

RESEARCH ARTICLE

Partners' age differences and first birth transitions by age at first and second union in Europe

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ABSTRACT We examine the link between the partners' age difference and the transition to the first birth in Europe, addressing a gap that typically considers age differences and fertility as separate research areas. Analysing GGS-II, we show that this association is moderated by age at union formation. For first unions formed before age 30, partners' age differences show only a minimal association with births. For first unions formed later, regional patterns emerge. In northern Europe, women are more likely to have their first child with a same-age or younger partner, suggesting changing gender and family norms. In the rest of Europe, men with an older partner are the least likely to have children, while women's fertility is highest when their partner is up to four years older. Finally, across all regions, men who are at least five years older than their partner in a second partnership are less likely to become a father. This study provides new insights for understanding fertility trends in contexts of delayed family formation and partnerships.

KEYWORDS Partners' age difference • First birth • Generations and Gender Survey • Age hypogamy • Europe

Introduction

Since the 1970s–80s, high-income countries have experienced a delay in family formation, both in the timing of the first union and childbearing (Billari et al., 2006). Partnership trajectories significantly shape fertility behaviours (Nishikido et al., 2022), and births rarely occur outside stable relationships – for which co-residence can be a proxy (Jalovaara and Fasang, 2017; Mikolai, 2017). The postponement of the first birth is therefore linked to a delay in the formation of the first cohabiting partnership, and individuals who enter partnerships later in life tend to have fewer or no children (Compans and Beaujouan, 2022; Hart, 2018; Mikolai, 2017). Biological constraints partly explain this trend, as reproductive capabilities decline with age, both for men (Ramasamy et al., 2015) and particularly for women (Baird et al., 2005). Intentions to have a child also tend to diminish with age (Beaujouan and Sobotka, 2017), potentially being revised downwards

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(Albertini and Brini, 2020) due to difficulties conceiving or social norms around the upper age limits for childbearing (Lazzari et al., 2024). At the same time, given the increasing prevalence of partnership dissolution and re-partnering (Beaujouan, 2011; Vidal and van Damme, 2024), second unions, which occur at later ages, may exhibit fertility dynamics that differ from those of first unions.

While most research focuses on individuals' characteristics, a strand of literature also emphasises the importance of including both partners in fertility studies, with a focus on socioeconomic factors (Nitsche et al., 2018; Trimarchi and Van Bavel, 2018, 2020). In addition, although the literature largely recognises the crucial role of men's and women's ages in fertility outcomes, little attention has been paid to the link between the age difference between partners and fertility, and how this varies over the life course (Beaujouan, 2011; La Rochebrochard and Thonneau, 2002). One might expect behaviours to depend significantly on this aspect, given that some age combinations may either facilitate or constrain fertility. For example, partners of a similar age may be more synchronised in their life stages, or older partners may decide to accelerate childbearing due to biological or social pressure. Furthermore, these dynamics may change as individuals grow older and exhibit different gender patterns.

Our aim is to address this issue by analysing whether age differences between different-sex partners are linked to the transition to parenthood in both first and second unions. To this end, we use data from the second round of the Generations and Gender Survey (GGG-II) and examine cross-regional differences by comparing northern, western and central and eastern European countries.

Background

Age difference between partners across contexts

The age difference between partners or spouses, which is often measured as the age gap between the male and the female partner in different-sex couples, has generally been positive over time and across different places. It typically ranges from two to nine years, with an average of close to four years globally (Ausubel et al., 2022; Casterline et al., 1986; Esteve et al., 2009; Kolk, 2015; Ni Bhrolcháin, 2005; Poppel et al., 2001). This means that, regardless of the context or historical period, women are consistently younger than men in partnerships. While the age difference is notably larger in more traditional family and gender contexts, it has narrowed over time in most countries (Hertrich, 2017; Tabutin et al., 2005; United Nations Population Division, 2016). For instance, the average age difference remains large in certain African and Asian countries, but is now below four years in most countries in Europe and the Americas (Ausubel, 2020; Tabutin et al., 2005; United Nations Population Division, 2016).

This feature is rooted in the patriarchal organisation of most societies, and it persists. Historically, women have tended to partner with older men, often due to the perceived economic stability and social maturity that age confers. This pattern is shaped by women's historically more precarious position in labour markets and financial systems. Conversely,

men typically express a preference for younger women, and some evolutionary perspectives suggest that this is particularly evident when considering the prospect of parenthood (Buss et al., 2000; Kenrick and Keefe, 1992). Accordingly, cultural representations valorise older men and devalue older women (Alarie and Carmichael, 2015), leading to greater social acceptability of age-hypergamous unions (where the man is older) and stigmatising age-hypogamous arrangements (where the woman is older), particularly in contexts characterised by traditional gender roles (Silva, 2019).

Beyond individual preferences and cultural norms, population composition can also constrain partners' availability. Substantial sex ratio imbalances, resulting from sex-selective practices, conflict or migration patterns, can narrow mating markets (Guilmoto, 2015; Ogasawara and Igarashi, 2025). This dynamic can prompt individuals to broaden their mating criteria in order to expand their pool of available partners (Lichter et al., 1992). Such "squeezed" mating markets are also evident among same-sex couples, who face smaller partner pools and exhibit larger age differences than different-sex couples (Silva and Percheski, 2024).

Age differences in different-sex couples also vary with the timing of the partnership. Typically, the older the male partner is, the greater the age difference is between the male and the female partner. Conversely, with age, women tend to form (new) partnerships with men who are their age or younger (Beaujouan, 2011; Bozon, 1990; Kolk, 2015; Ní Bhrolcháin, 2005). Patterns of parental age difference mirror these observations in high-income contexts (Dudel et al., 2023): fathers tend to be older than mothers, and the age gap between parents increases with the age at fatherhood. Meanwhile, young women tend to have children with older men and older women tend to have children with men of the same age. Dudel et al. (2023)'s cross-country aggregate-level analysis also reveals substantial variation in parental age differences, with the results showing increasing differences over time in eastern European countries and decreasing differences in western countries. However, the authors highlight the need for studies examining the individual mechanisms leading to such patterns (Dudel et al., 2023). Indeed, the distribution of parental age differences is determined by whether couples with specific age configurations go on to have children together. We adopt this complementary perspective here, using individual data to better understand the association between partners' age differences and fertility behaviours, and the role of the combination of partners' ages in having (or not having) a first child.

