

RESEARCH ARTICLE

Not all births are equal: Delivery type and fertility intentions by age at first childbirth

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ABSTRACT As maternal age at first birth continues to rise in Italy, this study investigates whether and how the mode of delivery at first birth is associated with subsequent fertility intentions, with a specific focus on differences by maternal age at childbirth. Using weighted data from the Fertility Over Forties survey (2024) on 2375 Italian mothers with one child, we estimate predicted fertility intentions by age at first childbirth (under and over age 35), accounting for delivery type and other characteristics of the delivery. Results show that the mode of delivery at first birth is significantly associated with fertility intentions, with more medicalised or interventional deliveries generally linked to lower intended fertility. At the same time, a strong age gradient emerges: mothers aged 35 and older report consistently lower fertility intentions across all delivery types. Differences across delivery modes within age groups are comparatively modest, and we do not find clear evidence that the association between delivery type and fertility intentions varies substantially by maternal age or healthcare setting. We discuss the implications of these results in light of the recent literature on reproductive careers and maternal age and call for greater attention to mothers' birth experiences and well-being in demographic research.

KEYWORDS Fertility intentions • Delivery type • Maternal age • Reproductive career

Introduction

Across Europe, and particularly in southern European countries such as Italy, the postponement of first births has become a defining feature of contemporary low fertility patterns (Sobotka and Beaujouan, 2018).

While periods of partial recuperation in fertility levels have occurred over time, they have been uneven and short-lived, whereas the trend towards the postponement of first births has followed a remarkably steady upward trajectory (Caltabiano, 2016). According to Eurostat data, Italy was among the European countries with the highest mean age at first birth in 2023 (31.8 years, with the European mean being 29.8), a figure that further increased to 31.9 in 2024 (Istat, 2025).

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Fertility postponement has two key implications. First, delaying the first birth mechanically shortens the reproductive window, reducing the time available for subsequent childbearing and increasing the risk of unrealised fertility intentions (Bongaarts and Feeney, 1998). Second, postponement may qualitatively reshape the experience of motherhood itself. Entering parenthood at later ages is associated with a higher likelihood of medicalised pregnancies and deliveries, as well as with increased exposure to obstetric interventions and adverse birth outcomes (Kenny et al., 2013; Myrskylä et al., 2013; Schmidt et al., 2012). Importantly, however, recent evidence suggests that the strength of this association is not constant over time, but varies across cohorts and institutional contexts, reflecting changes in medical practices and maternal selection (Goisis et al., 2018). As a result, women who postpone childbearing may not only face tighter biological constraints on parity progression, but may also experience childbirth under conditions that differ substantially from those encountered by younger mothers, in ways that are shaped by both age and context.

Moreover, the concept of “reproductive career” has recently been introduced to shed light on how past reproductive events influence current and future reproductive attitudes, behaviours and experiences (Johnson et al., 2018, 2023). This conceptualisation proposes two overarching dimensions for its operationalisation: density, which captures the overall frequency of reproductive events across the life course, and complexity, which reflects the diversity of event types experienced.

Although this framework appropriately redirects attention to reproductive experiences, it does not fully account for the possibility that experiences connected with reproductive health will have intrinsic physiological and emotional consequences. These consequences, in turn, can shape subsequent reproductive attitudes, behaviours and experiences. Moreover, this theory overlooks the reality that having children at different ages differs in terms of both the number of prior experiences mothers have accumulated and how they respond to those experiences.

While these issues have received substantial attention in the scientific literature, particularly in obstetrics-related research, their relevance and consequences for demographic processes remain underexplored, and several aspects of reproductive health have yet to be fully examined within demography.

In this paper, we focus on one such understudied dimension: the relationship between the experience of the first birth – specifically, the type of delivery – and subsequent fertility intentions. While extending the theory of reproductive career by focusing on the role of a single reproductive event at diverse ages, this paper aligns with the perspective of Margolis and Myrskylä (2015), who argued that parental experiences at first birth – particularly those of mothers – are a significant and understudied factor shaping completed family size. In this context, we focus on how different types of first delivery are associated with stronger or weaker intentions to have another child, with particular attention being paid to the mother’s age at first birth. We examine whether the medicalisation of birth (Christiaens and van Teijlingen, 2009), along with unplanned medical interventions when needed, may be differently associated with fertility intentions depending on whether the mother was above or below age 35 at the time of her first birth, as 35 is an age commonly identified as a critical threshold for maternal health and

demographic outcomes (Schmidt et al., 2012). We propose that the mode of delivery may itself play a role in women's fertility intentions by shaping their physical recovery, psychological well-being and overall birth experience. Unplanned interventional deliveries – such as emergency caesarean sections or operative vaginal deliveries¹ – and highly medicalised deliveries – such as planned caesarean sections – are often associated with greater physical strain, perceived loss of control or even trauma, potentially leading to a delay in or a reconsideration of future childbearing. In contrast, spontaneous vaginal deliveries may be more positive, empowering experiences (The Lancet, 2025), thereby reinforcing women's reproductive plans (as recently shown by Peters et al., 2025, in the Australian context). The type of delivery thus operates not only as a clinical event, but also as a subjective experience that may affect a woman's willingness or readiness to have additional children. Moreover, we consider delivery in a public versus a private hospital as a relevant factor in characterising the context in which childbirth takes place (*ivi*).

The Italian case, which is characterised by late fertility and a highly medicalised childbirth system, offers a particularly compelling setting for investigating the relationship between birth experiences and fertility intentions. Italy combines one of the lowest fertility rates in the world (Eurostat, 2023) and substantial postponement with a high prevalence of medicalised childbirths, including caesarean sections, which account for over one-third of all deliveries (Spina, 2023). According to the latest data from the Certificate of Delivery Care (CeDAP, 2025), the caesarean section rate in the country is 29.8%. This rate is among the highest in Europe, with pronounced variation across regions (around 23% in northern Italy versus 37.4% in southern Italy) and between private (53%) and public hospitals (28%). While no national policy mandates a specific delivery type, the 2012 National Health Plan explicitly identified the reduction of unnecessary caesarean deliveries as a public health priority, motivated by concerns over cost, clinical appropriateness and maternal and neonatal health (Scognamiglio, 2019). At the same time, the Italian welfare system offers limited structural support for families from the early stages of life, thus placing a considerable burden of care and planning on women (Mussida and Pattimo, 2021). These features make Italy an ideal context to explore how the physical and emotional costs of childbirth shape reproductive decisions.

