fertility decline than women with more education (Ermisch, 2021). Recent findings for Germany, Spain and the US indicate that the negative educational gradient in fertility has been weakening in recent cohorts (Kreyenfeld and Konietzka, 2017; Reher and Requena, 2019; Rybińska, 2020).

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There are several potential explanations for the more recent developments that run counter to the older, negative educational gradient. Partnerships, which are still considered a prerequisite for having children, might become less frequent or stable among lower educated women – especially in contexts of high female labour force participation and earnings (Jalovaara, 2012; Jalovaara and Andersson, 2023; Sturm and Van Bavel, 2024). Similar patterns have already been observed for men: across Europe, a higher likelihood of remaining single has been found for low educated men (De Hauw et al., 2017), which contributes to lower transition rates to parenthood across several European countries (Trimarchi and Van Bavel, 2017).

In high-income countries, the reconciliation of employment and childbearing may have become more feasible, particularly for women with higher earnings, who can more easily outsource childcare and domestic work. In contrast, women with lower education and less stable or no employment might not benefit from these changes to the same extent (Bergsvik et al., 2021; Wood et al., 2020). Given that barriers to realising fertility intentions, such as economic uncertainty, disproportionately affect vulnerable groups, it is crucial to examine how the dynamics of union formation and fertility differ by educational attainment.

While recent empirical findings support a weakening of the educational gradient in several European countries (Compans, 2021; Ermisch, 2021; Jalovaara et al., 2019; Reher and Requena, 2019), the mechanisms behind this change – such as differences in the likelihood of entering a (stable) partnership – are not yet analysed in detail. Furthermore, while recent studies find that higher own and parental socioeconomic status are related to later transitions to union formation and childbearing (Badolato et al., 2024; Ferraretto and Vitali, 2024), changes in these associations across cohorts are not taken into account. Additionally, focusing on the timing rather than the probability of giving birth can be problematic if the same factors that delay cohabitation and parenthood (e.g. education) also increase the probability of eventually experiencing these events (Kreyenfeld et al., 2023). In this study, we therefore analyse how women’s likelihood of transitioning to parenthood by age 35 and age 40 – given that first births seldom occur at higher ages – is related to educational attainment, and whether this association has changed across cohorts. Additionally, we analyse to what extent any observed changes can be attributed to shifts in the educational gradient in union formation. Specifically, we answer the following research question: *Has the likelihood of entering parenthood changed for lower educated women compared to higher educated women across cohorts? To what extent can this be explained by changes in the educational gradient in union formation?*

We apply logistic regression analysis to retrospective microdata from rounds 3 and 9 of the European Social Survey (ESS), with fieldwork conducted between 2006–2007 and 2018–2020, respectively. These rounds include the “Timing of Life” module with information on the timing of key life events, such as age at first cohabitation and age at first birth. We include women from 28 European countries from cohorts born between 1955 and 1985.

This paper makes four main contributions to the literature. First, by examining the interaction between cohort and education, we assess how the relationship between educational attainment and parenthood has changed across cohorts. Second, we explore to what extent these changes are driven by shifts in the educational gradient in cohabitation, highlighting

the role of partnerships as a mediating mechanism. Third, we broaden the scope beyond single-country studies by including a wide range of European countries. Finally, while previous studies found a positive educational gradient in fertility for men ([Trimarchi and Van Bavel, 2017](#)), we add to the empirical evidence on shifts in the educational gradient in fertility for women.

Background

The relation between education and fertility is complex and depends on the type of outcome considered ([Vasireddy et al., 2023](#)). Educational attainment can affect both the timing and the likelihood of giving birth, and disentangling the two can be difficult. On the one hand, higher socioeconomic status is usually associated with postponement of parenthood and union formation ([Brons et al., 2017](#); [Ferraretto and Vitali, 2024](#)). On the other hand, it has also been associated with the recuperation of fertility at higher ages ([Compans, 2021](#); [Ermisch, 2024](#); [Musni and Schnor, 2025](#)). Higher education and socioeconomic status may therefore be associated with the postponement of the transition to parenthood and, at the same time, with a higher likelihood of this transition eventually happening. In this research, we focus on lower educated women, examining the factors that may contribute to lower first birth rates among this increasingly marginalised group over time. To this end, we measure women's likelihood of ever entering parenthood by age 35. This cut-off age gives us the opportunity to examine the educational gradient in first births for newly studied cohorts of women, i.e. women born up to 1985, comparing them with the oldest cohort. Nevertheless, as we are aware that first births after age 35 are increasingly common, we also examine the educational gradient in first births using a cut-off age of 40 years old. We then compare the results obtained using the two different cut-offs, which gives us an indication of the potential role of first births at advanced ages when examining educational differentials over time.

First, we discuss why a negative educational gradient in fertility has been found in previous cohorts and persists in many countries (The educational gradient in fertility). Second, we discuss why shifts to a positive educational gradient in fertility are visible in recent cohorts, and how this might be related to changes in the educational gradient in union formation (Shifts to a positive educational gradient in fertility: The role of partnerships). Third, we present empirical evidence of shifts to a positive educational gradient in fertility by region (Earlier empirical evidence and regional differences).

The educational gradient in fertility

Different theoretical perspectives can explain why a continuously negative relation between educational level and fertility would be observable in most low-fertility contexts. First, longer enrolment in education leads to the postponement of births ([Ní Bhrolcháin and Beaujouan, 2012](#)). This is connected to the notion that postponed births lead to lower completed fertility among women because they are nearing the so-called social age

deadlines (finding themselves too old to have children, given existing norms) and biological deadlines (not being able to have children) (Schmidt et al., 2012).

Second, a diffusion of more individualistic norms and gender equality through higher education has been cited as a reason why women's agency has increased while their fertility has declined (Basu, 2002). From a cultural perspective, educational attainment could be connected to less traditional attitudes and weaker interest in forming a family, as the rise in education is associated with the diffusion of individualisation and secularism (Lesthaeghe, 1983, 2014). Higher education and less traditional values are associated with more positive attitudes towards voluntary childlessness across European countries (Merz and Liefbroer, 2012), and perceived costs to individual autonomy are negatively related to parenthood (Liefbroer, 2005).

Third, following economic theories of the family, the investment in education leads to higher returns in terms of income and status. Perceived career costs have been shown to influence the timing of women's entry into parenthood (Liefbroer, 2005). Connected to this, another important emerging factor could be the growing number of women with higher education and the resulting lower number of desirable partners with similar or higher levels of education (Van Bavel, 2012). As women are now more likely to be the main breadwinner of their family than in the past (Klesment and Van Bavel, 2017), the opportunity costs of childbearing may have increased. Furthermore, given that highly educated women tend to prefer partners with a similar education level, and that there is no longer a sufficient supply of equally educated potential male partners – also referred to as the “mating squeeze” (Van Bavel, 2012) – it could be expected that women with advanced degrees are becoming more likely to remain single and childless (Van Bavel, 2012).

In summary, several mechanisms might explain a negative educational gradient in fertility. This is evidenced by previous empirical studies. For cohorts born between 1940 and 1961, Wood et al. (2014) showed that childlessness is most frequent among highly educated women in 14 low-fertility countries. A study of 25 European countries found a persistent, although gradually decreasing, negative educational gradient in completed fertility (Merz and Liefbroer, 2017).

Recent evidence, however, indicates that fertility is declining, especially among lower educated individuals. A positive educational gradient has been observed for men, with highly educated men having more children than less educated men, e.g. in Finland (Nisén et al., 2014), and lower educated men having a lower probability of selecting into partnerships, and consequently entering parenthood, across 10 European countries (Trimarchi and Van Bavel, 2017). While this has been a longstanding trend for men, higher levels of childlessness are also increasingly found among lower educated women, primarily in the Nordic region (Jalovaara et al., 2019).

Shifts to a positive educational gradient in fertility: The role of partnerships

As empirical evidence shows, being in a partnership continues to be considered a prerequisite for having children (Berrington, 2004; Harknett and Hartnett, 2014; Kapitány et al., 2012; Rybińska and Morgan, 2019). Single men and women are significantly more

likely to postpone childbirth and abandon childbearing plans in comparison to married and cohabiting respondents in the Netherlands, Switzerland, Hungary and Bulgaria (Kapitány et al., 2012). Furthermore, people who have never had a partner or are in several living apart together relationships during their life course are most likely to remain childless in Germany (Raab and Struffolino, 2020) and Finland (Jalovaara and Fasang, 2017; Saarela and Skirbekk, 2020).

