What Drove the Decline in U.S. Teen Childbearing? A Cross-Cohort Decomposition*

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Preliminary and incomplete. Comments welcome.

Abstract

The U.S. teen birth rate has fallen by 80% since 1991, and lower birth rates before age 20 account for more than half of the fall in total fertility over the same period. By birth cohort, early first births rose before they fell: 31% of women born in 1962–1966 had a first birth by age 21, 33% of those born in 1976–1980 and 23% of those born in 1992–1996. To find which forces lie behind both movements, I estimate a life-cycle model of schooling, work, marriage and contraceptive use on three cohorts of women and decompose the change in early childbearing into the value of avoiding a birth, the cost and efficacy of contraception, exposure, abortion, the marriage market, the safety net and family background. Less sexual activity, more effective methods and a lower cost of contraception account for 56% of the fall in births at ages 15–19 between women born in 1976–80 and 1992–96 (25%, 14% and 17%), better earnings and schooling prospects for 25%, and better-educated mothers for 12%. The early births that better fertility control removed were unintended and were not had later: completed fertility falls by 0.25 births per woman, about twice the reduction in early births. The part of the decline due to fertility control was a fall in completed fertility, not a postponement.

JEL codes: J13, J12, J11, I21, J24, C61.

Keywords: teen childbearing, fertility timing, contraception, life-cycle models, cohort decomposition.

The Online Appendix is available at https://www.agustindiazcasanueva.com/uploads/Teen_Childbearing_Online_Appendix.pdf.

*Preliminary and incomplete. The views expressed herein are solely those of the author and do not necessarily reflect the views of the Central Bank of Chile. I used a large language model (Claude, Anthropic) to assist with the writing and editing of the text and with the development of the code; I take full responsibility for all content. All errors are my own.

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1 Introduction

The birth rate of American women aged 15–19 peaked at 61.8 per 1,000 in 1991 and has fallen almost every year since, to 12.6 in 2024—a decline of 80%. The decline is a large part of the fall in U.S. fertility. Between 1991 and 2024 the total fertility rate fell from 2.06 to 1.60 children per woman. Lower birth rates before age 20 reduced it by 0.25 children, more than half of the fall of 0.46: had they stayed at their 1991 level, the total fertility rate would be 1.85 today. Lower birth rates before age 25 reduced it by 0.55 children, more than the entire fall, because rising birth rates after age 30 offset part of the decline.[1] An account of why Americans have fewer children (Kearney and Levine, 2026; Kearney et al., 2022) therefore begins with why young women stopped having them early, and what the decline means for the fertility of these cohorts depends on whether the births they no longer have early are had later or not at all.

What changed in behavior is well established: the risk of a teen pregnancy fell mainly because contraceptive use improved, and less because teens had less sex (Lindberg et al., 2016; Santelli et al., 2007). Why contraceptive behavior improved is not, and three explanations compete. The first is incentives: rising returns to schooling, changing marriage prospects and a changing safety net altered the value of avoiding an early birth. The second is the technology of fertility control: contraception became cheaper, easier to obtain and more effective. The third is preferences and social norms: the erosion of the norm of shotgun marriage (Akerlof et al., 1996), the waning stigma of premarital sex (Fernández-Villaverde et al., 2014), and the "shifting priorities" of recent cohorts (Kearney et al., 2022), such as the waning belief that a fulfilled life requires children (Fernández et al., 2026).

Individual policies had measurable but local effects: Medicaid family-planning waivers reduced teen births by about 4% (Kearney and Levine, 2009), and Colorado's initiative to provide free or low-cost long-acting reversible contraception (LARC) reduced them by 6.4% in counties with funded clinics (Lindo and Packham, 2017) and by about 20% among teens living near those clinics (Kelly et al., 2020). Nationally, lower welfare benefits and expanded access to family planning account for about 13% of the decline between 1991 and

[1] Onofri et al. (2026) find the same pattern for 2000–2022; Online Appendix B reconciles their decomposition of the general fertility rate with the total-fertility-rate measure used here.

2008 (Kearney and Levine, 2015a), and, for the fall in all U.S. births after 2007, changing preferences are inferred from what measured factors leave unexplained (Kearney et al., 2022). The three explanations act on the same decision. Whether a young woman avoids a birth depends on what the birth would cost her in schooling, earnings, marriage prospects and transfers, and on what avoiding it costs: the price of a method, the effort of obtaining it, its side effects and stigma, and the risk that it fails. The share of the decline that each explains therefore cannot be read off estimates of one channel at a time, and requires a model in which schooling, work, marriage and fertility control are chosen jointly and the forces are priced in the same units. Eckstein et al. (2019) provide such an accounting for the schooling, marriage, fertility and employment of women born between 1935 and 1975, weighing incentives against contraceptive technology with preferences held fixed; only the last of their cohorts was in its teens when the decline in early childbearing began.

I weigh the three explanations within one estimated life-cycle model in which each acts through a distinct margin. Incentives act through the value of avoiding a birth, which the model derives from women's schooling, work and marriage prospects and from the safety net. Technology acts through the cost and the efficacy of contraception and the cost of abortion. Preferences are held fixed across cohorts, as in Eckstein et al. (2019), so the model does not assume that norms changed: a change in norms must appear in the data, as less sexual activity, as a lower estimated cost of contraception, which includes its stigma, or as a change in behavior that the measured environment cannot account for. Women also differ in an unobserved initial condition at age 14, as in Keane and Wolpin (2010), whose distribution depends on family background and is the same in every cohort; it captures what the measured environment does not about a girl's situation, and the NSFG's reports of whether a first birth was intended identify it. Applied to cohorts that span the decline, the model attributes the change in early childbearing to each margin and measures how much is left for norms.

Measured by the woman's year of birth rather than the calendar year, the decline is not a steady trend. About 30% of women born between the early 1960s and the early 1970s had a first birth by age 21. The share then rose, to 33% among women born in 1976–1980, the cohorts that were teenagers in the 1990s, just after the 1991 peak, and has fallen since, to

23% among women born in 1992–1996; the share with a first birth by age 17 fell from 10% to 4%. Both movements took place against large changes in marriage, schooling and family background. Between the cohorts born in 1962–1966 and in 1976–1980, the improvement in family background alone would have lowered the share with a first birth by 21 by 3.0 percentage points; within family backgrounds, early first births instead rose by 5.0 points, almost entirely among daughters of mothers with a high-school diploma or some college. Between the cohorts born in 1976–1980 and in 1992–1996 the share fell by 9.7 points, three-quarters of it within family backgrounds. Two questions follow: which forces raised early childbearing within family backgrounds among the cohorts that reached their teens in the late 1980s and 1990s, outweighing better family backgrounds and the fall in early marriage, and which forces reversed it for the cohorts that followed.

To answer them, I estimate the model on three cohorts, one before the rise, one at the peak and one in the decline: women born in 1962–1966, teenagers around 1980, before the rise; women born in 1976–1980, the peak cohorts; and women born in 1992–1996, the youngest cohorts observed past age 21, whose teens coincide with the steep decline after 2007. Every cohort is measured with the same surveys: the National Survey of Family Growth (NSFG) for fertility, contraception, sexual activity, marriage and schooling, pooling its rounds from 1982 to 2019 so that each cohort's contraceptive use is measured while the cohort was young, and the Current Population Survey (CPS) for employment and earnings. In the model, women choose schooling, work, marriage, saving and contraceptive use from age 14, and they differ by family background, measured by their mother's education. The value of avoiding a birth depends on a woman's earnings, schooling and marriage prospects and on how much the safety net insures a birth. The cost of contraception captures its price, the effort of obtaining it and its stigma; its efficacy is the typical-use failure rate of the methods a cohort used; and exposure is the share of women who are sexually active at each age. Efficacy and exposure are measured from the NSFG, cohort by cohort; the cost of contraception is estimated from contraceptive use, given the value of avoiding a birth that the schooling, marriage and employment moments pin down. The cost of abortion is estimated from the abortion share of teen conceptions, and the response of births to that cost is disciplined by the quasi-experimental evidence on parental-involvement laws, which

lowered minors' abortions but left their births about unchanged. Fecundity, like preferences, is common to all cohorts.

I estimate the model by the simulated method of moments, pooling the three cohorts so that the common parameters must rationalize all of them. Women born in 1984–1988, halfway through the decline, are not used in estimation; as in Keane and Wolpin (2007), they serve as a validation sample on which I test the model's out-of-sample predictions. I then decompose the change in early childbearing between the cohorts born in 1962–1966 and 1976–1980, the rise, and between those born in 1976–1980 and 1992–1996, the decline, following Eckstein et al. (2019). The mechanisms are ten blocks of cohort-specific parameters: women's earnings opportunities, schooling costs and support, the cost of contraception, the efficacy of contraception, exposure, the marriage market, the safety net, the child penalty, family background, and the cost of abortion. Because a sequential accounting depends on the order in which blocks are switched, I report Shapley contributions, which do not depend on the order and sum to the total change.

In the model, the decline is mostly a change in how young women avoided births and only secondarily a change in the incentive to avoid one. The model reproduces the fall in births at 15–19 between the cohorts born in 1976–1980 and 1992–1996 (12.9 births per 100 women against 12.4 in the data). The three margins of fertility control account for 56% of it: less sexual activity for 25%, the improved efficacy of the methods young women used for 14% and their lower cost of use for 17%. The incentive to avoid a birth accounts for 25%, through women's higher earnings and the greater resources of students, which raise the opportunity cost of an early birth, and better-educated mothers for 12%; the marriage market, the child penalty, the safety net and the cost of abortion together account for 8%. The model reproduces two thirds of the rise: births at 15–19 rise by 2.0 per 100 women against 3.0 in the data. The rise is the sum of offsetting forces: the cohorts who were teenagers in the 1990s were more often sexually active, which raised births at 15–19 by 2.6 per 100 women, while better-educated mothers lowered them by 2.5; the higher cost of contraception that minors faced and the lower support for schooling of the peak cohort account for the net rise. The early births that better fertility control removed were unintended, and they were not had later: with the decline cohort's fertility control, the peak cohort has 0.11 fewer births

per woman by 21 and 0.25 fewer over the life cycle, and the share of women childless at 45 rises from 10% to 17%. Nor is the decline a postponement in the data: the cohort born in 1992–1996 is 0.40 births per woman behind the peak cohort at age 29, and in the model the gap between the two cohorts widens with age. For the untargeted cohort born in 1984–1988 the model predicts 0.19 births per woman at 15–19 against 0.22 in the data, and its response of minors' births to the cost of abortion is in line with the evidence on parental-involvement laws.

The paper makes two contributions. First, it provides a structural accounting of the decline in which schooling, marriage, work and fertility control are chosen jointly, and in which the incentive to avoid an early birth is separated from the cost, the efficacy and the exposure margins of fertility control. Second, because the cost and the efficacy of contraception are separate blocks, the decomposition says whether cheaper access to contraception, more effective methods such as LARC, or better economic prospects for young women did most to reduce early births (Bailey et al., 2023; Kearney and Levine, 2009; Lindo and Packham, 2017).

Section 2 reviews the related literature and Section 3 documents the facts. Section 4 presents the model and Section 5 its estimation. Section 6 reports the decomposition and what it implies for completed fertility, and Section 7 concludes.

2 Related Literature

The paper relates to four literatures. The first documents the decline in U.S. teen childbearing and its proximate causes. Kearney and Levine (2012) document the high level of U.S. teen childbearing and its fall after 1991, and Kearney et al. (2022) and Kearney and Levine (2026) place births to young women at the center of the fall in U.S. fertility (see also Doepke et al., 2023). Demographic accountings attribute most of the fall in adolescents' pregnancy risk to better contraceptive use rather than less sexual activity (Lindberg et al., 2018, 2016; Santelli et al., 2007). Driscoll and Abma (2015) find that much of the 1991–2009 decline reflects a smaller share of teens in high-risk groups, such as daughters of mothers without a high-school degree, rather than lower risk within those groups, and Buckles et al. (2025) show

that the post-2007 fall in U.S. births is concentrated among young and unmarried women and in unintended births, which fell by 22% between 2007 and 2019 against 8.5% for intended births. These accountings establish which behavior changed and among whom, not why. A large body of work estimates the effect of one channel at a time: access to contraception and abortion (Bailey et al., 2023; Guldi, 2008; Kearney and Levine, 2009; Kelly et al., 2020; Lindo and Packham, 2017; Myers, 2017; Packham, 2017), welfare (Kearney, 2004; Lundberg and Plotnick, 1995), information about the consequences of teen motherhood (Kearney and Levine, 2015b), an estimate that Jaeger et al. (2020) dispute, inequality and local labor markets (Autor et al., 2019; Kearney and Levine, 2014; Kearney and Wilson, 2018), and, for the post-2007 break, smartphones and broadband, which reduced in-person contact and sexual frequency among teenagers (Hudson and Moscoso Boedo, 2026; Myers and Hooper, 2026). Together, measured policies explain a small share of the decline (Kearney and Levine, 2015a). I quantify these channels jointly, in one model in which their contributions can offset one another and add up to the observed change, and I separate the reasons contraceptive use rose—a stronger incentive, a lower cost, or more effective methods—from changes in sexual activity.

Second, the model belongs to the tradition of dynamic structural models of fertility (Hotz and Miller, 1988; Wolpin, 1984), alongside reduced-form models of the timing and spacing of births (Heckman and Walker, 1990), of models that jointly endogenize several of schooling, work, marriage and fertility (Adda et al., 2017; Francesconi, 2002; Keane and Wolpin, 2010; Sheran, 2007; Van der Klaauw, 1996), and of models of imperfect fertility control, in which contraception is a choice and a birth its stochastic outcome (Ejrnæs and Jørgensen, 2020; Hotz and Miller, 1993; Lavado, 2014; Michael and Willis, 1976); Keane and Wolpin (2010), estimated on the NLSY79, is its closest single-cohort antecedent, and Lavado (2014), who estimates contraceptive effort and its failure jointly with labor supply on the 1995 NSFG, the closest treatment of fertility control. Structural models of adolescents study sexual activity and contraception (Arcidiacono et al., 2012; Díaz Casanueva, 2026), abortion policy (Amador, 2017; Forsstrom, 2021), and the role of the welfare state and cross-country differences in teen childbearing (Di Nola et al., 2025). These models are estimated on one cohort or used for policy and cross-country counterfactuals; I use one to account for change

across cohorts. Rather than take the cost of an early birth from causal estimates, which range from small to modest (Ashcraft et al., 2013; Hotz et al., 2005), the model infers it from each cohort's schooling, marriage and employment choices.

Third, estimated life-cycle models have been used to account for cross-cohort changes in mothers' labor supply (Attanasio et al., 2008), female employment (Eckstein and Lifshitz, 2011) and the delay in marriage between 1970 and 2000 (Santos and Weiss, 2016). The closest paper is Eckstein et al. (2019), who hold preferences fixed and account for the schooling, marriage, fertility and employment of U.S. women born 1935–1975 through changes in family background and transfers, the marriage market, the wage structure and contraception, the last modeled as the incidence of unwanted pregnancies. I follow their design but focus on early childbearing, split fertility control into exposure, cost and efficacy, treat the safety net and the child penalty as separate blocks, add abortion as a costly ex-post margin of fertility control, and extend the accounting to the cohorts born in the 1990s; I report order-invariant Shapley contributions (Shorrocks, 2013). A macroeconomic literature makes fertility-control technology the driver of family change: the pill delayed marriage and first births (Bailey, 2006; Goldin and Katz, 2002), and better contraception accounts for the rise of premarital sex and nonmarital births and for the decline of marriage (Fernández-Villaverde et al., 2014; Greenwood and Guner, 2010; Greenwood et al., 2017, 2021). These models are calibrated to long-run aggregates and emphasize a single force. I measure efficacy from typical-use failure rates (Kost et al., 2008; Sundaram et al., 2017; Trussell, 2011), estimate the cost of contraception on micro data, and set both against the incentive channel.