The role of the partners' age difference in the first birth in a partnership

The influence of partnership trajectories and characteristics on fertility has been extensively studied. For instance, it has been shown that marital status plays a role in the first birth (Balbo et al., 2013). The timing of first union formation is also deemed a crucial factor associated with fertility behaviours, as delaying the formation of the first co-residential partnership is associated with a later age at childbirth (Compans and Beaujouan, 2022; Mikolai, 2017). In addition, separations contribute to first birth postponement (Mikolai, 2017), but people who re-partner at a younger age have a greater

chance to catch up on this delay by becoming a parent (Andersson, 2023). The literature has also increasingly examined the influence of both partners' characteristics on births, but with a focus on the combination of socioeconomic characteristics, such as educational attainment (Nitsche et al., 2018; Trimarchi and Van Bavel, 2018, 2020) or employment status (Di Nallo and Lipps, 2022). Within this range of studies, the age difference between partners is often considered as a mere control variable rather than as a research focus.

However, it may be an important factor in the first birth. First, as fecundity declines with both female and male age (Baird et al., 2005; Ramasamy et al., 2015), the partners' age gap can mirror the extent to which they face biological constraints coming from either one or both partners. This would mean that men and women who form a union at older ages would be less likely to have a child with a (much) older partner.

Second, partners with a large age gap may be at different stages in their lives, resulting in asynchronous readiness for parenthood. This can also come with specific power dynamics affecting the fertility decision-making process, with the older partner potentially having greater influence over reproductive choices (Osiewalska, 2018). Related to that, age heterogeneity within couples has been associated with a higher likelihood of union dissolution (Corti et al., 2023).

Third, reproductive norms surrounding the partners' age gap may be passed on to parenthood, either reinforcing social expectations of having children within an age-heterogamous couple (Dudel et al., 2023) or challenging them based on evolving attitudes. The latter dynamic may be particularly noteworthy among couples in which the woman is older than the male partner, an arrangement that deviates from the traditional pattern in which the partners are the same age or the man is older (Silva, 2019). In recent decades, there has been an increase in the proportion of these age-hypogamous partnerships in various countries in Europe, Latin America and North America (Kolk, 2015; McKenzie, 2021; Trimarchi et al. 2024). These relationships are often interpreted as indicative of cultural and normative change, reflecting enhanced individualisation in mating choices and more gender-equal views (Kolk, 2015; McKenzie, 2021; Trimarchi, 2022; Zentner and Mitura, 2012). When women who want to have a child form a union in their thirties and partner with a younger man, they may be more likely to catch up on the delay in motherhood (Kolk, 2015; McKenzie, 2021). Indeed, in high-income countries, the average age gap between the mother and the father tends to be smaller when the mother is in her thirties than when she is younger (Compans, 2021; Dudel et al., 2023).

Overall, observations of these mechanisms may be influenced by the self-selection of "family-prone" individuals (that is, those who are inclined towards family life or who want to have a child) into couples with a specific age difference. However, very little is known about the relationship between partners' age differences and fertility desires. While evolutionary theories suggest that preferences regarding the partner's age in mate selection are related to reproductive strategies (Buss et al., 2000; Kenrick and Keefe, 1992), the directionality of this relationship in the formation of contemporary partnerships is unclear. For example, partnering with a significantly older individual may indicate lower fertility intentions due to biological or social time constraints. However, an older partner may also

be perceived as being more socially established, which is associated with readiness for parenthood.

Finally, all these mechanisms may also be relevant for second and subsequent partnerships, and indeed the likelihood of having a child within a second union has been shown to depend on the ages of both partners (Beaujouan, 2011). As individuals who re-partner are older than those who enter a first partnership, biological and social constraints are inherently more pressing for them. Crucially, when both partners are older, the window for shared childbearing narrows dramatically. Yet re-partnering may also present an opportunity to fulfil previously delayed or unmet childbearing goals. If the first union does not result in childbirth and ends in separation, a second partnership may be viewed as a “last chance” for individuals with positive fertility intentions (Beaujouan, 2011; Vidal and van Damme, 2024). Childless individuals who wish to become parents may intensify their search for a new partner (Wagner et al., 2019), with awareness of age constraints possibly influencing their age preferences in mating (Sturm et al., 2023). This may result in a greater proportion of individuals intending to have children within specific age-difference configurations.

Hypotheses

Based on previous findings and the aforementioned theoretical arguments, we anticipate that there are gender-specific patterns in the relationship between the partners' age gap and the transition to parenthood. We also expect that at higher ages at union formation, women who partner with a man who is the same age or younger are more likely to have a first child than those in an age-hypergamous couple (Hypothesis 1a). Conversely, we hypothesise that while young men are more likely to have a child with a similarly aged female partner, as men's age at union formation increases, they are more likely to become a father with a younger female partner (Hypothesis 1b).

We examine how these hypotheses apply to first partnerships and whether they can be generalised across different regions of Europe. For second partnerships, we can only investigate the link between age differences and fertility across European regions without stratifying by age at union formation due to small sample sizes. The relationship between partners' age differences and fertility is likely to vary across contexts due to various normative frameworks, institutional arrangements and the extent of fertility postponement. In places where gender roles are more traditional and family policies are less supportive, such as in central and eastern Europe, larger age gaps (where the man is older than the woman) are more likely to be observed in the transition to parenthood than smaller age differences (Dudel et al., 2023; Trimarchi and Van Bavel, 2020). Therefore, we expect to find more support for H1b in these contexts. Conversely, in northern European countries, where births tend to be delayed (Sobotka, 2004) and gender equality is more pronounced and institutionalised (McDonald, 2000), the salience of positive age differences in fertility behaviours may have weakened, thus providing support for H1a.

Data and method

Generations and Gender Survey II

We use the second round of the international Generations and Gender Survey (GGG-II), which uses a standardised questionnaire to collect information on retrospective partnership histories.¹ We distinguish between three European regions: northern Europe, which includes Denmark, Norway and Finland; western Europe, which includes Austria, Germany, France, the UK and the Netherlands; and central and eastern Europe (shortened as CEE in the following), which includes Czechia, Estonia, Belarus, Croatia and Moldova. Men and women are surveyed from 2017 to 2024 (depending on the country), from age 18 to age 49 in Denmark and Germany; age 54 in Croatia, Finland and Norway; age 59 in Austria, Estonia, the Netherlands and the UK; age 69 in Czechia; and age 79 in Belarus, Moldova and France.

To study similar cohorts across regions, we focus on individuals born between 1970 and 1989 who have reached around age 30 at the time of the interview ($n = 58,865$) to ensure that the respondents have been reasonably exposed to the risk of forming a first co-residential partnership. We exclude 51 individuals who identified themselves as neither female nor male. Among them, 51,563 have had at least one relationship and 21,529 have had at least two relationships. We focus on heterosexual relationships since pathways to parenthood for same-sex couples differ. This is after excluding 1349 observations for first partnerships and 549 observations for second partnerships. To study the first birth from the respondents' viewpoint, we also exclude partnerships that are formed when ego is already a parent ($n = 3367$ and 1008 for first and second partnerships, respectively). We additionally exclude partnerships formed by individuals aged 41 or over at the time of union formation, as these are relatively uncommon (210 cases for first partnerships and 652 cases for second partnerships). We also want to observe unions that still have the time and ability to conceive, given that fecundity declines sharply when women and men are in their forties (Baird et al., 2005; La Rochebrochard and Thonneau, 2002; Ramasamy et al., 2015). A total of 110 first partnerships and 11 second partnerships are excluded because they lack a survey weight. Ultimately, we have conducted separate analyses for 34,899 first partnerships and 9036 second partnerships distributed across the three regions.

