Online Appendix

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

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This Online Appendix collects the supporting material for the paper: the construction of the data and the definition of the variables (Appendix A), additional facts on the cohort decline (Appendix B), the full recursive problem of the model (Appendix C) and the contraception choice (Appendix D), the parameters and the fit of the estimated model (Appendix E), the estimation of the wage processes (Appendix F), and the decomposition method with additional results (Appendix G). Sections are lettered A, B, ...; tables and figures are numbered A.1, B.1, ... References to a section, table, figure or equation "of the paper" point to the main text.

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A Data Construction and Variable Definitions

This appendix documents how the targeted moments and the measured inputs are built. Every cohort is measured with the same instruments and the same definitions: the National Survey of Family Growth (NSFG) for fertility, contraception, sexual activity, marriage and schooling, and the Annual Social and Economic Supplement of the Current Population Survey (CPS) for employment and earnings.

A.1 Data sources and cohort coverage

The NSFG moments pool the female respondent and pregnancy files of the rounds fielded in 1982, 1988, 1995, 2002, 2006–2010, 2011–2013, 2013–2015, 2015–2017 and 2017–2019 (National Center for Health Statistics, 2020). Each round is a national probability sample of women aged 15–44 (15–49 from 2015); the 1982 round is the first to include women who had never married. Each round's final weight is rescaled to sum to one, so that a cohort's estimate averages over the rounds that observe it. Pooling adds observations on the early years of the older cohorts, whose histories every later round records again. It is also the only way to measure contraception at young ages: contraceptive use is recorded only at the interview, so the 1982 round measures women born in the early 1960s at ages 15–20, the 1995 round women born in the late 1970s, and the 2006–2015 rounds women born in the 1990s. The estimation cohorts are women born in 1962–1966 (7,891 respondents, rounds 1982–2010, plus 26 women interviewed in 2011–2017), 1976–1980 (8,151, rounds 1995–2019) and 1992–1996 (4,324, rounds 2006–2019); the validation cohort, born in 1984–1988, has 7,004. The 2022–2023 round is not used: it was fielded mostly on the web, and for the same birth cohorts it reports shares with a first birth by age 21 that are 8 to 13 percentage points below those of the 2011–2019 rounds, a change in measurement rather than in behavior. For women born in 1980–1984, for example, the four rounds of 2011–2019 give between 30% and 34%, and the 2022–2023 round 20%. The CPS moments use every ASEC sample from 1976 to 2026 from IPUMS (Flood et al., 2025): 319,466 woman-years for the baseline cohort, 205,127 for the peak and 104,664 for the decline cohort. The ASEC records work and earnings for the previous calendar year; with age measured in March, a woman's birth year is the survey year

minus one minus her age, so her age equals her calendar-year age in the reference year, the convention of the moments. Standard errors are bootstrapped (NSFG: 500 Poisson-weight replications of respondents, rounds independent) or binomial with the Kish effective sample size (CPS).

A.2 Harmonization across NSFG rounds

Birth year and ages. The birth year comes from the century month of birth (1982–2013) or from the interview year minus age (2015–2019, exact to one year). Ages at first birth, first marriage and first intercourse are completed ages at the dated event: century months in 1982–2010, the age recodes (`AGEBABY1`, `VRY1STAG`) in every round, and years where only years are public. A woman counts toward the share with a first birth, a first marriage or first intercourse by age a (in completed years) only if she was interviewed after her $(a+1)$th birthday, so that every cohort is compared at the same ages. *Mother's education.* Mother's education is the education of the woman's mother (or mother figure), in four groups: less than high school, high school, some college, and a bachelor's degree or more. The 2002–2019 rounds record the four groups; the 1982–1995 rounds record years of schooling, mapped as fewer than 12, 12, 13–15 and 16 or more. Women without a mother figure are dropped. It is measured on the same absolute scale in every cohort, so the shift toward more-educated mothers is a change in composition rather than in measurement. *Education.* Own education has three groups: no high-school diploma or GED, a diploma or GED up to an associate degree, and a bachelor's degree or more. The schooling moments are measured at ages every cohort reaches, because the decline cohort is observed only to about 27 and the model has no re-entry. High-school dropout is no diploma or GED by age 20, from the dated diploma (the 1995 round dates diplomas and GEDs; the 2006–2019 rounds date diplomas only, and a GED-only holder is counted as credentialed by 20 with probability 0.485, the share measured in the 1995 round). College attendance is any college enrollment, among women aged 23 or older. College graduation is a bachelor's degree by age 25, from the dated degree (1995 and 2011–2019), among attenders aged 25 or older. Marriage by education uses women aged 25 or older, whose education is close to final. *Births.* First-birth stocks by age use the age at the first live birth. Birth rates at ages 14–24, children ever born and second births use