The fourth literature treats preferences, culture and social norms as the explanation: a change in what young people want. One approach measures preferences and norms directly, from the behavior of second-generation immigrants (Fernández and Fogli, 2009) or from survey attitudes (Fernández et al., 2026). A second models how norms evolve, through learning across generations (Fernández, 2013), through socialization that weakens as contraception makes premarital sex less risky (Fernández-Villaverde et al., 2014), or through norms, such as shotgun marriage, that erode once contraception and abortion are available (Akerlof et al., 1996). A third infers a change in preferences from what measured factors leave unexplained, as Kearney et al. (2022) do for the post-2007 fall in U.S. births. Structural cohort account-

ing disciplines this third route by holding preferences fixed (Attanasio et al., 2008; Eckstein et al., 2019), and I follow it: a change in norms about sex appears in measured exposure, a change in the stigma of contraception in its estimated cost, and a change in the stigma of early motherhood in the part of the change that the model does not fit, which the untargeted validation cohort tests. Differences across family backgrounds in early childbearing that the measured environment does not capture are carried by an unobserved initial condition, whose distribution is the same in every cohort.

3 The Decline in Early Childbearing: Data and Facts

This section documents the decline in early childbearing in the United States and the changes in marriage, schooling and family background that accompanied it. I combine the vital statistics, the abortion counts of the Guttmacher Institute, the National Survey of Family Growth and the Current Population Survey, and follow women by birth cohort. Early births rose among the cohorts born in the late 1970s and fell among those that followed; teen pregnancies and abortions fell, early marriage fell and schooling rose in both phases; and the rise and the decline both took place within family backgrounds, while mothers' education rose throughout.

3.1 Data

No single source measures every margin of early childbearing for every cohort at the ages that matter. Vital statistics count every birth but record little about the mother and nothing about how births were avoided. Surveys record sexual activity, contraception and family background, but in smaller samples, and women underreport abortions in them. I therefore combine four sources, each for what it measures best, and compare them where they overlap: the vital statistics for births, the Guttmacher Institute for abortions, the National Survey of Family Growth for the histories of individual women, and the Current Population Survey for employment and earnings.

Births. Birth rates by age come from the National Vital Statistics System for 1940–2024: births to women in each five-year age group per 1,000 women in that group, with ages 15–17 and 18–19 reported separately from 1960 on (National Center for Health Statistics, 2026a). To express them by cohort, a woman born in year c is assigned, at each age a, the rate of her age group in year $c + a$, and the sum of these rates over the ages below A gives the births per woman before age A of her cohort.[2] The NSFG, which provides the birth moments the model is estimated on, records fewer births to teenagers than the vital statistics: births of any order per woman at 15–19 are 8–12% lower for the three estimation cohorts, while first births agree, so the gap lies in second births and in the usual survey undercount.

Abortions. The Guttmacher Institute estimates abortions by age and year from its census of abortion providers and the age distribution reported to the Centers for Disease Control and Prevention, and reports them together with births for 1973–2019 (Chiu et al., 2024). Their sum is the number of pregnancies that ended in a birth or an induced abortion. I use these provider counts rather than the NSFG's: the 2006–2015 NSFG records 40% of the abortions counted by providers, with no significant difference by parity, race or union status (Jones and Kost, 2007; Lindberg et al., 2020). The NSFG's abortion reports enter only as ratios across groups of women, under the assumption that underreporting is proportional across those groups.

Individual histories. First births, sexual activity, contraception, marriage, schooling and family background come from the female respondent files of the National Survey of Family Growth (NSFG) (National Center for Health Statistics, 2020). It is the only national survey that records, for women of every cohort since the 1930s, dated histories of births, marriages and first intercourse together with current contraceptive use and the education of the woman's mother. I pool the nine rounds fielded between 1982 and 2019: 1982, 1988, 1995, 2002, 2006–2010 and the four two-year rounds of 2011–2019, which interview women aged 15–44 (15–49 from 2015) born between 1937 and 2004, and I harmonize their variables (Online Appendix A).

[2] Online Appendix B compares this series with the cohort fertility tables of the National Center for Health Statistics, which use single-year rates.

Employment and earnings. The NSFG does not record earnings. Employment and earnings come from the Annual Social and Economic Supplement of the Current Population Survey (CPS), 1976–2026 (Flood et al., 2025), which observes every cohort in every year and so follows employment and earnings by age, schooling and motherhood, as in Eckstein et al. (2019); schooling at ages 25–29 also comes from the CPS (U.S. Census Bureau, 2026). The return to work experience, which requires a panel, is estimated on the NLSY79 and NLSY97 (Online Appendix F).

3.2 Empirical Facts

Figure 1 shows the teen birth rate by calendar year and marks the years in which the cohorts studied in this paper were aged 15–19. The rate fell from 68.3 births per 1,000 women aged 15–19 in 1970 to 50.2 in 1986, rose to 61.8 in 1991, and has fallen since, to 12.6 in 2024. Each calendar year mixes five birth cohorts. The rise to 1991 and the decline of the 1990s took place while women born in the 1970s were teenagers, and the steep decline after 2007 took place while women born in the 1990s were teenagers. I document four facts.

1. By birth cohort, early births rose before they fell. Births per woman before age 20 rose from 0.26 among women born in 1962–1966 to 0.28 among those born in 1976–1980, and fell to 0.15 among those born in 1992–1996. The share of women with a first birth by 21 followed the same path.

2. Teen pregnancies and abortions fell in both phases. From the 1962–1966 to the 1976–1980 cohort, early births rose because fewer teen pregnancies ended in an abortion. From the 1976–1980 to the 1992–1996 cohort, they fell because fewer teens became pregnant: contraceptive use rose, methods became more effective and fewer teenagers were sexually active in a given year, although the age at first intercourse changed little.

3. Early marriage fell and schooling rose in both phases.

4. Mothers' education rose in every cohort. Within family backgrounds, early first births rose and then fell, mostly among daughters of mothers with a high-school diploma or

some college. Teen contraceptive use barely varies with mother's education, while the share of teen pregnancies ending in abortion rises steeply with it.

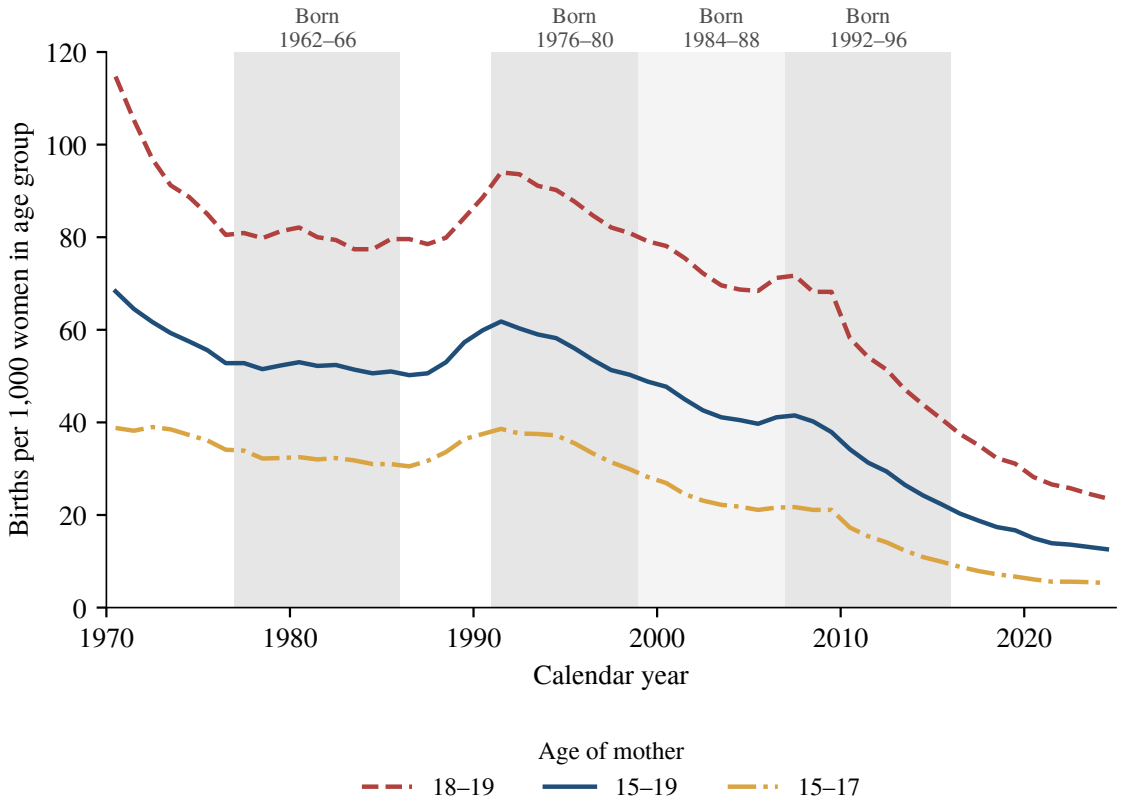


Figure 1. The Teen Birth Rate and the Teen Years of Each Cohort

Notes: Births per 1,000 women in each age group, by calendar year. Shaded areas mark the years in which the baseline, peak and decline cohorts (born 1962–1966, 1976–1980 and 1992–1996) and, lighter, the validation cohort (1984–1988) were aged 15–19. *Source:* National Center for Health Statistics, National Vital Statistics System (National Center for Health Statistics, 2026a).

3.2.1 Early births rose before they fell

Figure 2 shows births per woman by birth cohort, and Table B.1 in Online Appendix B reports them for the cohorts used in the rest of the paper. Births before age 20 fell among women born between the late 1940s and the late 1960s, rose to 0.30 per woman among women born in the mid-1970s and have fallen since: 0.26 among women born in 1962–1966, 0.28 among those born in 1976–1980 and 0.15 among those born in 1992–1996. Births before 25 followed the same path, with a smaller rise and a larger fall, from 0.82 to 0.52 per woman

between the 1976–1980 and 1992–1996 cohorts. Births before 20 account for 44% of that fall and births at 20–24 for 56%. The cohorts with more early births did not have fewer births later: women born in 1976–1980 had 2.20 children by age 45, against 2.05 among women born in 1962–1966. Whether women born in 1992–1996 will catch up after their twenties is not yet known; by age 28 they had about 0.8 births per woman, against about 1.2 in the two earlier cohorts (Figure 2, panel b). In calendar terms, this postponement is a large part of the recent fall in the total fertility rate: since 1991, lower birth rates before age 20 account for more than half of it (Online Appendix B).

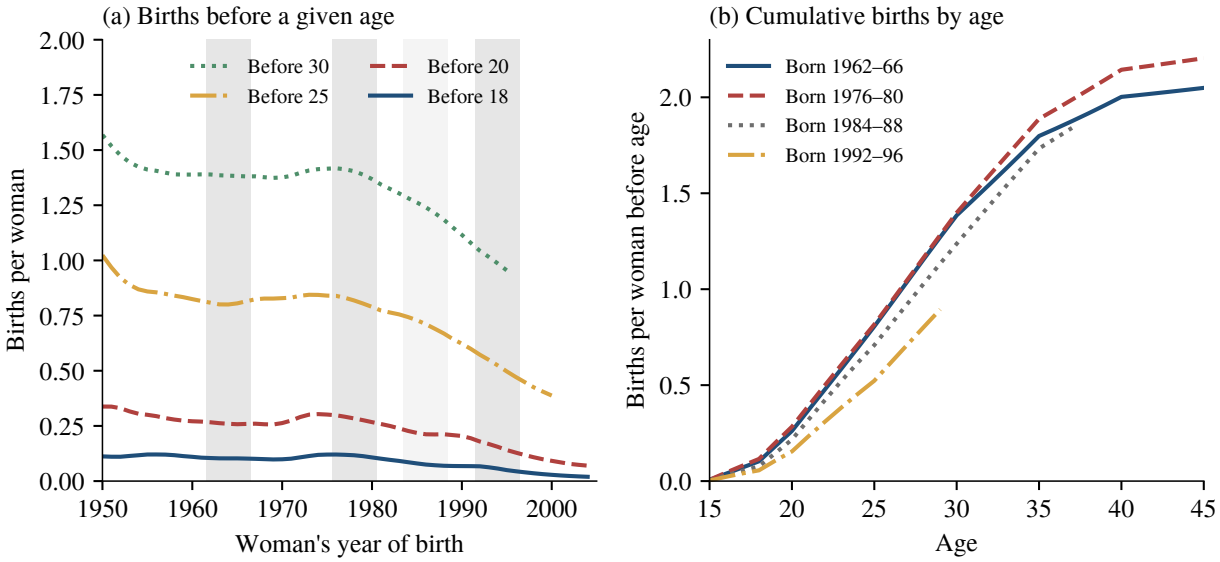


Figure 2. Births per Woman by Age and Birth Cohort

Notes: Births of any order per woman before the given age, cumulated along the cohort's diagonal of the vital-statistics age-specific birth rates (Section 3.1). Panel (a): by single year of birth; shaded areas mark the baseline, peak and decline cohorts (1962–1966, 1976–1980, 1992–1996) and, lighter, the validation cohort (1984–1988). Panel (b): averages over the birth years of each cohort, up to the last age observed for all of its birth years by 2024. *Source:* author's calculations from National Center for Health Statistics (2026a).

First births in the NSFG show the same profile (Figure 3). Early first births fell among women born in the 1950s, were flat among women born between the early 1960s and the early 1970s, at about 30% by age 21 and 8% by 17, rose to 33% and 10% among women born in the late 1970s, and have fallen since, steeply for women born after 1990: among women born in 1992–1996, 23% had a first birth by 21 and 4% by 17. The survey and the vital statistics agree. In the cohort fertility tables of the National Center for Health Statistics,

which cover women born up to 1991 (National Center for Health Statistics, 2026b), the cumulative first-birth rate by exact age 22 is 31.5% for women born in 1962–1966 and 33.0% for those born in 1976–1980, against 30.6% and 32.8% with a first birth by 21 in the NSFG. Because the decline reached women in their early twenties, I study births before age 22, not only teen births.

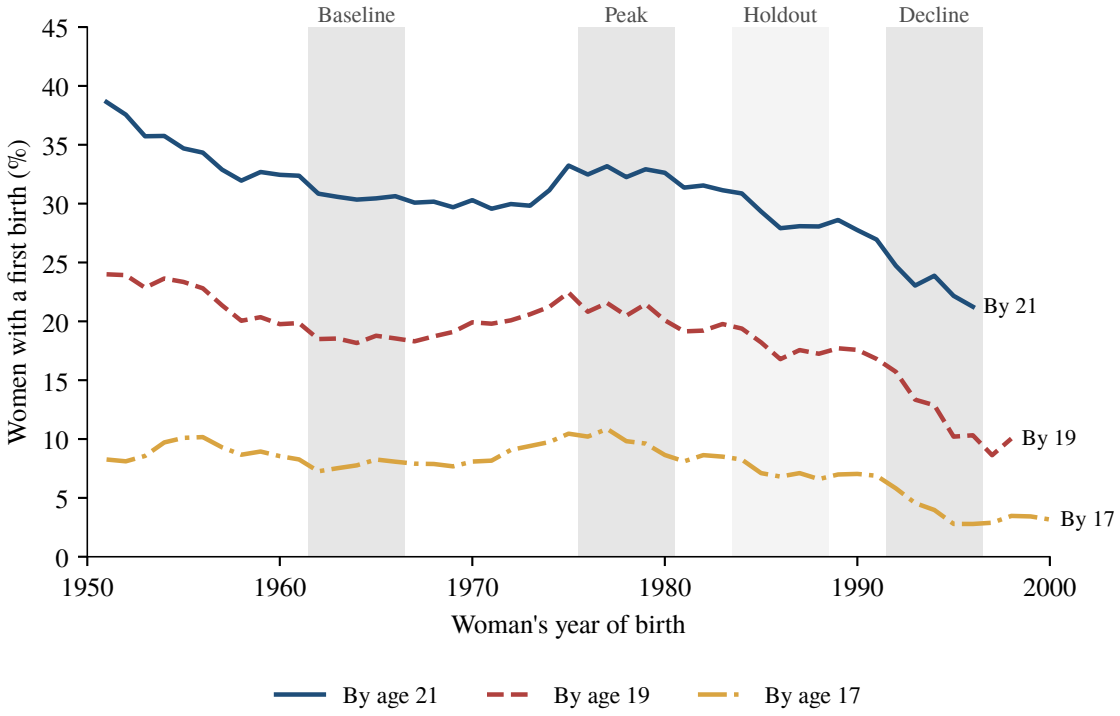


Figure 3. Early First Births by Birth Cohort

Notes: Share of women with a first live birth by ages 17, 19 and 21 (completed years), by year of birth, three-year centered moving average. Shaded areas mark the baseline (1962–1966), peak (1976–1980) and decline (1992–1996) cohorts and, lighter, the validation cohort (1984–1988). *Source:* author's calculations from the National Survey of Family Growth, 1982–2019 rounds (National Center for Health Statistics, 2020).