Measures and method

We employ discrete-time event-history models to examine respondents' transitions to parenthood in first or second unions. For first partnerships, a first set of models is run separately by sex and region with a control for country, and a second set introduces an interaction term between age differences and age at cohabitation. For second partnerships, we only discuss

1 For more information, see: <https://www.ggp-i.org/>

models without interaction. Models with interaction show no significant results due to the smaller number of second unions that start childless across regions, but the results are available in the Supplementary material (Figures S.3 and S.4, available online at <https://doi.org/10.1553/p-nk6a-fj74>).

Our main independent variable of interest is the age difference between the partners. It is measured as the rounded difference between the age of the male partner and the age of the female partner. In the model, we have operationalised it as categorical. Because positive age differences are more common and can span very large gaps, we distinguish between couples above and below the third quartile of the age difference distribution for all first partnerships (four years). We do not similarly distinguish cases in which the woman is older, given the small number of hypogamous couples (see Table 1 in the

Table 1. Descriptive statistics of first partnerships by region and sex

	Northern European countries		Western European countries		Central and eastern European countries	
	F	M	F	M	F	M
Average age difference between partners (years)	2.3	1.8	2.7	1.7	2.7	2.2
Age difference between partners (%)						
The man is min. 5 years older	22.1	14.4	25.7	16.9	25.8	22.2
The man is max. 4 years older	34.1	32.0	32.7	31.9	34.7	33.8
Same age	35.5	42.1	33.3	39.7	30.7	33.5
Woman is older	8.4	11.5	8.3	11.5	8.7	10.5
Average age at cohabiting (years)	22.6	24.6	23.4	25.6	22.4	24.9
Age at cohabitation (%)						
<25	73.9	55.7	65.7	44.4	74.4	51.1
25–29	18.7	29.0	25.2	37.2	18.6	34.2
30+	7.5	15.3	9.1	18.4	7.0	14.7
Married partnerships (%)	51.1	49.9	62.7	60.7	77.6	77.2
The partner has (a) child(ren) (%)	2.6	2.3	3.0	1.1	3.7	2.8
Cohort 1980–89 (%)	51.0	48.1	50.7	51.0	52.4	52.9
Tertiary educated (%)	60.0	44.8	46.8	46.0	47.7	41.8
Born in a foreign country (%)	10.8	9.0	18.4	16.9	6.9	6.3
Average level of religiosity (0–10)	3.0	2.2	3.6	3.0	5.4	4.7
Birth within the partnership (%)	61.0	62.5	73.6	71.4	83.4	79.9
Mean time to birth since partnership formation (years)	5.0	5.2	5.1	5.3	3.7	4.0
<i>N</i>	2578	1949	5388	3736	5892	4166

Note: F = female, M = male, max. = maximum, min. = minimum.

Source: GGS-II.

next section). Our categories are: (1) the man is a minimum of five years older, (2) the man is a maximum of four years older (two to four years older), (3) the partners are about the same age (the man is one year older, the partners are the same age or the woman is one year older) and (4) the woman is older (at least two years older). Next, to test our hypotheses, we have categorised age at entering shared residence, which we define as age at cohabitation (<25, 25–29, 30+ for first partnerships; <30, 30–34, 35+ for second partnerships). We also control for individual characteristics likely to affect fertility behaviours (education, birth cohort, religiosity, whether the respondent was born in the surveyed country) and other relevant partnership characteristics, as age differences may reflect heterogeneity between partners (Silva and Percheski, 2024). The two variables related to the partnership are binary and indicate whether the partnership ultimately leads to marriage and whether the partner already has children.² Table 1 displays the sample size by region and sex after excluding observations with missing variables.

We observe partnerships until they result in childbirth, and if not, until they separate or until 15 years have passed for first partnerships and 10 years have passed for second partnerships. These observation windows are empirically justified because first births rarely occur in partnerships beyond these time frames. Note that our analytical framework is not causal; observed associations between partner age differences and first births may reflect selection into particular partnership configurations.

Union dissolution may largely explain why first partnerships do not result in childbirth, as the proportion of first relationships that remain intact and childless is small (5–7%, depending on the region). Hence, as an alternative, models with separation as a competing risk are tested. They yield similar results regarding partners' age differences (Tables S.1 and S.2). This suggests that the role of age differences in the separation process is similar to their role in the childbearing process, or that separation does not affect the relationship between partners' age differences and the likelihood of giving birth within a union. As another robustness check, models are run by excluding partnerships in which either the man or the woman already has a child at the time of union formation. The results are similar for all sex groups, regions and first and second partnerships. To ensure that no single country drives the estimations, we also run analyses excluding one country at a time for each region, and the results are similar to those presented here.

Results

Descriptive results

Table 1 displays descriptive statistics of first partnerships formed when the female and male respondents are childless by sex and region. The age difference between the partners

2 Other relevant information for fertility, such as partners' educational level or country of birth, is not available for partnerships reported retrospectively.

ranges from 1.7 to 2.7 years. Between 8% and 12% of first partnerships are relationships in which the woman is older (Table 1). On average, the age at which individuals start cohabiting for the first time is around 22–24 for women and is around 25–26 for men. As the age at first cohabitation increases, the age difference with the partner tends to decrease for women and to increase for men, with the lines in Figure S.1 moving away from the zero axis for men and approaching it for women. Most first cohabitations result in childbirth, particularly for women, and more often in CEE than in western and northern Europe. For instance, in CEE countries, 83% of women's first partnerships and 80% of men's first partnerships result in childbirth, compared to 61% and 63% in northern European countries for women and men, respectively. On average, the transition to parenthood also occurs faster after partnership formation in CEE countries (within four years) than in the rest of Europe (within five years) (Table 1).

If the second partnership starts without children, the age difference with the partner is rather similar to that in the first partnership for women and is larger for men (Table 2). However, second partnerships, particularly those formed by women, are more likely than first partnerships to be age-hypogamous. On average, second partnerships are formed at around age 27–28 for women and at around age 28–29 for men.