A major strength of this study lies in the uniqueness of the Italian dataset from the FORTIES (Fertility Over Forties) project, which – unlike other national sources – links detailed measures of delivery type and childbirth experiences with direct questions on fertility intentions. Fertility intentions have been widely studied in the Italian context, particularly with respect to the role of economic factors (e.g. Vignoli et al., 2022) and gender equality (e.g. Mills et al., 2008). The FORTIES project provides a rare opportunity to study fertility intentions at first childbirth across maternal age groups, including detailed

1 Emergency caesarean sections refer to unplanned surgical deliveries performed in response to acute obstetric complications. Operative vaginal deliveries involve the use of instruments (e.g. vacuum or forceps) to assist vaginal birth due to medical reasons related to the mother or the foetus. Induced deliveries refer to medically initiated labour before the spontaneous onset of labour, typically using methods such as oxytocin or membrane rupture.

information about the delivery, in a country where the postponement of childbearing is both widespread and socially stratified (Caltabiano et al., 2017).

Understanding these mechanisms in Italy can thus shed light on broader patterns of fertility decline in ageing, low-fertility societies. This contribution is particularly valuable because existing research has rarely been able to combine information on childbirth experiences and subsequent reproductive plans. Previous studies examining the association between mode of delivery and subsequent fertility (for example, Evers et al. (2014) and Kjerulff et al. (2020)) relied on high-quality clinical or administrative data, but did not include information on fertility intentions and did not offer comparably detailed measures of delivery type and childbirth experiences.

Moreover, these studies focused on demographic and institutional contexts that differ substantially from the Italian case. The findings of previous international studies are therefore not fully transferable to low-fertility contexts, as they are embedded in healthcare systems, gender regimes and family policy frameworks that differ substantially from those in Italy.

Finally, this paper is the first to explicitly consider age at first childbirth as a key dimension for understanding whether and how the type of delivery is associated with subsequent fertility intentions. Given the widespread postponement of childbearing and the qualitatively distinct experiences of childbirth at different life stages, we argue that accounting for maternal age at first birth is crucial to understanding heterogeneity in the link between delivery type and reproductive plans.

Childbirth experience and short-term reproductive planning

The experience of childbirth is a pivotal life event that may shape women's future fertility behaviour and intentions. A growing body of research suggests that the type and perceived quality of childbirth can significantly impact mothers' well-being. Several studies have focused on the role of delivery mode, driven in part by the evidence indicating that caesarean section has become the most common major surgery performed worldwide (Davis et al., 2022). The prevalence of this procedure almost doubled between 2000 and 2015 (Boerma et al., 2018), with caesarean section deliveries accounting for 27% of births in high-income countries globally and one in three births in southern Europe (Betran et al., 2021).

It has been suggested that the stress and medical complications often accompanying this procedure and other medicalised delivery types contribute to negative childbirth experiences, potentially discouraging women from considering future pregnancies. Unplanned interventional deliveries are also linked to more negative emotional responses and worse postpartum well-being (Carquillat et al., 2016; Green et al., 2022; Guittier et al., 2014; Rowlands and Redshaw, 2012). Moreover, beyond the mode of delivery, the overall childbirth experience, encompassing perceived levels of autonomy and support and medical outcomes, plays a critical role in women's subsequent reproductive plans (The Lancet, 2025).

Within a reproductive career framework, this evidence emphasises the role of specific reproductive events – such as the type of delivery – in shaping subsequent attitudes,

behaviours and experiences, and how these events may cluster along distinct life course trajectories (Johnson et al., 2018; Miller and Pasta, 1988; Thomeer et al., 2022).

Studies conducted in European settings have demonstrated that the mode of birth may have a significant impact on women's psychological and physical outcomes, particularly in the first few months after birth. Based on data from the National Maternity Survey 2010, which documented women's experiences of maternity care in England, Rowlands and Redshaw (2012) found that, compared to women who had spontaneous vaginal births or planned caesarean sections, those who experienced forceps-assisted vaginal births or unplanned caesareans reported poorer health and psychological well-being. These women reported experiencing a lack of control, worry and an intense period of anxiety or uncertainty during labour, which may have negatively affected their psychological well-being. Research has also pointed out that maternal subjective perceptions, such as a feeling of loss of control during labour or of inadequate communication with healthcare providers, are associated with a reduced willingness or ability to imagine a subsequent pregnancy (Guittier et al., 2014).

Both qualitative and quantitative research have investigated the relationship between parental experiences at first childbirth and subsequent fertility decisions. Qualitative evidence suggests that the experiences associated with first childbirth, including the mode of delivery, can significantly shape new parents' desired family size. Just as the challenges and exhaustion parents face during the first year of their child's life may lead them to revise their plans to have additional children, experiencing prolonged labour or complications associated with a caesarean section can generate reluctance to relive the experience (Newman, 2008). In the health domain, factors such as breast-feeding difficulties, sleep deprivation, depression, domestic isolation and relationship breakdown may further delay or discourage childbearing. Guittier and colleagues (2014), based on interviews with 24 primiparous women in Switzerland, showed that the mode of delivery influenced women's perceived control, emotional responses and early interactions with their newborn. These dimensions are critical in shaping how women imagine a subsequent pregnancy. In particular, emergency caesarean sections are more often associated with negative experiences, potentially affecting women's willingness to plan further births.

Turning to the quantitative evidence, the literature has examined the impact of first childbirth experiences on subsequent reproductive decisions, with results varying by population characteristics, follow-up duration and measurement strategies. A key distinction is between studies focusing on fertility intentions and studies examining second birth transitions. While some authors have argued that realised fertility behaviours are more directly relevant for population dynamics (Margolis and Myrskylä, 2015), others have emphasised that fertility intentions remain informative, as they capture the interplay between preferences and constraints, and may help to distinguish between biological limitations and voluntary postponement (Billari et al., 2009; Thomson and Brandreth, 1995). Following Shorey et al. (2018), we posit that accounting for intentions offers valuable insights into whether delayed or interrupted parity progressions are due to reduced fecundity or voluntary choices. In Italy, moreover, it has been ascertained that intentions and the subsequent realisation of intentions are relatively closely aligned (Régnier-Loilier and Vignoli, 2011).