The rest of the paper compares three cohorts chosen from this profile. The baseline cohort, born in 1962–1966, reached its teens around 1980, on the flat part of the profile; the peak cohort, born in 1976–1980, was in its teens in the 1990s; and the decline cohort, born in 1992–1996, was in its teens between 2007 and 2015 and is the youngest observed past age 21. I call the change from the baseline to the peak cohort the rise and the change from the peak to the decline cohort the decline. I also report women born in 1984–1988, halfway through the decline. Each of these cohorts has its contraceptive use measured at ages 15–17

and 18–21 in a round fielded at those ages.

3.2.2 Teen pregnancies and abortions fell in both phases

Teen pregnancies were stable at about 0.47 per woman among women born in the 1960s, rose slightly among women born in the early 1970s and have fallen since (Figure 4, panel a). Women born in 1962–1966 had 0.47 pregnancies ending in a birth or an abortion per woman before age 20, women born in 1976–1980 had 0.43 and women born in 1992–1996 had 0.21.[3] In the first phase, early births rose although teen pregnancies fell. Abortions before 20 fell from 0.21 to 0.15 per woman, and the share of teen pregnancies that ended in an abortion from 45% to 35%, so more of the pregnancies that did occur were carried to term (panel b). In the second phase teen pregnancies halved, births and abortions fell together, and the abortion share fell further, to 30%.

Panels (c) and (d) show how pregnancies were avoided. Among childless women at risk of pregnancy (sexually active in the three months before the interview, neither pregnant nor sterilized), the share using a method at ages 15–17 was 67% among women born in 1962–1966, 74% among those born in 1976–1980 and 84% among those born in 1992–1996 (panel d). At ages 18–21 use changed less, from 78% to 83% and 85%, and none of these changes is precisely estimated. Exposure moved with the two phases: among childless women aged 15–17, the share sexually active in the three months before the interview, the at-risk population of panel (d) and the exposure measure of the model, rose from 22% in the baseline cohort to 27% in the peak cohort and fell to 21% in the decline cohort, while the share who had had intercourse by 18 moved less (panel c). The methods also changed. Their failure rate, the share of typical users who conceive within a year, rose slightly in the first phase, from 12.0% to 12.8%, as condoms replaced part of the pill, and fell to 8.7% in the second, partly because more young women used implants and IUDs and mostly because the typical-use failure rate of each method fell. The age at first intercourse changed much less: 53% of women born in 1962–1966 had first intercourse before 18, 59% of those born in 1976–1980 and 55% of those born in 1992–1996, and between 75% and 77% of each cohort before 20 (panel c). This

[3]The counts exclude miscarriages and stillbirths and date each pregnancy by the woman's age at its outcome.

agrees with Santelli et al. (2007) and Lindberg et al. (2016), who attribute most of the fall in teen pregnancy risk to contraception. The decline in sexual activity among high-school students in the Youth Risk Behavior Survey, from 54% who had ever had intercourse in 1991 to 32% in 2023, came mostly after 2013 and concerns women born from the late 1990s on, younger than the cohorts studied here (Centers for Disease Control and Prevention, 2024; Kann et al., 2012).

3.2.3 Early marriage fell and schooling rose in both phases

Table 1 compares the four cohorts. The share of women married by age 21 fell from 36% among women born in 1962–1966 to 22% among those born in 1976–1980 and 13% among those born in 1992–1996. The share with a bachelor's degree at ages 25–29 rose from 23% to 32% and then 44%, and the share without a high-school diploma fell from 13% to 12% and then 5%. From the baseline to the peak, then, early marriage fell by two-fifths and college completion rose by a third, yet the share with a first birth by 21 rose, from 31% to 33%. Both changes raise the cost of an early birth: fewer early births are supported by a husband's earnings, and more women have college careers that a birth would interrupt.

3.2.4 Within family backgrounds, early first births rose and then fell

Teen and nonmarital births are far more common among girls who grow up with less-educated or lower-income parents (An et al., 1993; Haveman and Wolfe, 1995; Kearney and Levine, 2012), so a change in the family backgrounds of successive cohorts can move early childbearing by itself. I measure family background by the education of the woman's mother, which the NSFG records on the same scale in every round; the survey has no measure of the income of the family a woman grew up in. Table 2 and Figure 5 report first births by 21 by mother's education. The share of women whose mother had not finished high school fell from 28% (born 1962–1966) to 23% (1976–1980) and 16% (1992–1996), and the share whose mother had a bachelor's degree doubled, from 14% to 27%. Early births are far more common among daughters of less-educated mothers: 47% to 49% had a first birth by age 21,

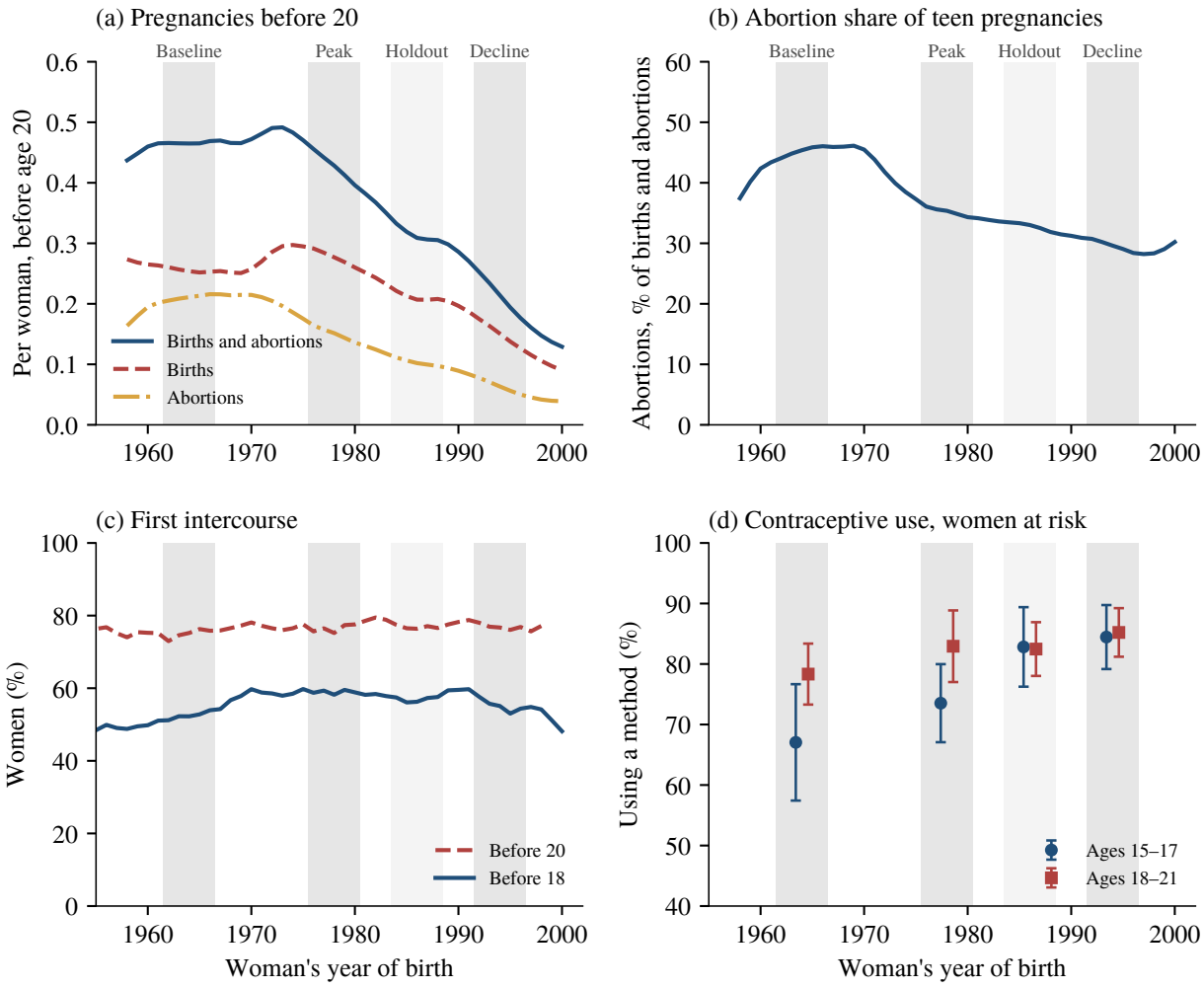


Figure 4. Teen Pregnancy, Abortion, Sexual Activity and Contraception by Birth Cohort

Notes: Panels (a) and (b): pregnancies ending in a live birth or an induced abortion before age 20, by age at outcome, cumulated along each birth year's diagonal of the Guttmacher age-specific rates for 1973–2019. Panel (c): share of women with first intercourse before the given age, among women interviewed after that age, three-year centered moving average. Panel (d): contraceptive use among childless women who had intercourse in the three months before the interview and were neither pregnant nor sterilized, for the baseline, peak, 1984–1988 and decline cohorts, measured in the rounds fielded while each cohort was at those ages; bars are 95% confidence intervals. Shaded areas as in Figure 3. *Source:* author's calculations from Chiu et al. (2024) and the NSFG, 1982–2019 rounds (National Center for Health Statistics, 2020).

Table 1. Early Childbearing, Marriage, Schooling and Family Background, by Birth Cohort

Women born in	1962–66 (Baseline)	1976–80 (Peak)	1984–88 (Validation)	1992–96 (Decline)
A. Early first births				
First birth by 17	7.9	10.0	7.1	3.9
First birth by 19	18.7	21.1	18.0	12.4
First birth by 21	30.6	32.8	29.2	22.8
B. Marriage and schooling				
Married by 21	35.5	22.1	16.1	12.6
No high-school diploma, ages 25–29	13.4	11.8	8.7	5.1
Bachelor's degree or more, ages 25–29	23.4	31.8	37.3	43.7
C. Family background				
Mother: less than high school	28.9	23.1	17.9	16.2
Mother: bachelor's or more	13.7	21.8	24.6	27.7
D. Period measure				
Teen birth rate (vital statistics)	52.1	55.6	42.4	31.9
Women aged 22 or older (N)	5,735	6,843	5,070	1,592

Notes: Percent of women, except the teen birth rate. First births and first marriages by the given age (completed years), among women interviewed after that age. Schooling is the percent of women aged 25–29 without a high-school diploma and with a bachelor's degree or more, from the Current Population Survey, averaged over the years in which each birth year of the cohort was aged about 27. Mother's education among women with a mother figure. The teen birth rate is the vital-statistics rate at ages 15–19 (births per 1,000 women), averaged over the years each cohort spent at those ages. Mother's education and first births by 21 among women aged 22 or older. Weights: each round's final weight, rescaled to sum to one within the round. *Source:* author's calculations from the NSFG, 1982–2019 rounds (National Center for Health Statistics, 2020), U.S. Census Bureau (2026) and National Center for Health Statistics (2026a).

against 13% to 16% among daughters of college graduates. To measure how much of each change the rise in mothers' education accounts for, I split the change in the share with a first birth by 21 between two cohorts into a between-group term, the change in mothers' education weighted by each group's rate, and a within-group term, the change in each group's rate weighted by its share (Table 2). From the baseline to the peak, the between-group term is −3.0 percentage points and the within-group term +5.0, almost entirely among daughters of mothers with a high-school diploma (from 29% to 35%) or some college (from 18% to 30%), so the net change was +2.0 points. From the peak to the decline the share fell by 9.7 points; the between-group term is −2.3 and the within-group term −7.5, three-quarters of the fall, again in the two middle groups (to 23% and 18%), while among daughters of mothers without a high-school diploma early births barely moved in either phase (47%, 49% and 48%).

Family background matters less for whether a teenager uses contraception than for how her pregnancies end (Kearney and Levine, 2014; Singh et al., 2001). Among sexually active childless girls aged 15–17, contraceptive use ranges only from 0.58 to 0.80 across groups of mother's education in the 1962–1966 cohort and from 0.64 to 0.77 in the 1976–1980 cohort, with no monotone gradient. The share of first pregnancies at 15–21 that end in an abortion, by contrast, rises steeply with mother's education: from 25% among daughters of mothers without a high-school diploma to 77% among daughters of college graduates in the 1962–1966 cohort, from 20% to 68% in the 1976–1980 cohort and from 12% to 40% in the 1992–1996 cohort (NSFG pregnancy histories, scaled to the Guttmacher totals).

4 Model

The model describes how a young woman avoids an early birth and why she wants to. Exposure to the risk of conception, the costs of contraception and of abortion, and the efficacy of the methods available differ across cohorts; the gain from avoiding a birth depends on what the birth would do to her schooling, earnings, marriage prospects and eligibility for transfers. Schooling, work, marriage, saving and fertility control are therefore chosen jointly, each year from age 14, and the model keeps four margins apart: the value of avoiding a

Table 2. First Births by Age 21 and Mother's Education: Composition and Within-Group Change

	Share of women			First birth by 21		
Mother's education	1962–66	1976–80	1992–96	1962–66	1976–80	1992–96
Less than high school	28.1	22.5	16.2	47.2	48.6	47.9
High school	43.3	32.5	28.1	28.8	35.4	22.5
Some college	14.8	23.3	29.0	17.7	29.8	18.0
Bachelor's or more	13.7	21.7	26.7	15.6	14.4	13.1
All women	100	100	100	30.5	32.5	22.8
	1962–66 to 1976–80			1976–80 to 1992–96		
Change in first birth by 21 (pp)	+2.0			-9.7		
Between groups	-3.0			-2.3		
Within groups	+5.0			-7.5		

Notes: Rates are among women aged 22 or older at the interview who report their mother's education; the shares of mother's education are those of all respondents in the cohort, which the model uses as its distribution of family background, so the all-women rates and the decomposition are the ones the estimation targets (Table 1 reports the shares among women aged 22 or older). The change in the share with a first birth by 21 is split exactly into a between-group term, $\sum_M \bar{r}_M \, \Delta s_M$, and a within-group term, $\sum_M \bar{s}_M \, \Delta r_M$, where s_M is the share of women whose mother has education M, r_M their rate, and bars denote averages of the two cohorts. *Source:* author's calculations from the NSFG, 1982–2019 rounds (National Center for Health Statistics, 2020).