Models for first partnerships without interaction

Tables 3 and 4 display results from separate event-history models by region without interaction, for women and men, respectively. They estimate first birth hazards after first partnership formation adjusted for a set of covariates. First birth hazards peak at around 6–9 years into the relationship in northern and western Europe, whereas transitions to motherhood tend to occur within the first years following the start of co-residence in CEE contexts (Tables 3 and 4).

The western and CEE countries show a conventional pattern whereby a woman who enters a partnership is more likely to transition to a first birth if her partner is older and is less likely to transition to a first birth if her partner is younger (Table 3). In northern European countries, a woman has a significantly higher chance of having a child if her partner is younger than if her partner is the same age. This is also the case in western Europe before controls are applied (model not shown here), but this association disappears after controlling for age at cohabitation. The other age difference patterns remain stable in univariate and adjusted models.

In all regions, a man who enters a partnership is less likely to transition to a first birth if he is much older than his partner than if his partner is the same age (Table 4). In western Europe, the coefficients vary when controlling for age at cohabitation and the partner's parental status. In CEE countries, only the partner's parental status emerges as a mediating factor (not shown here). For this reason, we test an interaction between the age difference between the partners and the partner's parental status for men in both regions, but the results are not significant, probably due to the small number of cases (Figure S.2). The mediating role of age at cohabitation is explored in greater detail in the following section.

Table 2. Descriptive statistics of second partnerships by region and sex

	Northern European countries		Western European countries		Central and eastern European countries	
	F	M	F	M	F	M
Average age difference between partners (years)	2.3	2.5	3.0	2.5	2.2	2.8
Age difference between partners (%)						
The man is min. 5 years older	25.2	25.1	31.5	30.0	25.7	36.6
The man is max. 4 years older	26.9	33.9	25.1	28.4	25.9	24.2
Same age	31.0	27.1	27.5	27.6	27.6	24.6
Woman is older	16.9	13.8	15.8	14.0	20.8	14.5
Average age at cohabiting (years)	26.6	27.5	27.3	29.4	27.5	29.1
Age at cohabitation (%)						
<30	76.4	68.9	68.1	52.4	48.9	42.2
30–34	18.0	24.8	23.6	33.8	32.4	37.7
35+	5.7	6.3	8.3	13.8	18.7	20.1
Married partnerships (%)	53.1	45.8	58.6	52.0	49.2	48.9
The partner has (a) child(ren) (%)	8.5	3.6	10.2	7.1	16.7	12.7
Cohort 1980–89 (%)	56.3	50.7	53.7	51.9	61.7	52.0
Tertiary educated (%)	60.6	40.5	50.0	46.6	27.5	10.9
Born in a foreign country (%)	6.3	7.6	17.7	14.0	6.9	4.7
Average level of religiosity (0–10)	2.6	1.9	2.9	2.6	3.8	3.4
Age at first separation (years)	24.3	25.7	25.5	27.0	25.4	27.1
Age at first separation (%)						
<25	57.0	47.5	48.3	29.9	47.7	31.5
25–29	34.6	34.5	33.2	44.4	35.1	40.7
30+	8.4	18.0	18.5	25.7	17.2	27.8
Birth within the partnership (%)	56.6	53.4	53.0	54.8	48.7	45.1
Mean time to birth since partnership formation (years)	4.2	4.1	4.8	4.3	4.6	4.1
N	691	463	1017	638	735	453

Note: F = female, M = male, max. = maximum, min. = minimum.

Source: GGS-II.

Regarding age at first union formation, a young age at cohabiting (<25) is negatively associated with first birth hazards, but not significantly in CEE countries for both sexes (Tables 3 and 4). Hazards are positive for individuals who partner late (30+) in northern and western European countries, although not significantly for women. Conversely, in

Table 3. Associations between individual and first partnership characteristics and first births by region, women (discrete-time event-history models)

	Northern European countries			Western European countries			Central and eastern European countries		
	Coeff	SE	p-value	Coeff	SE	p-value	Coeff	SE	p-value
Intercept	-3.907	0.17	<0.001	-4.254	0.11	<0.001	-3.154	0.10	<0.001
Baseline (years)									
1	1.426	0.16	<0.001	1.063	0.09	<0.001	1.325	0.06	<0.001
2	1.777	0.16	<0.001	1.336	0.09	<0.001	1.204	0.06	<0.001
3	2.096	0.16	<0.001	1.481	0.09	<0.001	1.044	0.07	<0.001
4	2.241	0.16	<0.001	1.666	0.09	<0.001	0.675	0.08	<0.001
5	2.315	0.17	<0.001	1.738	0.10	<0.001	0.662	0.08	<0.001
6	2.402	0.17	<0.001	1.854	0.10	<0.001	0.714	0.09	<0.001
7	2.525	0.18	<0.001	1.806	0.10	<0.001	0.393	0.11	<0.001
8	2.391	0.19	<0.001	1.873	0.11	<0.001	0.502	0.11	<0.001
9	2.514	0.20	<0.001	1.895	0.12	<0.001	0.320	0.13	0.013
10	1.813	0.24	<0.001	1.548	0.14	<0.001	0.301	0.14	0.034
11	1.735	0.26	<0.001	1.400	0.15	<0.001	-0.090	0.18	0.610
12	1.999	0.26	<0.001	1.223	0.18	<0.001	0.095	0.18	0.593
13	1.352	0.34	<0.001	1.231	0.19	<0.001	-0.685	0.26	0.009
14	1.169	0.40	0.003	1.062	0.22	<0.001	-0.902	0.30	0.003
15	0.374	0.61	0.537	0.590	0.28	0.035	-0.746	0.30	0.014
Age difference (ref = "Same age")									
The man is min. 5 years older	0.126	0.08	0.100	0.105	0.05	0.028	0.094	0.05	0.037
The man is max. 4 years older	0.052	0.06	0.418	0.088	0.04	0.044	0.127	0.04	0.002
The woman is older	0.209	0.11	0.050	0.064	0.07	0.353	-0.075	0.07	0.250
Age at cohabiting (ref = "25-29")									
<25	-0.380	0.07	<0.001	-0.382	0.04	<0.001	-0.050	0.04	0.252
30+	0.043	0.11	0.701	0.131	0.07	0.055	-0.207	0.07	0.006
Marriage (ref = "Not married")	0.250	0.06	<0.001	0.685	0.05	<0.001	1.342	0.06	<0.001
The partner has a child (ref = "No child")	-0.356	0.20	0.075	-0.552	0.13	0.000	-0.989	0.10	<0.001
Religiosity	0.037	0.01	<0.001	0.047	0.01	0.000	0.027	0.01	<0.001
Not born in the surveyed country	-0.262	0.09	0.004	-0.030	0.05	0.561	-0.052	0.07	0.450

(table continues)

Table 3. (*continued*)

	Northern European countries			Western European countries			Central and eastern European countries		
	Coeff	SE	<i>p</i> -value	Coeff	SE	<i>p</i> -value	Coeff	SE	<i>p</i> -value
Cohort 1980–89 (ref = “1970–79”)	–0.155	0.06	0.005	–0.071	0.04	0.048	–0.188	0.03	<0.001
Below tertiary education (ref = “Tertiary educated”)	–0.040	0.07	0.564	0.380	0.04	<0.001	0.123	0.03	<0.001
AIC		9557			21,722			22,948	
<i>N</i> partnership-year		15,027			31,499			26,620	

Note: AIC = Akaike information criterion, Coeff = coefficient, max. = maximum, min. = minimum, SE = standard error.

