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Abstract

Objective: This study investigates how perceived own fecundity and that of the partner are related to life satisfaction, relationship satisfaction, and union dissolution.

Background: Across many high-income countries, fertility has been gradually moving to ages at which fecundity starts to decline. This delay in reproductive timing can have profound implications for individuals' fertility outcomes, increasing the risk of either voluntary or involuntary childlessness. In a context that is characterized by late childbearing, perceived fecundity, both one's own and that of the partner, may emerge as an important determinant of individuals' overall satisfaction and the dynamics of their romantic relationships.

Method: Using 13 waves of longitudinal data from the German Family Panel (pairfam), we employ individual fixed-effects models to examine within-person changes in perceived fecundity, both one's own and that of the partner, and their consequences for satisfaction and relationship outcomes.

Results: Declines in perceived fecundity, for both oneself and one's partner, were associated with reductions in life and relationship satisfaction. A key finding is that the partner's perceived fecundity, as rated by the anchor, had a stronger impact on relationship outcomes than the anchor's own perceived fecundity. Additionally, an increase in the risk of union dissolution was observed with a decline in the partner's perceived fecundity, while such an association was not found with one's own perceived fecundity. Our analysis revealed no significant gender differences in these associations. Additional analyses, in which we interacted perceived fecundity with parental status and age, showed that the relationship between perceived fecundity and outcomes was weaker among parents than among childless individuals, and decreased with age.

Conclusion: The study contributes to the literature on fertility dynamics and their social implications by highlighting the role of subjective perceptions of one's own fecundity and that of the partner in shaping life satisfaction and relationship resilience.
Keywords Perceived fecundity, fertility, relationship, life satisfaction, separation, partnership

Introduction

Family formation patterns and living arrangements in Western countries have undergone major changes over the 20th century (see Buchmann & Kriesi, 2011 for a review). Individuals have increasingly delayed marriage, parenthood, and leaving the parental home (Billari & Liefbroer, 2010; Gauthier, 2007). At the same time, the likelihood of never entering marriage or parenthood has risen (Goldscheider, 1997; Rowland, 2007). These shifts have noticeably altered family structures in the West. This transformation has led to the emergence and the increasing prevalence of diverse living arrangements such as nonmarital cohabitation (Heuveline & Timberlake, 2004), out-of-wedlock childbearing (Wu, 2008), divorce (Schoen & Canudas-Romo, 2006), and repartnering after union dissolution (Buyukkececi, 2021). Consequently, complex family structures have emerged that are characterized by partnership dissolution, single parenthood, and stepfamily formation (Thomson, 2014).

Significant changes in partnership patterns, along with the widespread postponement of childbearing, may have profound implications for overall reproductive experiences. Delayed parenthood in particular has the potential to increase the prevalence of extended time to pregnancy (Schmidt et al., 2012). Accordingly, many couples may

encounter difficulties in achieving their desired family size, which can lead to either involuntary childlessness or the failure to fully realize their family-building aspirations. Recent evidence highlights the significance of the perceived ability to have children (Passet-Wittig et al., 2020). For individuals desiring children, infertility, defined as the inability to get pregnant within one year (or longer) of unprotected sex, often represents a substantial obstacle to fulfilling their reproductive aspirations (Loftus & Andriot, 2012). Within the scope of interpersonal relationships and overall life satisfaction, few aspects of life hold as much significance as fertility dynamics and their impact on life satisfaction and union stability (Li et al., 2020). Across European countries, having one or more children, with two being the most common ideal, is a personal aspiration shared by most people (Testa, 2012). Nonetheless, while approximately 20% of women from the early 1970s cohorts have experienced permanent childlessness (Kreyenfeld & Konietzka, 2017), a substantial portion have fallen short of their desired family size, resulting in a "fertility gap" that varies across Europe. Analyses focusing on women have found an average fertility gap ranging from 0.5 to 1.0 children per woman (Beaujouan & Berghammer, 2019).

While parenthood remains a significant aspect of the life course aspirations of many individuals (Johnson-Hanks et al., 2011), it is noteworthy that there are distinct gender differences in the centrality of parenthood and in how individuals define themselves. Research suggests that parenthood tends to be more important for a woman's self-concept than for a man's (Katz-Wise et al., 2010). Nevertheless, across cultures, parents – both women and men – consistently underscore the profound significance they attach to their children (Nauck, 2014).

In contemporary high-income societies, where family-building decisions span extended periods and encompass diverse life trajectories, understanding the dynamics of fertility and their consequences for life satisfaction and relationship satisfaction has become increasingly important. Fecundity, defined as the biological ability to have children, might play a crucial role in shaping these dynamics. Shifts in fecundity perceptions, at either the individual or the couple level, can trigger profound emotional and practical adjustments within partnerships, potentially influencing their stability (Dourou et al., 2023; JamaliGandomani et al., 2022).

While the significance of parenthood in individuals' life course aspirations is well-established (Johnson-Hanks et al., 2011), most existing studies on the consequences of fecundity for relational outcomes adopt a cross-sectional approach, and often concentrate on individuals undergoing medical treatment for infertility (e.g., McQuillan et al., 2007). Although these studies offer valuable insights, they are susceptible to selection and omitted variable bias. Individuals undergoing treatment represent a specific subpopulation with serious subfecundity or infertility, and their selection is based on a desire to have children. This unique subpopulation may experience decreased well-being, and additional selection occurs based on couple dynamics and available resources.

While research focusing on the general population, rather than solely on those clinically identified as subfecund or infertile, could provide crucial insights and enhance the generalizability of findings, to date, only one study by McQuillan and colleagues (2022) has examined the longitudinal relationship between the perceived ability to have children and life satisfaction. In our contribution to the literature, we revisit and extend McQuillan et al.'s study. However, our study goes beyond a focus on individual

fecundity by also considering relational outcomes, including relationship satisfaction and the risk of separation, and incorporating the partner's perceived fecundity. Accordingly, we compare the interplay between subjective biology, operationalized as the perceived ability to conceive, and social outcomes. Specifically, we explore how an individual's perception of their own and their partner's fecundity, as rated by the anchor, are related to the anchor's life satisfaction, relationship satisfaction, and likelihood of experiencing union dissolution. For our analysis, we adopt a life course perspective and use 13 waves of data from the German Family Panel (pairfam), which includes longitudinal information on the perceived fecundity of an anchor and, where available, that of their partner, as rated by the anchor, as well as on the anchor's life and relationship satisfaction and relationship status. This dataset is exceptionally well-suited for assessing how within-person changes in perceived fecundity, as well as in the partner's perceived fecundity, are related to life satisfaction and relationship resilience by employing individual-level fixed effects and adopting a life course perspective.

Background

Perceived (sub)fecundity

While there are various definitions of fecundity, in population research, it is defined as the biological capacity to reproduce, regardless of pregnancy intentions (e.g., Wood, 1989). In contrast, fertility can be defined as the actual manifestation of fecundity, as measured by live births and, in some cases, stillbirths (Smarr et al., 2017).

A couple's fecundity dynamics are fluid, as either partner may experience difficulties at any given time. These challenges may spontaneously emerge, resolve, undergo treatment, or persist, underlining the nuanced nature of fecundity. Though birth rates

offer a quantifiable measure of fertility at the population level, directly measuring fecundity at the couple level remains difficult. Therefore, researchers often rely on proxy measures to evaluate fecundity (Smarr et al., 2017). For women, these measures include hormonal profiles, menstrual cycles, ovulation patterns, and biomarkers like anti-Müllerian hormone (Pincheira-Donoso & Hunt, 2017; Steiner, 2013). Male fecundity can be assessed based on semen quality, testicular volume, and hormonal profiles (Olsen & Ramlau-Hansen, 2014). One measure of couple fecundability is the number of calendar months or menstrual cycles required to conceive, with a longer time-to-pregnancy (TTP) indicating lower fecundity (Hong et al., 2022).