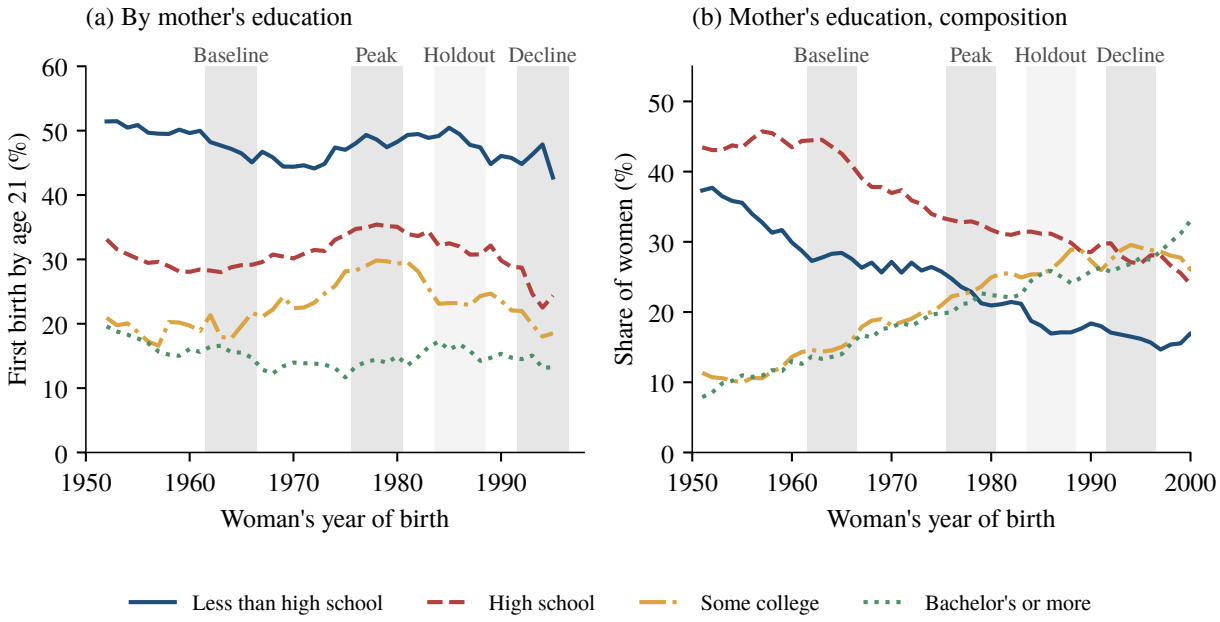


Figure 5. Early First Births and Family Background by Birth Cohort

Notes: Panel (a): share of women with a first birth by age 21 by the education of the woman's mother, five-year centered moving average. Panel (b): distribution of mother's education, three-year centered moving average. Women without a mother figure are excluded. Shaded areas as in Figure 3. *Source:* author's calculations from the NSFG, 1982–2019 rounds (National Center for Health Statistics, 2020).

birth, the cost of avoiding it, the efficacy of the methods, and exposure. In the lineage of Wolpin (1984) and Hotz and Miller (1993), a birth is the stochastic outcome of contraceptive choices; as in Keane and Wolpin (2010) and Eckstein et al. (2019), schooling, work, marriage and fertility are chosen jointly. The model is common to all cohorts; cohorts differ only in a set of parameters, and the decomposition attributes the change in early childbearing to those differences.

4.1 Environment

Cohorts, mother's education and time. A cohort g is a population of women born in the same years: 1962–1966 (the baseline cohort), 1976–1980 (the peak) and 1992–1996 (the decline). A woman enters the model at age 14 with zero assets and her mother's education $M \in \{1, 2, 3, 4\}$ (less than high school, high school, some college, a bachelor's degree or more), which summarizes her family background and is distributed as $\pi_g(M)$. A period is one year from 14 to 45 and four years afterwards, longer once the fecund window closes: a

woman can conceive through 45, works through 65 and dies at the end of 81.

State. The state of a woman at the start of period t is

$$\Omega_t = \{a_t, M, u, e_t, x_t, m_t, n_t, k_t, \tau_t\},$$

where $a_t \geq 0$ is assets; $u \in \{1, 2\}$ is unobserved heterogeneity, an initial condition fixed at age 14; e_t is schooling, which records enrollment in high school (ages 14–17) and in college (18–21) and afterwards takes the values $\{D, H, C\}$ (high-school dropout, high-school graduate, college); x_t is years of full-time experience; $m_t \in \{0, 1, 2\}$ is marital status (single, married with no child born before the marriage, married after a birth); $n_t \in \{0, 1, 2, 3+\}$ is parity, the number of children born; k_t is the age group of the youngest child (none, 0–1, 2–5, 6–17); and τ_t is the number of years since age 18 in which she has received cash welfare, which matters only under the TANF time limit.

Children. The state carries children by their number and the age of the youngest, not by the age of each child (Adda et al., 2017; Sommer, 2016). Parity n_t counts births; k_t places the youngest child in one of three age groups, 0–1, 2–5 and 6–17, or records that no child is at home. All of a woman's children are treated as at home while the youngest is, so a child leaves the household when the youngest reaches 18, and the costs of children, through the equivalence scale and the child penalty on work, and the flow utility of a young child all depend on n_t and k_t only. A birth sets the youngest child's group to 0–1 and raises parity by one. Because the state records the group and not the child's exact age, the group cannot advance on a fixed schedule; instead it advances each year with probability one over its length in years, one half from 0–1, one quarter from 2–5 and one twelfth from 6–17, after which the youngest child leaves home. A child therefore spends on average exactly two, four and twelve years in the three groups, and a woman's decisions respond to the age of her youngest child in expectation, at the cost of a state that is four values instead of eighteen.

Timing. Figure 6 summarizes the order of decisions within a year. A single woman first meets a potential husband with probability $\mu_g(e_t, t)$ and decides whether to marry. A woman

with fewer than three children then learns whether she is exposed to the risk of conception this year and, if exposed, decides whether to use contraception; the conception outcome is drawn, and a conception can end in an abortion. A conception in year t is a birth at the start of year $t+1$: parity rises by one and the youngest child's age group is 0–1. Finally she chooses schooling (whether to continue, if enrolled), labor supply, consumption and saving. Because the schooling decision is taken after the conception outcome, an early pregnancy raises the cost of staying in school.

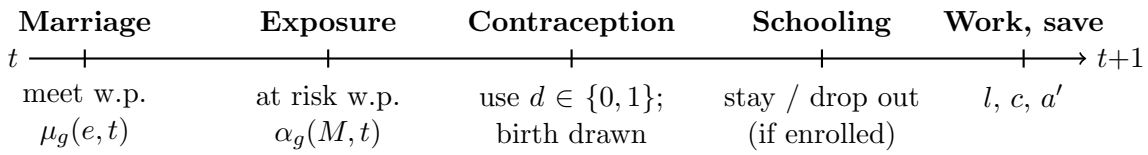


Figure 6. Timing Within a Fertile Period

Notes: Marriage is available to single women from age 18. Exposure and contraception apply to women with fewer than three children at ages 14–45; a conception in year t is a birth at the start of $t+1$. The schooling decision exists while enrolled (high school at 14–17, college at 18–21). The four-year working periods after 45 keep only the marriage stage and the last stage; retired periods keep only the marriage stage and consumption and saving.

4.2 Preferences

A woman's utility in year t is

$$U_t = \underbrace{u(c_t)}_{\text{consumption}} + \underbrace{\Psi_g(t, e_t, m_t, n_t, k_t)\, l_t}_{\text{work}} + \underbrace{\big(\omega_0 + A(t) + \omega_u \mathbf{1}\{u=2\}\big)\, b_t}_{\text{birth}} + \underbrace{\big(\pi_n + \omega_y \mathbf{1}\{k_t \le 5\}\big)\, n_t}_{\text{children}} + \underbrace{\sigma_l\, \varepsilon_t(l_t)}_{\text{taste shock}}, \tag{1}$$

where c_t is consumption per adult equivalent, $l_t \in \{0,1\}$ is work, $b_t = 1$ in the year of a conception that she carries to term, n_t is the number of children, and k_t the age of the youngest. Women discount the future at the annual rate β.

Consumption. Utility from consumption is $u(c) = c^{1-\gamma}/(1-\gamma)$. Household consumption is divided by the equivalence scale $\nu(m, n^h)$, through which children cost money; utility is additively separable in consumption and work.

Work. The taste for work has four terms:

$$\Psi_g(t,e,m,n,k) = \underbrace{\psi_l(t,e)}_{\text{age, schooling}} + \underbrace{\psi_{lk,g}(e)\,\varrho(k)\,\upsilon_2^{\mathbf{1}\{n\geq 2\}}}_{\text{child penalty}} + \underbrace{\psi_{lm}(e)\,\mathbf{1}\{m>0\}}_{\text{married}} + \underbrace{\psi_{lc,g}(e)}_{\text{cohort}}. \qquad (2)$$

The first term is the disutility of work by schooling group, with age-band dummies for 14–25, 26–29, 30–37, 38–45, 46–49, 50–53 and 54–65, as Keane and Wolpin (2010) let the disutility of nonleisure time shift with age.

The second term is the child penalty, the additional disutility of working with a child at home. Its level $\psi_{lk,g}(e)$ applies while the youngest child is under two. The factor $\varrho(k)$ is one at 0–1, $\varrho_{2\text{-}5}$ at 2–5, $\varrho_{6\text{-}17}$ at 6–17 and zero without a child at home, and υ_2 scales the penalty for a mother of two or more. The cost of working with children falls with the age of the youngest child and rises with the number of children. The level is cohort-specific: it summarizes how compatible motherhood and work were for a cohort, through childcare, workplace flexibility and norms. How the penalty changes as the youngest child grows older, $\varrho_{2\text{-}5}$ and $\varrho_{6\text{-}17}$, and with a second child, υ_2, is common to all cohorts.

The third term shifts the taste for work of married women. Without it, the income effect of the husband's earnings produces a larger employment gap between married and single women than in the data.

The fourth term is a cohort shift by schooling, zero for the baseline cohort. It captures employment opportunities that median earnings miss, such as the job-offer rates that Eckstein et al. (2019) let differ by cohort, and changes in women's attitudes to work (Fernández, 2013).

Births and children. The third term of (1) is the value of a birth, received in the year of the conception. Its level ω_0 makes most women eventually want a child even though a birth is costly at every age. Two features of the value of a birth follow Keane and Wolpin (2010). It changes with the age t at which the child is conceived, through a quartic common to all women, $A(t) = \sum_{j=1}^{4} \omega_{a,j}\, z^j$ with $z = (t-14)/31$. And women belong to one of two unobserved types, $u \in \{1,2\}$: a woman of type 2 values a birth by ω_u more at every age, and the probability of type 2 depends on mother's education, $\Pr(u=2 \mid M) = \Lambda(q_0 + q_1(M-1))$

with Λ the logistic function, and is the same in every cohort. The type is an initial condition: it stands for what the measured environment does not capture about a girl's situation at age 14 and that lowers the cost of an early birth to her, such as the home she grows up in, her information and expectations, and the prospects of her peers, all correlated with mother's education. Kearney and Levine (2012) attribute early childbearing among disadvantaged girls to a low economic trajectory, and Edin and Kefalas (2005) document that low-income mothers see a birth as a source of worth that other routes do not offer them; the measured environment carries the part of that trajectory that earnings, schooling costs, the safety net and exposure can account for, and the type the rest. Its role in the model is to let a share of early births be intended rather than failures of fertility control, as a third of first births conceived at 14–17 are reported to be.

The fourth term is the yearly utility of children. The parity taste π_n lets the model fit completed fertility by mother's education once the timing of the first birth is matched; with $\pi_n < 0$, each additional child is valued less than the first. Children also give a flow utility ω_y per child-year while the youngest is five or younger, the ages at which the child penalty on work applies, so that the cost of a young child in time and money is set against a benefit at the same ages; ω_y is fixed (Online Appendix E.1). There is no choice of child quality: children cost money through the equivalence scale and time through the child penalty.

Taste shocks. The last term of (1) is the taste shock to the work choice. Every discrete choice except the claiming of cash welfare carries i.i.d. type-I extreme value taste shocks with a choice-specific scale.

4.3 Fertility and fertility control

A woman with fewer than three children faces, in every year from 14 to 45, the risk of conception in three layers: exposure, fecundity and contraception.

Exposure. With probability $\alpha_g(M, t)$ a childless woman is sexually active during the year and therefore at risk of conception; a mother is at risk with probability one. Exposure is measured outside the model, by cohort, mother's education and single year of age, as the

share of woman-years in which childless women are sexually active. It captures both later first intercourse and less activity afterwards, the two margins of the decline in teen sexual activity (Kearney and Levine, 2012).

Fecundity. An exposed woman who does not contracept conceives within the year with probability

$$p^0(t,e,k) = \lambda_{\max}\,\Lambda\big(\theta_0 + \theta_{26\text{–}33}\mathbf{1}\{26 \le t \le 33\} + \theta_{34\text{–}45}\mathbf{1}\{t \ge 34\} + \theta_H\mathbf{1}\{e \le H\} + \theta_D\mathbf{1}\{e = D,\, t \le 25\}\big)\,\big(1 - \delta_{pp}\mathbf{1}\{k = 0\text{–}1\}\big), \tag{3}$$

a logistic function of age-band and schooling dummies (Carro and Mira, 2006), scaled by $\lambda_{\max} = 0.85$, the first-year conception rate of women using no method (Trussell, 2011); δ_{pp} is the postpartum reduction in fecundity in the two years after a birth, set outside the model. The schooling dummies capture differences in coital frequency and in the care taken by women who report no method; fecundity is common to all cohorts.

In the index, a high-school student enters as a dropout and a college student as a high-school graduate, so that θ_D and θ_H describe the fecundity of women still in school as well as of those who left at that level.

Contraception. An exposed woman chooses whether to use contraception, $d \in \{0,1\}$. A user conceives with probability $\rho_g(M)\,p^0(t,e,k)$, where $\rho_g(M) \in (0,1)$ is the typical-use failure rate of cohort g's method mix relative to using no method. The failure rate is measured outside the model: its level from each cohort's method mix in the NSFG, and its gradient in mother's education from the failure rates by poverty status of Sundaram et al. (2017), which are higher for poor women with every method (see also Rosenzweig and Schultz, 1989). The separation of the cost of contraception from its efficacy goes back to Michael and Willis (1976).

Use carries a utility cost that captures the price of a method, the effort of obtaining it, side effects, negotiation with a partner and stigma (Black et al., 2010). As in Hotz and Miller

(1993), the cost is a quadratic in age plus a linear term in education, here the mother's:

$$\begin{aligned}\phi_{s,g}(t, M, n) = \underbrace{\phi_{s,g} + \Delta\phi^{m}_{s,g}\mathbf{1}\{t \leq 17\}}_{\text{cohort level, minors}} + \underbrace{\phi_{s,1}(t-14) + \phi_{s,2}(t-14)^2}_{\text{age}} \\ + \underbrace{\kappa_M(M-1)}_{\text{family}} + \underbrace{\mathbf{1}\{n>0,\ t \leq 21\}\,\Delta\phi^{mom}_{s}}_{\text{young mothers}}.\end{aligned} \tag{4}$$

The level $\phi_{s,g}$ differs across cohorts. So does the *premium for minors*, $\Delta\phi^{m}_{s,g}$, for the rules and prices that women under 18 face: parental consent and notification, confidentiality, the reach of subsidized clinics, and buying a method without income or insurance (Kearney and Levine, 2009; Packham, 2017). The age profile $\phi_{s,1}, \phi_{s,2}$, the slope in mother's education κ_M, which captures differences in information about methods or in access through the family beyond those the model generates through the opportunity cost of a birth, and the *premium for young mothers* $\Delta\phi^{mom}_{s}$, which applies to mothers aged 21 or younger and governs the spacing of births after an early first birth, are common to all cohorts. Age enters the use decision only through the cost (Arcidiacono et al., 2012; Hotz and Miller, 1993).