There are reasons to expect that women's higher educational attainment and higher earning potential are increasingly becoming key factors in the partner choice process of men. In younger generations, women's enrolment in education now exceeds that of men in many countries (Van Bavel et al., 2018; Vincent-Lancrin, 2008). While educational expansion has led to higher overall levels of homogamy (both partners have higher education), the gender imbalance in higher education has contributed to a rise in hypogamy, i.e. the woman is more educated than the man (Katrňák and Manea, 2020; Leesch and Skopek, 2024). In other words, if the partners in a couple have differing levels of educational attainment, the woman is now more likely to have a higher degree than the man (De Hauw et al., 2017; Esteve et al., 2016; Grow and Van Bavel, 2015). Across the 1954–1980 cohorts and 27 European countries, Erát (2021) indeed found a positive correlation between the share of women in higher education and an increase in hypogamy. As the share of women with higher education increases, higher educated women are more likely to “partner down” while lower educated men are more likely to partner with higher educated women, possibly leading to the increased marginalisation of lower educated women in the partnering market.

Changes in the partnering market and preferences among men for having an equally or higher educated female partner can also be explained by women's increased earning potential and the diffusion of gender egalitarian norms. The labour market position of women compared to that of men has improved in recent years (Goldin, 2014), and the reversal of the gender gap in education is associated with women having higher earnings relative to men (Van Bavel and Klesment, 2017). Furthermore, the stability and security of typically male, blue-collar occupations have declined, leading to a rise in dual earner and female breadwinner households (Klesment and Van Bavel, 2017; Vitali and Arpino, 2016). Along with the increasing labour force participation of women, we see a diffusion of gender egalitarian norms, which are, in turn, associated with changing gender relationships in both the public and the private sphere (Goldschneider et al., 2015). Men holding more egalitarian gender role attitudes are, for example, more prone to sharing household chores (Sullivan et al., 2014) and more likely to enter a union with a higher educated female partner (Trimarchi, 2022). Measuring actual mate preferences over 25 years in the US, Boxer et al. (2015) found that both men and women place increasing value on a partner's financial prospects. While the traditional preference for a financially successful male partner might persist, research also shows that women increasingly value family orientation and communion in their male partners (Meeussen et al., 2019), indicating increasing gender convergence in partner preferences (Zentner and Eagly, 2015).

Finally, the opportunity costs of childrearing have decreased as women are given more opportunities to combine family and work life (Kalwij, 2010). This could benefit women with higher incomes in particular, as they are, for example, more likely to take advantage of

(higher quality) childcare (Van Lancker, 2018). Studies indeed suggest that some work–life reconciliation policies, such as those providing for parental leave and childcare services, are especially beneficial to women with higher, rather than lower, incomes (Bergsvik et al., 2021; Wood et al., 2020).

These developments imply that the earning potential of women is an increasingly important factor in the partnering market. In this study, we are interested in the overall likelihood of living with a partner versus remaining single until a certain age. Rather than analysing differences between marriage and cohabitation, which also vary by region (Hiekel et al., 2014), we therefore jointly consider both married and unmarried cohabitation. While differences in the educational gradients of marriage and cohabitation exist (Kalmijn, 2013; Perelli-Harris and Lyons-Amos, 2016), findings for more recent cohorts show an overall lower prevalence of unions among lower educated women, especially in more gender equal contexts (Hudde and Engelhardt, 2023; Jalovaara, 2012; Jalovaara and Andersson, 2023; Sandström and Karlsson, 2019; Sturm and Van Bavel, 2024).

In Finland, higher education has been shown to promote both marriage and cohabitation among women born between 1969 and 1981, with an even stronger positive effect of higher education and income being observed in the most recent cohort born between 1975 and 1981 (Jalovaara, 2012). From 1989 to 2020, the prevalence of unions between ages 18 and 49 declined across all educational groups in Finland, but especially for lower educated men and women (Jalovaara and Andersson, 2023). In line with these findings, lower educated women have been shown to be less likely to live with a partner in Sweden, the Netherlands and Estonia in the years 2002 to 2013 (Sandström and Karlsson, 2019). Increasing rates of living without a partner have also been found for lower educated women in Western Germany over the 1976–2019 period (Hudde and Engelhardt, 2023). Across the 1960–1985 cohorts, the likelihood of ever having cohabited (both married and unmarried) with a partner by ages 35 to 45 has decreased for lower educated women compared to higher educated women in the southern and western European regions (Sturm and Van Bavel, 2024). As partnerships continue to be a requirement for having children, a lower likelihood of having a (stable) partnership by a certain age may, in turn, make it more likely that women will postpone or forego parenthood.

In summary, we argue that the educational gradient in fertility may be shifting, as higher education and, consequently, higher earning potential improve women's chances of finding a stable partner in recent cohorts. Our argumentation is based on shifts in the share of women with higher education, assortative mating and changing preferences of men. Nevertheless, the link between education, fertility and couple formation remains complex. Unobserved factors such as certain personality traits and family orientation may influence the likelihood of both entering a stable partnership and having children (Baizán et al., 2003; Trimarchi and Van Bavel, 2017). In a context in which growing numbers of women are attaining higher education, lower educated women represent an increasingly selective group. Having children earlier might limit their opportunities to pursue higher education (Johansen et al., 2020; Raymo et al., 2015), leading to a negative association between education and fertility. In contrast, individuals who prefer to have a higher educated partner or a higher income before starting a family could also increase their efforts to achieve higher education, leading to a positive association between education and fertility. In conclusion,

the advantages of higher education in the partnering market may explain why fertility is declining among women with lower levels of education. The selection into lower education, on the other hand, could explain both a positive and a negative gradient in fertility.

Earlier empirical evidence and regional differences

The share of women in higher education differs across European countries and regions, as do women's labour market participation and income levels. Furthermore, family policies, and the degree to which they promote gender egalitarianism or reinforce the male breadwinner model, differ across contexts. Consequently, we can expect to observe differences between countries and regions in how education relates to fertility, and how these patterns shift across cohorts.

The Nordic countries in our sample (Denmark, Finland, Iceland, Norway and Sweden) are characterised by relatively high shares of women in tertiary education and high levels of female labour force participation (Eurostat, 2023a, 2023b). The investments in these countries in both care provided to children under the age of three and parental leave are among the highest in Europe, making it easier for women to combine work and family life (Thévenon, 2011). The clearest signs of a converging or reversing educational gradient in fertility have been found in the relatively gender egalitarian context of the Nordic countries. Jalovaara et al. (2019) compared cohort total fertility and ultimate childlessness by educational attainment for the cohorts born between 1940 and 1974. For women in Denmark, Norway and Sweden, they found that childlessness levels are now highest among those who are the least educated (ISCED 0–2). Higher childlessness levels and stronger declines in first births have also been found for lower educated women in more recent cohorts in Finland (Hellstrand et al., 2022; Rotkirch and Miettinen, 2017).

Moreover, recent studies have reported an emerging positive association between individual economic stability and fertility in the Nordic countries. For example, Comolli et al. (2021) observed a larger decline in first and second birth rates among low educated women after the economic crisis in Denmark, Finland, Norway and Sweden. Stronger declines in first birth rates have also been found among women with weaker labour market attachment in Sweden (Ohlsson-Wijk and Andersson, 2022), and among women with education in fields characterised by higher unemployment and lower income levels in Finland (Hellstrand et al., 2024).

Compared to the Nordic countries, the western European countries in our sample (Austria, Belgium, Switzerland, Germany, France, Great Britain, Ireland and the Netherlands) have family policies that are more strongly influenced by the one earner family model, although considerable variation exists among them (Thévenon, 2011). While women's levels of participation in higher education and the labour force are, on average, lower in these countries than in the Nordic countries, they have increased (Eurostat, 2023a, 2023b), and levels of gender equity in financial and economic resources are higher than the EU average across all the countries in our sample (EIGE, 2023).

The heterogeneity of the western European context is reflected in the educational gradient in fertility. In the German-speaking countries (Austria, Germany and Switzerland),

where childlessness rates are among the highest in Europe, higher educated women are more likely than their lower educated counterparts to remain childless (Neyer et al., 2017; Sobotka, 2012). However, for Germany, Kreyenfeld and Konietzka (2017) found that childlessness is now increasing more among lower educated women born in West Germany between 1940 and 1964, while it has plateaued for women with a tertiary degree.

Signs of a diminishing educational gradient in fertility are also found in France, Belgium and the Netherlands. For example, Compans (2021) showed that among the cohorts born between 1950 and 1970 in France, higher educated women tend to catch up on fertility, while lower educated women are more likely to remain childless. For Belgium, empirical evidence points to a weakening, albeit still positive, educational gradient in childlessness (Van Bavel, 2014; Wood et al., 2014). For the Netherlands, van Wijk, Valk and Liefbroer (2022) have shown that for women, employment precariousness and past income precariousness are negatively related to the likelihood of transitioning to parenthood. Conversely, women's incomes have been found to be increasingly positively related to higher first birth transition rates over the 2008–2022 period (van Wijk 2024). For the United Kingdom, the findings are mixed. Kuang et al. (2024) identified a persistent positive educational gradient in childlessness among women born between 1956 and 1978, while Ermisch (2021) reported a more pronounced decline in first birth rates among lower educated women born after 1970. Based on the increasingly gender egalitarian context of the western European countries and results pointing to changes in the negative gradient in fertility in some countries, we would expect to find an overall weakening of the educational gradient in fertility in these countries, albeit to a lesser extent than in the northern European countries.