As an alternative to medically defined infertility measures, which often involve costly medical procedures, representative surveys at the population level, such as the Generations and Gender Survey (GGS), the National Survey of Reproductive and Contraceptive Knowledge, and the German Family Panel (pairfam), employ self-reported measures in the form of questions about the respondent's perceptions of their own ability to procreate. While evidence suggests that individuals' perceived ability to have children fluctuates over time (Passet-Wittig et al., 2020), the relationship between perceived fecundity and real fecundity is complex and dynamic. In our study, we acknowledge the evolving nature of perceived fecundity using self-reported measures, and recognize its potentially important role as a driver of life satisfaction and union dynamics, irrespective of its direct correspondence with true fecundity.

Perceived fecundity, life and relationship satisfaction, and the risk of union dissolution

Since the 1960s, there has been a shift toward prioritizing personal goals and self-fulfillment, which has led to delayed childbirth and marriage, lower fertility rates, and

increased acceptance of childlessness in developed countries. This is often referred to as the Second Demographic Transition (SDT; Lesthaeghe, 2014; van de Kaa, 1987). Despite these prevailing trends, parenthood remains a significant aspect of the lives of most adults (Testa, 2012), with approximately four out of every five women in Europe becoming mothers (Kreyenfeld & Konietzka, 2017). As a result, in addition to the extensive research into the determinants of fertility decline, there is a growing body of literature exploring why individuals continue to form unions and have children despite these changing trends. This research seeks to answer the question of why fertility is not even lower than it currently is (Kohler & Mencarini, 2016, p. 328).

Some of this literature draws on the value of children approach from the 1970s, which posits that children (and marriage) contribute to an individual's overall life satisfaction (e.g., Fawcett, 1988; Friedman et al., 1994). Morgan and King (2001). This research often links the motivation to have children to biological predispositions, social pressures, and rational choice, ultimately concluding that humans have evolved preferences for having children. Many studies have supported this perspective, emphasizing the connection between evolved dispositions and the desire for childbearing (e.g., Kohler, 2013).

Moreover, a large body of literature has explored the relationship between childbearing and life satisfaction (e.g., Hansen, 2012; Margolis & Myrskylä, 2011, 2015; Umberson et al., 2010). Overall, findings from longitudinal studies (e.g., Margolis & Myrskylä, 2015) point to a clear pattern of an initial positive boost in life satisfaction following childbirth, which gradually diminishes over time. This observation aligns with the set-point theory, which posits that the impact of any given life event on well-being is temporary, as individuals adapt to their new circumstances and their satisfaction levels

return to their pre-event baseline (Headey & Wearing, 1989). One possible explanation for this phenomenon is that the expected level of happiness associated with childbearing before the event, which presumably plays a significant role in shaping individual behavior, may not align perfectly with the actual happiness an individual experiences over the long run (Aassve et al., 2012).

Predicting the long-term impact of such a life-changing event on one's happiness is indeed challenging. Some individuals may experience an even greater level of happiness than they had expected, while others may find that their happiness level falls short of their pre-event expectations.

Nevertheless, the perception of diminishing chances or of foregone opportunities for having children can have significant implications for life satisfaction, particularly for individuals who aspire to become parents. This perceived loss can take various forms, such as the fear of missing out on the joys of parenthood, concerns about one's biological clock, and anxieties about the future of the relationship (McQuillan et al., 2012). Regardless of which partner in a couple has reproductive issues, both partners are generally affected by and experience infertility as a shared challenge in the context of their relationship (Johnson & Johnson, 2009). Consequently, a perceived decline in an individual’s own fecundity or in that of their partner can contribute to a decrease in their overall life satisfaction.

Stressful experiences or events that affect an individual can also have negative consequences for their partner and their relationship, a phenomenon known as dyadic stress (Karney et al., 2005; Randall & Bodenmann, 2009). Perceived declines in fecundity can be a significant stressor for couples, and the consequences may not be limited to the individuals directly affected, as they can also extend to their partners

(Martins et al., 2014). Berghuis and Stanton (2002) identified infertility as a prototypical example of a dyadic stressor. The inability to conceive a child can have a profound impact on the emotional and psychological well-being of both partners, potentially disrupting and increasing the costs of their relationship (Newsom et al., 2005). From the standpoint of social exchange theory (Kelley, 1959), the partners' commitment to a relationship is tied to their perception of the benefits it offers, while being inversely associated with the perceived costs involved (Nakonezny & Denton, 2008). Consequently, changes in the perceived ability to have children may have implications for relationship outcomes.

While early research suggested that infertility could lead to relationship strain (Greil, 1997), more recent studies have indicated that the impact of infertility on couples is highly variable, with a meta-analysis of infertile couples reporting heterogenous and inconclusive findings regarding the influence of infertility on marital relationships and quality of life (Luk & Loke, 2015). The analysis found that a lack of partner support led to negative consequences like stress and dissatisfaction, whereas couples who actively fostered a supportive relationship experienced not only improved life satisfaction, but also a deeper connection and a stronger marital bond.

It is important to note that most of these studies focused solely on infertile couples or used cross-sectional data, which limited their ability to assess within-person changes and their relationship to couple dynamics. This study adopts a life course perspective, and, unlike previous studies that focused solely on infertile couples or used snapshots in time, we examine how perceived declines in an individual's own and their partner's fecundity over time are related to changes in their relationship satisfaction and risk of union dissolution. This novel approach allows us to examine for the first time the

dynamic interplay between fecundity perceptions, relationship dynamics, and long-term outcomes.

Notably, we further acknowledge that the significance of these changes might vary based on individual characteristics. Specifically, we examine whether the observed associations of perceived fecundity with life and relationship satisfaction, as well as with the risk of union dissolution, vary according to parental status and age. For instance, for individuals who already have children, the ramifications of their own fecundity decline might be less significant than they are for individuals without children. Similarly, the effects of a partner's perceived fecundity decline on relational outcomes may be more pronounced for individuals in their thirties than in their forties, as declines in fecundity at older ages are more likely to be perceived as normal and expected.

Additionally, couples' aspirations to have children are likely to diminish with age. By examining these potential moderating effects, we gain a deeper understanding of the nuanced ways in which perceived fecundity shapes relationship trajectories across the life course.

Own perceived fecundity (OPF) vs. partner's perceived fecundity (PPF)

In the present study, we extend previous research by considering not only the individual's own perceived fecundity (OPF), but also the partner's perceived fecundity (PPF), as rated by the anchor.

As discussed earlier, if perceived changes in fecundity are related to life satisfaction through diminished chances or foregone opportunities to have children, the effects of OPF and PPF on life satisfaction may not differ notably. This is particularly likely to be

the case if measurements of perceived fecundity are primarily based on personal assessments rather than incorporating medical information, which could introduce alternative pathways for influencing life satisfaction.

However, OPF and PPF might have different effects on relationship satisfaction and the risk of separation. While a perceived decline in one's own fecundity may be seen as a personal challenge, a perceived decline in the partner's fecundity could be interpreted as a challenge to the shared goal of parenthood and to the relationship, potentially increasing the perceived "costs" of the relationship, especially if both partners strongly want to have a first child or to expand their family (Levinger, 1976). This contrasting framing suggests that a decline in the partner's fecundity might have a greater impact on relationship satisfaction and the likelihood of separation, particularly for couples who prioritize having children.

Gender differences

There are several reasons why there may be gender differences in the consequences of perceived fecundity for life satisfaction, relationship satisfaction, and the risk of separation. Biomedical factors, socialization, and gender roles all contribute to these potential differences. The majority of recent studies support earlier research concluding that infertility is more distressing for women than for men (Anderson et al., 2003; Peterson et al., 2007; Simionescu et al., 2021).