Let $\Delta V = V^b - V^{nb}$ be the value of a birth, the value of the rest of the period with a birth minus its value without one; it is negative when a birth is unwanted. The use decision has type-I extreme value taste shocks with scale σ_s. Writing $\phi_{s,g}$ for $\phi_{s,g}(t, M, n)$ and ρ_g for $\rho_g(M)$, the value of an exposed childless woman before she decides is

$$V^{nb} + \sigma_s \log\Big[\exp\Big(\frac{p^0\Delta V}{\sigma_s}\Big) + \exp\Big(\frac{\rho_g\, p^0\Delta V - \phi_{s,g}}{\sigma_s}\Big)\Big], \tag{5}$$

she uses contraception with probability

$$P^{use} = \Lambda\left(\frac{(1-\rho_g)\,p^0\,(-\Delta V) - \phi_{s,g}}{\sigma_s}\right), \tag{6}$$

where Λ is the logistic function, and, before exposure is drawn, she has a birth this period with probability

$$p^b = \alpha_g(M,t)\; p^0(t,e,k)\left[1 - (1-\rho_g)\,P^{use}\right]. \tag{7}$$

Equations (6)–(7) contain the four margins. An early birth becomes less likely when

avoiding it is worth more, because $-\Delta V$ rises with a woman's wage, schooling and marriage prospects and falls with how much the safety net insures a birth; when use is cheaper ($\phi_{s,g}$); when methods fail less often; and when fewer women are exposed (α_g). Parity enters fertility through ΔV, the value of an additional birth at the woman's current parity, and, for mothers aged 21 or younger, through the use cost.

Abortion. After a conception, a woman ends the pregnancy with probability

$$P^{ab} = \Lambda\left(\frac{-\Delta V - \phi_{a,g}(t, M)}{\sigma_a}\right), \tag{8}$$

where σ_a is the scale of the taste shocks of the abortion decision. The cost captures the price of an abortion, the distance to a provider, legal restrictions such as parental-involvement laws, and stigma:

$$\phi_{a,g}(t, M) = \phi_{a,g} + \Delta\phi_a \, \mathbf{1}\{t \geq 18\} + \kappa_a(M - 1) \, \mathbf{1}\{t \leq 21\}. \tag{9}$$

The level $\phi_{a,g}$ differs across cohorts and carries the changes in access over time. The shift $\Delta\phi_a$ applies from age 18 and fits the higher abortion share of minors' conceptions; the slope κ_a applies through age 21, the ages at which the abortion share by mother's education is measured, after which the woman's own schooling takes the place of her mother's; both are common to all cohorts.

Abortion insures against contraceptive failure. The value of a conception, $G = \sigma_a \log[\exp(\Delta V/\sigma_a) + \exp(-\phi_{a,g}(t, M)/\sigma_a)]$, replaces ΔV in (5) and (6), and the birth probability (7) is multiplied by $1 - P^{ab}$. A cheaper abortion therefore lowers births directly and raises them indirectly, by weakening the incentive to use contraception (Kane and Staiger, 1996). The slope κ_a works through the same channel: daughters of more-educated mothers end a much larger share of their first teen pregnancies in abortion while their contraceptive use is about the same, and a lower abortion cost for them lets the model reproduce a teenage use rate that barely varies with mother's education.

4.4 Schooling

All women are enrolled in high school at 14 and receive an annual consumption allowance h_g from their families while enrolled. In each year from 14 to 17, after the conception outcome, a student chooses whether to continue or to drop out and work. Continuing carries a psychic cost $\phi_H(M) = \phi_{H,0} + \phi_{H,M}(M-1)$ for every student, which generates dropout among women who do not become mothers, and the extra cost ϕ_H^k for a mother, plus $\phi_H^{k,0}$ while her child is under two. A woman who completes the fourth year is a high-school graduate at 18 and chooses whether to enter college, at a psychic cost

$$\kappa_C(M, n^h) = \xi_C + \xi_M(M-1) + \mathbf{1}\{n^h > 0\}\,\phi_C^k,$$

linear in mother's education as the schooling utility of Eckstein et al. (2019) is linear in parents' education, and higher for a woman who has already had a child. Students do not work. A college student receives the parental allowance $a_g^C\, s_g(M)$, plus need-based aid g_g if her mother did not finish high school, and pays tuition and fees TC_g each year. The allowance has a cohort-specific level a_g^C and a profile $s_g(M)$, family income at 14–17 by mother's education relative to its mean. The entry decision is available to single graduates: the marriage offer at 18 precedes it, so a woman who marries at 18 does not enter college. In each of the four college years, after the conception outcome, she chooses whether to continue, at the cost ϕ_{CD}^k if she is a mother, or to leave as a high-school graduate; completing the fourth year makes her a college graduate at 22, at a graduation cost ϕ_G. There is no re-entry, so schooling is final by 22.

4.5 Marriage

From age 18 a single woman who is not a student meets a potential husband with probability $\mu_g(e,t)$ and marries if the value of marriage, plus a type-I extreme value taste shock with scale σ_m that captures match qualities the model does not include (Sheran, 2007; Van der Klaauw, 1996), exceeds that of remaining single; marriage is absorbing. A married household pools income, including the husband's earnings $w_g^h(e,t,m)$, which depend on the woman's schooling, her age, and whether she married before or after her first birth, since women who

marry after a birth match with lower-earning husbands (Online Appendix F). Consumption is shared through the equivalence scale $\nu(m, n^h) = 1 + \nu_a \mathbf{1}\{m > 0\} + \nu_k n^h$, where n^h is the number of children at home. The meeting rates and the husbands' earnings are cohort-specific. Marriage insures the cost of an early birth, so fewer marriage opportunities raise the value of avoiding one; for a single woman, the safety net replaces part of that insurance.

4.6 Labor market

A working woman earns a cohort-specific annual earnings profile $w_g(M, e, x, t)$: the cohort's age profile of median earnings by education, from the CPS, around which earnings vary with experience and family background according to equations estimated on the NLSY (Online Appendix F). The returns to schooling and experience are the opportunity-cost channel: a woman with higher returns to college and to experience loses more from a birth that ends her schooling or keeps her out of work. Experience accumulates with years of work, and after retirement a woman receives Social Security.

4.7 Government: taxes and the safety net

Taxes and transfers follow the federal statutes and the median state's rules in force for each cohort, program by program. Let $\varpi \in \{0, 1\}$ indicate that the woman claims cash welfare (AFDC or TANF) this year. Disposable annual income is

$$y^{net} = y - \mathcal{T}_g(y; m, n^h) + \mathrm{EITC}_g(y; m, n^h) + \varpi\, B_g(y^f; n^h) + FS_g\big(y, \varpi B_g;\, 1 + \mathbf{1}\{m > 0\} + n^h\big), \tag{10}$$

where y is gross household earnings, y^f the woman's own earnings, $\mathcal{T}_g$ the federal income and payroll taxes, EITC_g the earned income tax credit, FS_g food stamps, and B_g the AFDC/TANF cash benefit of a single mother,

$$B_g(y^f; n^h) = \max\big\{\bar{B}_g(n^h) - \chi_g \max\{y^f - D_g,\, 0\},\, 0\big\},$$

with maximum $\bar{B}_g(n^h)$ by family size, benefit-reduction rate χ_g and disregard D_g. Claiming carries a utility cost $\eta_g^w + \Delta\eta^w \mathbf{1}\{t \le 21\}$, the standard representation of stigma and hassle

costs (Keane and Moffitt, 1998; Low et al., 2022; Moffitt, 1983); its cohort level also absorbs the parts of TANF the model does not represent, such as work requirements and sanctions. Three rules matter for teenagers and young mothers. A minor mother who lives with her parents has her benefit reduced by part of their income, which the rules count as available to her; under TANF she receives it only while she attends high school (U.S. Congress, 1996); and TANF limits receipt after age 18 to $\bar{\tau}_g$ years in a lifetime, so the years of receipt a woman has used, τ_t, are part of her state and she weighs the value of a year of welfare now against keeping it for later, as in Low et al. (2022). Online Appendix C.2 gives the details. The safety net acts on early fertility through the incentive: a more generous guarantee lowers the cost of a birth to a single woman, the minor-parent rules raise it for a teenager, and an EITC that pays only if she works raises the value of the schooling and experience that a birth puts at risk.

4.8 Recursive problem

I state the problem of a single woman who has finished school, in a year of the fertile window, and relegate the other cases to Online Appendix C. Let V_t^1, V_t^2 and V_t^3 denote the values at the marriage, fertility and work–saving stages, and let $b \in \{0, 1\}$ record whether a conception carried to term occurred this year, so that next year parity rises by one and the youngest child is aged 0–1 if $b = 1$, and otherwise parity is unchanged and the youngest child's age group stays or advances as described above. At the work–saving stage, given her work choice l, she chooses consumption, saving and, if eligible, whether to claim cash welfare, ϖ:

$$
\begin{aligned}
v_t^3(\Omega_t, b, l) = \max_{c,\, a',\, \varpi} \Big\{ & u(c) + \Psi_g(t, e, m, n, k)\, l - \big(\eta_g^w + \Delta\eta^w \mathbf{1}\{t \le 21\}\big)\varpi \\
& + \big(\omega_0 + A(t) + \omega_u \mathbf{1}\{u = 2\}\big)\, b \\
& + \big(\pi_n + \omega_y \mathbf{1}\{k \le 5\}\big)\, n + \beta\, \mathbb{E}\, V_{t+1}^1(\Omega_{t+1}) \Big\} \\
\text{s.t.} \quad & \nu(m, n^h)\, c + a' = (1 + r)\, a + y_g^{net}(\Omega_t, l), \\
& a' \ge 0, \quad x_{t+1} = x_t + l,
\end{aligned}
$$

and

$$V_t^3(\Omega_t, b) = \sigma_l \log \sum_{l \in \{0,1\}} \exp\big(v_t^3(\Omega_t, b, l)/\sigma_l\big).$$

At the fertility stage, with $\Delta V_t = V_t^3(\Omega_t, 1) - V_t^3(\Omega_t, 0)$ the value of an additional birth and G_t its abortion-adjusted counterpart,

$$V_t^2(\Omega_t) = V_t^3(\Omega_t, 0) + \alpha_g(M, t, n)\, \sigma_s \log\Big[e^{p^0 G_t/\sigma_s} + e^{(\rho_g(M) p^0 G_t - \phi_{s,g}(t,M,n))/\sigma_s}\Big],$$

which is (5) averaged over exposure; for a woman with three children $V_t^2 = V_t^3(\Omega_t, 0)$. At the marriage stage, with $m^* = 1$ for a childless woman and $m^* = 2$ for a mother,

$$V_t^1(\Omega_t) = \mu_g(e, t)\, \sigma_m \log\Big[e^{V_t^2(\Omega_t \,|\, m=m^*)/\sigma_m} + e^{V_t^2(\Omega_t \,|\, m=0)/\sigma_m}\Big] + \big(1 - \mu_g(e, t)\big)\, V_t^2(\Omega_t \,|\, m = 0).$$

The model is solved by backward induction over the 41 periods (Online Appendix C.9).

4.9 What differs across cohorts

A cohort is a vector of parameters, split into those common to all cohorts and ten cohort-specific blocks, each one mechanism and the unit the decomposition switches. As in Eckstein et al. (2019), there is no cohort-specific taste for early births that could absorb the decline: the only cohort-specific tastes are the child penalty and the shift in the taste for work, both identified from CPS employment. Efficacy and exposure are measured, so the cost of contraception is the only fertility-control parameter whose change across cohorts is inferred from births and contraceptive use; a decline that the measured changes cannot account for shows up there or as poor fit.

5 Estimation

I estimate the common parameters and the cohort-specific parameters that are not measured by the simulated method of moments, pooling the three cohorts in one criterion, as Eckstein et al. (2019) do for the three cohorts on which they estimate preferences. With pooling, preferences, fecundity and the psychic costs of schooling must rationalize every cohort at

Table 3. Primitives of the Model: Cohort-Specific Blocks and Common Parameters

		Cohort-specific		
	Block	Measured	Estimated	Common to all cohorts
1	Women's labor market	$w_g(M, e, x, t)$	$\psi_{lc,g}(e)$	$\psi_l(t, e)$, $\psi_{lm}(e)$, ψ_{ret}, σ_l
2	Schooling costs and support	TC_g; $s_g(M)$	h_g, a_g^C, g_g	$\phi_{H,0}$, $\phi_{H,M}$; ξ_C, ξ_M; ϕ_H^k, $\phi_H^{k,0}$, ϕ_C^k, ϕ_{CD}^k, ϕ_G; σ_H, σ_C, σ_{CD}
3	Cost of contraception	—	$\phi_{s,g}$; $\Delta\phi_{s,g}^m$ (ages 14–17)	$\phi_{s,1}$, $\phi_{s,2}$ (age profile); κ_M; $\Delta\phi_s^{mom}$; σ_s
4	Efficacy of contraception	$\rho_g(M)$	—	—
5	Exposure	$\alpha_g(M, t)$	—	—
6	Marriage market	w_g^h	$\mu_g(e, t)$	σ_m
7	Taxes and safety net	$\mathcal{T}_g$, EITC_g, $\bar{B}_g(n^h)$, χ_g, D_g, $\bar{\tau}_g$, FS_g, $\varsigma_g(M)$	η_g^w	$\Delta\eta^w$
8	Child penalty	—	$\psi_{lk,g}(e)$	$\varrho_{2\text{-}5}$, $\varrho_{6\text{-}17}$, υ_2
9	Family background	$\pi_g(M)$	—	—
10	Cost of abortion	—	$\phi_{a,g}$	$\Delta\phi_a$; κ_a; σ_a
	Preferences and fecundity, held fixed across cohorts	—	—	γ, β, r; ν_a, ν_k; ω_0, $\omega_{a,j}$, ω_u, q_0, q_1, ω_y, π_n; θ_0, $\theta_{26\text{–}33}$, $\theta_{34\text{–}45}$, θ_H, θ_D, δ_{pp}

Notes: Each block is one mechanism and the unit the decomposition switches between cohorts. Cohort-specific parameters are either measured outside the model, cohort by cohort, or estimated by SMM jointly with the common parameters, pooling the three cohorts (Section 5). Measured inputs: women's and husbands' earnings profiles from the CPS; tuition from published series and parental support $s_g(M)$ from CPS family income by mother's education; efficacy from each cohort's method mix and typical-use failure rates, with the gradient in M from failure by poverty status; exposure from age at first intercourse and intercourse in the last three months in the NSFG; taxes and transfers from the statutes and program rules in force for each cohort; family-background shares from the NSFG. Common parameters are listed next to the block whose cohort-specific parameters they complete. Preferences and fecundity are the same in every cohort, so they are not a block: the decomposition has nothing to switch there.

once, so cohort differences in behavior come from the cohort-specific blocks of Table 3. Because every cohort is measured with the same surveys and definitions, a difference in targeted moments across cohorts is a change in behavior rather than in measurement. Women born in 1984–1988 are not used in estimation and serve as a validation sample (Keane and Wolpin, 2007).

Parameters set outside the model. Risk aversion, the discount factor and the interest rate follow Adda et al. (2017); the equivalence scale is the OECD-modified scale; the yearly utility of a young child is fixed at 0.18. The cohort-specific inputs are measured cohort by cohort (Online Appendix E.1). Women's earnings are the CPS profile of median earnings by education and age, with the returns to experience and to family background estimated on the NLSY; husbands' earnings are the CPS earnings of husbands by the wife's education. Exposure is the share of sexually active women by age in the NSFG rounds fielded when the cohort was that age. Efficacy is the failure rate of the cohort's method mix at 15–21, relative to the 85% conception rate without a method: $\rho_g = 0.141$, 0.151 and 0.102. The peak cohort's efficacy is lower because the condom replaced part of the pill; the decline cohort's is higher because implants and IUDs spread. Taxes and transfers are the rules in force when the cohort turned 20 (the tax rules of 1984, 1998 and 2014; the AFDC/TANF schedules of January 1985, July 1998 and July 2014), and the minor-parent rules those in force when it was 14–17. All money amounts are divided by an index of aggregate real income, 1.00, 1.18 and 1.33 for the three cohorts. Without this correction, aggregate growth alone would change choices: the utility of consumption is concave, so higher incomes lower the weight of every cost measured in utility units.