Much of the empirical literature on this topic has focused on the association between mode of delivery – focusing on caesarean sections and vaginal births – and maternal well-being, typically over relatively short follow-up periods (Lydon-Rochelle et al., 2001; Majzoobi et al., 2014). Longer-term evidence is more limited. Using longitudinal data from the Australian Longitudinal Study on Women’s Health, Davis et al. (2022) showed that undergoing a caesarean section has a small but persistent impact on a woman’s long-term well-being, although the relevance of such long horizons for parity progression remains unclear. Additional research has shown that positive delivery experiences, characterised by high satisfaction and feelings of empowerment, are associated with stronger intentions to have additional children, and that, conversely, traumatic or highly medicalised birth experiences without sufficient emotional support can lead to “birth trauma”, potentially resulting in a desire to avoid future pregnancies altogether (Gottvall and Waldenström, 2002). A systematic review by Shorey et al. (2018) consistently found that negative first childbirth experiences, particularly those associated with the mode of delivery, are linked to a lower likelihood of parity progression and to longer interbirth intervals. Some studies, such as Gottvall and Waldenström (2002), have relied on women’s subjective evaluations of their first childbirth experience using self-reports and rating scales. These studies have generally shown that having a caesarean section, and particularly an unplanned or emergency caesarean delivery, is associated with a prolonged interbirth interval, and may even inhibit parity progression compared to having a spontaneous vaginal birth.

Evidence based on administrative and clinical data further supports this pattern. Studies using obstetric records (Carlander et al., 2015; Fussing-Clausen et al., 2014; O’Neill et al., 2015) have found that having a caesarean section or complicated vaginal delivery is linked to a reduced probability of having a second birth compared to having an uncomplicated vaginal birth. Women who undergo a caesarean section or experience complications such as shoulder dystocia have been shown to be about 14–23% less likely to have another child compared to women who have an uncomplicated vaginal delivery (Fussing-Clausen et al., 2014; O’Neill et al., 2015). By contrast, Carlander et al. (2015) found no significant association between delivery mode and subsequent childbearing in Sweden, noting that access to postnatal support and counselling may mitigate the negative consequences of adverse childbirth experiences. Shorey and colleagues’ (2018) review confirmed that a negative childbirth experience can influence subsequent reproductive decisions, with a prior negative experience being associated with a reduced likelihood of having another child.

Overall, the literature points in a direction consistent with the “reproductive career” framework, and suggests that the experience of first childbirth – particularly when characterised by complications, medical interventions or low perceived control – can influence both fertility intentions and subsequent reproductive behaviour, although the magnitude of these effects appears to depend on contextual factors.

Research on fertility intentions has, however, largely overlooked the role of childbirth experiences, especially in relation to the timing of these events within the reproductive life course. In particular, whether and how the type of delivery is related to subsequent reproductive intentions remains an open question. This paper addresses this gap by investigating whether different modes of delivery are associated with different fertility intentions. Accordingly, we ask:

RQ1. Among mothers with one child, is the type of first delivery associated with the intention to have a second child?

When studying the experience of the first birth in relation to fertility intentions, it is crucial to consider the mother's age at the first birth. This is especially significant in the European context, where a key factor driving differences in countries' overall fertility levels is the probability of transitioning from the first to the second birth (Van Bavel and Rózanska-Putek, 2010; for Italy, Fiori et al. 2018), and where postponement is a salient feature, particularly in southern Europe. In terms of reproductive careers, a negative first delivery experience is likely to affect women's likelihood of transitioning to a second birth differently depending on their age. Women who delay having their first child are often more educated and of higher socioeconomic status, and they may have fewer incentives to have another child in the short term, especially if their first childbirth was a negative or stressful experience (Zasloff et al., 2007). Furthermore, women who have their first child later in their reproductive career may place less emphasis on the short-term difficulties associated with becoming a parent (*ivi*). Childbearing later in life may intensify fertility constraints, which may make older mothers more determined to achieve their reproductive goals despite negative childbirth experiences (Casterline and Han, 2017). Moreover, compared to younger mothers, older mothers might be more prepared for parenthood, having planned for it more carefully (Gregory, 2007), which could facilitate their transition to a second birth, regardless of their first birth experience. Moreover, high socioeconomic status parents may prioritise long-term goals over short-term challenges, potentially downplaying the difficulties of the first birth in pursuit of the ultimate goal of having a larger family (Margolis and Myrskylä, 2015).

Conventionally, advanced maternal age refers to women aged 35 years or older at the time of a full-term birth. Advanced maternal age is an independent factor influencing adverse pregnancy outcomes and complications (Ye et al., 2024). In the reviewed literature, very little evidence is available in relation to women's age at first birth. Gottvall and Waldenström (2002) found that primiparas who were younger than 35 years old and who rated their first birth experience as negative were less likely to have a subsequent birth compared to those who rated their experience as average or good. Analogously, Margolis and Myrskylä (2015) observed that a large drop in well-being around the first birth was associated with a significantly lower hazard of progressing to a second birth among women who had their first birth at age 30 or older, relative to those who had their first child at younger ages. However, they did not investigate the role of the mode of delivery in influencing reproductive plans.

Based on these premises, the present study aims to answer the following research question:

RQ2. Does the relationship between the mode of delivery and fertility intentions vary depending on whether the mother is younger or older than age 35 at the first childbirth?

Although the Italian healthcare system is predominantly public, childbirth can also take place in private facilities. According to CeDAP data (2025), 9.1% of all births in 2024 occurred in private clinics. In this context, we ask whether the private sector may partially compensate for potential imbalances across age groups by offering different delivery trajectories, and whether this role varies by mode of delivery. Indeed, the same data show that

the share of caesarean deliveries among all births is higher in private clinics than in the public sector. This pattern is particularly relevant in light of the documented association between advanced maternal age and more medicalised births, raising the possibility that private facilities differentially attract or accommodate older mothers, or respond to age-specific clinical and perceived risks (Peters et al., 2025).

This leads to our third research question:

RQ3. Do fertility intentions vary by mode of delivery and maternal age depending on whether the birth takes place in a public or a private facility?