Among the early explanations for this disparity were that women have a strong desire to become a parent, whereas men are more concerned with fulfilling the social role of parenthood (Hjelmstedt et al., 1999). Other researchers posited that women tend to perceive infertility as a distinctive life challenge, while men's responses to it are akin to

their reactions to other issues, such as to conflict within relationships (Andrews et al., 1992; Ying et al., 2015). This supposed distinction in men's and women's perceptions has led scholars to argue that a woman's experience of infertility is more "direct" and is intricately connected to her self-identity, whereas a man's experience of infertility is "indirect" and is channeled through his relationship with his wife (Greil, 1997; Greil & Johnson, 2014).

More recently, however, it has been recognized in the literature that these gender differences are enhanced by the sociocultural context (Greil et al., 2010), especially in contexts where pro-natalism is more prevalent and motherhood is more central (Parry, 2005; Ulrich & Weatherall, 2000). In such contexts, women may be expected to have children in order to achieve adult status and to gain acceptance in society (Hollos, 2003). Because fertility is so central in these contexts, traditional understandings of infertility might coexist alongside biomedical interpretations to a greater extent there than in developed nations (Dyer et al., 2005; Gerrits, 1997), and women in these societies may suffer more than men when they are perceived to be infertile.

German context

Germany stands out among developed nations for its long period of low fertility, with the total fertility rate (TFR) remaining consistently below 1.5 children from 1975 to 2015 (Federal Statistics Office, n.d.). This trend was particularly evident in West Germany, where the fertility rate declined sharply starting in the 1970s, accompanied by a significant postponement of childbearing and a notable proportion of women remaining childless (Bujard & Lück, 2015). While the fertility rate in East Germany did not decline as sharply as in West Germany, after unification, the fertility rate dropped

rapidly in the east, falling below 1.0 for a short period. In recent years, there has been a slight increase in the TFR across

Germany, with the rate surpassing 1.5, suggesting a potential shift in fertility patterns. In response to these low fertility rates, there has been an increasing acknowledgment of infertility issues and a rise in the utilization of assisted reproductive technologies (ART) in Germany. These technologies have become more prevalent, with ART accounting for 2.8% of all births in Germany in 2015 (Trappe, 2017). Since January 2004, the law for the modernization of statutory health insurance (GMG) has been in effect, which mandates insurance coverage of 50% of the costs for a maximum of three attempts of IVF or ICSI treatment or eight inseminations. To qualify for coverage, a couple must be married, with the woman being between 25 and 40 years old and the man being between 25 and 50 years old (Passet-Wittig et al., 2014). While awareness and acceptance of ART remain high in Germany, concerns about medical treatment persist among childless individuals who want to start a family (Wippermann, 2014).

Although Germany is often characterized as a conservative welfare state (Esping-Andersen, 1990), there were fundamental differences in gender norms between East and West Germany (Kühn et al., 2019). East Germany's state-socialist system mandated employment for both men and women, in sharp contrast to West Germany's socially conservative welfare state, which perpetuated the male-breadwinner model through its policies (Borck, 2014). Consequently, German society became polarized into two distinct groups: a shrinking family sector consisting of married couples with two or more children, and an increasing nonfamily sector due to a rise in lifelong childlessness, especially among highly educated women with strong professional aspirations (Kreyenfeld & Konietzka, 2017). Following German reunification in 1990, East

Germany had to adopt the West German policy framework (Berger, 2013), albeit with some exceptions, such as continued policy support for daycare centers for children (Zoch & Hondralis, 2017). Germany's family policies underwent a significant shift in the mid-2000s (Zoch & Schober, 2018). New policies aimed at boosting mothers' participation in the workforce were introduced, along with key reforms expanding childcare options and parental leave entitlements.

Amid these societal shifts, the perception of the ability to have children in Germany emerged as a dynamic rather than a static concept. Research indicates that approximately 39% of women and 48% of men who said they perceived themselves as being unable to conceive in one year changed their response in the following year, indicating that they no longer perceived themselves as having a problem (Passet-Wittig et al., 2020). This highlights the importance of examining perceived fecundity as a dynamic rather than a static concept.

In contrast to traditional interpretations emphasizing pronatalism and women's social roles, which have been shown to exacerbate gender differences in other contexts (Greil et al., 2010; Parry, 2005), gender differences in the associations between perceived fecundity and life satisfaction, relationship satisfaction, or union dissolution are expected to be less pronounced in Germany. This is due to the relatively high social acceptance of childlessness and the less prominent role of pronatalism in shaping societal expectations (Kreyenfeld & Konietzka, 2017).

Data and Methods

We used 13 waves of longitudinal data from the German Family Panel (pairfam; Brüderl et al., 2022). Launched in 2008, pairfam was originally based on a

representative sample comprised of over 12,000 German residents across three birth cohorts: 1971-1973, 1981-1983, and 1991-1993. To assemble these cohorts, anchors were meticulously recruited from a pool of 33,620 addresses selected from over 300 randomly chosen communities. In the second wave, pairfam introduced an additional dataset known as the Demographic Differences in Life Course Dynamics in Eastern and Western Germany (DemoDiff), which included 1,489 respondents. Wave 11 of the project welcomed a new cohort born between 2001 and 2003, along with a refresher sample of 6,000 respondents from the two younger cohorts. While the attrition rate was relatively high during the second wave (23%), it stabilized at about 10% in subsequent waves, consistent with the broader German context (Müller & Castiglioni, 2015).

We combined data from waves 1 through 13 of the pairfam, resulting in 18,912 individuals and over 100,400 person-years. Given our study's specific focus on relationship factors, we limited our sample to individuals actively engaged in romantic partnerships at any point in time (n=14,279). This selection was necessary, as our key outcome variables (relationship satisfaction and union dissolution), as well as one of our primary predictors (partner's perceived fertility), could only be evaluated for those in relationships. Moreover, individuals with missing data on both their own and their partner's perceived fertility (n=2,566) were not included in the analyses. We also excluded individuals with only one observation available (n=2,865). This yielded a final analytic sample of 8,848 individuals and 54,612 person-years. Sample sizes varied slightly across analyses depending on missing information on specific outcomes.

Measures

Our study encompassed three distinct outcome measures: life satisfaction, relationship satisfaction, and union dissolution. To assess life and relationship satisfaction, we used a global 11-point scale (Schimmack et al., 2008) ranging from zero (indicating "extremely dissatisfied") to 10 (signifying "extremely satisfied"). In addition to these measures, we used union dissolution as a binary variable. It took a value of zero in all years leading up to the year of separation, and transitioned to a value of one in the year of separation.

To assess the participants' own perceived fecundity (OPF), we followed the approach of McQuillan and colleagues (2022) and Passet-Wittig et al. (2020) by using the following question: "Some people are not able to procreate naturally. As far as you know, is it physically possible for you to conceive naturally?" Similarly, the partner's perceived fecundity (PPF), as rated by the anchor, was derived from the following question: "As far as you know, would your partner be able to procreate by natural means?" Both items featured a four-point scale: (i) definitely yes, (ii) probably yes, (iii) probably no, and (iv) definitely no. This structured approach ensured a standardized evaluation of the perceived fecundity of both the individual and their partner within our study. To facilitate interpretation, we recoded the perceived fecundity item so that higher values correspond to higher levels of perceived fecundity.