Source: GGS-II.

CEE countries, a late age at first partnership formation is negatively associated with first birth hazards for both women and men (Table 3).³

In sum, while men across all European regions show a reduced likelihood of transitioning to a first birth when they are much older than their partner, women’s fertility patterns vary markedly across regions. In northern Europe, women are more likely to transition to a first birth if they are in an age-hypogamous union, while in CEE countries, women are more likely to transition to a first birth if they are in a traditional age-hypergamous union. This variation may be explained by the fact that age at cohabitation serves as a key confounding factor in some regions, as will be explored in the next section.

Models for first partnerships with interaction

We now examine how the transition to the first birth varies according to the age difference between the partners and the respondents’ age at the beginning of their first partnership. To do so, we include an interaction term in the models presented in the previous section. Figure 1 shows the results for women, and Figure 2 shows those for men, as predicted cumulative probabilities five years after partnership formation. This time frame is close to the average time between partnership formation and birth (Table 1).

3 Although not the primary focus of this analysis, it is noteworthy that marriage is positively associated with first birth hazards across all regions and for both sexes (Tables 3 and 4). Partnering with a man or a woman who is already a parent at union formation is negatively associated with childbirth in all regions and for both sexes (but not significantly for women in northern European countries). Conversely, religiosity is positively and significantly associated with fertility in all regions and for both sexes. Women born in a foreign country show negative first birth hazards in northern Europe. Younger cohorts are less likely to have a child (not significant for men and women in western Europe). The association between childbirth and educational attainment is positive for men in all regions and for women in all regions except for northern European countries. Finally, the country-fixed associations show that in northern Europe, fertility within the first partnership is lower in Finland and higher in Norway compared to Denmark. In western Europe, the likelihood of having a child within the first partnership is lowest in Austria; while in CEE countries, it is highest in Belarus (Table S.3).

Table 4. Associations between individual and first partnership characteristics and first births by region, men (discrete-time event-history models)

	Northern European countries			Western European countries			Central and eastern European countries		
	Coeff	SE	p-value	Coeff	SE	p-value	Coeff	SE	p-value
Intercept	-3.975	0.20	<0.001	-4.384	0.13	<0.001	-3.277	0.11	<0.001
Baseline (years)									
1	1.634	0.20	<0.001	1.066	0.12	<0.001	1.160	0.07	<0.001
2	1.936	0.20	<0.001	1.448	0.12	<0.001	1.212	0.07	<0.001
3	2.266	0.20	<0.001	1.627	0.12	<0.001	0.911	0.08	<0.001
4	2.300	0.21	<0.001	1.601	0.12	<0.001	0.834	0.09	<0.001
5	2.454	0.21	<0.001	1.713	0.12	<0.001	0.845	0.10	<0.001
6	2.790	0.21	<0.001	1.856	0.12	<0.001	0.706	0.11	<0.001
7	2.839	0.22	<0.001	2.052	0.13	<0.001	0.431	0.13	0.001
8	2.721	0.23	<0.001	1.971	0.14	<0.001	0.410	0.14	0.003
9	2.635	0.24	<0.001	2.036	0.14	<0.001	0.140	0.16	0.386
10	2.541	0.26	<0.001	1.852	0.16	<0.001	0.106	0.17	0.543
11	2.982	0.26	<0.001	1.540	0.18	<0.001	0.427	0.17	0.013
12	2.395	0.31	<0.001	1.474	0.20	<0.001	0.215	0.20	0.293
13	0.664	0.62	0.283	1.241	0.24	<0.001	-0.484	0.29	0.100
14	1.050	0.55	0.055	0.929	0.28	0.001	-1.295	0.46	0.005
15	0.914	0.62	0.141	0.898	0.31	0.004	-0.975	0.42	0.021
Age difference (ref = "Same age")									
The man is min. 5 years older	-0.465	0.10	<0.001	-0.248	0.07	<0.001	-0.127	0.06	0.033
The man is max. 4 years older	-0.271	0.08	<0.001	-0.095	0.05	0.065	0.039	0.05	0.415
The woman is older	0.197	0.11	0.067	-0.075	0.07	0.311	-0.090	0.07	0.214
Age at cohabiting (ref = "25-29")									
<25	-0.569	0.07	<0.001	-0.370	0.05	<0.001	-0.080	0.05	0.082
30+	0.415	0.10	<0.001	0.229	0.06	<0.001	-0.073	0.06	0.257
Marriage (ref = "Not married")	0.215	0.07	0.003	0.900	0.06	<0.001	1.299	0.07	<0.001
The partner has a child (ref = "No child")	-2.324	0.43	<0.001	-1.616	0.31	<0.001	-1.197	0.14	<0.001
Religiosity	0.049	0.01	<0.001	0.037	0.01	<0.001	0.037	0.01	<0.001
Not born in the surveyed country	-0.036	0.11	0.751	0.061	0.06	0.349	0.149	0.08	0.056

(table continues)

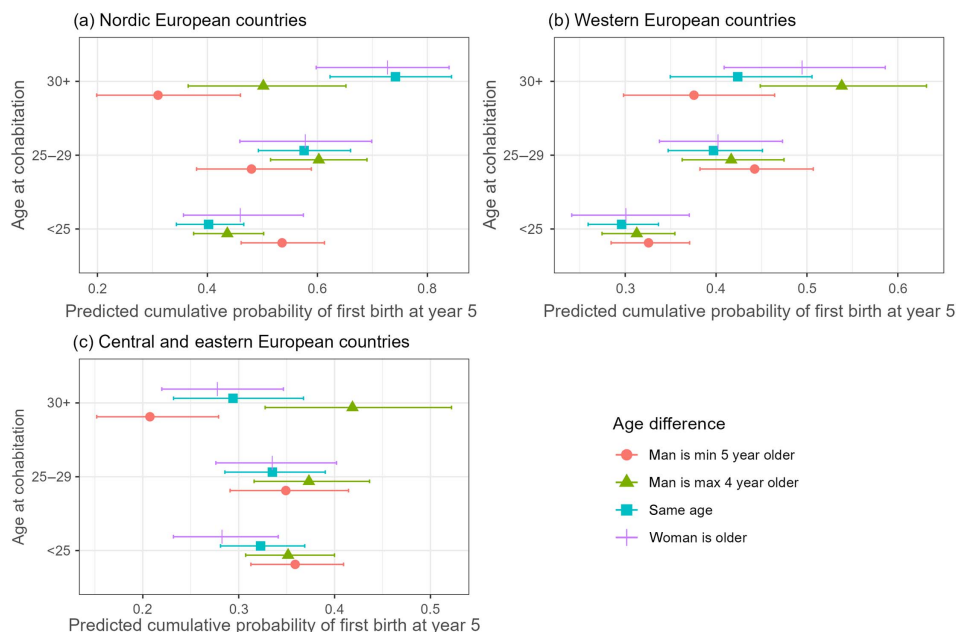
Table 4. (continued)