The southern European countries in our sample (Croatia, Cyprus, Italy, Portugal, Slovenia and Spain) are generally characterised by welfare systems that rely more strongly on the family and provide less extensive childcare and more limited periods of paid parental leave (Merz and Liefbroer, 2017; Thévenon, 2011). Compared to the Nordic and western European countries, the shares of women enrolled in tertiary education and female employment rates are lower in southern Europe (Eurostat, 2023a, 2023b). Furthermore, in these countries, levels of gender equity in access to financial and economic resources are, on average, lower than the EU mean (EIGE, 2023). This could indicate that, compared to the Nordic and western European regions, the southern European region has a more traditional division of labour, less favourable conditions for combining work and family life and, consequently, higher opportunity costs when starting a family for women.

Previous studies indeed found positive gradients of childlessness for Spain and Italy (Donno and Tanturri, 2020; Impicciatore and Zuanna, 2017; Wood et al., 2014), as well as strong negative educational gradients in completed fertility for Cyprus, Spain and Portugal (Merz and Liefbroer, 2017). Nevertheless, for Spanish women born between 1965 and 1969, Reher and Requena (2019) found that differences in childlessness levels between female college graduates and lower and medium educated women disappeared or were considerably reduced. Based on previous empirical findings and the more traditional gender role orientation in the southern European countries, we would expect to observe that the educational gradient in fertility remains negative, although signs of a convergence across educational levels might be visible in more recent cohorts.

The eastern European countries in our sample (Bulgaria, Czechia, Estonia, Hungary, Lithuania, Latvia, Poland, Slovakia and Ukraine) are characterised by partly contradictory developments. On the one hand, higher education and female employment expanded rapidly during the communist period and, by 1975, there were no differences in terms of years of schooling between men and women in Bulgaria, the Czech Republic, Hungary, Poland and Slovakia (Ganzeboom and Nieuwbeerta, 1999). At the same time, fertility was promoted through strong pronatalist policies (David et al., 1999). Current employment levels across the eastern European countries are, on average, higher than those in the southern and western European countries and are comparable to those in the Nordic countries (Eurostat, 2023a). While women's employment levels are high, levels of gender equity in women's access to financial and economic resources in eastern Europe are considerably lower than the EU average (EIGE, 2023). Declining childcare provision following the fall of socialism indicates a re-traditionalisation of public policies (Pascall and Manning, 2000; Robila, 2012), and implies that women in eastern Europe face greater obstacles to combining childcare and work.

Compared to other European regions, childlessness levels in eastern Europe are relatively low (Beaujouan et al., 2016). Within the region, childlessness levels are highest among highly educated women born between 1916 and 1965 in the Czech Republic, Hungary, Poland, Romania and Slovakia, and the childlessness gap between lower and higher educated women even seems to have increased in more recent cohorts (Beaujouan et al., 2016). According to Wood et al. (2014), the educational gradient in first births is persistently negative for Hungary but is weakening for Bulgaria and Estonia. Overall, we would therefore expect to observe a persistent negative, albeit weakening, educational gradient in fertility across the eastern European region.

As empirical results show, there are signs that the negative educational gradient in fertility is changing in some countries. Nevertheless, results differ across countries, which is partly attributable to the different data sources and cohorts studied. By utilising data from the ESS, with round 9 of the ESS collected in 2018/19, we can include information on the age at first birth of more recent cohorts and compare the likelihood of transitioning to parenthood across broader geographical regions.

Hypotheses

The current study aims to investigate how the likelihood of becoming a parent by a certain age cut-off varies by educational background, and whether this relationship varies across cohorts. Based on the theoretical framework and previous empirical findings, we first hypothesise that *across cohorts, the likelihood of having a first child by age 35 (40) has decreased for lower educated women compared to medium and higher educated women (Hypothesis 1)*. Second, we expect that changes in the association between educational attainment and fertility are influenced by the selection into partnerships. As having higher education is increasingly beneficial to women in the partnering market, we expect that women with lower education are less likely to find a partner to cohabit with, which, in turn, decreases their likelihood of entering parenthood. We therefore hypothesise that

the association between educational attainment and having a first child is partly mediated by the likelihood of ever having cohabited with a partner (married or unmarried cohabitation) (Hypothesis 2). Finally, based on the theoretical framework and previous findings, we expect that shifts to a positive educational gradient in fertility are most pronounced in regions with higher shares of women with tertiary education and higher levels of gender equality in terms of family policies, labour market participation and earnings. Especially in those regions, we would expect that having higher education as a woman is more conducive to finding a partner and entering parenthood. We therefore hypothesise that shifts to a positive educational gradient in fertility are especially pronounced in the Nordic region and, to a lesser extent, in the western European region, and are less visible in the southern and eastern European regions (Hypothesis 3).

Data and methodology

Data and sample selection

We use retrospective microdata from the ESS rounds 3 and 9, with fieldwork conducted between 2006 and 2007 for ESS round 3 and between 2018 and 2020 for ESS round 9. Both rounds include the “Timing of Life” module, which asks respondents about the timing of events such as first cohabitation and age at first birth. To test the likelihood of having had a partner and a first birth by age 35, we select women born between 1955 and 1985 to ensure they are at least 35 years old at the time of the interview. Additionally, to test to what extent the results differ for women who are at least age 40, we select a second sample that includes women born between 1950 and 1980 to ensure that they are at least 40 years old at the time of the survey. This means we can include first births happening between ages 35 and 40, which are rarer but increasingly common in recent cohorts. In the following, we focus on the sample, descriptive and multivariate results for the sample of women born between 1955 and 1985, who are at least 35 years old at the time of the survey. Results on the comparison between a first birth by age 35 and a first birth by age 40 are reported at the end of the results section.

In the ESS, we only have information on the year in which an event happened, rather than the month. For cohabitation, we limit the cut-off age to 34, counting births from those cohabitations until age 35, allowing for a pregnancy period. We also experimented with different age cut-offs, which led to similar results. We exclude women who report currently being enrolled in education (2.5% of the sample).

The ESS provides broad geographical coverage and the data quality is considered to be high due to standardised sampling strategies, non-response handling and data cleaning across countries (Stoop et al., 2010). We focus our analysis on EU countries but also include Great Britain, Iceland, Norway, Switzerland and Ukraine. In total, our sample includes women from 28 European countries. Not all countries participate in both rounds and the sample of lower educated women is increasingly limited as we move to more recent cohorts (for country participation by round, see Table S.1 in the supplementary material, available online at <https://doi.org/10.1553/p-kddn-zj78>). This limited number of observations is the

reason why we group countries into four broader geographical regions to get robust estimates. Nevertheless, we include country dummies in our models and cluster standard errors by country to account for country heterogeneity within regions. Table 1 gives an overview of the sample size by country.

Table 1. Sample size by country and region

Region	Country	Code	Sample
Nordic	Denmark	DK	527
	Finland	FI	608
	Iceland	IS	184
	Norway	NO	543
	Sweden	SE	561
			2423
Western	Austria	AT	1101
	Belgium	BE	723
	Switzerland	CH	647
	Germany	DE	1013
	France	FR	822
	Great Britain	GB	932
	Ireland	IE	856
	Netherlands	NL	708
			6802
Southern	Cyprus	CY	372
	Croatia	HR	527
	Italy	IT	606
	Portugal	PT	626
	Slovenia	SI	498
	Spain	ES	704
			3333
Eastern	Bulgaria	BG	737
	Czechia	CZ	625
	Estonia	EE	696
	Hungary	HU	628
	Lithuania	LT	553
	Latvia	LV	286
	Poland	PL	564
	Slovakia	SK	515
	Ukraine	UA	285
			4889
	Total		17,447

Measures

We analyse two different outcomes. First, we analyse the likelihood of ever having cohabited (married or unmarried) with a partner by age 34 (= 1) vs at a later age or never (= 0). Second, we analyse the likelihood of having had a first birth by age 35 (= 1) vs later or never (= 0). Our main independent variables are educational attainment and cohort. To achieve comparability across countries, we harmonise the definitions of educational level attained using the International Standard Classification of Education (ISCED), distinguishing between low education (ISCED 0–2), middle education (ISCED 3–4) and high education (ISCED 5–6). Therefore, respondents who did not complete a secondary education degree are considered to have low education; those who at least completed secondary education are categorised as having medium education; and those who completed tertiary education to at least the bachelor level are classified as having post-secondary education. Respondents are asked to identify the highest level of education they had attained at the time of the interview. We group women into three 10-year cohorts, distinguishing between the 1955–1964, 1965–1974 and 1975–1985 cohorts.