Moments. For each cohort I build the same moments from the NSFG and the CPS, one set per block of the model. Fertility: births per woman at each age from 14 to 24, first births by age and mother's education, children ever born and second births. Fertility control: contraceptive use among sexually active childless women at 15–17 and 18–21, overall and by mother's education, and by schooling at later ages; the abortion share of first pregnancies at 15–17 and 18–21, overall and by mother's education. Schooling: high-school dropout and

college attendance, by teen birth and by mother's education. Marriage and work: marriage by schooling and age; employment by schooling and age for childless women, for mothers by the age of the youngest child, and for married women. Safety net: the share of single mothers who claim cash welfare. Three further moments identify what these cannot. The share of first births conceived at 14–17 and at 18–21 that the mother reports as intended, and the share of those conceptions that occurred while a method was used, both by mother's education, identify the unobserved type and the conception technology. The response of births at 15–17 to a higher abortion cost for minors, matched to the zero effect of parental-involvement laws on births, identifies the substitution between contraception and abortion (Section 5.2). A cell is targeted when it has at least 30 observations, which leaves 250, 240 and 153 moments for the three cohorts, fewer for the youngest because it is observed to a lower age and from a smaller sample; the pooled criterion sums over the moments each cohort supports, as in Eckstein et al. (2019).

Criterion. The criterion is the sum over cells of squared proportional deviations between the model and the data, with equal weight on every cell; shares are scaled by their Bernoulli standard deviation, and birth rates and first-birth stocks by their own level (Online Appendix E.2). The cells that define the objects of the decomposition, births per woman at each age from 15 to 19 and first births by 17 and by 21 by mother's education, carry ten times the weight of the other cells, so that the criterion does not trade the cohort changes in early childbearing for the many cells that describe schooling, work and marriage. The parameter vector has 65 common parameters and 24 cohort-specific ones per cohort; 128 are estimated and the rest are held at the previous cohort's values or normalized. Standard errors are sandwich standard errors: the Jacobian of the moments is computed by central differences, and the variances of the data moments by bootstrap, adjusted for simulation error.

Incomplete life cycles. The decline cohort is observed to about age 27 in the NSFG and 33 in the CPS. As in Attanasio et al. (2008) and Eckstein et al. (2019), each cohort is scored only at the ages at which it is observed, its earnings beyond that age follow the

baseline cohort's age profile from its own level, the marriage-meeting rates of age bands that no marriage moment of the cohort covers are held at the previous cohort's values, and women know their cohort's parameters over the whole life cycle. Completed fertility beyond the window is a forecast of the model.

Identification. The first-birth stocks by age and mother's education identify fecundity and, given exposure, the value of a birth ω_0; children ever born and second births identify the parity taste π_n. The schooling, marriage and employment moments pin down the continuation values, and hence ΔV, in each schooling-age cell. Given ΔV, contraceptive use among exposed women identifies the cost of use relative to the scale σ_s, and the variation of use across cells, which moves ΔV at a given cost, identifies σ_s. Use at 15–17 relative to use at older ages identifies the minors' premium on the cost of use and the age profile of the cost; the nearly flat gradient of use in mother's education, against an incentive that rises steeply with it, identifies κ_M. The abortion shares identify the abortion costs, and births by single year of age the age profile $A(t)$. The share of first births reported as intended and the share of conceptions that occur under a method identify the unobserved type: a woman of the second type conceives without a method and carries the conception to term, and its probability by mother's education is read from the gradient of the intended share. Without these moments the type is not identified, because at the estimates no woman of the common type values a birth before 22. Employment by schooling and age identifies ψ_l; employment of mothers relative to childless women, by the age of the youngest child, the child penalty and its profile; employment of married women ψ_{lm}; and differences in employment across cohorts at given earnings $\psi_{lc,g}$.

5.1 Estimates

Table 4 reports the estimated cohort-specific parameters next to the measured inputs of the same blocks; Online Appendix Table E.3 reports every parameter with its standard error. The measured margins of fertility control moved in opposite directions across the two phases. Exposure at 15–17 rose from 0.224 to 0.267 between the baseline and the peak cohort and fell back to 0.206 for the decline cohort, and the efficacy of the methods young women used

was about constant in the rise and improved by a third in the decline (the relative failure rate fell from 0.151 to 0.102), as long-acting methods spread.

The estimated cost of contraceptive use for women of 18 and older is 0.056 and 0.058 for the baseline and peak cohorts and 0.031 for the decline cohort, for daughters of mothers without a diploma. Minors pay this cost plus a premium, which rose from 0.010 for the baseline cohort to 0.037 for the peak cohort and is zero for the decline cohort, so their cost of use is 0.066, 0.095 and 0.031. In consumption terms the cost is large: for a woman of the peak cohort it is equivalent to giving up about \$8,700, 46% of a year's consumption at 18–21, and the minors' premium to a further \$2,300.[4] The cost is therefore not the price of a method but what keeps a woman from using one given the value of avoiding a birth: access without income or confidentiality, information, and negotiation with a partner. The cost falls with mother's education, by 0.032 for each of the four education groups, and is negative for daughters of mothers with some college or a college degree, whose use the value of avoiding a birth alone does not account for. The path of the minors' premium lines up with the history of minors' access to confidential care: the decline cohort, teenagers in 2007–2015, came of age after the Medicaid family-planning expansions (Kearney and Levine, 2009) and the first state programs that offered long-acting methods at no cost (Kelly et al., 2020; Lindo and Packham, 2017), and its estimated cost of use is the lowest of the three.

The cost of abortion rose across cohorts, from 0.74 to 1.00 and 1.19 (standard errors 0.15–0.20), which the model infers from the falling abortion share of teen conceptions (Table 5). The direction matches the history of access: the number of abortion providers fell from 2,908 in 1982 to 2,042 in 1996 (Henshaw, 1998), and parental-involvement laws enacted before the mid-1990s lowered minors' abortion rates by 15–20% (Joyce et al., 2020).

The cost of abortion also falls with mother's education. Through age 21, daughters of college graduates face a cost 0.63 below that of daughters of mothers without a diploma ($\kappa_a = -0.21$ for each education group), almost the whole baseline cost of 0.74; from 18 on the cost is 0.23 higher than for minors. The cost of use does not vary with age beyond the

[4]The equivalent is the cut in that year's consumption that lowers utility by the cost, computed for every simulated childless, single, sexually active woman of the cohort at the relevant ages and averaged; consumption is in 2016 dollars divided by the cohort's index of aggregate real income (Section 5). Because consumption differs across cohorts, the money equivalents are not comparable across them; the use decision compares the cost with the value of avoiding a birth in the same utility units.

minors' premium. The taste shocks are of the same size as the costs they attach to. The scale of the use shock equals the adult cost of use ($\sigma_s = 0.061$). The scale of the abortion shock is about half the cost of abortion ($\sigma_a = 0.62$). The scale of the marriage shock, $\sigma_m = 0.12$, is worth about a year of consumption, so a woman accepts an offer when the match pays.

For women of the second unobserved type, the net cost of a birth at 15–21 is lower by $\omega_u = 1.55$ (standard error 0.22) than for the first; against a common value of a birth of -0.82, a conception at those ages is worth carrying to term for them. The probability of the second type falls with mother's education: 0.37 for daughters of mothers without a diploma, and 0.27, 0.20 and 0.14 for daughters of high-school graduates, of mothers with some college and of college graduates. The model classifies a first birth as intended when a woman of the second type conceives without a method. By this definition, 0.38, 0.27 and 0.19 of first births conceived at 14–17 are intended in the three cohorts, against 0.29, 0.25 and 0.18 in the NSFG pregnancy files.

5.2 Model fit

I judge the model by its fit to every targeted moment of every cohort (Online Appendix Table E.4), by its fit to the outcomes the decomposition studies (Table 5, Figures 7 to 9), and by its prediction for a cohort it was not estimated on: women born in 1984–1988, whose parameters are interpolated between the peak and the decline cohorts and whose moments are never used in estimation. The estimates are preliminary, and work on improving the fit of the model is ongoing.

Figure 7 puts the model's four cohorts on the cohort profile of Section 3: the model reproduces the rise from the baseline to the peak cohort, most of the decline, and the position of the validation cohort halfway down it.

The model reproduces the level and the decline of teen births (Figure 8). Births per woman at 15–19 are 0.232, 0.252 and 0.123 in the model against 0.230, 0.260 and 0.136 in the data; first births by 21 are 0.318, 0.324 and 0.208 against 0.305, 0.325 and 0.228. The decline is 12.9 births per 100 women against 12.4, and 11.6 points of first births by 21 against 9.7. The model reproduces part of the rise: births at 15–19 rise by 2.0 per 100 women against 3.0 in the data, first births by 17 by 1.1 points against 2.0, and first births by 21 by 0.6

Table 4. Cohort-Specific Parameters

	1962–1966	1976–1980	1992–1996
Measured inputs			
Efficacy: failure rate of the users' method mix relative to no method, ρ_g	0.141	0.151	0.102
Exposure: childless women sexually active at 15–17, α_g	0.224	0.267	0.206
College tuition, fees (thousand 2016$ per year), TC_g	5.57	8.34	12.60
Cash-welfare time limit (years)	none	5	5
Share of mothers without a high-school diploma, $\pi_g(1)$	0.281	0.225	0.162
Estimated			
Cost of contraceptive use, $\phi_{s,g}$	0.056	0.058	0.031
additional at ages 14–17, $\Delta\phi^m_{s,g}$	0.010	0.037	0.000
Cost of abortion, $\phi_{a,g}$	0.737	0.998	1.187
Child penalty on work, HS graduates, $\psi_{lk,g}(2)$	-0.049	-0.030	-0.035
Work taste, cohort shift, HS graduates, $\psi_{lc,g}(2)$	0.000	-0.013	-0.004
Marriage-meeting rate, HS graduates 16–21, μ_g	0.205	0.170	0.036
College allowance (thousand 2016 $ per year, detrended), a^C_g	37.0	23.1	73.3
Need-based aid, daughters of mothers without a diploma, g_g	1.5	19.4	35.7
Cost of claiming cash welfare, η^w_g	0.0196	0.0216	0.0247

Notes: Measured inputs as described in Section 3.1 and Online Appendix A; exposure is the share of childless women sexually active in the last three months, averaged over ages 15–17 and weighted by the cohort's family-background shares. Costs and penalties are in utility units.

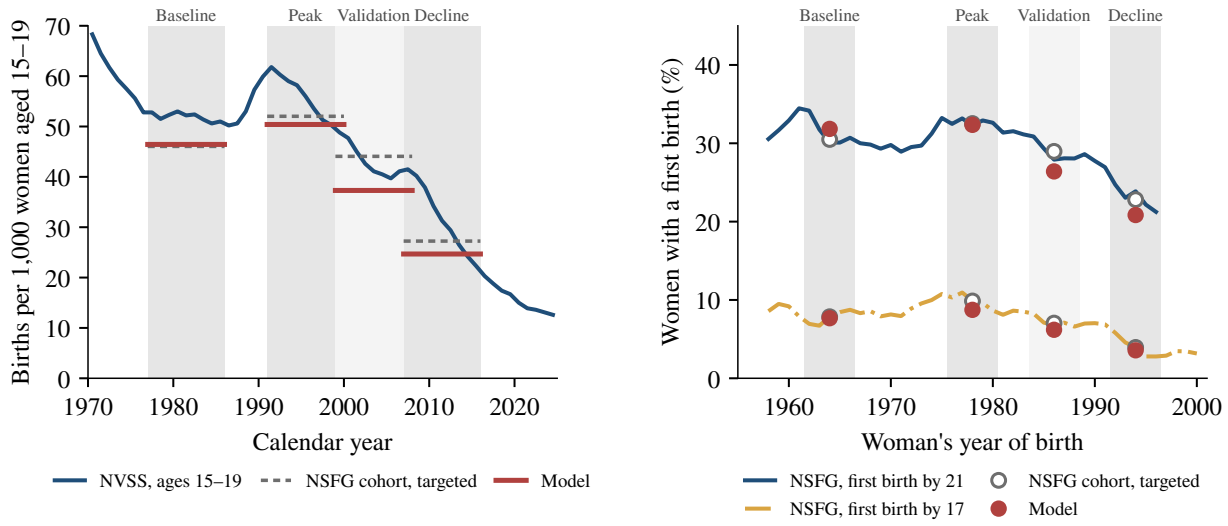


Figure 7. The Model's Cohorts on the Cohort Profile of Early Childbearing

Notes: Left: births per 1,000 women aged 15–19 by calendar year (NVSS, as in Figure 1); for each cohort, the NSFG moment the estimation targets (dotted) and the model (red) over the years the cohort was 15–19. Right: the share of women with a first birth by 17 and by 21 by year of birth (NSFG, three-year moving average, as in Figure 3); hollow markers are the NSFG cohort moments and red markers the model, at the cohort's middle birth year. The 1984–1988 cohort is not used in estimation. NSFG birth rates run below the NVSS.

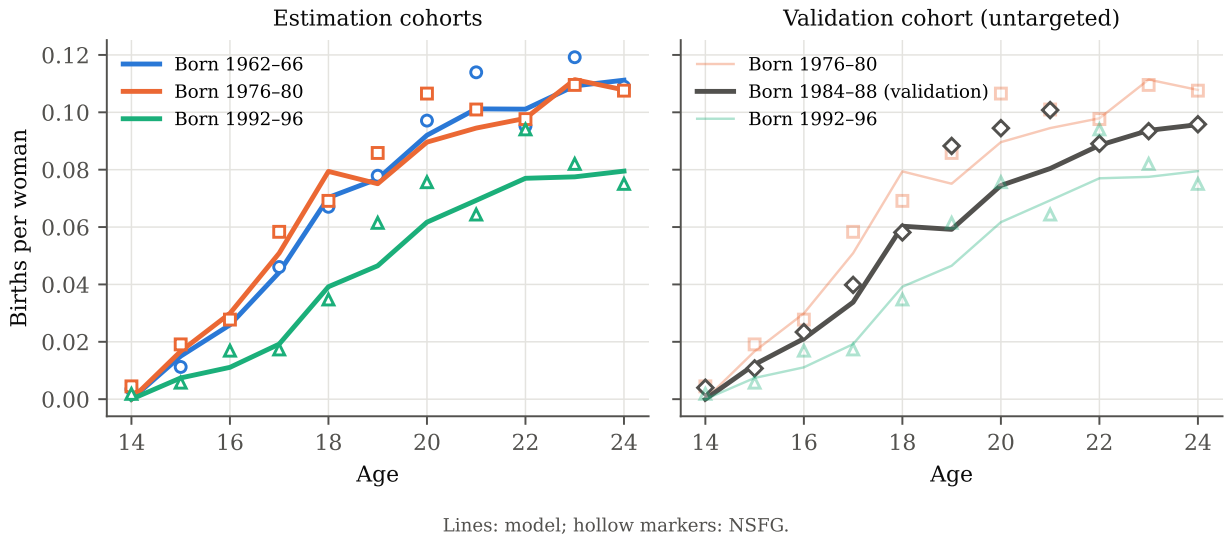


Figure 8. Births per Woman by Age: Data and Model

Notes: Births of any order per woman at each age, NSFG (markers) and model (lines). Left: the three estimation cohorts. Right: the untargeted validation cohort born in 1984–1988, with the estimation cohorts around it in light colors.

points against 2.0. Births at 20–24 are 0.52, 0.50 and 0.37 against 0.53, 0.52 and 0.39; the progression of teen mothers to a second birth within four years is 0.60, 0.57 and 0.48 against 0.55, 0.60 and 0.45. The first-birth rate at 22 is 0.06 against 0.04 in every cohort, and at 19 it is 0.057, 0.054 and 0.037 against 0.054, 0.057 and 0.051.