the pregnancy files (1995–2019): a live birth at completed age a counts toward the rate at a among women interviewed after their $(a+1)$th birthday. *Contraception.* The targeted contraception moments are use rates among women who are sexually active, childless and not pregnant,

$$\Pr(\text{Contraception}_{it} = 1 \mid \text{SexuallyActive}_{it} = 1,\ k_{it} = 0,\ \text{age group},\ \text{Educ}_{it}),$$

which matches the model's use decision among exposed, childless women. A woman is a user if her current contraceptive status at the interview is a method, and at risk if she is a user or reports intercourse in the three months before the interview without using a method; pregnant, postpartum, sterile and pregnancy-seeking women, and women without recent intercourse, are not at risk; women (or whose partners) relying on contraceptive sterilization, whom the recode counts as users, are also removed from the at-risk group, because the model's use is a per-year choice of a reversible method and a sterilized couple has left the risk set (the exclusion is immaterial before 22 and lowers the use rates at 34–38 by 4–15 points). The cells by mother's education at 15–17 and 18–21 use the same definition within each family-background group. The status recode (`CONSTAT`/`CONSTAT1`) is defined the same way in every round; in 1982 the nonusers with recent intercourse are identified from the separate three-month intercourse item. As a check, the harmonized share of all women aged 15–44 using a method is 55.7%, 60.3%, 64.2%, 61.9% and 62.2% in the 1982, 1988, 1995, 2002 and 2006–2010 rounds, the published NCHS figures. Because the status is current, each cohort's use at a given age comes from the rounds in which it was that age. *Abortion.* The abortion targets are national: for each cohort and age band (15–17 and 18–21) the abortion share of abortions plus births in the Guttmacher 1973–2019 series (Chiu et al., 2024) over the calendar years in which the cohort was those ages, multiplied by the ratio of the nulliparous to the all-pregnancy abortion share in the NSFG pregnancy files 2002–2019 for the same ages and years. A pregnancy is nulliparous when no earlier pregnancy of the woman ended in a live birth; fetal losses are excluded from both shares. The rescaling assumes that the underreporting of abortions in the NSFG is proportional across parity within an age band, so that it cancels in the ratio. Lindberg et al. (2020) estimate that the 2006–2015 NSFG

records 44% of the abortions of women with no prior birth and 37% of those of women with one or more; the difference is not statistically significant, but a differential of that size would raise the measured nulliparous share by about a tenth, which is the size of the rescaling itself, so the first-pregnancy targets may be overstated by up to that amount. A version of the estimates that targets the all-pregnancy shares directly, without the rescaling, is in progress. The targets are 0.53 and 0.46 for the baseline cohort, 0.39 and 0.35 for the peak and 0.31 and 0.26 for the decline cohort. The targets by mother's education rescale the national level for ages 15–21 by the ratio of each group's abortion share of first pregnancies to the all-group share in the NSFG pregnancy files 2002–2019 (first pregnancies at 15–21 in the same calendar windows), which assumes that underreporting is proportional across groups of mother's education (Jones and Kost, 2007). Lindberg et al. (2020) find no significant difference in reporting by the woman's own education but more complete reporting among women above twice the poverty line (55% against 32–34%); to the extent that daughters of more educated mothers are less often poor, the NSFG gradient overstates the true gradient in the abortion share, and κ_a with it. In the peak cohort the targets are 0.20, 0.34, 0.47 and 0.68 from the lowest to the highest group.