We ran additional analyses distinguishing between two educational categories (tertiary vs non-tertiary education) but did not find significant differences between the two groups across most cohorts and regions. Furthermore, previous studies show a U-shaped or inverse U-shaped relation with education, meaning that in some countries, both low and highly educated individuals have higher (or lower) fertility than their medium educated counterparts (Wood et al., 2014). We therefore decided to distinguish between three educational levels.

Our models are controlled for parental educational background (both parents are low educated, only the father has medium/high education, only the mother has medium/high education, both parents have medium/high education, both parents have unknown education levels), as parental socioeconomic status strongly influences the timing and quantum of cohabitation and fertility (Brons et al., 2017; Ferraretto and Vitali, 2024). We control for belonging to a religious denomination as religiosity continues to play a role in both partnership and family formation (Berghammer, 2012; Vignoli and Salvini, 2014). Following earlier studies, we control for migration background (being born in a European country vs being born outside of Europe) (Lacroix et al., 2024).

Analytical strategy

We run logistic regressions separately for countries grouped by geographical region. We control for country and estimate clustered standard errors by country to account for differences within regions. For the first outcome, cohabiting by age 34, we estimate two models. Model 1 includes all the main independent and control variables. Model 2 adds an interaction between education and cohort. For the second outcome, having a first birth by age 35, we estimate three models. Similar to the first outcome, we run the analysis with all the main dependent and control variables (Model 1) and then include an interaction between education and cohort to test the first hypothesis (Model 2). Finally, we run the analysis including the measure of having cohabited with a partner by age 34 to test the

second hypothesis (Model 3). By comparing the coefficients before and after controlling for cohabitation, we can assess to what extent the association between educational attainment and fertility changes when accounting for the selection into cohabitation. We present average marginal effects (AMEs), as they have the advantage of being comparable across models. Unlike odds ratios, AMEs are not affected by changes in the distribution of independent variables (Mood, 2010).

The causal relationship between education, partnerships and fertility is complex and is affected by endogeneity. Unobserved factors such as certain personality traits could increase the likelihood of completing higher education as well as of finding a partner or entering parenthood. Not accounting for those factors could lead to biased estimates. To control for unobserved factors influencing both outcomes, previous studies have applied multi-process modelling (Baizán et al., 2003; Trimarchi and Van Bavel, 2017). Given that the ESS does not have information on all partnerships and fertility histories, it is not possible to apply a multi-process event history model. As a robustness check, to account for endogeneity issues between cohabitation and parenthood, we applied a bivariate probit model using the share of equally educated male partners as an instrumental variable. The instrumental variable should directly affect the likelihood of cohabiting while only influencing the outcome of a first birth by age 35 indirectly, through the effect on union formation. To run our model, we use the `ivprobit` command in STATA. The results are in line with those we obtained with a logistic regression analysis and show an overall negative influence of education on first births (see Section S.1 in the online supplementary material for the results of the IV approach and a more detailed explanation of the instrumental variable). The results of the IV probit give only marginal evidence of endogeneity, which could be due to the instrument used. It is difficult to argue that the share of male partners with the same level of education affects cohabitation directly, and first births only indirectly (through partnership formation). Educational homogamy may directly affect the transition to a first birth, given that similarly educated partners may share values, norms and preferences regarding fertility (Nitsche, 2024; Trimarchi and Van Bavel, 2018).

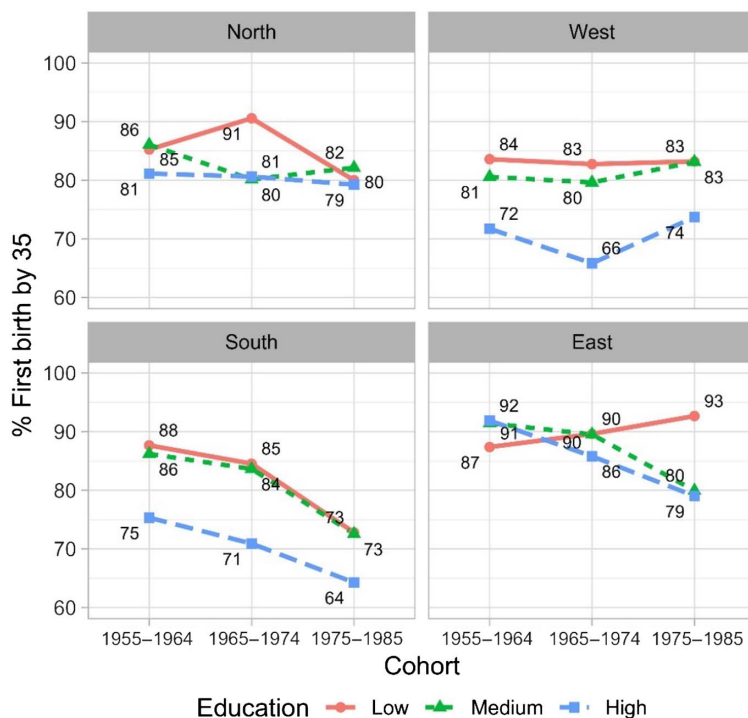
Results

First, we present the shares of women cohabiting by age 34 and having a first birth by age 35. We compare the shares across region, cohort and educational level. Second, we present the results of the multivariate analysis. We compare the results before and after adding controls for cohabitation. Finally, we also run the model on a sample of women who are at least 40 years old.

Descriptive results

Figure 1 shows the share of women who experience a first birth by age 35 by region and educational level, and for the three cohorts in our sample. The majority of women experience a first birth before the age of 35 (81% across the sample), but the shares vary by region,

Figure 1. Share (in %) of women experiencing a first birth by age 35 by region, educational level and cohort (1955 to 1985)

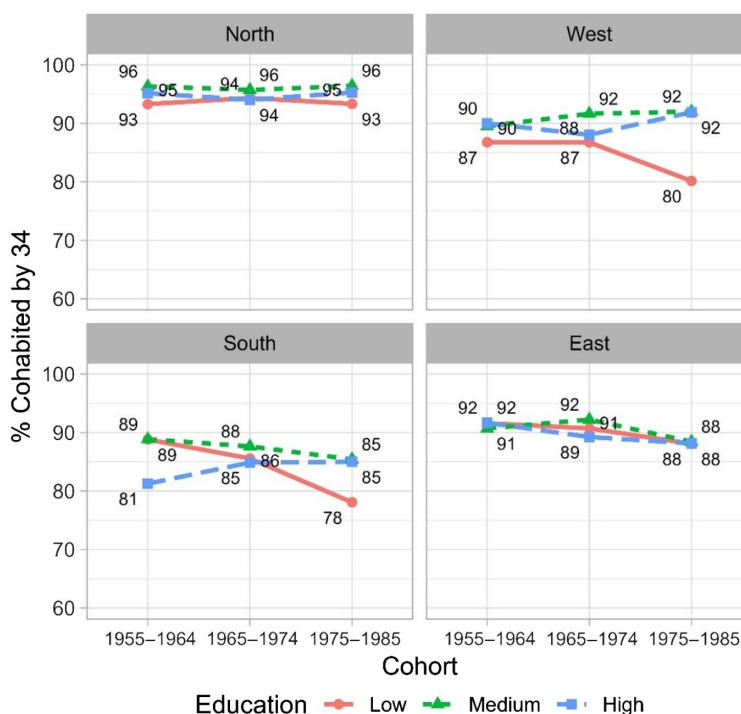


Source: ESS rounds 3 and 9 (own calculations).

cohort and educational level. In the Nordic region, approximately 82% of women experience a first birth before age 35. While lower educated women have the highest shares of first births by age 35 in the 1965–1974 cohort (91%), the shares converge across educational groups in the most recent cohort. In the western European region, on average, 77% of women experience a first birth by age 35. In the most recent cohort, the share of women having a first child by age 35 is higher for those with lower than with higher education (83% vs 74%). In the southern European region, only 64% of highly educated women transition to parenthood before age 35 in the most recent cohort. Among lower educated women in this cohort, the share is approximately nine percentage points higher (73%) but has declined 15 percentage points from the oldest cohort. Finally, the eastern European region has the highest share of first births by age 35 (~88%). For highly and medium educated women in this region, the share having a first birth by age 35 has decreased by around 11 percentage points, while for their lower educated counterparts, it has increased by around six percentage points.