Figure 9 shows the gradients that motivate the model's treatment of family background. In the data, first births by 17 and by 21 fall steeply with the mother's education, while contraceptive use among sexually active girls barely varies with it. The model reproduces the gradient in births in the baseline and peak cohorts; in the decline cohort it understates first births by 21 among daughters of mothers without a diploma (0.34 against 0.48). It reproduces the flat gradient in use in the peak cohort; in the decline cohort, use at 15–17 among daughters of college graduates is 0.92 against 0.78. The abortion share of first conceptions rises with mother's education in the data and in the model, from about 0.2 among daughters of mothers without a diploma to 0.4–0.8 among daughters of college graduates; the model understates the top of the gradient in the baseline cohort (0.63 against 0.78). Table 6 compares the split of each cohort change into a between-group and a within-group term in the data and in the model. The model matches the between-group terms of early first births (for first births by 21: -2.9 and -1.9 points against -3.0 and -2.3); the within term of the decline is -9.6 against -7.5 and the within term of the rise $+3.4$ against $+5.0$. In the data teen contraceptive use rose overall by 6.5 points from the baseline to the peak cohort and by 11 points from the peak to the decline cohort, almost all within family backgrounds; in the model it rises by 9 and 17 points.

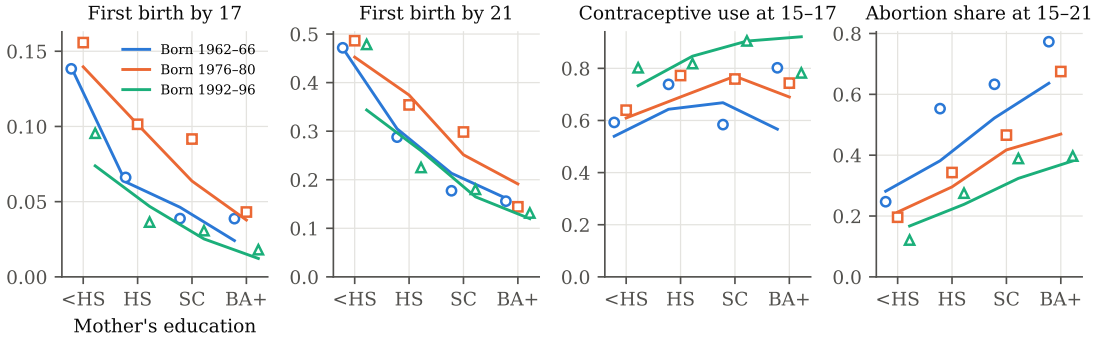
Contraceptive use at 18–21 is 0.75, 0.82 and 0.88 against 0.78, 0.83 and 0.85, and at 15–17 the model is 7 points below the baseline cohort's data (0.60 against 0.67), 4 below the peak cohort's and 2 above the decline cohort's. The abortion share of conceptions at 15–17 fits in the peak and decline cohorts (0.37 and 0.35 against 0.39 and 0.31) and is 9 points low in the baseline cohort (0.44 against 0.53); at 18–21 it is 0.38, 0.30 and 0.25 against 0.46, 0.35 and 0.26. The share of first conceptions at 14–17 that occur while a method is used is 0.13, 0.19 and 0.29 against 0.17, 0.33 and 0.39.

The cost of abortion acts on births through two channels: a share of conceptions that end in abortion, and the use of contraception by women who know that a conception will

Table 5. Fit of Early Childbearing and Its Margins, and the Validation Cohort

	Born 1962–66		Born 1976–80		Born 1992–96		Born 1984–88	
	Data	Model	Data	Model	Data	Model	Data	Prediction
Births per woman, 15–19	0.230	0.232	0.260	0.252	0.136	0.123	0.220	0.186
Births per woman, 20–24	0.534	0.515	0.522	0.501	0.391	0.365	0.474	0.433
First birth by 17	0.079	0.077	0.099	0.087	0.039	0.036	0.070	0.062
First birth by 21	0.305	0.318	0.325	0.324	0.228	0.208	0.290	0.264
mother without a diploma	0.472	0.471	0.486	0.452	0.479	0.344	0.495	0.426
mother with a BA or more	0.156	0.162	0.144	0.191	0.131	0.120	0.168	0.141
Contraceptive use, 15–17	0.670	0.604	0.735	0.693	0.845	0.863	0.828	0.790
Contraceptive use, 18–21	0.783	0.752	0.829	0.821	0.852	0.878	0.825	0.862
Abortions per conception, 15–17	0.527	0.436	0.385	0.372	0.314	0.345	0.358	0.355
Abortions per conception, 18–21	0.459	0.376	0.354	0.300	0.259	0.245	0.291	0.280
First births reported as intended, conceived at 14–17	0.287	0.378	0.250	0.274	0.183	0.190	0.205	0.167
First conceptions at 14–17 while using a method	0.167	0.133	0.331	0.191	0.391	0.292	0.409	0.247
Second birth within 4 years, first at 15–17	0.549	0.600	0.598	0.568	0.448	0.482	0.624	0.530
No HS diploma (no teen birth)	0.131	0.173	0.143	0.183	0.081	0.076	0.129	0.110
College attendance	0.538	0.551	0.646	0.558	0.697	0.747	0.687	0.671
Ever married by 21, HS diploma	0.426	0.414	0.287	0.343	0.188	0.188	0.214	0.261
Employed 26–29, BA+	0.768	0.726	0.743	0.749	0.775	0.769	0.726	0.755
Single mothers on AFDC/TANF, 18–21	0.493	0.590	0.235	0.171	0.069	0.079	0.119	0.099

Notes: Data: NSFG, except employment and cash welfare (CPS ASEC). Births per woman: sum of the single-age birth rates. First births by age: weighted by each cohort's shares of mother's education. Contraceptive use: current use among sexually active childless women. Abortions per conception: abortion ratios (Online Appendix A). Intended: first births whose conception the mother reports as wanted then or sooner; while using a method: first conceptions that occurred while a method was used (NSFG pregnancy files). The 1984–1988 cohort is not used in estimation; its parameters are interpolated between the 1976–1980 and 1992–1996 cohorts.



Lines: model; hollow markers: NSFG. Use: current method among exposed childless girls. Abortion: share of first conceptions at 15–21 ending in abortion.

Figure 9. Early Childbearing, Contraceptive Use and Abortion by Family Background: Data and Model

Notes: By mother's education. First births by 17 and by 21: share of women; contraceptive use: current use of any method among childless girls aged 15–17 who were sexually active in the last three months; abortion: share of first conceptions at 15–21 that end in abortion. NSFG (markers) and model (lines), estimation cohorts.

Table 6. Composition and Within-Background Changes: Data and Model

		Rise: 1962–66 → 1976–80			Decline: 1976–80 → 1992–96		
		Change	Between	Within	Change	Between	Within
First birth by 17	Data	+2.0	-0.9	+2.9	-5.9	-0.6	-5.3
	Model	+1.1	-1.0	+2.0	-5.2	-0.6	-4.5
First birth by 21	Data	+2.0	-3.0	+5.0	-9.7	-2.3	-7.5
	Model	+0.5	-2.9	+3.4	-11.5	-1.9	-9.6
Contraceptive use, 15–17	Data	+5.0	+0.2	+4.8	+9.8	+0.5	+9.3
	Model	+8.3	+0.7	+7.7	+17.4	+1.2	+16.3

Notes: Percentage points. The change between cohorts is split exactly as in Table 2: between-group $\sum_M \Delta\pi(M)\bar{y}(M)$ and within-group $\sum_M \bar{\pi}(M)\Delta y(M)$, with bars denoting averages of the two cohorts and π the NSFG family-background shares in both rows.

be costlier to end. The quasi-experimental evidence bounds the net of the two. Parental-involvement laws lowered minors' abortions by 15–20% and left their births about unchanged (Joyce et al., 2020), so the fall in abortions was offset by fewer conceptions. I include this response as a moment: the proportional change in the model's births at 15–17 when the minors' abortion cost of the peak cohort rises by 25%, and its data counterpart is the estimated effect of the laws on births, which is zero. A zero net effect is informative because the two channels of the abortion cost have opposite signs: it requires the use response to offset the fall in abortions. At the estimates the response is −1.8%: the model's minors react to costlier abortion by using contraception more (by 9%), so that a fall of a third in their abortions is almost exactly offset by fewer conceptions. A 10% higher cost lowers minors' abortions by 15%, the size of the effect of the laws, and their births by 1.2%. The abortion block's contribution to the decline (Section 6.2) is therefore disciplined by this evidence: in a model in which minors' births responded more to the cost of abortion, the rise in that cost would account for more of the decline, and the cost and efficacy of contraception for less.

College attendance is 0.55, 0.56 and 0.75 in the model against 0.54, 0.65 and 0.70. Attendance after a teen birth is 0.16 and 0.31 in the peak and decline cohorts against 0.34 and 0.38. Dropout among women without a teen birth is within 5 points of the data in every cohort. Online Appendix Figure G.1 shows employment and marriage by age and education. Employment by age and education fits within a few points except for married dropouts at 22, who work 6–10 points less in the model than in the CPS in every cohort. Marriage fits for college graduates. Marriage by 21 is 0.41 and 0.34 against 0.43 and 0.29 among high-school graduates of the two older cohorts, and 0.21 against 0.14 among dropouts of the decline cohort. The share of single mothers on cash welfare at 18–21 is 0.59, 0.17 and 0.08 against 0.49, 0.24 and 0.07.

The value of avoiding an early birth is the model's central incentive, so I compare the model's causal effect of a teen birth with quasi-experimental estimates, none of which is targeted. For the simulated women who have a first birth from a conception at 14–16, I re-simulate the same women, with the same draws, when that pregnancy ends in a miscarriage, the comparison of Hotz et al. (2005). Online Appendix Table G.2 reports the effects. A birth before 18 lowers the probability of a high-school diploma by 12–16 points and college

attendance by 20–29 points, and raises cash-welfare receipt at 18–24 by 7–25 points, more in the cohorts with a more generous safety net. The effect on the diploma is above the range of Fletcher and Wolfe (2009) (5–10 points), who also find lower earnings and more cash assistance; Hotz et al. (2005) find no lasting effect on attainment, counting equivalency degrees, and higher earnings at later ages, and Ashcraft et al. (2013) argue that correcting for non-random miscarriage restores part of the negative effects.

The model's prediction for the untargeted 1984–1988 cohort, halfway through the decline, is close for the margins of fertility control and for schooling: contraceptive use at 15–17 is 0.79 against 0.83, the abortion share at 15–17 is 0.36 against 0.36, college attendance 0.67 against 0.69 and the share of single mothers on cash welfare 0.10 against 0.12. Births per woman at 15–19 are 0.186 against 0.220, first births by 17 0.062 against 0.070 and first births by 21 0.264 against 0.290.

6 Decomposing the Decline

6.1 Methodology

To attribute the cohort difference in early childbearing to mechanisms, I follow the cohort-accounting approach of Eckstein et al. (2019). Each mechanism is one of the ten blocks of cohort-specific parameters in Table 3. Starting from the baseline economy, with every block at the value of the cohort born in 1962–1966, I replace a set of blocks with the values of the peak cohort, born in 1976–1980, re-solve the model, simulate the same women with the same random draws, and record the change in outcomes. The same exercise runs from the peak economy to the economy of the decline cohort, born in 1992–1996, which splits the change into the rise and the decline.

I attribute each phase's change to the ten blocks by their Shapley values (Shorrocks, 2013): a block's contribution is its effect on the outcome when it is switched to the later cohort's values, averaged over all orders in which the blocks can be switched. The contributions do not depend on the order of the switches and add up exactly to the total change, and computing them requires solving the model at all $2^{10} = 1{,}024$ combinations of blocks in each

phase. Paz-Pardo (2024) uses the same decomposition to account for differences between generations in a life-cycle model.[5]

I decompose four outcomes: the birth rate at ages 15–19 (births of any order per woman-year), the share of women with a first birth by age 17, the share with a first birth by age 21, and college attendance, overall and within each family background. Exposure and efficacy are measured, so their contributions are the model's behavioral response to measured changes, while the changes in the costs of contraception and abortion are estimated. Block 9 holds only the shares $\pi_g(M)$; the exposure, earnings and schooling prospects and parental resources that come with a family background belong to the blocks of those mechanisms. The marriage-meeting rates of the decline cohort from age 26 on are held at the peak cohort's values, so the marriage block of the decline carries no change in late marriage. The change in each outcome is split into a between-group and a within-group term as in Table 2, so the model's split can be compared with the data's. The contribution of the family-background block is then traced to channels: at the earlier cohort's estimates I remove, one at a time, the dependence on family background of exposure, earnings, schooling costs and college support, the cost of contraception and the minor-parent rules, and attribute the gap in early births across family backgrounds to each by the same Shapley rule. Standard errors for the contributions come from the bootstrap distribution of the estimates.

6.2 Results

The decline in early childbearing was mostly a change in how young women avoided births, and only secondarily a change in why. Table 7 reports the Shapley contribution of each block to the change in the birth rate at 15–19, in births per 100 women over the five years, in first births by 17 and by 21, and in college attendance, in both phases.[6] Between the peak and the decline cohorts, the three margins of fertility control account for 56% of the fall in births at 15–19: less sexual activity for 25%, more effective methods for 14% and a lower cost of use for 17%. The incentive to avoid a birth accounts for 25%, 13% through women's

[5] Online Appendix G gives the formula and reports the one-at-a-time and sequential accountings of Eckstein et al. (2019).

[6] The one-at-a-time accounting is in Online Appendix G.2.

earnings and 12% through the resources of students, and better-educated mothers for 12%; the marriage market, the child penalty, the safety net and the cost of abortion together for 8%. The rise before the peak was the net of two forces of similar size: more sexual activity raised births at 15–19 by 2.6 per 100 women and better-educated mothers lowered them by 2.5, and the higher cost of contraception that minors faced and the lower support for schooling of the peak cohort account for the net rise.