Moreover, respondents who were pregnant or whose partners were pregnant were not asked the perceived fecundity questions, as pregnancy signifies fertility. Their OPF and PPF were treated as definitely yes following McQuillan et al. (2022). Similarly, individuals or partners who were sterilized were categorized as definitely no for their

respective OPF or PPF. This strategy avoided excluding relevant groups, especially couples expecting a child, and potentially limited generalizability. Including pregnant and sterilized individuals yielded an additional 369 participants and 4,333 person-years of data. We performed a series of robustness checks, detailed in the supplementary analyses section, to ensure the validity of our findings.

Statistical model

To examine how individuals' own perceived fecundity (OPF) and their partner's perceived fecundity (PPF) relate to life and relationship satisfaction, as well as the risk of separation, we employed the following equation:

$$Y_{it} = \alpha_i + \beta_1 X_{it} + \beta_2 Age_{it} + \beta_3 Age_{it}^2 + \beta_4 P_{it} + \varepsilon_{it}$$

In our model, *t* indicated the year, *i* represented the anchor, and ε was the error term. Y referred to the three outcomes examined: life satisfaction, relationship satisfaction, and the risk of separation. We estimated the same equation for each outcome separately. Employing individual-level fixed effects (FE) in all models, denoted by α, allowed us to leverage within-person variation over time to address potential endogeneity and unobserved heterogeneity in the relationship between perceived fecundity and the outcomes examined. These models controlled for all time-invariant characteristics of individuals and couples, such as personality traits, preferences, and genetic factors, which could confound the effect of perceived fecundity. Additionally, we included age effects by incorporating linear and quadratic specifications of age (i.e., Age_{it} and Age_{it}^2) into our models, given the likely association between age and fertility patterns as well as the outcome variables. Additionally, we controlled for parental status (P_{it}) using

a dichotomous dummy variable, as it could be related to both the main predictor and the outcomes.

Table 1 Descriptive statistics (standard deviations in parentheses)

Panel A: Descriptive Statistics	Own Perceived Fecundity (OPF)				Partner's perceived fecundity (PPF)				
	High		Low		High		Low		Overall
	Men	Women	Men	Women	Men	Women	Men	Women	
Life satsifaction (0-10)	7.7	7.7	7.5	7.4	7.7	7.7	7.3	7.6	7.6
	(1.5)	(1.6)	(1.8)	(1.9)	(1.5)	(1.6)	(1.8)	(1.7)	(1.6)
Relationship satisfaction (0-10)	7.9	7.8	7.7	7.6	7.9	7.8	7.7	7.5	7.8
	(2.1)	(2.2)	(2.3)	(2.4)	(2.1)	(2.2)	(2.2)	(2.4)	(2.2)
Separation (0 or 1)	0.05	0.05	0.04	0.03	0.06	0.05	0.06	0.03	0.05
Age (20-50)	34.1	33.9	38.6	38.9	34.5	34.3	39.2	38.6	
	(7.1)	(7.0)	(6.3)	(6.1)	(7.1)	(7.1)	(6.0)	(5.6)	
Parental status (0 or 1)	0.6	0.7	0.7	0.8	0.6	0.7	0.7	0.8	0.6
Number of transitions in OPF									1.4
									(1.8)
Number of transitions in PPF									1.3
									(1.7)
N (person-years)	23,294	30,013	1,608	2,607	22,437	29,319	1,288	2,150	57,522

Panel B: Transition probabilities					
Own Perceived Fecundity (OPF)	*Trans. prob.*	Definitely no	Probably no	Probably yes	Definitely yes
	Definitely no	66.7	5.4	6.2	21.7
	Probably no	15.1	39.3	23.0	22.7
	Probably yes	1.6	2.6	62.3	33.5
	Definitely yes	2.2	0.8	11.3	85.8
Partner's perceived fecundity (PPF)					
	Definitely no	70.2	6.6	5.2	18.0
	Probably no	15.7	45.5	20.3	18.5
	Probably yes	1.1	2.5	62.1	34.4
	Definitely yes	1.5	0.5	10.7	87.3

Source: Pairfam (Wave 1-13), release 13.0.

The main predictor in our models, denoted by X, referred to either own perceived fecundity (OPF) or partner's perceived fecundity (PPF). To address potential collinearity issues arising from the likely correlation between OPF and PPF (Passet-Wittig et al., 2020), we estimated the effects of OPF and PPF separately.

We compared these models with pooled ordinary least squares (OLS) models using the same sample employed for the fixed-effects analysis. Additionally, we compared the

results from these OLS and FE models with a pooled sample that included all observations from pairfam. These observations provided a benchmark for comparison with the FE models, and allowed us to assess the magnitude and direction of the potential bias due to omitted variables, as well as the impact of sample selection that resulted from using the FE model. Given that the results of the OLS models were substantively similar regardless of the chosen sample, we opted to present the estimated effects using FE models and OLS models with the fixed-effects sample.

For analyses focusing on union dissolution, we estimated linear probability models given that the outcome was a dichotomous variable. Moreover, we used lagged measures of own perceived fecundity (OPF) and partner's perceived fecundity (PPF) for two reasons. First, union dissolution is a protracted process, and the ramifications of perceived fecundity variations may not manifest immediately. Employing lagged measures enabled us to capture the delayed effects of changes in perceived fecundity on the likelihood of separation, thus allowing for a more nuanced understanding of their relationship. Second, as questions regarding the partner's perceived fecundity were not administered to single individuals, using lagged measures ensured data availability even when individuals transitioned to being single in the subsequent wave. Thus, incorporating lagged measures mitigated this issue by ensuring that data on the partner's perceived fecundity were available for all observations in the analysis.

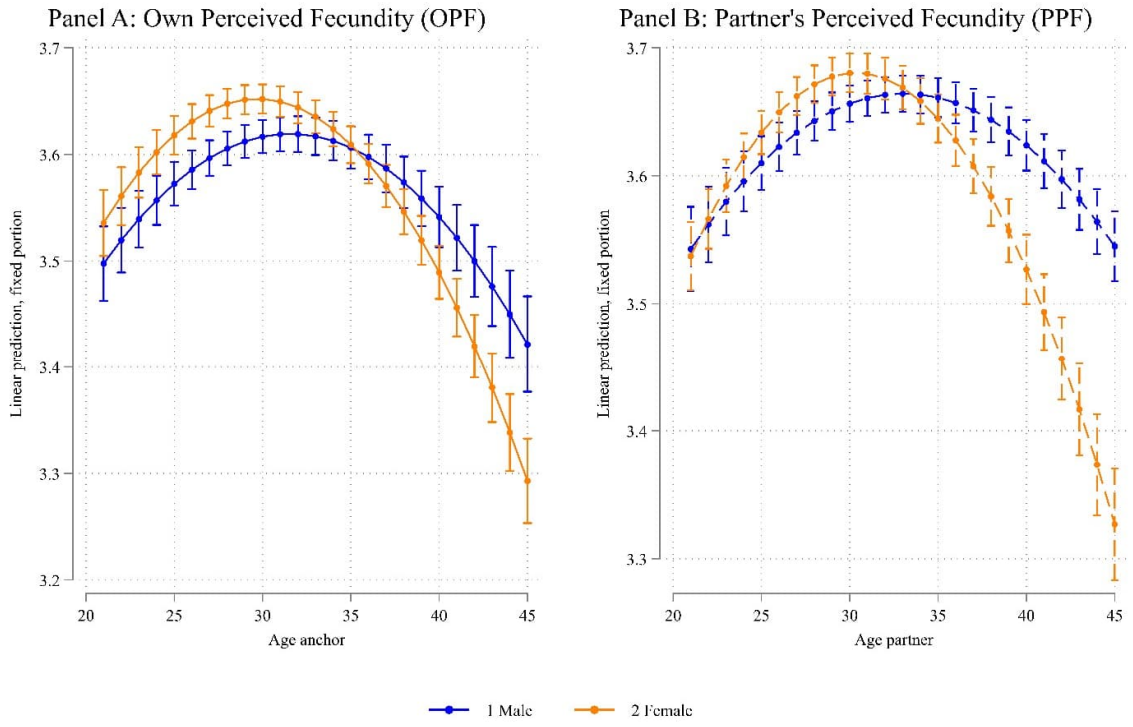
Results

Descriptive statistics

Panel A of Table 1 presents descriptive statistics for the three outcome measures and control variables included in the main models, disaggregated by gender and perceived fecundity categories. Individuals were categorized as having high perceived fecundity if

they responded definitely or probably yes when asked about their own (OPF) or their partner's fecundity (PPF), and as having low perceived fecundity if they responded definitely or probably no.