Figure 2 shows the share of women who have experienced a first cohabitation by age 34. The majority of women have cohabited at least once before the age of 34, but we see signs of

Figure 2. Share (in %) of women experiencing a first cohabitation by age 34 by region, educational level and cohort (1955 to 1985)



Source: ESS rounds 3 and 9 (own calculations).

a reversal in the educational gradient. For the western European region, we find that the share of women cohabiting has declined from 87 to 80% for lower educated women in the most recent cohort, while it has remained more stable or even increased for medium and higher educated women. For the southern European region, we also find a slight increase in the share cohabiting by age 34 among higher educated women (from 81 to 85%), while we see a decline among lower educated women (11 percentage points, from 89 to 78%). For the Nordic and eastern European regions, we observe more similar shares of women cohabiting by age 34 across educational levels and cohorts.

Multivariate analysis

Likelihood of cohabiting by age 34 across cohorts

In terms of the likelihood of cohabiting by age 34, we find a positive and significant interaction between medium and higher education and cohort for women in the western and southern European regions (see Table 2). This indicates that women born between 1975

Table 2. Log-odds of ever having cohabited by age 34

	North		West		South		East	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Education (ref: low)								
Medium	0.470 [†] (0.267)	0.577 (0.445)	0.253* (0.122)	0.065 (0.127)	0.155* (0.068)	0.010 (0.088)	-0.036 (0.194)	-0.187 (0.222)
High	0.173 (0.306)	0.336 (0.535)	0.226 [†] (0.131)	0.223 [†] (0.122)	-0.195 (0.178)	-0.616*** (0.173)	-0.282 (0.203)	-0.195 (0.237)
Cohort (ref: 1955–1964)								
1965–1974	-0.166 [†] (0.088)	0.312 (0.597)	0.025 (0.065)	0.008 (0.168)	-0.031 (0.216)	-0.263 (0.290)	-0.083 (0.085)	-0.191 (0.187)
1975–1985	0.066 (0.208)	0.084 (1.544)	0.195* (0.076)	-0.429 (0.358)	-0.016 (0.267)	-0.615 [†] (0.320)	-0.456*** (0.106)	-0.519 [†] (0.296)
Parental education (ref: both low)								
Only father medium/high	-0.084 (0.187)	-0.088 (0.181)	0.200*** (0.057)	0.191*** (0.055)	-0.129 (0.168)	-0.130 (0.174)	-0.075 (0.227)	-0.078 (0.230)
Only mother medium/high	0.324 (0.321)	0.321 (0.320)	0.122 (0.082)	0.118 (0.085)	0.154 (0.264)	0.136 (0.262)	0.185 (0.163)	0.181 (0.163)
Both medium/high	0.057 (0.104)	0.058 (0.109)	0.203 (0.219)	0.190 (0.218)	-0.314* (0.137)	-0.363** (0.132)	0.057 (0.174)	0.052 (0.177)
Both unknown	0.357 (0.615)	0.358 (0.625)	-0.154 (0.155)	-0.164 (0.152)	-0.130 (0.365)	-0.134 (0.351)	-0.348 (0.315)	-0.349 (0.313)
Religiosity (ref: religious)								
Not religious	0.076 (0.274)	0.083 (0.262)	0.334* (0.161)	0.328* (0.160)	-0.116 (0.172)	-0.104 (0.174)	-0.146 (0.224)	-0.148 (0.224)
Migration background (ref: born in European country)								
Born outside Europe	-0.672*** (0.185)	-0.680*** (0.173)	-0.112 (0.180)	-0.104 (0.179)	0.245 (0.196)	0.263 (0.203)	0.127 (0.168)	0.124 (0.168)

(table continues)

Table 2. (continued)

	North		West		South		East	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Interaction cohort x education								
Medium # 1965–1974		–0.449 (0.659)		0.259 (0.184)		0.216 (0.283)		0.375* (0.183)
Medium # 1975–1985		–0.006 (1.340)		0.784† (0.431)		0.580*** (0.159)		0.178 (0.381)
High # 1965–1974		–0.564 (0.821)		–0.192 (0.231)		0.582 (0.360)		–0.155 (0.224)
High # 1975–1985		–0.055 (1.792)		0.704† (0.402)		1.092*** (0.299)		–0.067 (0.342)
Observations	2423	2423	6802	6802	3333	3333	4889	4889

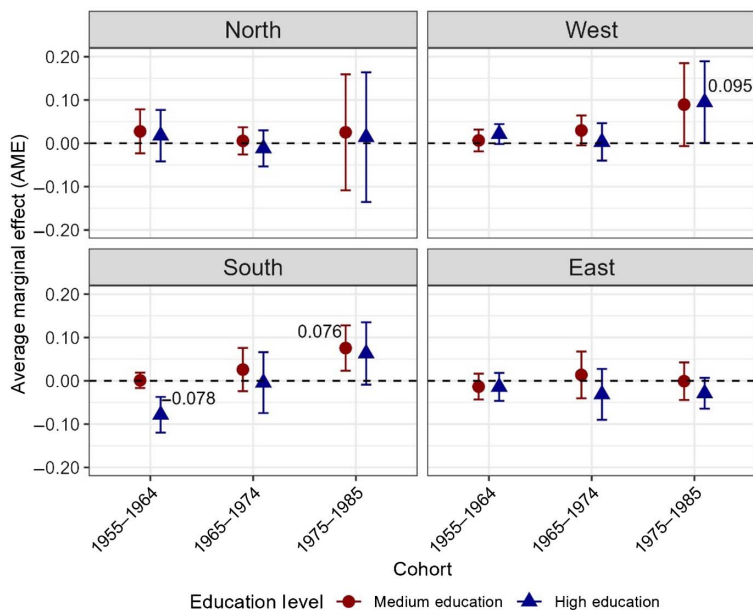
Note: Models are controlled for country (not displayed here). Clustered standard errors in parentheses; † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

and 1985 with advanced education have a higher likelihood of cohabiting with a partner by age 34 compared to their counterparts with lower education.

Based on the model, we calculate and plot the AMEs for each combination of education and cohort (see Figure 3). The AMEs represent the averaged difference in the predicted probability of cohabiting by age 34 depending on whether the woman has medium or high education vs lower education, given that the values of the covariates remain at their observed levels. For example, in the southern European region, the model predicted likelihood of women in the oldest cohort (1955–1964) cohabiting by age 34 is on, average, 7.8 percentage points lower for those with higher education than for those with lower education.

For the southern European region, we indeed find that higher educated women are less likely to cohabit by age 34 than lower educated women in the oldest cohort, while this difference becomes smaller and statistically insignificant in the second cohort. In the most recent cohort, highly educated women are even estimated to be more likely to have cohabited by age 34, although the association is not statistically significant. For medium educated women, we find that they are, on average, 7.6 percentage points more likely to have cohabited by age 34 than lower educated women in the most recent cohort, while the differences are smaller and insignificant in the older cohorts.

Figure 3. Average marginal effects of medium and high education compared to lower education on the likelihood of ever having cohabited by age 34



Note: 95% confidence intervals. Average marginal effects based on results of logistic regression (Table 2, Model 2). Clustered standard errors by country.

Source: ESS rounds 3 and 9 (own calculation).

For the western European regions, we also find signs of a reversal of the educational gradient in cohabitation. In the most recent cohort, higher educated women are, on average, 9.5% more likely to have cohabited by age 34. Nevertheless, the confidence interval is large, indicating a larger uncertainty or variation in the most recent cohort.

For the eastern and northern European countries, we do not find significant changes in the educational gradient in cohabitation. For the eastern European region, it appears that higher educated women are even less likely to cohabit than lower educated women in the recent cohort, although the finding is not statistically significant.

In summary, in line with our argumentation, we find signs of a shift to a positive educational gradient in union formation for the southern and western European regions.

Likelihood of having a first birth by 35

In the next step, we estimate the likelihood of having a first birth by age 35. Table 3 shows the results of the logistic regression. Model 1 includes the main dependent variables and control variables. For all regions, we find that having high education is negatively related to entering parenthood by 35, although this only reaches significance for the western and southern European countries. In Model 2, we add an interaction effect between cohort and educational attainment. In the northern, western and southern European regions, we find positive interactions between education and cohort, before controlling for cohabitation, but the results are not significant. For the eastern European region, we find, contrary to our hypothesis, that the negative association between education and the likelihood of entering parenthood before 35 has increased significantly in the recent cohort. Possible reasons for this finding are discussed in the last section. In Model 3, we add cohabitation to the model. Not surprisingly, having cohabited by age 34 is strongly positively associated with fertility.

In summary, while we find a positive interaction between education and cohort for the northern, western and southern European regions – indicating that education is more positively related to fertility in the more recent cohorts – these findings remain insignificant. We are therefore unable to confirm our first hypothesis regarding a shift in the educational gradient in fertility.