Data and methods

Data

This study was developed in the framework of the FORTIES project, through which we constructed an original dataset focusing on the childbirth and postnatal experiences of 3200 heterosexual Italian mothers with one or two children. Data were collected through a computer-assisted web interview survey in autumn 2024, administered by a professional survey agency under the supervision of the FORTIES research team. Respondents retrospectively reported on their first delivery and the subsequent postnatal period, providing detailed information on their birth experiences, maternal well-being and sociodemographic background. The survey covers several thematic areas, including experiences of obstetric violence, postpartum psychological well-being, the division of household labour and the associated mental workload and mothers' feelings of regret.

Compared to the original survey, this analysis is restricted to mothers with one child who are in a partnership at the time of the interview and whose first child was not adopted, resulting in a final sample of 2375 respondents. The sample is composed of two groups: 759 mothers who had their first child at age 20 to 34, and 1616 mothers aged 35 to 45 who had their first child at age 35 or older (i.e. who were childless up to age 35). The first child of the mothers in both groups was born no more than 15 years before the survey. To improve the comparability between the analysed sample and the reference population, all analyses are conducted using calibrated sample weights based on age, level of education and area of residence; details on the construction of these weights are provided in Supplementary material S2 (available online at <https://doi.org/10.1553/p-9mzp-nm56>).

Data collection took place between September and December 2024. The sample is composed exclusively of Italian women in heterosexual couples; foreign citizens and individuals in homosexual partnerships were not included.

Methods

The dependent variable is represented by the fertility intentions, measured on a 0–10 scale, which capture the intention to have another child in the following three years (Lappegård et al., 2022). The question on fertility intentions was placed at the beginning of the

questionnaire, before any information regarding the childbirth experience was introduced, to avoid potential priming effects.

Table S.1 in the supplementary material provides a detailed overview of the characteristics of the analytical sample, which includes mothers divided into two age groups: those under and those over 35 years old at their first birth. The mean age in the total sample is 34.98 years, with clear differences between the two groups (30.59 for those under age 35 and 39.80 for those over age 35). Overall, 45.05% of the sample experienced spontaneous vaginal births, 10.67% had planned caesarean sections and 44.27% underwent unplanned interventional births. Specifically, emergency caesarean sections occurred in 15.37% of cases, induced vaginal births occurred in 19.03% of cases and operative vaginal births occurred in 9.87% of cases.

In terms of education, 42.04% of participants held a university degree (bachelor's, master's or PhD), with the percentage being higher among older mothers (48.60%) than among younger mothers (36.06%). Employment data show that 49.40% of the women had a permanent work contract, and that 65.97% of their partners were also permanently employed. The variables are binary indicators distinguishing individuals with a permanent contract from those in precarious employment or out of the labour force. Not surprisingly, the older age group (57.99%) accounted for a higher percentage of the mothers with a permanent contract than the younger age group (41.56%).

Geographically, the sample is distributed across Italian regions, with 47.60% residing in the north, 18.80% living in the centre and 33.60% residing in the south. Women over age 35 are more represented in the north and centre, while women under age 35 are more concentrated in the south. Given the existence of regional disparities in obstetric practices – such as the higher prevalence of caesarean sections in southern Italy (Masciullo et al., 2020) – the geographic area of residence is included as a control variable in the analysis.

Most births reported by the respondents took place in a public hospital, with only 13.19% occurring in a private clinic. A relatively higher proportion of births took place in a private setting among the younger cohort (17.03%).

Additionally, the average time since the first birth at the time of the interview was 3.58 years, and was longer among younger mothers (4.43 years) than among older mothers (2.72 years), suggesting differences between age groups in birth spacing patterns.

Finally, we include information on the use of assisted reproductive technology (ART) in the conception of the first child (Cozzani et al., 2025). The share of mothers who used ART for their first pregnancy was 6.96% among all mothers, 2.53% among younger mothers and 11.82% among older mothers.

Although information on child health is available in the dataset, this variable is not included in the main specifications. Prior research shows that infant health outcomes, including birthweight, are associated with mode of delivery (Keag et al., 2018; Sandall et al., 2018; Tilstra et al., 2020), suggesting that child health is likely to lie on the causal pathway between delivery type and subsequent fertility intentions. Controlling for it would therefore involve conditioning on a post-treatment variable, and could introduce bias. For this reason, we exclude child health from the main models and instead interpret it as a potential mechanism linking childbirth experiences to later fertility intentions.

Variables and analytical strategy

The analytical strategy consists of estimating a series of OLS regression models to assess the association between fertility intentions and the type of birth delivery. To ensure analytical coherence and avoid conflating women at different stages of their reproductive careers, we focus our analyses exclusively on one-child mothers.

The key independent variable is the type of delivery, initially grouped into three categories (Model 1): spontaneous vaginal delivery (reference category), planned caesarean section and unplanned interventional delivery (including emergency caesarean, induced vaginal and operative vaginal deliveries). Spontaneous vaginal delivery refers to a birth that occurs without the use of surgical or pharmacological interventions to initiate or expedite labour. Planned caesarean section denotes a surgical delivery scheduled before the onset of labour, typically for medical or obstetric reasons. The unplanned interventional birth category encompasses emergency caesarean sections, pharmacologically induced vaginal deliveries and operative vaginal deliveries (i.e. vaginal births that require the assistance of obstetrical instruments such as forceps or vacuum extractors to facilitate the baby's passage through the birth canal, often due to a prolonged second stage of labour, foetal distress or maternal exhaustion). Respondents were asked to report the most relevant type of delivery by selecting a single category. While this approach captures the dominant feature of the birth experience, it does not account for the possible overlap of multiple procedures (e.g. induction followed by operative delivery), which may cumulatively contribute to more complex or potentially stressful childbirth experiences. In a subsequent specification, delivery type is further disaggregated to distinguish between these specific medicalised interventions (spontaneous vaginal, planned caesarean, emergency caesarean, induced vaginal and operative vaginal deliveries).

To test RQ1, models are progressively adjusted to include relevant explanatory variables and controls. The baseline specification includes sociodemographic characteristics, employment status, partner's employment and geographic area (Model 1). Subsequently, we add place of delivery, years since first childbirth and use of ART (Model 2).

This stepwise approach allows us to test the robustness of our results to the inclusion of delivery-related factors that may act as mediators in the relationship between the birth experience and fertility intentions. More specifically, these variables are introduced to examine whether and how this relationship operates through broader dimensions of reproductive health, the care context and life planning, and to better isolate the effect of the type of childbirth.