	Northern European countries			Western European countries			Central and eastern European countries		
	Coeff	SE	p-value	Coeff	SE	p-value	Coeff	SE	p-value
Cohort 1980–89 (ref = “1970–79”)	–0.247	0.07	<0.001	–0.099	0.04	0.022	–0.120	0.04	0.003
Below tertiary education (ref = “Tertiary educated”)	0.152	0.07	0.024	0.143	0.04	0.001	0.191	0.04	<0.001
AIC		7207			14,962			16,476	
N partnership-year		11,743			22,757			19,937	

Note: AIC = Akaike information criterion, Coeff = coefficient, max. = maximum, min. = minimum, SE = standard error.

Source: GGS-II.

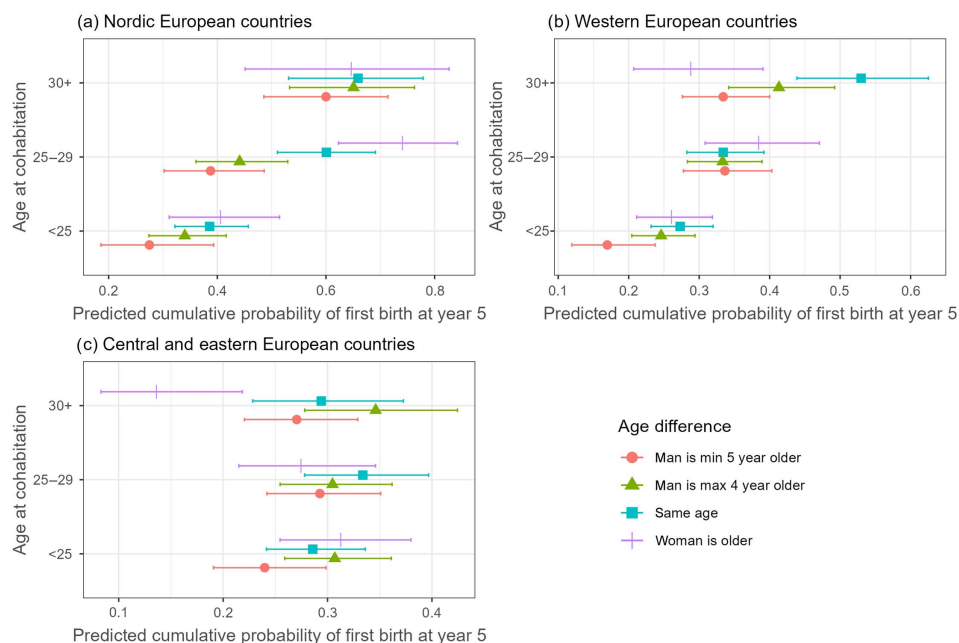
Figure 1 Predicted cumulative first birth probabilities (with confidence intervals) within five years after first partnership formation by age at cohabitation, age difference between partners and region, women (discrete event-history model with interaction)



Note: Models control for marital status, whether the partner has children, education, birth cohort and the country of birth.

Source: GGS-II.

Figure 2 Cumulative predicted first birth probabilities (with confidence intervals) within five years after first partnership formation by age at cohabitation, age difference between partners and region, men (discrete event-history model with interaction)



Note: Models control for marital status, whether the partner has children, education, birth cohort and the country of birth.

Source: GGS-II.

For women who begin their first partnership before the age of 30, the cumulative probability of a first birth tends to increase slightly with the age difference, but confidence intervals suggest no statistical significance (Figure 1). One exception to this pattern is observed in northern Europe, where women who form their first partnership before age 25 are significantly more likely to have a child when they are partnered with a man who is at least five years older than when their partner is the same age (Figure 1a). Conversely, for northern European women in a first partnership formed at a later age (30 or over), the probability of having a child decreases with the age difference between the partners. Indeed, women who partner with a man who is the same age or younger are more likely to have a child than women in an age-hypergamous couple. This is particularly significant when compared to partnerships where the man is at least five years older (Figure 1a). We do not observe this clear gradient in the other European regions, where childbirth in a partnership formed at a later age is most likely when the man is up to four years older than the female respondent, and this is only significant in CEE countries compared to women with a partner who is much older (Figure 1c).

For men who begin their first partnership before age 30, the pattern is reversed compared to that observed among women, as the cumulative probabilities of having a first birth tend to decrease with age differences (Figure 2). More precisely, in western Europe, only men who partner before age 25 and are at least five years older than their partner show significantly lower cumulative probabilities of transitioning to a first birth compared to same-age couples (Figure 2b). Like for women, the differences are small for men who partner in their late mid-twenties in western Europe and CEE countries (Figures 2b and 2c). However, men in northern Europe who form a first partnership at age 25–29 are significantly more likely to become a father with a female partner who is older or the same age rather than with a (much) younger partner (Figure 2a). At ages 30 and above, there are no differences by age gap in northern Europe (Figure 2a). In western European countries, men are more likely to become a father with a partner of the same age than with a partner with whom they have an age gap of at least five years (Figure 2b). Finally, in CEE countries, men who form a partnership in their thirties with an older woman appear to have lower cumulative probabilities of transitioning to a first birth than men in the other types of partnerships (Figure 2c).

In sum, the patterns observed in models without interactions only apply to specific ages at union formation. However, the findings confirm significant gender and regional differences in the link between partner age gaps and fertility.

Models for second partnerships

In the final part of this analysis, we examine whether the age patterns observed in first partnerships are also evident in second partnerships in Europe. The age difference between the partners shows no significant association with first birth hazards in women's second partnerships (Table 5). For men who are at least five years older than their second partner, first birth hazards are significantly lower in all regions of Europe. The only exception is that first birth hazards are even lower among men who re-partner with an older woman in CEE countries (Table 6).