Figure 1 Trajectories of perceived fecundity by age and gender (PPF in dashed lines)



Source: pairfam (waves 1-13), release13.0.

Overall, both life and relationship satisfaction tended to be lower among individuals who perceived either their own or their partner's fecundity as lower, with no significant gender variations observed. This association was slightly more pronounced for PPF than for OPF. Regarding union dissolution, no significant differences emerged across groups, except that men who perceived an inability (versus an ability) of their partner to have children reported higher separation rates.

Panel B of Table 1 reveals the frequency of transitions between states. Regarding OPF, around 22% of individuals in the definitely no state shifted to definitely yes in the next wave, while 67% did not change their response. Conversely, transitions from definitely yes to definitely no were much less common, with only 2% of individuals making such a shift, and 86% remaining in the definitely yes category. Similar trends were observed when focusing on PPF. These findings highlight the dynamic nature of perceived fecundity, despite a general tendency to remain in the same state. While transitions do occur, individuals are more likely to maintain their initial perceptions of OPF and PPF. Figure 1 (Panels A and B) shows the dynamic relationship between age, gender, and perceived fecundity based on growth curve models, where perceived fecundity was the dependent variable, and age and gender were the independent variables. The model included random slopes of age for each individual. The figure used data on both OPF and PPF. Until their early thirties, females reported higher perceived fecundity (Panel A, yellow curve). Thereafter, however, women's scores began to decline more noticeably, with their perceived fecundity becoming lower than that of males (red curve) in later years. These turning points occurred consistently for both OPF (Panel A) and PPF (Panel B) at around ages 31-32 for females and ages 33-34 for males. Notably, male respondents' PPF was rated consistently higher than their OPF. This gap was particularly pronounced at later ages, when women's perceptions of their partner's fecundity reached levels similar to their perceptions of their own fecundity in their twenties.

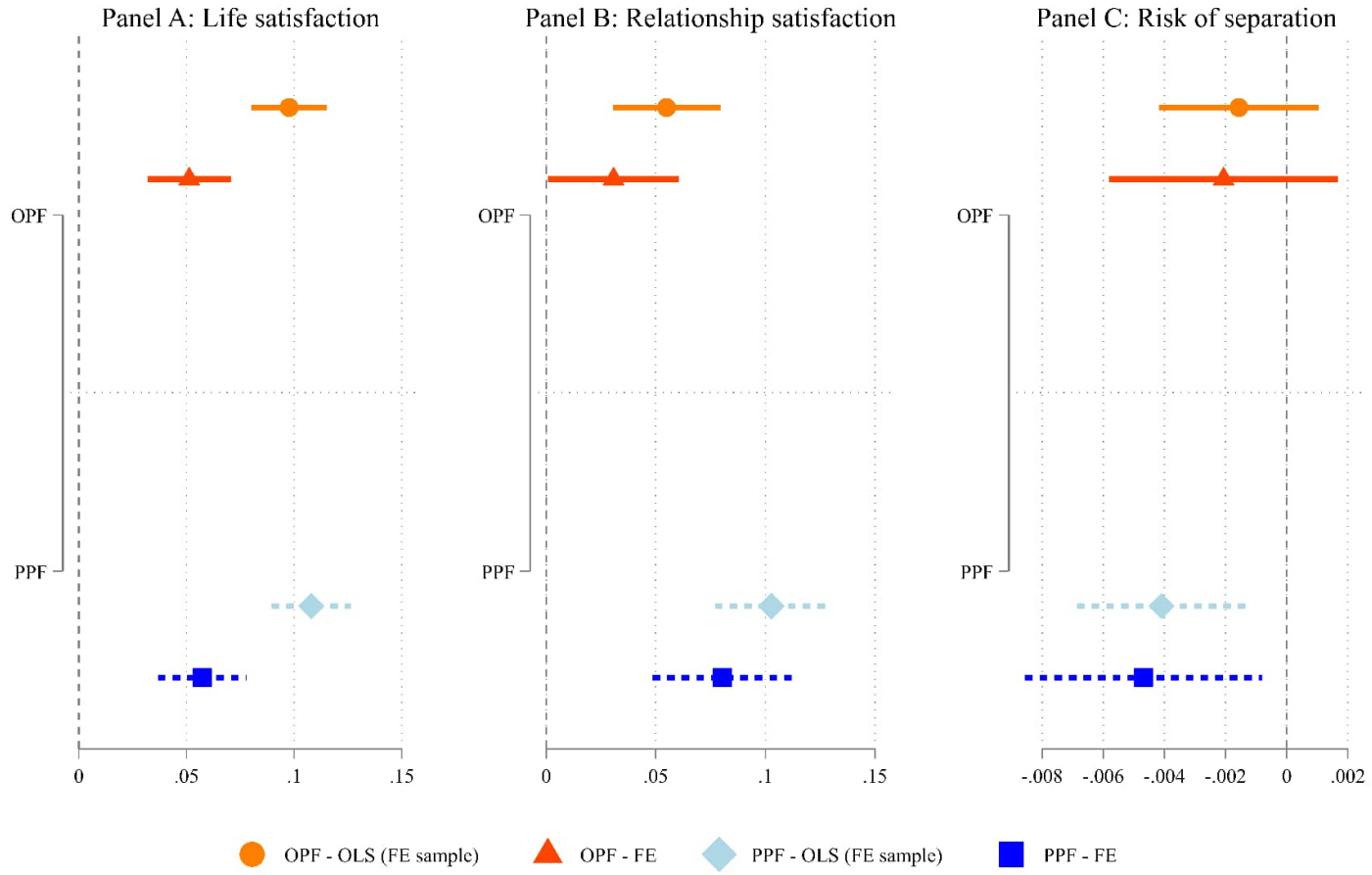
Regression results

Figure 2 displays the main effects derived from our analysis of the three focal outcomes, with detailed results presented in Appendix Table A1. To obtain a comprehensive understanding of these relationships, we employed two distinct approaches. First, OLS models incorporating the fixed-effects sample provided a broad perspective on the relationships between variables. Fixed-effects models were then utilized to isolate the impact of independent variable changes on the outcomes while accounting for all time-invariant individual factors.

Panel A of Figure 2 illustrates a positive correlation between life satisfaction and perceived fecundity. In the fixed-effects models, moving from a lower category of own perceived fecundity (OPF) to a higher category corresponded to a 0.05 increase in life satisfaction, whereas having a child was associated with a larger increase of 0.11 in life satisfaction, as shown in the second column of Panel A in Table A1 in the Appendix. This indicates that a two-unit change in OPF yielded similar effects for life satisfaction as having a child. Furthermore, a significant association between partner's perceived fecundity (PPF) and life satisfaction was observed, with effect sizes comparable to those for own perceived fecundity (OPF). Notably, when incorporating fixed-effects models to control for time-constant individual-level characteristics, the effects observed in ordinary least squares (OLS) models diminished considerably. This suggests the presence of unobserved characteristics associated with perceived fecundity and life satisfaction.