Likelihood of having a first birth by age 35: Medium compared to lower educated women

These findings are more clearly illustrated by plotting the AMEs of education on the likelihood of having a first birth by age 35. Figure 4 plots the AMEs of medium compared to lower educated women before and after controlling for cohabitation.

For the Nordic countries, we find that medium education is negatively related to entering parenthood by age 35 in the 1965–1974 cohort. In the recent cohort, the association turns positive, but the results are not significant. For the western European region, we do not find significant differences across educational groups and cohorts when comparing medium and lower educated women. For the southern European region, the results show that medium educated women are less likely than lower educated women to transition to parenthood before age 35 in recent cohorts after controlling for cohabitation. As the previous results for cohabiting by age 34 show, a shift to a positive educational gradient in cohabitation seems to emerge in the southern European countries. When accounting for this positive

Table 3. Log-odds of having a first birth by age 35

	North			West		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Education (ref: low)						
Medium	-0.073(0.268)	0.157(0.400)	0.015(0.525)	-0.158(0.123)	-0.191(0.136)	-0.264 [†] (0.145)
High	-0.203(0.185)	-0.159(0.185)	-0.295(0.340)	-0.733 ^{***} (0.113)	-0.652 ^{***} (0.132)	-0.820 ^{***} (0.164)
Cohort (ref: 1955–1964)						
1965–1974	-0.094(0.094)	0.461(0.297)	0.480(0.306)	-0.130 [*] (0.061)	-0.021(0.204)	-0.035(0.207)
1975–1985	-0.127(0.152)	-0.409(0.529)	-0.486(0.542)	0.170 [*] (0.081)	-0.006(0.140)	0.207(0.184)
Parental education (ref: both low)						
Only father medium/high	-0.302 [*] (0.143)	-0.303 [*] (0.142)	-0.327 [*] (0.146)	-0.065(0.057)	-0.069(0.057)	-0.139 [*] (0.065)
Only mother medium/high	0.023(0.115)	0.011(0.111)	-0.058(0.139)	-0.149(0.144)	-0.151(0.143)	-0.208(0.139)
Both medium/high	-0.290 [*] (0.141)	-0.299 [*] (0.140)	-0.361 [*] (0.179)	-0.182 [*] (0.088)	-0.184 [*] (0.090)	-0.261 [*] (0.104)
Both unknown	-0.171(0.137)	-0.172(0.145)	-0.290(0.217)	-0.002(0.189)	-0.007(0.191)	0.044(0.239)
Religiosity (ref: religious)						
Not religious	-0.286 [†] (0.151)	-0.285 [*] (0.146)	-0.365 [*] (0.148)	-0.249 [*] (0.126)	-0.252 [*] (0.127)	-0.369 ^{**} (0.129)
Migration background (ref: born in European country)						
Born outside Europe	-0.380 ^{***} (0.068)	-0.386 ^{***} (0.060)	-0.260 ^{**} (0.081)	0.133(0.084)	0.132(0.083)	0.174(0.107)
Interaction cohort × education						
Medium # 1965–1974		-0.875 [*] (0.396)	-0.922 [*] (0.436)		-0.005(0.188)	-0.065(0.160)
Medium # 1975–1985		0.206(0.787)	0.242(0.943)		0.250(0.233)	-0.020(0.259)
High # 1965–1974		-0.449(0.333)	-0.403(0.247)		-0.231(0.275)	-0.204(0.274)
High # 1975–1985		0.341(0.661)	0.399(0.583)		0.132(0.208)	-0.133(0.245)
Cohabitation by age 34 (ref: did not cohabit by age 34)						
Cohabited by 34			3.499 ^{***} (0.256)			2.213 ^{***} (0.125)
Observations	2423	2423	2423	6802	6802	6802

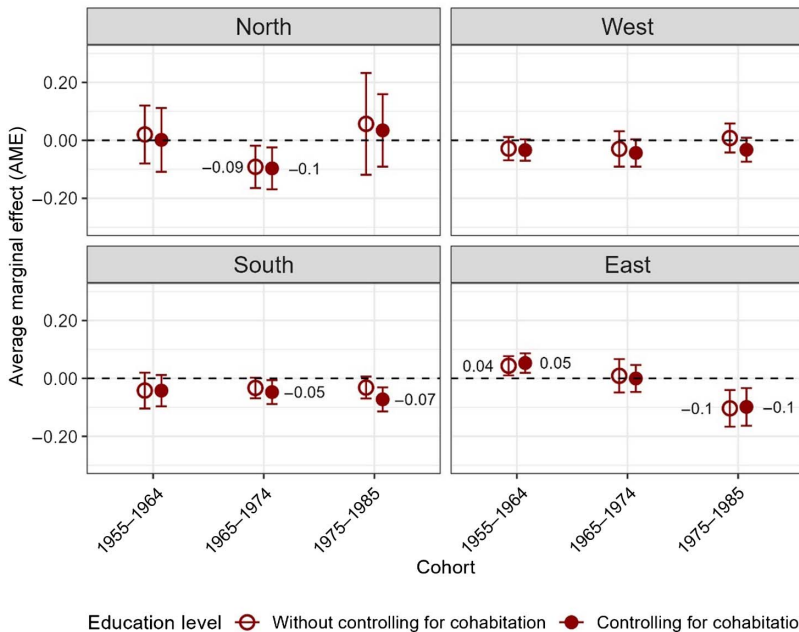
(table continues)

Table 3. (continued)

	South			East		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Education (ref: low)						
Medium	-0.303 [*] (0.147)	-0.360(0.276)	-0.446(0.312)	0.088(0.166)	0.477 ^{**} (0.153)	0.685 ^{***} (0.188)
High	-0.927 ^{***} (0.160)	-1.001 ^{***} (0.259)	-0.945 ^{**} (0.310)	-0.204(0.213)	0.370(0.228)	0.540 [*] (0.211)
Cohort (ref: 1955–1964)						
1965–1974	-0.130 [†] (0.072)	-0.165(0.244)	-0.020(0.216)	-0.294 ^{**} (0.096)	0.202(0.251)	0.380(0.299)
1975–1985	-0.530 ^{**} (0.189)	-0.723 [*] (0.321)	-0.569(0.400)	-0.763 ^{***} (0.146)	0.533(0.473)	0.919(0.634)
Parental education (ref: both low)						
Only father medium/high	-0.111(0.176)	-0.109(0.172)	-0.073(0.136)	-0.156(0.165)	-0.183(0.166)	-0.175(0.138)
Only mother medium/high	0.107(0.163)	0.091(0.167)	0.041(0.174)	-0.020(0.176)	-0.020(0.180)	-0.151(0.232)
Both medium/high	-0.201(0.127)	-0.212 [†] (0.117)	-0.084(0.112)	-0.121(0.148)	-0.106(0.153)	-0.146(0.183)
Both unknown	-0.348 [*] (0.152)	-0.346 [*] (0.150)	-0.391 ^{**} (0.127)	-0.114(0.312)	-0.096(0.311)	0.093(0.248)
Religiosity (ref: religious)						
Not religious	-0.491 ^{***} (0.078)	-0.488 ^{***} (0.080)	-0.573 ^{***} (0.081)	-0.011(0.095)	-0.015(0.095)	0.050(0.088)
Migration background (ref: born in European country)						
Born outside Europe	-0.017(0.127)	-0.011(0.132)	-0.128(0.198)	-0.085(0.256)	-0.104(0.266)	-0.164(0.359)
Interaction cohort × education						
Medium # 1965–1974		0.097(0.216)	-0.043(0.158)		-0.377(0.318)	-0.688 [*] (0.348)
Medium # 1975–1985		0.172(0.313)	-0.125(0.453)		-1.447 ^{**} (0.456)	-1.910 ^{**} (0.651)
High # 1965–1974		0.018(0.498)	-0.337(0.484)		-0.813 ^{***} (0.245)	-0.955 ^{***} (0.288)
High # 1975–1985		0.317(0.254)	-0.174(0.309)		-1.497 [*] (0.607)	-1.842 ^{**} (0.696)
Cohabitation by age 34 (ref: did not cohabit by age 34)			2.742 ^{***} (0.359)			2.946 ^{***} (0.162)
Cohabited by 34						
Observations	3333	3333	3333	4889	4889	4889

Note: Models are controlled for country (not displayed here). Clustered standard errors in parentheses; [†] $p < 0.10$, ^{*} $p < 0.05$, ^{**} $p < 0.01$, ^{***} $p < 0.001$.

Figure 4. Average marginal effects of medium compared to lower education on the likelihood of having a first birth by age 35



Note: 95% confidence intervals. Average marginal effects based on results of the logistic regression (Table 3, Model 2 and Model 3). Clustered standard errors by country.
Source: ESS rounds 3 and 9 (own calculation).

association in more recent cohorts, the difference between medium and lower educated women in the likelihood of transitioning to parenthood by age 35 is larger. For the eastern European region, we find that medium educated women are more likely to have a first birth by age 35 than lower educated women in the oldest cohort, but are around 10 percentage points less likely to have a first birth by age 35 in the most recent cohort.