Place of delivery (categorised as private hospital or public hospital) may reflect differences in the quality of care, degree of medicalisation and patient autonomy during childbirth, all of which can shape women's experiences and subsequent reproductive preferences. Years since first childbirth captures the temporal distance from the previous birth, which is relevant in terms of both biological recovery and changes in family circumstances or life course expectations. Finally, the use of ART signals the presence of fertility challenges and may influence both the value attributed to childbearing and the perceived feasibility of having additional children.

To test RQ2 and RQ3, we interact the type of delivery with maternal age at first birth (under age 35 vs age 35 or older) (Models 3 and 4) and with place of delivery (Model 5). We estimate models including these interaction terms and compute predicted values evaluated at the observed values of the covariates. These predictions are presented graphically to illustrate differences across groups. For Model 3, we complement these results with marginal effects and pairwise comparisons (Tables S5 and S6 in Supplementary material S1), which provide formal tests of differences across delivery types.

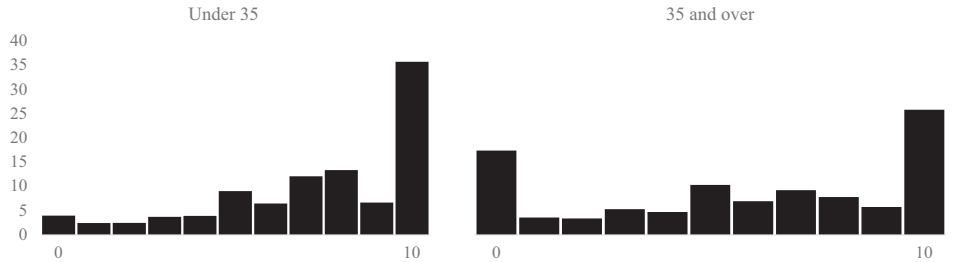
Results

Figure 1 displays the distribution of fertility intentions, measured on a 0–10-point scale, across groups of mothers based on their age at first childbirth. The results indicate a clear age gradient: younger mothers (under age 35) tend to report stronger intentions to have another child, whereas mothers who had their first child at age 35 or older tend to report markedly weaker fertility intentions. Average fertility intentions are 7.28 for mothers whose first birth occurred before age 35, and 5.73 for those whose first birth occurred at age 35 or older. The figure also highlights differences in the distribution of fertility intentions: high intention values are more common among mothers who had their first child before age 35, whereas older first-time mothers exhibit a more pronounced concentration of responses at zero.

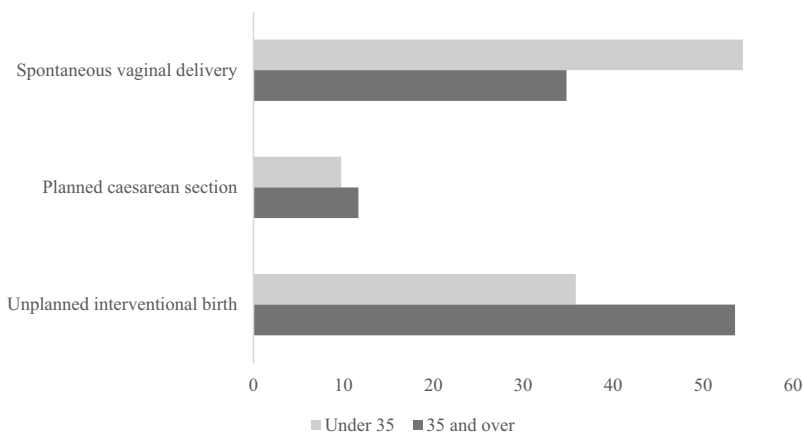
Figure 2 provides a descriptive overview of the distribution of childbirth types by mother’s age at first birth. The results show clear age-related differences in delivery experiences. Younger mothers (under age 35 at first birth) are substantially more likely to experience a spontaneous vaginal delivery (54.41%) compared to older mothers (34.79%). In contrast, unplanned interventional births are significantly more common among mothers who had their first child at age 35 or older (53.53%) than among younger mothers (35.83%). Planned caesarean sections also occur slightly more frequently among older mothers (11.67%) than among younger mothers (9.76%).

To address our first research question (RQ1), we examine whether different first delivery types are associated with variations in fertility intentions.

Figure 1. Fertility intentions from zero (no intentions) to 10 (strong intentions) by mother’s age at first childbirth



Source: FORTIES data (2024). Data are weighted

Figure 2. Type of first childbirth by mother's age at first childbirth

Source: FORTIES data (2024). Weighted data

Estimates in Table 1 show that, among mothers with one child, having a planned caesarean section is associated with a reduction of 0.617 points in fertility intentions compared to having a spontaneous vaginal delivery, a statistically significant effect at the 5% level. Given that fertility intentions are measured on a 0–10 scale, this corresponds to a moderate substantive difference, equivalent to a reduction of approximately six percentage points on the scale. Although modest in absolute terms, this difference is comparable to or larger than several other covariates included in the model, and points to a non-negligible association between childbirth experiences and subsequent reproductive intentions. The difference in estimated coefficients between Model 1 and Model 2 (respectively, -0.617 and -0.698 , $p < 0.05$) indicates that controlling for additional birth-related characteristics helps to clarify the association between undergoing a planned caesarean section and subsequent reproductive plans. Similarly, experiencing an unplanned interventional birth is associated with a smaller and less precisely estimated reduction in fertility intentions (-0.337 , $p < 0.1$ vs. -0.370 , $p < 0.1$) compared to having a spontaneous vaginal delivery in both model specifications.

While the overall R -squared values remain modest – an expected feature of models predicting subjective outcomes such as fertility intentions – the increase observed across specifications (from 0.079 to 0.086) suggests that accounting for childbirth experiences improves the model's explanatory power.