Panel B reveals a negative association between declines in OPF and PPF and relationship satisfaction. Similar to the results for life satisfaction, the OLS models yielded larger effect sizes, but the decrease was less pronounced in the fixed-effects models. Moreover, decreases in PPF had a stronger negative impact on relationship satisfaction than decreases in OPF.

Figure 1 Main findings (PPF in Dashed Lines)



Source: Pairfam (Wave 1-13), release 13.0.

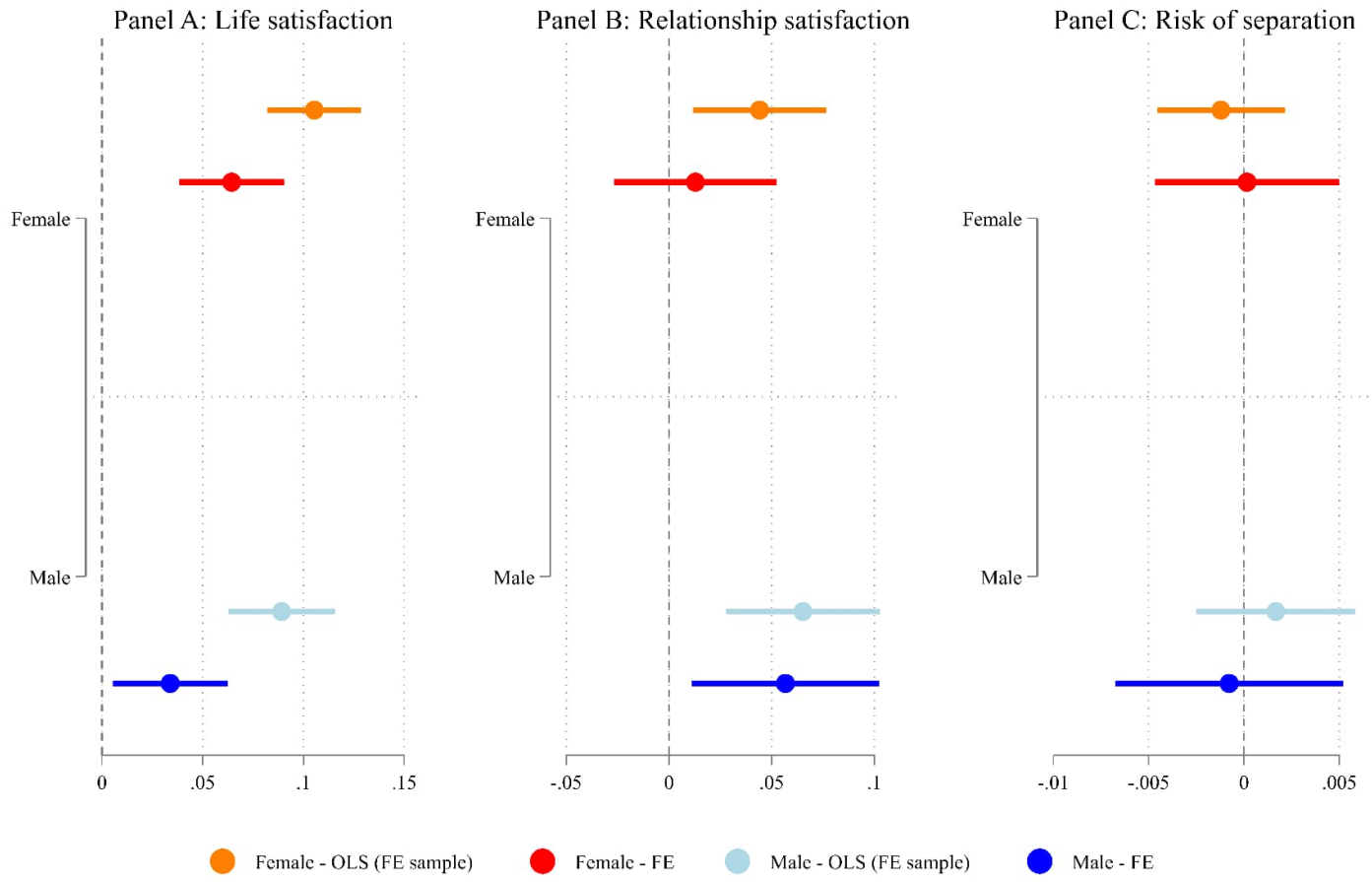
Panel C shows the relationship between perceived fertility and separation risk. No significant association was found between OPF and separation. There is, however, a discernible pattern: individuals were more likely to separate when they reported a decline in PPF. Specifically, a one-unit decline in PPF was linked to a 0.5 percentage point increase in the likelihood of separation, which was comparable in effect size to that of parental status (see column 4 located in Panel C of Table A1 in the Appendix). Considering the annual base rate of separation (i.e., 0.15), a decline in PPF corresponded to an increase of approximately 3-4% in the annual base rate of the separation risk.

Gender differences

Figure 3 presents gender-specific analyses exploring the relationship between own perceived fecundity (OPF) and the outcomes of interest. Findings regarding gender differences in how the partner's perceived fecundity (PPF) related to the outcomes are reported in Figure A1 of the Appendix, with detailed estimates provided in Table A2. Overall, no significant gender differences were found in the relationship between life satisfaction and either OPF or PPF.

In Panel B of Figure 3, estimates regarding relationship satisfaction are presented. Results indicated that higher OPF was associated with higher relationship satisfaction to a greater extent among males than among females, and these effects remained statistically significant in the fixed-effects models as well. Interestingly, while the OLS models indicated that the positive correlation between PPF and relationship satisfaction was also significantly stronger among males than among females, as shown in Panel B of Figure A1, these effects notably diminished among males after introducing

Figure 2 Analyses by gender (focusing on own perceived fecundity)



Source: Pairfam (Wave 1-13), release 13.0.