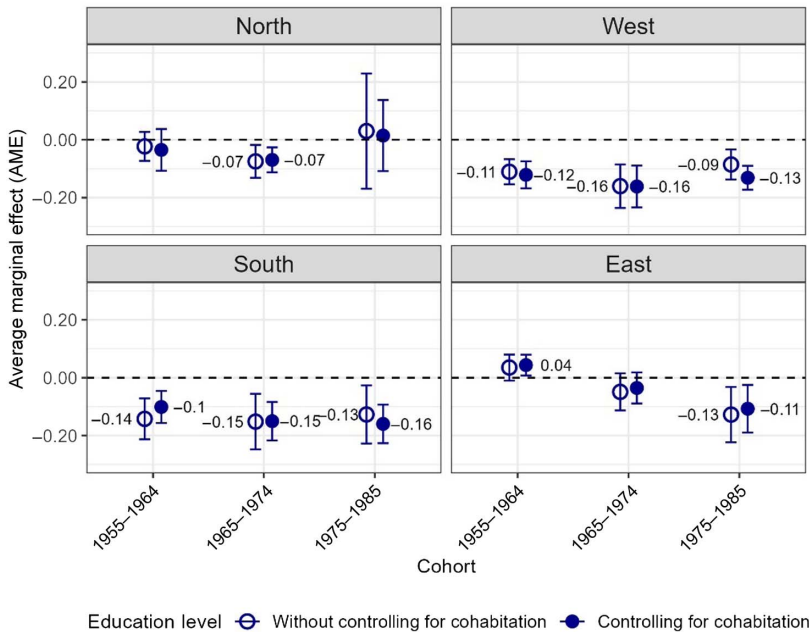
In summary, when comparing the results of medium to lower educated women, we cannot confirm a change in the educational gradient in fertility. For the eastern European region, we even find that medium educated women are less likely than lower educated women to experience a first birth by age 35 in the most recent cohort.

Likelihood of having a first birth by age 35: High compared to lower educated women

Figure 5 plots the AMEs of high compared to lower educated women before and after controlling for cohabitation. For the Nordic region, we find that the negative association between higher education and the likelihood of becoming a parent by age 35 has turned insignificant in the most recent cohort. Nevertheless, the sample is too small to draw reliable conclusions regarding this contrast for the Nordic region.

For the western European region, we find that higher educated women are significantly less likely to have a first birth by age 35 across all cohorts. For the 1975–1985 cohort, before

Figure 5. Average marginal effects of high compared to lower education on the likelihood of having a first birth by 35



Note: 95% confidence intervals. Average marginal effects based on results of logistic regression (Table 3, Model 2 and Model 3). Clustered standard errors by country.

Source: ESS rounds 3 and 9 (own calculation).

controlling for cohabitation, we see that higher educated women are nine percentage points less likely than lower educated women to have a first child by age 35. After controlling for cohabitation, higher educated women are even less likely (–13%) to experience a first birth by age 35. In the most recent cohort, higher education is increasingly positively related to cohabiting with a partner by age 34, and controlling for this association leads to a larger negative association.

Similar results can be found for the southern European region. Across all cohorts, women with higher education are less likely to have a child by age 35 than their lower educated counterparts, indicating a negative educational gradient in fertility. In the oldest cohort (1955–1964), after controlling for cohabitation, the AMEs decrease from 14 to 10 percentage points. By contrast, in the youngest cohort (1975–1985), the distance between higher and lower educated women becomes larger after controlling for cohabitation. In the most recent cohort, higher educated women are, on average, 16 percentage points less likely to have a first child by age 35.

Finally, the findings for the eastern European region diverge from those for the other regions. In the oldest cohort in our sample, we find that higher educated women are slightly but significantly more likely to have a first child by age 35 than lower educated women.

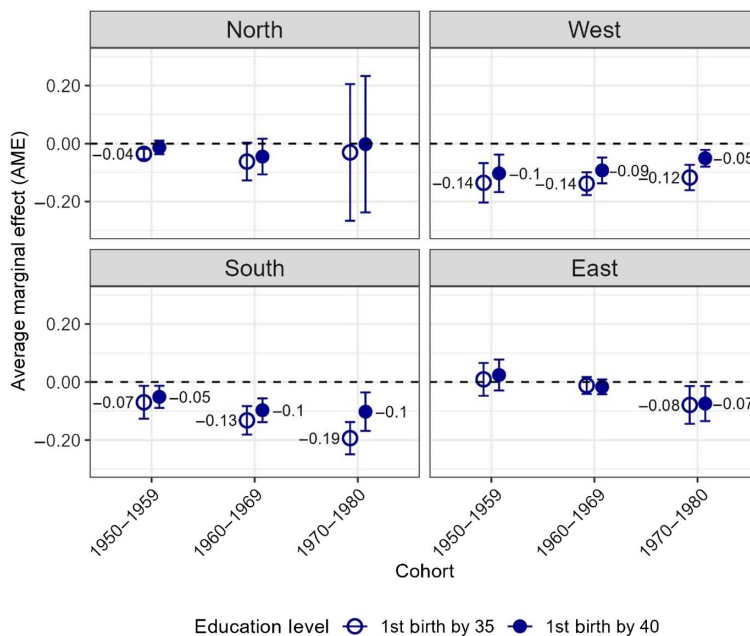
In the most recent cohort, by contrast, higher educated women are around 11 percentage points less likely than lower educated women to enter parenthood by age 35. The potential reasons for this reversal to a negative educational gradient in the eastern European region are discussed in the conclusion.

In summary, when comparing higher and lower educated women, we do not find signs of a reversal of the educational gradient in fertility (Hypothesis 1). Across all regions (except for the Nordic region, where the sample size is too small to reliably interpret), higher educated women are significantly less likely to experience a first birth by age 35 than their lower educated counterparts. In terms of Hypothesis 2, we do find that the relation between education and fertility is partly mediated by the likelihood of cohabiting by age 34.

Comparison of the likelihood of having a first birth by age 35 and age 40

Births are increasingly postponed to higher ages, especially among women who are enrolled in education for longer periods. Thus, as an alternative model specification, we run our analysis on a sample of women born between 1950 and 1980 to include women who are at least 40 years old at the time of the survey. Figure 6 shows a comparison of the AMEs of higher

Figure 6. Comparison of average marginal effects of higher and lower education on the likelihood of having a first birth by age 35 and by age 40



Note: 95% confidence intervals. Average marginal effects based on results of the logistic regression for the 1950–1980 cohorts. Clustered standard errors by country.

Source: ESS rounds 3 and 9 (own calculation).

and lower educated women, now comparing the likelihood of having a first birth by 35 vs by age 40 for this older cohort. The results are based on the model after controlling for cohabitation. The results for the most recent cohort of the Nordic region cannot be interpreted due to the small sample size. For a comparison of medium and lower educated women, see [Figure S.1](#) in the online supplementary material.

For the western European region, we find that higher educated women are less likely than lower educated women to have a first birth by age 40 across cohorts. Nevertheless, a share of higher educated women who do not have a child by age 35 do go on to have children between ages 35 and 40. In the recent cohort, higher educated women are five percentage points less likely than lower educated women to experience a first birth by age 40, while they are 12 percentage points less likely to have a first birth by age 35. Furthermore, the gap in the likelihood of entering parenthood by age 40 has narrowed across cohorts from 10 percentage points in the oldest cohort to five percentage points in the youngest cohort.

For the southern European region, we see that higher educated women are even less likely than lower educated women to enter parenthood by age 35 in the recent cohort (a change from -13 to -19%), but also that the difference in the likelihood of having a first birth by age 40 remains stable across the cohorts from 1960 to 1980 (-10%). This indicates that higher educated women are postponing first births to after age 35.

Finally, for the eastern European region, we find that the probability of entering parenthood by age 40 follows a similar pattern to that for entering parenthood by age 35, with higher educated women being around eight vs seven percentage points less likely to have a first birth by that age than lower educated women in the recent cohort.

In summary, our results differ if we consider the probability of having a first birth by age 35 for the 1955–1985 cohorts or the probability of having a first birth by age 40 for the 1950–1980 cohorts. While this divergence may also be related to the inclusion of different cohorts, our results indicate that a share of higher educated women postpone their first birth until after age 35. For the western European region, for example, we find that the difference between lower and higher educated women narrows more visibly across cohorts when we consider having a first birth by age 40 compared to by age 35. It therefore remains to be seen what share of women in the cohorts up to 1985 will enter parenthood after the age of 35.