Maternal age shows a negative and statistically significant association with fertility intentions across specifications, while higher education is positively and significantly associated with fertility intentions. These links may reflect greater perceived control over fertility trajectories or access to resources that support parenthood. Partner's employment status also appears to matter: having a partner with a permanent job is associated with significantly higher fertility intentions, which may point to perceived economic stability as a

Table 1. Regression model: fertility intentions of mothers with one child, including type of delivery

	Model 1	Model 2
Type of delivery (ref. Spontaneous vaginal delivery)		
Planned caesarean section	−0.617** (0.288)	−0.698** (0.291)
Unplanned interventional birth	−0.337* (0.183)	−0.370* (0.182)
Age of the mother	−0.144*** (0.0143)	−0.145*** (0.014)
Education (ref. Medium/low education)		
Higher education	0.471*** (0.159)	0.420*** (0.159)
Employment status (ref. Other condition)		
Permanent contract	0.184 (0.176)	0.213 (0.176)
Partner’s employment status (ref. Other condition)		
Permanent contract	0.427** (0.179)	0.363** (0.179)
Area of residence (ref. North)		
Centre	0.099 (0.224)	0.090 (0.224)
South	0.542*** (0.195)	0.598*** (0.197)
Place of first childbirth (ref. Public hospital)		
Private hospital		0.489** (0.242)
Years since first childbirth		−0.087** (0.031)
ART (ref. No)		
Yes		0.042 (0.335)
Constant	11.04*** (0.523)	11.38*** (0.539)
Observations	2375	2375
R-squared	0.079	0.086

Standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$
Source: FORTIES data (2024). Weighted estimates

precondition for family expansion. Finally, the area of residence shows a notable gradient: respondents living in the south consistently report higher fertility intentions than those in the north (reference category), in line with well-documented regional differences in family norms and fertility behaviour in Italy. In the extended model (Model 2), giving birth in a private hospital is positively associated with fertility intentions (+0.489, $p < 0.05$), which suggests that giving birth in a setting characterised by higher perceived quality of care or comfort may be linked to a slightly greater willingness to plan additional births. Moreover, fertility intentions are negatively associated with the number of years since the first childbirth (−0.087 per year, $p < 0.05$). This indicates that as time passes, a woman’s willingness to expand her family progressively weakens, resulting in a small but cumulative association over time. By contrast, having conceived through ART is positively but not significantly related to fertility intentions, indicating that there is no robust association once other factors are considered.

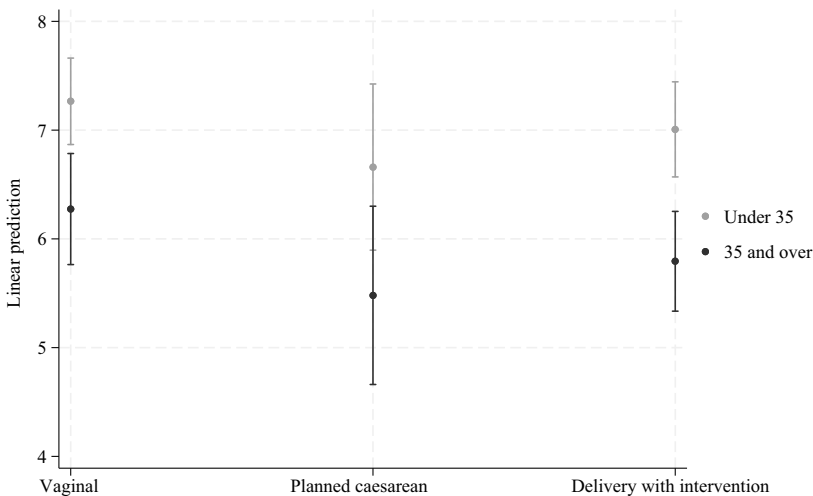
To address the second research question (RQ2), we first show a graph that includes predicted values derived from the interaction between type of delivery and age group (Figure 3).

Figure 3 displays predicted fertility intentions by type of delivery, separately for women who had their first child before and after age 35. Predicted fertility intentions are highest among younger mothers who experienced a spontaneous vaginal birth (around 7.2 on the 0–10 scale), which can serve as a reference category for comparisons across more intervention-intensive delivery modes and later ages at childbearing, which are typically associated with higher obstetric and clinical risks.

Among mothers under age 35 at first birth, differences in fertility intentions are negligible across delivery types, which suggests that birth mode plays a limited role at younger ages. Although mothers who had a planned caesarean section report somewhat lower predicted fertility intentions (approximately 6.6), overall intended fertility remains relatively high regardless of delivery type. This suggests that delivery experiences early in the reproductive career do not substantially alter fertility plans, possibly because younger women perceive greater temporal and biological flexibility for future childbearing.

By contrast, mothers aged 35 or older display consistently lower predicted fertility intentions across all delivery modes. Even among those who had a spontaneous vaginal birth, predicted intentions are significantly lower (around 6.3). The decline is more pronounced for women who had a planned caesarean section (approximately 5.5), and remains substantial for those who had an interventional delivery (around 5.8). While delivery mode is associated with some variation in fertility intentions within each age group, these differences remain relatively modest. Older mothers exhibit systematically lower intentions across

Figure 3. Predicted fertility intentions by type of delivery and age group



Complete model: Table S.2, Supplementary material S.1

Source: FORTIES data (2024). Weighted estimates

all birth types relative to the group with the highest intentions. This pattern reflects the joint distribution of later childbearing and more medicalised delivery experiences, rather than differential age gradients across delivery types.

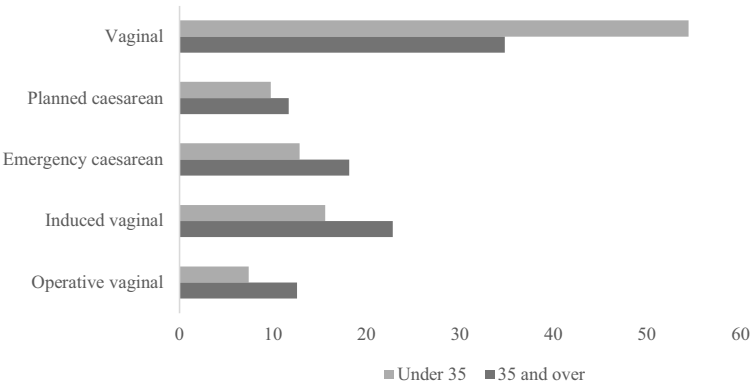
Overall, we find a negative age gradient in fertility intentions across all delivery types. However, pairwise comparisons of marginal effects do not provide evidence that these gradients differ significantly across modes of delivery (formal tests reported in Supplementary material A, Tables S5 and S6).