Regarding other age-related factors, the later women in northern and western Europe separate from their first union, the lower their likelihood of becoming a mother within the second partnership is, particularly from age 30 onwards (Table 5). For men, those who separate before age 30 in northern Europe are less likely to experience births within the second union (Table 6). We also see that birth hazards are negative for individuals who re-partner before age 30 compared to those who enter a second union at age 30–34, but this difference is not significant for women in CEE countries (Table 5), and for men, it is only significant in western European countries (Table 6).⁴

4 Marriage is significantly and positively associated with childbirth in western Europe for both sexes (Tables 5 and 6). Re-partnering with someone who already has a child is negatively associated with first birth hazards for women in all regions (Table 5) and for men in western and central and eastern Europe (Table 6). Religiosity is only significantly associated with birth for women in northern Europe (Table 5), while younger cohorts of men in CEE countries show lower birth hazards (Table 6). First birth hazards in second partnerships are also significantly lower only for women in northern Europe (Table 5). Finally, country fixed effects show that first birth hazards are lower in Finland than in Denmark and are lower in Austria than in Germany and the Netherlands. There are no significant differences across CEE countries (Table S.4).

Table 5. Associations between individual and second partnership characteristics and first births by region, women (discrete-time event-history models)

	Northern European countries			Western European countries			Central and eastern European countries		
	Coeff	SE	p-value	Coeff	SE	p-value	Coeff	SE	p-value
Intercept	-3.549	0.34	<0.001	-3.848	0.28	<0.001	-2.629	0.31	<0.001
Baseline (years)									
1	1.948	0.32	<0.001	1.606	0.23	<0.001	0.936	0.21	<0.001
2	2.503	0.31	<0.001	1.859	0.23	<0.001	1.201	0.21	<0.001
3	2.308	0.33	<0.001	1.932	0.24	<0.001	0.810	0.24	0.001
4	2.607	0.33	<0.001	1.952	0.25	<0.001	0.851	0.25	0.001
5	2.599	0.34	<0.001	2.071	0.26	<0.001	0.895	0.26	0.001
6	2.449	0.37	<0.001	2.078	0.27	<0.001	0.802	0.29	0.006
7	2.373	0.40	<0.001	1.752	0.31	<0.001	0.536	0.35	0.127
8	2.683	0.40	<0.001	1.252	0.38	0.001	0.716	0.37	0.050
9	1.135	0.66	0.088	1.422	0.40	<0.001	-0.165	0.54	0.761
10	1.360	0.67	0.042	1.508	0.41	<0.001	-0.232	0.62	0.707
Age difference (ref = "Same age")									
The man is min. 5 years older	0.162	0.16	0.309	-0.018	0.13	0.890	-0.064	0.17	0.708
The man is max. 4 years older	-0.065	0.14	0.652	-0.075	0.13	0.554	-0.056	0.15	0.712
The woman is older	-0.018	0.17	0.918	-0.063	0.14	0.656	-0.188	0.16	0.232
Age at cohabiting (ref = "30-34")									
<30	-0.505	0.16	0.001	-0.268	0.13	0.033	-0.226	0.16	0.148
35+	-0.376	0.32	0.243	0.148	0.21	0.471	-0.541	0.28	0.057

(table continues)

Table 5. (continued)

	Northern European countries			Western European countries			Central and eastern European countries		
	Coeff	SE	p-value	Coeff	SE	p-value	Coeff	SE	p-value
Marriage (ref = "Not married")	0.114	0.13	0.389	0.246	0.12	0.046	0.219	0.15	0.146
The partner has a child (ref = "No child")	-1.594	0.34	0.000	-1.864	0.31	0.000	-1.685	0.27	0.000
Religiosity	0.042	0.02	0.048	0.028	0.02	0.081	-0.011	0.02	0.592
Not born in the studied country	-0.328	0.22	0.143	-0.305	0.15	0.039	-0.079	0.23	0.733
Cohort 1980-89 (ref = "1970-79")	-0.160	0.12	0.167	0.193	0.10	0.049	0.082	0.13	0.515
Below tertiary education (ref = "Tertiary educated")	-0.312	0.15	0.038	-0.079	0.10	0.443	0.066	0.12	0.593
Age at separation 1 (ref = "25-29")									
<25	0.081	0.13	0.537	-0.170	0.11	0.137	-0.125	0.14	0.356
30+	-0.540	0.25	0.032	-0.576	0.16	0.000	-0.339	0.20	0.092
AIC		2251			3256			2264	
N		3310			5230			3699	

Note: AIC = Akaike information criterion, Coeff = coefficient, max. = maximum, min. = minimum, SE = standard error.

Source: GGS-II.

Table 6. Associations between individual and second partnership characteristics and first births by region, men (discrete-time event-history models)

	Northern European countries			Western European countries			Central and eastern European countries		
	Coeff	SE	p-value	Coeff	SE	p-value	Coeff	SE	p-value
Intercept	-2.561	0.326	0.000	-3.592	0.330	<2e-16	-2.524	0.425	0.000
Baseline (years)									
1	1.319	0.298	0.000	0.774	0.255	0.002	1.157	0.322	0.000
2	1.419	0.306	0.000	1.380	0.245	0.000	1.768	0.314	0.000
3	1.612	0.312	0.000	1.222	0.264	0.000	1.507	0.336	0.000
4	1.757	0.324	0.000	1.784	0.261	0.000	1.811	0.345	0.000
5	2.152	0.330	0.000	1.648	0.284	0.000	1.790	0.373	0.000
6	1.660	0.384	0.000	1.339	0.321	0.000	0.926	0.485	0.056
7	2.388	0.372	0.000	1.310	0.350	0.000	1.289	0.470	0.006
8	1.248	0.541	0.021	1.305	0.377	0.001	1.253	0.516	0.015
9	1.565	0.549	0.004	1.213	0.435	0.005	0.423	0.781	0.588
10	0.050	1.052	0.962	-0.046	0.754	0.951	1.487	0.609	0.015
Age difference (ref = "Same age")									
The man is min. 5 years older	-0.567	0.200	0.005	-0.478	0.166	0.004	-0.441	0.202	0.029
The man is max. 4 years older	-0.318	0.173	0.066	-0.157	0.160	0.328	0.061	0.201	0.762
The woman is older	0.142	0.238	0.549	-0.051	0.217	0.816	-0.738	0.321	0.022
Age at cohabiting (ref = "30-34")									
<30	-0.211	0.176	0.231	-0.621	0.155	0.000	-0.170	0.199	0.394
35+	-0.090	0.334	0.786	-0.136	0.213	0.522	-0.196	0.295	0.507

(table continues)

Table 6. (continued)