Conclusion and discussion

Evidence from previous studies shows that the negative educational gradient in fertility – higher education being associated with lower fertility – is weakening or even reversing, particularly in the Nordic countries ([Jalovaara et al., 2019, 2022](#); [Kravdal and Rindfuss, 2008](#)), but also in other European regions ([Compans, 2021](#); [Ermisch, 2021](#); [Kreyenfeld and Konietzka, 2017](#); [Reher and Requena, 2019](#); [Rybińska, 2020](#)). Nevertheless, results vary by country and cohort and depend on the way fertility is measured. In this paper, we have focused on the transition to parenthood by age 35. We compared the likelihood of lower, medium and higher educated women having a first birth by age 35 across three cohorts born between 1955 and 1985. Given the societal changes occurring over time,

in particular the diffusion of a dual earner model across many European countries, we expect that lower educated women are increasingly being marginalised in the partnering market, and are, in turn, less likely to enter parenthood.

From our results, we can draw two main conclusions. First, across cohorts in the western and southern European regions, we find a persisting negative educational gradient in the likelihood of having a first birth by age 35 when comparing lower and higher educated women from the cohorts born between 1955 and 1985. For the eastern European region, we also find a negative association between having a first birth by age 35 and education in the 1975–1985 cohort, as well as a positive educational gradient in the older cohorts. For the Nordic region, we find a positive association, but the results are not statistically significant, and the sample of lower educated women in the Nordic region is too small to enable us to draw reliable conclusions. In summary, these findings contradict our first hypothesis that the likelihood of having a first child by age 35 has decreased for lower educated women compared to medium and higher educated women.

Second, similar to previous findings (Sturm and Van Bavel, 2024), we find evidence for a shift in the educational gradient in union formation. In line with the second hypothesis, we find that the association between education and fertility is partly mediated by cohabitation. After controlling for ever having cohabited by 34 – an outcome that is positively related to education in recent cohorts in the western and southern European regions – the association between education and fertility becomes even more negative. In other words, in the model without cohabitation, some of the positive effect of cohabitation on the probability of experiencing a first birth is attributed to education. Given that the effect of education on women's likelihood of having a first birth is negative, the positive effect, derived from the educational gradient in cohabitation, pulls the education coefficient towards zero, making the educational gradient in first births look flatter. Once we control for cohabitation, we account for that extra positive effect, and the effect of education looks more strongly negative. This indicates that the positive link between education and cohabitation partly masks the underlying negative educational gradient in fertility.

Despite having a higher likelihood of cohabiting by age 34, higher educated women continue to have a lower likelihood of entering parenthood by age 35 relative to their lower educated counterparts. One reason for this finding could be the increasing postponement of parenthood. While we chose age 35 as an age cut-off to measure the eventual transition to a first birth, first births are increasingly postponed to even higher ages, especially among higher educated women. We ran additional analyses with the 1950–1980 cohorts to compare the likelihood of having a first birth by age 35 and by age 40 for that cohort. For the southern European region, we find that the likelihood of having a first birth by age 35 declines strongly between higher and lower educated women, while the educational gradient in having a first birth by age 40 is less negative and remains more stable across cohorts. For the western European region, we find that the negative educational gradient in the likelihood of having a first birth by age 40 narrows from nine percentage points in the 1960–1969 cohort to five percentage points in the 1970–1980 cohort. For the southern and western European regions, these findings indicate a trend towards the postponement of first births until after age 35 that might be even more apparent in the more recent cohorts of women born

after 1985. These results also highlight the relevance of studying variation in both the timing and the quantum of fertility.

Another explanation for this finding could be the variation in levels of voluntary childlessness across educational groups. Attitudes towards voluntary childlessness have been more positive among women with higher education (Merz and Liefbroer, 2012), meaning that having a partner might no longer be as strongly associated with the likelihood of transitioning to parenthood (Hellstrand et al., 2022). Both postponement of first births to after age 35 and higher levels of childlessness at the end of the reproductive window could explain why higher rates of transitioning to a first cohabitation by age 34 do not necessarily translate into a higher likelihood of entering parenthood by that age. Finally, previous studies indicate that lower educated women are more likely to experience a first birth outside of a union (Koops, 2021).

In terms of regional differences, we expected to find shifts to a positive educational gradient, especially for the Nordic European region. The smaller sample size of lower educated women in the most recent cohorts implies that the margin of uncertainty around our sample estimates is very large, which could explain why the point estimates deviate from those of studies using register data with large numbers of observations in all groups (Jalovaara et al., 2019).

For the western and southern European regions, we also expected to observe a narrowing educational gradient in union formation and fertility. In terms of the likelihood of cohabiting with a partner before age 34, we indeed find shifts to a positive educational gradient, which partly mediates the association between education and fertility. In terms of the likelihood of having a first child by age 35, we nevertheless find a negative educational gradient across all cohorts. For the western European region, we see a narrowing of the educational gradient when comparing the likelihood of having a first birth by age 40, indicating a postponement of first births to after age 35.

The eastern European region follows a different pattern. In the older cohorts born between 1955 and 1964, we find that medium and higher educated women are more likely than lower educated women to have a first birth by age 35. A possible explanation for this finding lies in the promotion of higher education during the communist period, leading to a rapid educational expansion and similar levels of educational attainment for men and women (Ganzeboom and Nieuwbeerta, 1999). Both fertility and female employment were encouraged during socialist rule (Pollert, 2003), which would imply stronger marginalisation of lower educated women in the older cohorts. Declining childcare provision following the fall of socialism nevertheless indicates a re-traditionalisation of public policies (Pascall and Manning, 2000; Robila, 2012), and could explain why the gap in the likelihood of having a first birth by age 35 (and by age 40) widens across cohorts. Nevertheless, our study can only provide general trends across regions and might conceal developments in individual countries.

Some further limitations must be acknowledged. In the ESS, we only have information on the first transition to cohabitation and therefore cannot take union instability into account. A previous study for Finland, for example, suggests that union instability, rather than never entering a union, leads to lower union prevalence among lower educated women (Jalovaara and Andersson, 2023). In this analysis, we compare women who do not enter a

union until a certain age threshold to women who enter a (possibly unstable) union. By not further distinguishing between different partnering trajectories, we might underestimate the marginalisation of lower educated women in the partnering market and its effect on fertility outcomes.

Furthermore, an important drawback of our reliance on the ESS is that we do not have retrospective information on the educational attainment of the respondents and their partners. As a result, we cannot address the role of assortative mating (Gustafsson and Worku, 2005; Kreyenfeld, 2002; Trimarchi and Van Bavel, 2017). If we cannot control for the education of the partner, we might overestimate the likelihood of women with lower education entering parenthood, as we cannot control for the positive effect of their potentially higher educated male partner. Even though the prevalence of couples in which the woman is less educated than the man might decline further, considering the educational attainment of current (and past) partners remains crucial to understanding fertility behaviour.

Finally, we are studying an increasingly selective group, as the shares of lower educated women are declining across cohorts and regions. This makes it even more important to account for unobserved factors jointly affecting the likelihood of entering a partnership, transitioning to parenthood or completing advanced education. By utilising longitudinal or retrospective data on the complete partnership and educational histories of the respondents as well as their (previous) partners, future studies should seek to further disentangle the associations between educational attainment, partnerships and parenthood by accounting for unobserved heterogeneity as well as assortative mating.

In conclusion, although previous studies from single countries indicate a shift to a positive educational gradient in fertility or a convergence across educational groups (Compans, 2021; Ermisch, 2021; Kreyenfeld and Konietzka, 2017; Reher and Requena, 2019; Rybińska, 2020), our results show a persisting negative gradient in fertility across broader geographical regions. Especially for the Nordic countries, this discrepancy is likely due to the smaller sample size compared to studies utilising register data (Jalovaara et al., 2019, 2022). Because we examine an increasingly selective group of lower educated women and relatively rare events at higher ages, it is important to use surveys with sufficiently large sample sizes by country and educational group. Using data from the Generations and Gender Survey (GGS), Trimarchi and Van Bavel (2017), for example, found positive educational gradients in fertility for men. Employing the recent GGS round, with data collection starting from 2020, could help capture more recent patterns in women's fertility gradients.

In line with previous work (Sturm and Van Bavel, 2024), our study confirms shifts to a positive educational gradient in union formation in the western and southern European regions. Although higher educated women are more likely to cohabit with a partner, this does not necessarily translate into higher first birth rates. We argue that this may be partly explained by increased postponement of first births to after age 35, which could become visible in the cohorts born after 1985. As our findings indicate a clear marginalisation of women with lower educational attainment in the partnering market, future research should continue to investigate how this affects subsequent family formation.

Supplementary materials

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Supplementary file 1. Table S.1, Figure S.1, Section S1. Instrumental variable approach (ivprobit model)



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