We now examine childbirth information in greater detail by disaggregating the category of unplanned interventional births into three subtypes: emergency caesarean, induced vaginal and operative vaginal deliveries. Figure 4 shows that both emergency caesarean (18.14%) and induced vaginal births (22.81%) occur more frequently among older mothers than among younger mothers (12.85% and 15.58%, respectively). Operative vaginal deliveries are also more common in the older age group (12.59%) than in the younger age group (7.40%). Overall, these findings suggest that mothers of advanced reproductive age experience a higher degree of medical intervention during delivery.

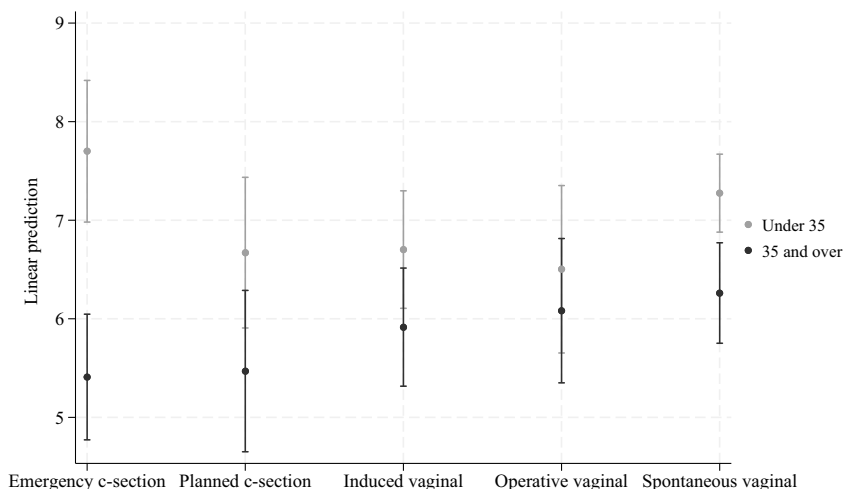
Figure 5 refines the analysis by distinguishing between different modes of delivery, showing that the age gradient in fertility intentions is not uniform across delivery types. While some variation across delivery modes is observable, these differences remain relatively limited within each age group. In particular, having an emergency caesarean section is associated with lower predicted fertility intentions, a pattern that is evident across both age groups rather than being specific to older mothers. Overall, the results indicate that differences by delivery mode are modest compared to the strong and consistent association between age at first birth and fertility intentions.

Finally, we address our third research question (RQ3) by examining whether the type of hospital (public or private) plays a role in the relationship between age at first birth, delivery type and fertility intentions. Figure 6 presents predicted fertility intentions by delivery mode and age group, separately for births occurring in public and private hospitals.

Figure 4. Detailed type of first childbirth by mother’s age at first childbirth



Source: FORTIES data (2024). Weighted data

Figure 5. Predicted fertility intentions by detailed type of delivery and age group

Note: The values for planned caesarean section and vaginal delivery are reported here to facilitate an integrated view of the results. Complete model: Supplementary material [Table S.3](#), Supplementary material [S.1](#)

Source: FORTIES data (2024). Weighted estimates

Across the two settings, a clear age gradient emerges, with older mothers reporting lower fertility intentions across all delivery types. Differences across delivery modes within each age group appear relatively limited for births occurring in both public and private hospitals. While some variation is observable – for instance, lower predicted values for emergency caesarean sections – these patterns are evident across age groups and do not differ substantially between public and private settings.

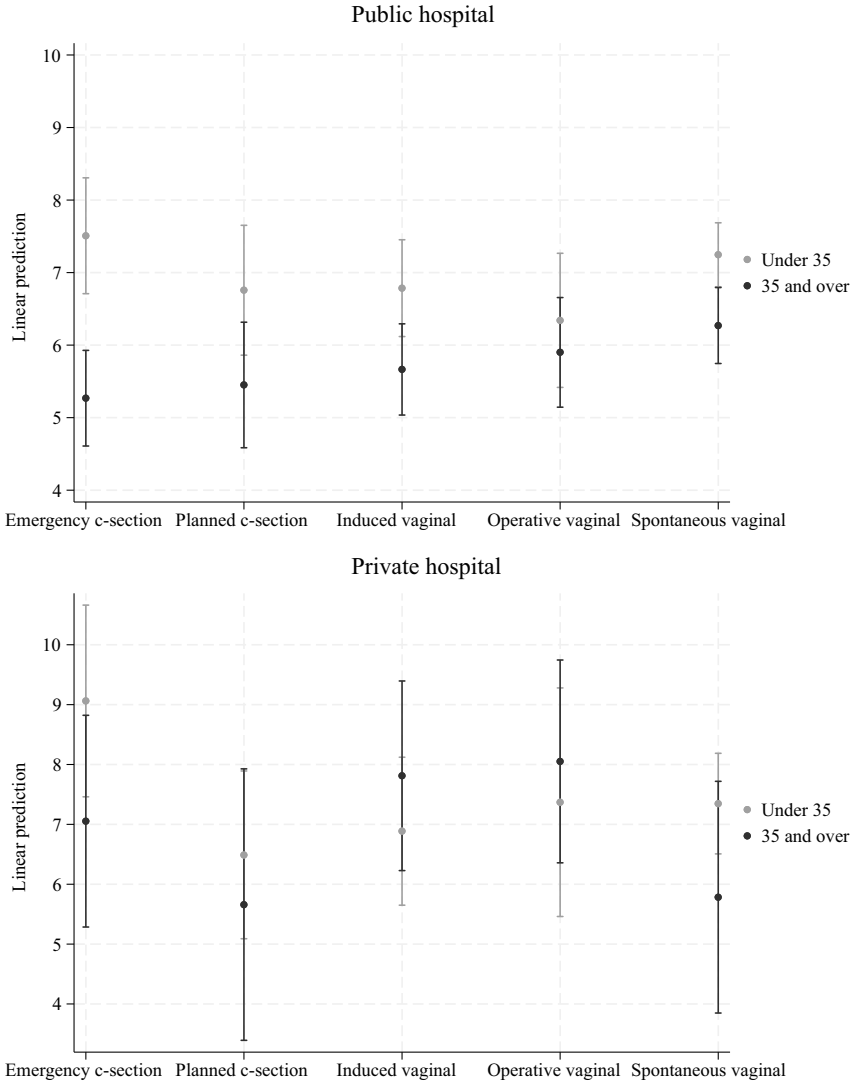
Overall, the results suggest that the type of hospital in which the first birth occurs does not meaningfully alter the relationship between age at first birth and fertility intentions. Rather, the dominant pattern remains consistently lower fertility intentions among older mothers, regardless of their delivery mode and the hospital context in which they had their first child.