Table 7. Shapley Decomposition of the Change in Early Childbearing and College Attendance, Both Phases

	Births 15–19		FB by 17		FB by 21		College	
	Rise	Decline	Rise	Decline	Rise	Decline	Rise	Decline
Women's labor market	+0.3	-1.7	+0.1	-0.7	+0.5	-1.9	-1.7	+6.6
	(0.5)	(0.8)	(0.3)	(0.4)	(0.5)	(0.8)	(1.5)	(2.3)
Schooling costs and support	+0.7	-1.5	+0.1	-0.5	+1.0	-1.3	-2.5	+5.5
	(0.8)	(0.9)	(0.3)	(0.3)	(0.7)	(0.9)	(2.2)	(3.4)
Cost of contraception	+1.1	-2.2	+0.3	-0.5	+0.7	-1.7	-0.3	+0.4
	(1.5)	(1.2)	(0.4)	(0.3)	(1.2)	(1.0)	(0.4)	(0.3)
Efficacy of contraception	+0.5	-1.8	+0.1	-0.4	+0.6	-2.7	-0.1	+0.5
	(0.1)	(0.3)	(0.0)	(0.1)	(0.1)	(0.4)	(0.0)	(0.2)
Exposure	+2.6	-3.2	+1.6	-2.1	+1.1	-1.4	-0.7	+0.8
	(0.3)	(0.5)	(0.2)	(0.4)	(0.3)	(0.2)	(0.1)	(0.2)
Marriage market	+0.7	-0.4	+0.3	-0.2	+0.7	-0.1	-0.7	+1.9
	(0.9)	(0.7)	(0.5)	(0.3)	(0.8)	(0.6)	(1.8)	(2.1)
Safety net	-0.9	-0.2	-0.5	-0.1	-0.5	-0.2	+0.7	0.0
	(0.4)	(0.1)	(0.2)	(0.0)	(0.3)	(0.1)	(0.3)	(0.1)
Child penalty	-0.5	-0.4	-0.3	-0.1	+0.1	-0.6	+1.6	+0.5
	(0.5)	(0.6)	(0.3)	(0.3)	(0.5)	(0.6)	(0.8)	(0.9)
Family background (composition)	-2.5	-1.5	-0.7	-0.5	-2.3	-1.5	+4.1	+2.7
	(0.2)	(0.2)	(0.1)	(0.1)	(0.2)	(0.2)	(0.5)	(0.5)
Cost of abortion	0.0	+0.1	+0.1	0.0	-1.2	-0.1	+0.4	+0.1
	(0.6)	(0.3)	(0.2)	(0.1)	(0.8)	(0.4)	(0.4)	(0.2)
Total change, model	+2.0	-12.9	+1.1	-5.2	+0.6	-11.6	+0.9	+18.9
Total change, data	+3.0	-12.4	+2.0	-5.9	+2.0	-9.7	+10.9	+5.1

Notes: Shapley contribution of each block: its effect on the outcome when it is switched from the earlier cohort's values to the later cohort's, averaged over all orders in which the ten blocks can be switched (2^{10} solved economies per phase, Online Appendix G.1); the contributions add up to the model's total change. Standard deviations over 100 draws of the parameter vector from its estimated distribution in parentheses. Rise: 1962–1966 to 1976–1980; decline: 1976–1980 to 1992–1996. Births per 100 women over ages 15–19; the other outcomes in percentage points. Data: NSFG, first births and college attendance weighted by each cohort's shares of mother's education.

Between the peak cohort and the decline cohort, the model's births at 15–19 fall by 12.9 per 100 women (the data: 12.4) and first births by 21 by 11.6 points (the data: 9.7). Less sexual activity, the largest single block, accounts for 3.2 births per 100 women (bootstrap standard deviation 0.5), and for 2.1 of the 5.2 points of the fall in first births by 17, where the change in exposure was largest. The efficacy of the methods young women used accounts for 1.8 births (0.3) and, because a method that fails less often protects every year of a woman's late teens and early twenties, for 2.7 of the 11.6 points of first births by 21, the largest contribution to that outcome. Because efficacy is measured from the methods each cohort used, this block includes any response of method choice to a higher value of avoiding a birth. Holding each method's failure rate at its 1995–2002 value, the change in the method mix alone lowers the relative failure rate from 0.151 to 0.131, two-fifths of the improvement; the rest is that the pill and the condom failed less often for typical users. At most 0.7 of the 1.8 births, then, could belong to the incentive margin rather than to the technology. The lower cost of contraceptive use accounts for 2.2 births (1.2). Women's labor-market opportunities account for 1.7 births (0.8) and 1.9 points of first births by 21: the decline cohort's higher earnings raise the opportunity cost of an early birth. Schooling costs and support add 1.5 births. The composition of family background accounts for 1.5 births (0.2), close to its share in the data's split (Table 6). The cost of abortion, the marriage market, the child penalty and the safety net together move births at 15–19 by about one birth per 100 women.

Between the baseline and the peak cohort the model's births at 15–19 rise by 2.0 per 100 women against 3.0 in the data, and first births by 21 rise by 0.6 points against 2.0. The net change is the sum of forces of opposite sign, the two largest of them precisely estimated. More sexual activity raises births at 15–19 by 2.6 per 100 women (0.3) and first births by 17 by 1.6 points, the largest force of the phase; the slightly worse method mix adds 0.5 births and the lower college allowance of the peak cohort adds 0.7 (0.8) and the marriage market 0.7 (0.9). Better-educated mothers lower births by 2.5 (0.2), the safety net, through the deeming rules that applied to the peak cohort's minors, by 0.9 and the child penalty by 0.5; the higher cost of abortion lowers first births by 21 by 1.2 points (0.8) and leaves births at 15–19 unchanged. The higher cost of contraceptive use that the peak cohort's minors faced adds 1.1 births, with a standard deviation of 1.5. Most of the rise in the data happened

within family backgrounds, among daughters of mothers with a high-school diploma or some college; in the model the within-background change in first births by 21 is +3.4 points against +5.0 in the data.

The rise in mothers' education lowers early births in both phases, by 2.3 points of first births by 21 in the rise and 1.5 in the decline. Behind the composition effect is the gap in early births across family backgrounds: in the model, first births by 21 are 31 points more common among daughters of mothers without a diploma than among daughters of college graduates in the baseline cohort, and 26 points in the peak cohort. When each channel is made independent of family background in turn, schooling costs and parental support account for 38% and 42% of the gap in the two cohorts, and the unobserved heterogeneity that the measured environment does not capture for 37% and 49%; the slope of the cost of contraception in mother's education accounts for a quarter and a third, and exposure for a tenth in the baseline cohort and none in the peak cohort.

College attendance rises by 0.9 points in the rise and 18.9 in the decline in the model, against 10.9 and 5.1 in the data. The composition of family background accounts for 4.1 and 2.7 points in the two phases; in the decline, women's labor-market opportunities add 6.6 points and schooling support 5.5.

6.3 Completed fertility and the births that were avoided

Births before 20 account for more than half of the fall in U.S. fertility since 1991, so what the decline in early childbearing means for completed fertility depends on whether the births avoided in the teens were had later. If the decline were a postponement, the decline cohort's cumulative births would converge to the earlier cohorts' at later ages. The model answers this for the part of the decline that came from fertility control. Figure 10 first compares cumulative births by age in the model with the vital statistics for the three cohorts: the model reproduces the profiles to age 30 and the gap between the decline cohort and the two earlier ones, and runs above the vital statistics after 35, where fertility is outside every cohort's observation window and untargeted. Table 8 and the right panel then give the peak cohort the decline cohort's cost of contraception, efficacy and exposure, holding every other block at the peak cohort's values, and the decline cohort the peak cohort's fertility control.

Table 8. Fertility Control and Completed Fertility

	Births per woman			First birth	Childless	Early births	
	by 21	by 29	completed	by 21 (%)	at 45 (%)	intended	unintended
Born 1962–66	0.42	1.24	2.52	32.0	9.7	0.146	0.381
Born 1976–80	0.44	1.24	2.52	32.6	9.8	0.131	0.403
with 1992–96 fertility control	0.33	0.96	2.27	26.8	16.6	0.155	0.252
Born 1992–96	0.25	0.85	2.08	21.0	22.4	0.098	0.234
with 1976–80 fertility control	0.35	1.13	2.40	26.8	13.2	0.083	0.368

Notes: Model simulations. Each cohort's economy, and for the peak and decline cohorts the same economy with the three fertility-control blocks (cost of contraception, efficacy, exposure) at the other cohort's values. Births per woman by the stated age; completed fertility counts the births from every conception in the fertile window, ages 14–45, the last of which occur at 46, so it exceeds births before 46 in Figure 10. Early births: births per woman from conceptions at ages 14–21, intended when the conception occurred without a method and the woman preferred a birth, unintended otherwise. Fertility after each cohort's observation window is the model's forecast.

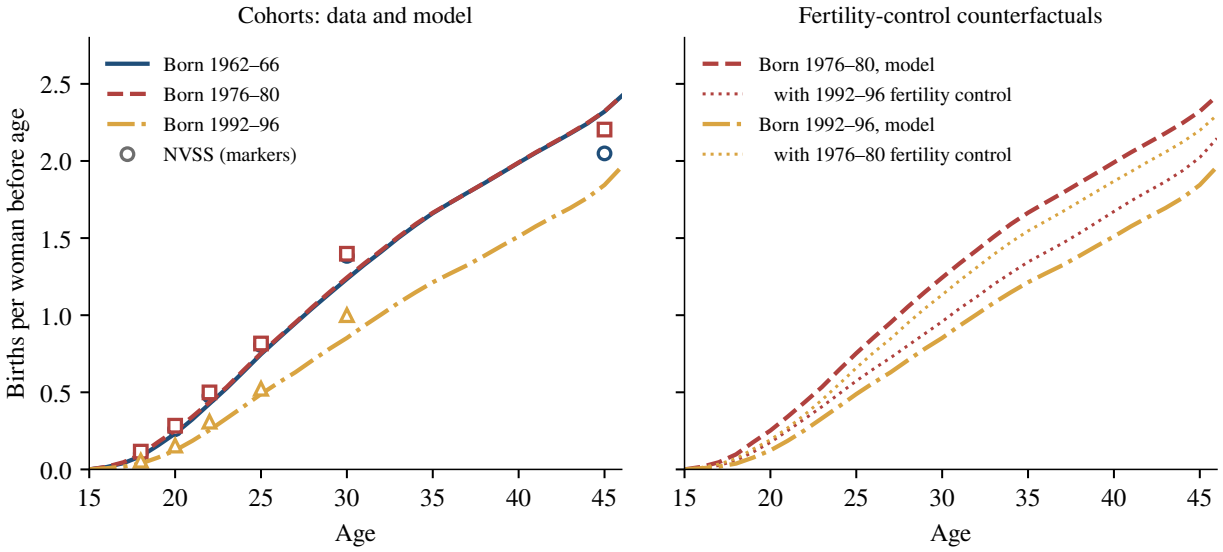


Figure 10. Births per Woman by Age: Data, Model and Fertility-Control Counterfactuals

Notes: Cumulative births per woman before each age, as in Figure 2. Left: the model (lines) and the vital statistics (markers; NVSS, cohort rates built from the age-specific rates of each calendar year) for the three estimation cohorts. Right: the peak and decline cohorts in the model, and each with the other's fertility control (dotted). Fertility after each cohort's observation window is the model's forecast.

The births avoided were not recuperated. With the decline cohort's fertility control, the peak cohort has 0.11 fewer births per woman by 21, 0.28 fewer by 29 and 0.25 fewer over the life cycle, and the share of women still childless at 45 rises from 10% to 17%. More effective and cheaper methods lower births at every age, not only in the teens, so the change in fertility control lowers completed fertility by about twice the early-birth reduction. The exercise run in reverse gives the same answer: with the peak cohort's fertility control, which combined more sexual activity in the teens with less effective and costlier methods, the decline cohort would have 0.31 more births per woman. Against the model's difference in completed fertility between the two cohorts, 2.52 against 2.08, fertility control accounts for 0.25–0.31, 57% to 70%, close to its 56% share of the fall in births at 15–19. The rest of the difference, from incentives and family background, is not recuperated either: the model's gap between the two cohorts widens with age, from 0.18 births per woman by 21 to 0.39 by 29 and 0.44 at the end of childbearing.

The early births that fertility control removed were the unintended ones. Among births from conceptions at 14–21, the decline cohort's fertility control removes 0.15 unintended births per woman from the peak cohort and adds 0.02 intended ones: women who avoid an unintended early birth and then have one they want at those ages. Intended early births fell as well, from 0.13 to 0.10 per woman between the two cohorts, and fertility control accounts for none of that fall; the other blocks do. The levels of completed fertility are forecasts, since the peak cohort is observed to about age 40 and the decline cohort to its mid-twenties. The differences across economies are more reliable than the levels: fertility after the observed ages comes from the same common parameters in every economy, so the model's error at those ages largely cancels when two economies are compared.

Figure 11 uses the model to project the decline cohort's fertility beyond the ages the vital statistics cover. The cohort born in 1992–1996 is observed to age 29, with 1.00 births per woman against 1.40 for the peak cohort at the same age. Extending its profile with the model's increments after 29 gives 1.96 births by 45; adjusting those increments by the ratio of the vital statistics to the model for the peak cohort at the same ages, which corrects the model's excess fertility after 35, gives 1.63. The cohorts born in 1962–1966 and 1976–1980 completed 2.05 and 2.20. On either projection, the decline cohort's shortfall at 29, 0.40

births per woman, is not recovered later: the projected gap in completed fertility is 0.24 to 0.57 births.

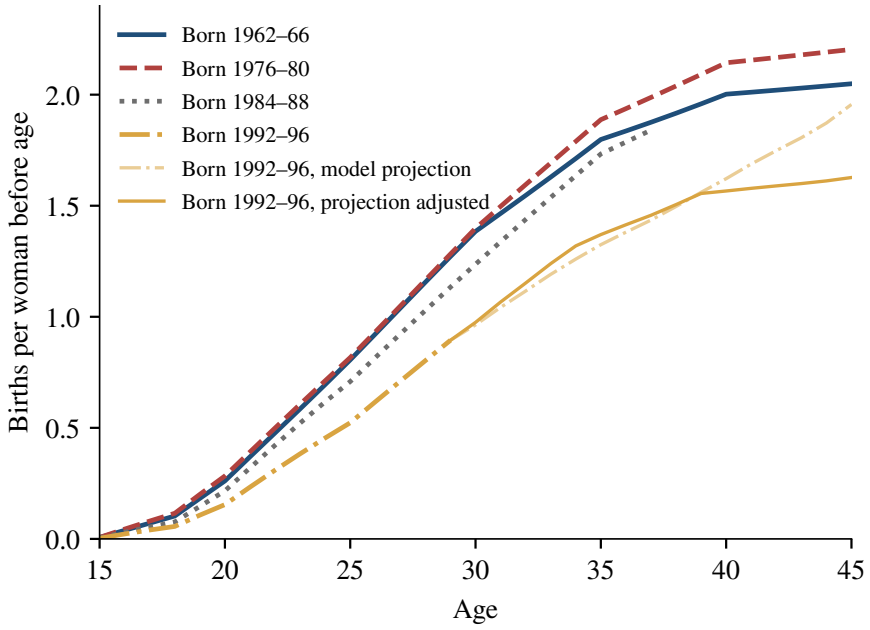


Figure 11. Cumulative Births by Age: Projecting the Cohort Born in 1992–1996

Notes: Births per woman before each age from the vital statistics, as in Figure 2, for the four cohorts, to the last age each is observed at. The projection of the 1992–1996 cohort after age 29 adds the model's yearly increments for that cohort; the adjusted projection scales each increment by the ratio of the vital statistics to the model for the 1976–1980 cohort over the same five-year age group.

7 Conclusion

Births to teens and women in their early twenties account for most of the fall in U.S. fertility since 1991. By birth cohort, early first births rose before they fell: flat for women born in the 1960s, highest among women born in the late 1970s, who were teenagers in the 1990s, and falling since, while early marriage fell, schooling rose and family backgrounds improved throughout. I estimate a life-cycle model of schooling, work, marriage and fertility control on three cohorts, observed before the rise, at the peak and in the decline, and attribute the change in early childbearing to ten blocks of cohort-specific parameters, separating the value of avoiding a birth from the cost, the efficacy and the exposure margins of fertility control.

Between the cohorts born in 1976–1980 and 1992–1996, the three margins of fertility

control account for more than half of the fall in births at 15–19, women's earnings and the costs and support of schooling for a quarter, and the composition of family background for an eighth; abortion, the marriage market, the child penalty and the safety net contribute little. For the cohorts who were teenagers in the 1990s, more sexual activity raised early births by more than better-educated mothers lowered them, and the model reproduces two thirds of the rise in teen births. The early births that fertility control removed were unintended, and they were not had later: better fertility control lowers completed fertility by about twice the early-birth reduction, and the cohort born in 1992–1996, 0.40 births per woman behind the peak cohort at 29, is projected to end childbearing 0.24 to 0.57 births behind. The decline in early childbearing is a fall in completed fertility, not a shift of births to later ages, and the teen component of the fall in U.S. fertility is made of births that women were trying to avoid. For policy, the split implies that programs acting on fertility control, access to contraception and the diffusion of methods without user error, reduce early births by more than programs acting on the return to avoiding one.

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