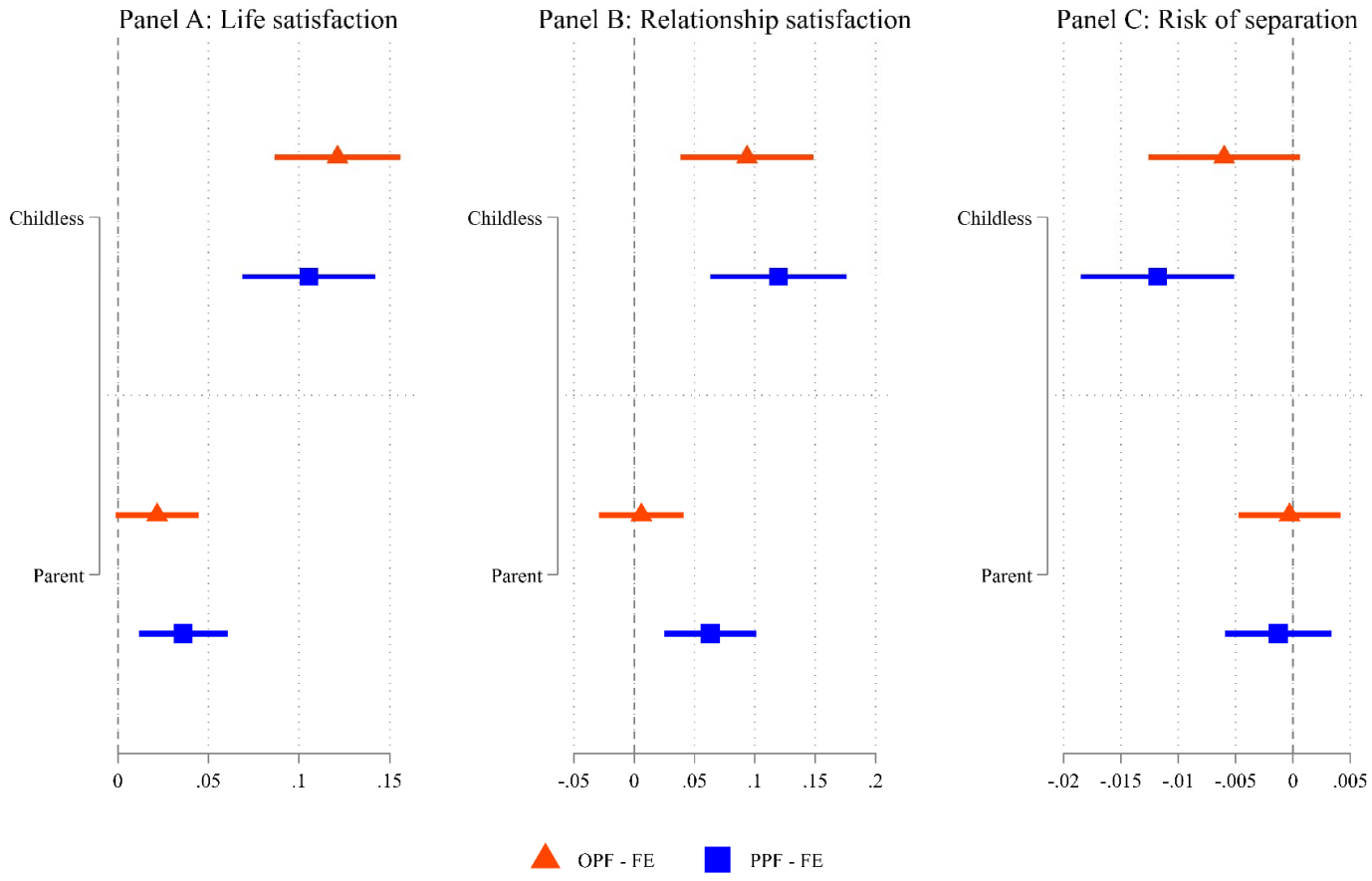
individual-level fixed effects, while they slightly increased among females. As a result, gender differences became statistically insignificant in the fixed-effects models. Moving forward, we examined potential gender differences in the relationship between the risk of separation and perceived fecundity in Panel C. We found no significant gender disparities in the relationship between OPF and the risk of separation. Similarly, analyses shown in Panel C of Figure A1 (Appendix) revealed non-significant effects of PPF on separation risk for both genders. Interestingly, although not statistically significant, the estimated effects for men trended slightly stronger in magnitude compared to those for women.

Differences by parental status and age

To further examine the role of perceived fecundity in life satisfaction, relationship satisfaction, and union stability, we conducted additional analyses by interacting OPF and PPF with parental status and age in separate models. These interactions tested whether the effects of perceived fecundity varied by the reproductive status and age of the individuals. We used the same three models as in the main analysis: OLS pooled sample, OLS fixed-effects sample (singletons are dropped), and fixed-effects models. However, for simplicity and clarity, we only reported the results from the fixed-effects models, as they provided the most rigorous and reliable estimates by controlling for unobserved individual heterogeneity.

Findings were qualitatively similar to those from the OLS models. Figure 4 displays the predicted values of each outcome variable based on the interaction effects for childless respondents and parents (full estimates are provided in Table A3 in the Appendix). The effects of OPF and PPF on life and relationship satisfaction were more pronounced and

Figure 3 Analyses by interaction with parental status



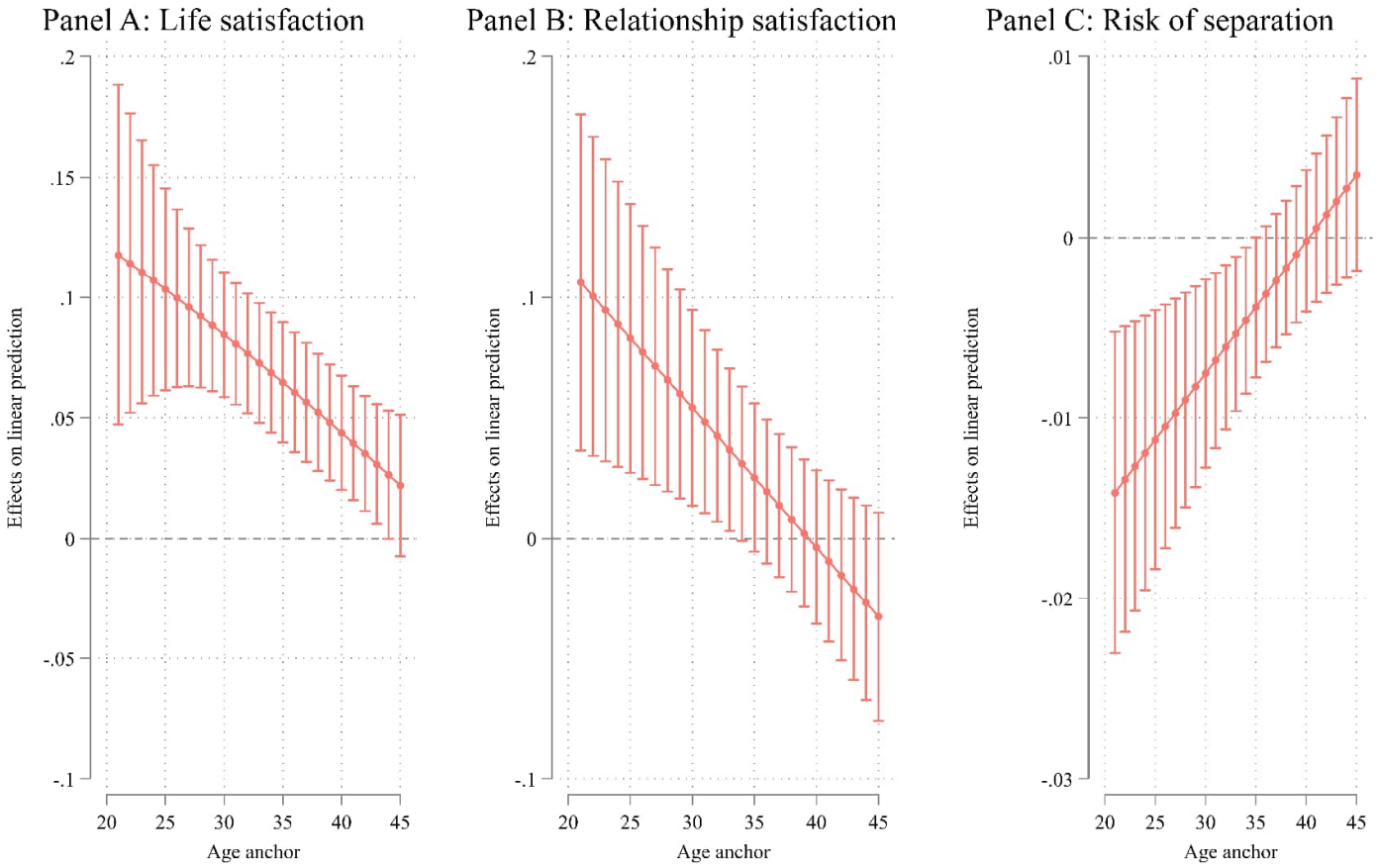
Source: Pairfam (Wave 1-13), release 13.0.

significant for childless respondents than for parents. This implies that perceived fecundity was more important for the life satisfaction and relationship satisfaction of individuals who did not yet have children. Similarly, the effect of PPF on separation risk was stronger and more significant for childless respondents than for parents.