While the observed patterns point to some heterogeneity across delivery modes in private hospitals, these estimates are based on relatively small subgroup sizes and are associated with wide confidence intervals. As such, they should be interpreted with caution and viewed as indicative rather than conclusive.

Conclusions

These findings offer new insights into how childbirth experiences shape women's reproductive careers. Building on the conceptual framework of reproductive careers ([Johnson et al., 2018, 2023](#)), which emphasises the temporal accumulation and diversity of reproductive events across the life course, and on broader reflections on the diverse meanings of

Figure 6. Predicted fertility intentions by detailed type of delivery and age group in public and private hospitals



Note: Complete model in [Table S.4](#), Supplementary material [S.1](#)

Source: FORTIES data (2024). Weighted estimates

postponement, our study suggests that the mode of delivery – often treated as a purely medical variable – can also be understood as an experiential event encompassing emotional, physiological and behavioural dimensions.

While the “density” of reproductive events has long been a central focus in demographic research, our results highlight the importance of “complexity”, namely how specific

delivery experiences are associated with fertility intentions. Beyond counting the number of reproductive transitions, we show that the qualitative features of a single delivery experience are related to subsequent fertility intentions. These findings are also relevant to broader debates on the medicalisation of childbirth and the role of embodied well-being in shaping reproductive decisions. In this sense, highly medicalised or intervention-intensive deliveries – such as planned caesarean sections or unplanned interventional births – may have repercussions that extend beyond immediate clinical outcomes, shaping not only maternal well-being, but also future long-term reproductive planning, although these differences remain modest compared to other dimensions. Importantly, age at first birth emerges as a key dimension, with older mothers consistently reporting lower fertility intentions across delivery types. This pattern suggests that life course timing is closely intertwined with childbirth experiences.

Using weighted data from the FORTIES project, we show that the type of delivery is associated with fertility intentions. At the same time, a strong and consistent age gradient emerges, with older mothers reporting lower fertility intentions than younger mothers across all delivery types.

Differences across delivery modes remain comparatively limited within each age group, and we do not find clear evidence that the association between delivery type and fertility intentions varies substantially by maternal age or healthcare setting.

Overall, these patterns suggest that the timing of entry into motherhood plays a central role in structuring fertility intentions, while delivery experiences may represent a secondary, albeit meaningful, dimension within women's reproductive careers. This interpretation is consistent with the view that delayed childbearing is not only a matter of timing, but also shapes the conditions under which reproductive experiences are lived and evaluated (Casterline and Han, 2017; Margolis and Myrskylä, 2015).

By framing delivery type within the intersecting domains of medicalisation and well-being, our study contributes to a more holistic understanding of reproductive careers – one that accounts not only for the timing and number of births, but also for the quality and perceived impact of reproductive events. This perspective is particularly relevant for both demographic research and public health policy, especially in contexts where women's fertility intentions are shaped by their experiences of autonomy, vulnerability and care during their first childbirth. As Italy has one of the highest levels of fertility postponement in Europe coupled with a continuously rising age at first birth, the patterns documented here may become increasingly common in the coming years.

These results also resonate with the literature on birth trauma and subjective well-being, which shows that experiencing perceived loss of control, emergency interventions and limited emotional support during delivery can negatively affect women's mental health and future reproductive behaviour (Guittier et al., 2014; Rowlands and Redshaw, 2012). Further research on these aspects and their underlying mechanisms would be valuable, especially in settings where childbirth is not examined solely through the lens of medicalisation. At the same time, our findings suggest that these factors operate within a broader life course framework in which age at first birth remains the dominant dimension.

This study has some limitations that should be acknowledged. First, the analysis relies on cross-sectional data collected after the first birth, and therefore does not allow us to observe

fertility intentions before pregnancy. Pre-pregnancy intentions may differ systematically across women, and could be correlated with both delivery planning and subsequent reproductive desires. For example, more risk-averse individuals may be more likely to opt for a planned caesarean section while also expressing lower fertility intentions. Although such potential differences cannot be directly tested with the available data, we acknowledge them as a potential source of unobserved heterogeneity.

Second, the survey lacks detailed information on maternal health prior to pregnancy. Pre-existing health conditions may affect both the likelihood of experiencing a medicalised delivery and subsequent fertility intentions. Although we control for some birth-related characteristics, these measures cannot fully capture maternal health vulnerabilities preceding childbirth, leaving room for residual confounding, particularly in the case of planned caesarean sections. Importantly, however, the strongest negative associations observed in the analysis are concentrated among unplanned interventional births. Because these events are, by definition, unexpected, they are less likely to reflect prior fertility preferences or delivery planning strategies.

Despite these caveats, one message emerges clearly: the type of delivery is not merely a medical detail, but is instead one of several experiential dimensions associated with how women subsequently engage with their reproductive trajectories. Future research on fertility intentions should take the experiential and embodied dimensions of childbirth seriously, especially as medicalisation and delayed parenthood become increasingly common in low-fertility societies.

From a policy perspective, our evidence underscores the need to rethink perinatal care, placing greater emphasis on emotional support and post-delivery debriefing. Public health campaigns and prenatal education should prepare women for a broader range of delivery outcomes and help to normalise variation in childbirth experiences in order to mitigate women's feelings of loss or failure. In contexts characterised by delayed parenthood, these aspects may be particularly relevant, as childbirth experiences are embedded within tighter reproductive timelines and may carry greater weight in shaping subsequent intentions. This perspective complements existing demographic models of parity progression by underscoring how subjective and embodied dimensions of reproductive events, alongside background characteristics, help to shape fertility trajectories and, more broadly, reproductive careers. The first delivery is not merely a medical event, but is rather a formative experience that can influence whether and how women imagine, postpone or abandon future childbearing. In contexts characterised by late fertility and low second birth rates, such as Italy, these findings have important implications for understanding stalled or unrealised fertility.

Supplementary materials

Available online at <https://doi.org/10.1553/p-9mzp-nm56>

Supplementary file 1. Tables S.1–S.7



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