	Northern European countries			Western European countries			Central and eastern European countries		
	Coeff	SE	p-value	Coeff	SE	p-value	Coeff	SE	p-value
Marriage (ref = "Not married")	-0.015	0.155	0.924	0.490	0.172	0.004	0.325	0.204	0.111
The partner has a child (ref = "No child")	-1.348	0.748	0.071	-1.177	0.389	0.002	-1.291	0.371	0.001
Religiosity	0.016	0.028	0.573	0.035	0.022	0.114	0.020	0.026	0.453
Not born in the studied country	-0.546	0.292	0.061	0.221	0.187	0.238	0.329	0.338	0.330
Cohort 1980-89 (ref = "1970-79")	0.068	0.149	0.647	0.138	0.129	0.283	-0.447	0.167	0.007
Below tertiary education (ref = "Tertiary educated")	-0.107	0.152	0.481	0.113	0.125	0.365	-0.123	0.157	0.432
Age at separation 1 (ref = "25-29")									
<25	-0.504	0.170	0.003	-0.026	0.159	0.870	-0.106	0.186	0.568
30+	-0.399	0.222	0.073	-0.289	0.171	0.091	-0.409	0.236	0.082
AIC		1516			2010			1332	
N		2194			3100			2143	

Note: AIC = Akaike information criterion, Coeff = coefficient, max. = maximum, min. = minimum, SE = standard error.

Source: GGS-II.

While some results suggest that there are social or biological age constraints on childbearing in cases in which there are large age differences between the partners or in which the partners separate from their previous union at later ages, the selection of more or less family-prone individuals into specific partnership trajectories and configurations may also be at play. However, the small sample size prevents us from conducting a more in-depth analysis. Similarly, limited sample sizes prevent us from analysing the interaction between age at second partnership and age differences, as we did for first unions, with all models producing non-significant results (Figures S.3 and S.4).

Conclusion

Scholars have generally examined age differences between partners and fertility as separate research objects. Studies on fertility transitions either omit the partner age gap from their analysis (Andersson, 2023; Baizán et al., 2004; Hart, 2018; Mikolai, 2017; Nishikido et al., 2022; Raab and Struffolino, 2020; Sturm et al., 2023; Wagner et al., 2019) or include it as a mere control variable (e.g. Compans and Beaujouan, 2022). Meanwhile, partnership studies tend to focus on age differences without examining their link to childbearing behaviours (Alarie, 2019; Ausubel et al., 2022; Casterline et al., 1986; Kolk, 2015; McKenzie, 2021; Trimarchi, 2022).

Unlike previous studies, we focus on the relationship between the partners' age difference in first and second partnerships and the transition to a first birth by highlighting gender differences in this relationship and by addressing these issues across different contexts.

Our findings indicate that the role of the partners' age difference in the likelihood of transitioning to a first birth is not uniform across the life course, but is moderated by the age at union formation (Sturm and Van Bavel, 2024). Failing to account for this interaction between the age at partnering and the age gap limits our understanding of the effect of the partners' age difference on fertility.

Once age at union formation is accounted for, the association between the partners' age difference and the probability of transitioning to a first birth varies by region. Hypothesis 1a, according to which women who partner at a higher age with a man who is the same age or younger are more likely to have a first child than those who partner with an older man, is only supported in northern Europe. There, this pattern is observed for women who first partner at age 30 or older. At later ages, most women have likely achieved professional stability and may therefore prioritise finding a family-oriented partner (Meeussen et al., 2019). At the same time, structural constraints in the mating market may explain why older women often have children with a same-age or younger partner, as the majority of older men may already be partnered or have children, which may discourage them from having another child. This configuration could also reflect less traditional attitudes regarding gender roles within a couple and less conservative mating preferences in these contexts. In northern European countries, the more traditional pattern, according to which men are more likely to have a first child with a younger woman as their age increases (Hypothesis 1b), is observed only among women who partner for the first time before age 25, as they are more likely to have their first child with a much older man. Overall, these

countries exhibit a less conventional pattern, possibly driven by a greater adherence to gender equality.

In CEE and western European countries, the age difference between the partners appears to be only weakly associated with the probability of transitioning to a first birth among those who partner before age 30. Men who partner with an older woman after the age of 30 are the least likely to have a child, which partly supports the traditional pattern hypothesis (H1b). Conversely, one might expect age-hypergamous couples to be more likely to have a child; however, this is only true when the woman is partnered with a man who is up to four years older, rather than with someone much older. The extent to which late partnerships result in childbirth is constrained by biological factors, as both men and women experience a decline in fecundity with age (Baird et al., 2005; La Rochebrochard and Thonneau, 2002; Ramasamy et al., 2015). They also face social age deadlines for childbearing (Lazzari et al., 2024), which may influence their childbearing decisions. Thus, at later ages, the relationship between the partners' ages and their fertility may partly depend on a combination of biological and social age limits.

In addition, the analysis of second unions suggests that, overall, a man being much older than his female partner is a barrier to entering fatherhood with no cross-regional differences. This may be due to the later ages at which subsequent partnerships are formed, with similar constraints being observed across contexts. However, we are not able to explore this question in further detail.

This study has limitations that we would like to mention. Due to the small sample sizes, we cannot run separate analyses by country. We also lack information on the quality of the respondents' past relationships, or on the socioeconomic characteristics, migrant status (only available for the current partner at the time of the interview), attitudes regarding family and fertility intentions of their previous partners. As a result, we do not know to what extent the effect of the partners' age difference entails matching on other dimensions, e.g. education (Trimarchi et al., 2024). Partner selection on one attribute may entail selection of the partner on another attribute (Uunk, 1996). For instance, it is likely that partners of similar ages are also homogamous in terms of education (i.e. they have the same level of education). Finally, our analytical framework does not account for the effects of different country-level factors; therefore, we cannot determine whether cross-regional differences are driven by changes in gender and family norms or other factors.

Despite these limitations, our study provides interesting insights into current and future trends in delayed family formation. We find that for women, partnering at a later age with a younger man may be a facilitating factor for catching up after postponing childbearing, especially in northern Europe. As research has begun to document an increase in the proportion of age-hypogamous couples in several contexts (Kolk, 2015; McKenzie, 2021; Trimarchi et al. 2024), this study further enhances our understanding of evolving family formation patterns in contemporary societies, and of how the interplay between age differences shapes fertility behaviours in diverse regional contexts. However, we cannot currently determine whether the observed fertility patterns reflect the effect of age gaps or whether individuals with specific fertility preferences self-select into particular age gap configurations. We are also unable to distinguish between biological and social effects. Future research should focus on the mechanisms that explain the observed

patterns, which may be related to selection, preferences and constraints in the mating market, as well as to the biological constraints and social norms specifically associated with childbearing ages.

Supplementary materials

Available online at <https://doi.org/10.1553/p-nk6a-fj74>

Supplementary file 1. Figures S.1–S.4, Tables S.1–S.4



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