We conducted additional robustness checks, the details of which can be found in the Appendix. These alternative specifications yielded findings that were qualitatively consistent with our main models. First, we excluded respondents if they or their partner experienced pregnancy or sterilization, which was categorized as "definitely yes" and "definitely no," respectively, in our primary models, acknowledging that our assumptions about their perceived fertility might not accurately reflect their reported perceptions. Overall, our findings remained robust to this specification, as indicated in Figure A3 in the Appendix, with two exceptions. While relationship satisfaction was significantly associated with PPF in the fixed-effects models, it was not significantly associated with OPF. Additionally, the significant coefficient for PPF observed in the main models became insignificant in these alternate models. However, further analyses (not displayed) revealed that the risk of separation increased with decreasing PPF among childless individuals and younger respondents. Second, we replicated our primary models by including both OPF and PPF in the same model (refer to Figure A4 in the Appendix).

In additional analyses not shown, we employed logit models with random effects at the individual level to assess the risk of separation instead of a LPM model, which yielded similar findings. Moreover, we acknowledged asymmetric effects, suggesting that the consequences of declines and increases in perceived fecundity might not be the same for the outcomes examined. However, the estimated effects of declines and of increases

Figure 4 Analyses by interacting OPF with age



Source: Pairfam (Wave 1-13), release 13.0

were not significantly different from each other. In addition, we used a categorical variable for age rather than a quadratic measure, as the age distribution might not have spread out evenly given that we focused on particular cohorts. The findings were qualitatively robust to this specification. These findings are available from the authors.

Discussion

Evidence indicates that the perceptions of one's ability to have children can change over the life course (Passet-Wittig et al., 2020). These shifting views of fecundity may affect important social outcomes, given that becoming a parent remains a core life goal for many people (Johnson-Hanks et al., 2011). Accordingly, we examined how one's own perceived fecundity (OPF) and the partner's perceived fecundity (PPF), as rated by the anchor, are related to life satisfaction, relationship satisfaction, and separation risk. By exploring how subjective biology is related to social outcomes, our study advances our understanding of fertility-related dynamics.

Descriptive analysis revealed temporal fluctuations in perceived fecundity (OPF and PPF) that declined consistently with age. Notably, this decline was steeper for females, suggesting that both men and women tend to view male fecundity as less affected by age. Turning to our fixed-effects models that accounted for age effects and time-invariant characteristics at the individual level, the findings indicated that, overall, decreases in OPF and PPF were consistently associated with lower life satisfaction, in line with prior research (McQuillan et al., 2022). While previous findings on childbearing and happiness are mixed, some evidence suggests that this variability is driven by pre-childbearing expectations not always matching post-childbearing experiences (Aassve et al., 2012). Similarly, while we cannot know the counterfactual

life satisfaction levels of individuals with declining fecundity if they became parents, declining perceived fecundity potential was nonetheless related to diminished satisfaction.

These findings suggest that changes in the partner's perceived fecundity might pose a greater challenge to the relationship, potentially impacting how the individual views the relationship's overall viability. Conversely, a decline in OPF may be perceived as being a more personal challenge. An individual's view of their partner's reproductive prospects may carry greater weight for relational outcomes than their assessment of their own fecundity. Alternatively, the "self-serving bias" posits that individuals attribute positive outcomes to internal factors but blame negative outcomes on external forces (Miller & Ross, 1975). Thus, a very similar fertility decline that is perceived externally rather than internally could exert a stronger influence.

We found no gender differences in outcomes, in contrast to prior research showing that infertility is more distressing for women than for men (Anderson et al., 2003; Peterson et al., 2007). One potential explanation for these conflicting findings is that most previous studies focused on infertile couples who are often childless or used cross-sectional data in which associations may reflect unobserved confounding. In contrast, our longitudinal fixed-effects design accounted for time-invariant confounding by examining within-person changes. Furthermore, our observation that there were no significant gender disparities in individuals' reactions to declines in fecundity aligns with prior research, supporting the acceptance of the medical model. This model views medical conditions as individual phenomena, whereas infertility, particularly in developed nations, is perceived as a condition affecting a couple, regardless of which partner has a functional impairment (Greil et al., 2010). In contrast, in some societies,

medical explanations of infertility coexist with traditional perspectives. These traditional views often place the primary burden of infertility on the woman, with the female partner frequently being blamed for a couple's childlessness, sometimes exclusively (Dyer et al., 2005).

In another perspective, gender differences in levels of fertility-related distress might depend on the cultural context. The prevalence of a medical model explaining infertility is especially pronounced in Western societies, whereas in other cultural landscapes, these medical interpretations coexist with more traditional perspectives (Greil et al., 2010). Despite a recent increase in fertility rates in Germany, they are still far below replacement levels.

Moreover, there is a widespread acceptance of childlessness in Germany (Kreyenfeld & Konietzka, 2017). This context suggests that traditional pronatalist interpretations, which often emphasize women’s social roles, may be less relevant for our specific cohorts (Greil et al., 2010). Consequently, the smaller observed gender differences in fertility behavior could be attributed to this cultural backdrop.

Furthermore, previous evidence suggests that the expected utility of childbearing is lower in Germany than in other Western countries with higher fertility rates (Billari and Kohler, 2009). It is, however, important to note that these findings may not fully capture the experiences of our specific cohorts, who have seen fertility rate increases. Taking a similar perspective, the perceived effects of changes in fecundity could vary in intensity across different contexts. Hence, it would be insightful to extend our longitudinal design to a cross-national level. For example, the Generations and Gender Programme (GGP) data include information on similar items, offering an opportunity to explore whether and how these patterns differ in other Western settings. Our additional analyses further

showed that negative consequences were stronger for childless and younger individuals, in line with our expectations and providing further support to our main conclusions. Parenthood may reduce the negative effects of perceived fecundity on life satisfaction, relationship satisfaction, and union stability because parents may have already fulfilled their reproductive goals and have less desire or pressure to have more children. Age may also moderate the effect of perceived fecundity on life satisfaction, relationship satisfaction, and union stability because older individuals might have lower fertility expectations and aspirations than younger individuals. These findings may also be linked to the observation that parents tend to be less affected by perceived fecundity because as individuals age, they are more likely to have had already children, reducing the impact of fecundity on their social outcomes.

In conclusion, we acknowledge several limitations and offer suggestions for future research. One limitation was the challenge we faced in understanding how pairfam participants perceived questions on fecundity and the factors or assumptions that influenced their ratings of their own and their partner's fecundity. It is noteworthy that, particularly compared to dyadic approaches, the single-reporter method can yield an incomplete or distorted picture of relationship characteristics (Carr, 2018). However, our descriptive evidence regarding the temporal shape of perceived fecundity changes by age and gender lends support to the validity of our measurements. Additionally, our longitudinal design and utilization of variations within perceived fecundity to assess its association with life satisfaction and relational outcomes may have resulted in a selective sample, potentially underrepresenting certain groups, such as individuals experiencing significant declines in perceived fecundity. Although attrition rates

remained relatively stable at around 10% (Müller & Castiglioni, 2015), it is important to consider these points when interpreting the results.

Literature on the social consequences of fecundity remains limited. Future research could examine the interplay between age, socioeconomic status, and family values. Outcomes like socialization and relationships with relevant others following changes in perceived fecundity could also be explored. Datasets with extensive social and attitudinal information, like pairfam, are well-suited for investigating links between fertility patterns and social outcomes. Moreover, the proposed mechanisms explaining our expectations were not investigated in this study, but warrant exploration: e.g., whether the effects are moderated when holding more familialistic values or having larger desired family sizes. In conclusion, as delayed childbearing grows, understanding how individuals perceive their own and their partner's fecundity is increasingly important. As childbearing decisions are often reached jointly, the relational implications of perceptions should be taken into account when seeking to promote healthy partnerships amid fertility challenges. These findings can inform policies supporting the family planning and relationships of couples facing fertility issues.

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