A.3 Labor-market outcomes

A woman-year is classified as employed if she worked at least 26 weeks, usually more than 20 hours a week, and earned at least \$10,500 (2016 dollars) in wages and salaries, the threshold of the NLSY definition the model was first estimated with. Education is current education in March: no diploma (11th grade or less, or 12th grade without a diploma), a diploma to an associate degree (before 1992, completed 12th grade to three years of college), and a bachelor's degree or more (before 1992, four or more years of college). Employment cells are targeted from age 22, when education is close to final. Mothers of young children are women whose youngest own child in the household is under six. Earnings are deflated to 2016 dollars with the CPI-U.

A.4 Validation against the NLSY

For the NLSY birth years (1957–1964 and 1980–1984), the NSFG and CPS moments agree with the NLSY moments built with the same definitions where the instruments coincide: high-school dropout with and without a teen birth (0.60 and 0.12 in the NSFG against 0.58 and 0.12 in the NLSY79), marriage by 21 by education, and employment by education at 22–25 (0.23, 0.54 and 0.64 in the CPS against 0.20, 0.55 and 0.65). They differ where the NLSY departs from vital statistics or uses another definition: births by 21 among daughters of mothers with some college or a degree are lower in the NLSY79, and NLSY contraceptive use is defined differently (current use in the NLSY79, the share of protected acts in the NLSY97).

B Additional Facts

Cohort fertility from vital statistics. Section 3.1 of the paper puts the five-year age-group birth rates on birth cohorts along the diagonals of the Lexis diagram. The NCHS cohort fertility tables cumulate single-year rates along the same diagonals for cohorts born up to 1991 (National Center for Health Statistics, 2026b), which gives a check on the approximation. Over the cohorts born between 1955 and 1985, my series differs from theirs by -0.2% on average at age 20 (range -1.7% to $+1.0\%$) and by $+0.3\%$ at age 25 (range -0.9% to $+1.2\%$), the ages at which the five-year groups end. Within a group the approximation is cruder: it is 4% low at age 18 and 3% high at age 22, because the rate of a group is applied to all of its ages. The same tables report cumulative first-birth rates, which check the NSFG: by exact age 22, 31.5% for women born in 1962–1966 and 33.0% for women born in 1976–1980, against 30.6% and 32.8% with a first birth by age 21 in the NSFG. Table B.1 reports the cohort series of Section 3.2 of the paper for the four cohorts of the model.

Births by age in calendar time. Figure B.1 plots the birth rates by age and calendar year. The decline was steeper among younger teens: from 1991 to 2024 the rate at ages 15–17 fell 86%, from 38.6 to 5.3, and the rate at 18–19 fell 75%, from 94.0 to 23.6. The birth rate at 20–24 followed with a lag. It fell slowly until 2007 and has fallen by half since, from

Table B.1. Births, Pregnancies and Fertility Control before Age 20, by Birth Cohort

Born	1962–1966	1976–1980	1984–1988	1992–1996
Ages 15–19 in	1977–1985	1991–1999	1999–2007	2007–2015
	Baseline	Peak	*Validation*	Decline
A. Births per woman (vital statistics)				
Before age 18	0.10	0.12	0.08	0.06
Before age 20	0.26	0.28	0.22	0.15
Before age 25	0.81	0.82	0.71	0.52
Before age 45 (completed)	2.05	2.20	–	–
B. Pregnancies before age 20 (Guttmacher)				
Births and abortions per woman	0.47	0.43	0.31	0.21
Abortions, % of births and abortions, before 18	48	37	36	33
Abortions, % of births and abortions, before 20	45	35	33	30
C. Sexual activity and contraception (NSFG), %				
First intercourse before age 18	53	59	57	55
First intercourse before age 20	75	77	77	77
Contraceptive use at 15–17, women at risk	67	74	83	84
Contraceptive use at 18–21, women at risk	78	83	82	85
Annual failure rate of the methods used	12.0	12.8	11.5	8.7

Notes: Panel A: births of any order per woman before the given age, cumulated along each birth year's diagonal of the vital-statistics age-specific birth rates and averaged over the birth years of the cohort; completed fertility is not yet observed for the two youngest cohorts. Panel B: pregnancies ending in a live birth or an induced abortion, by age at outcome, cumulated in the same way. Panel C: first intercourse among women interviewed after the given age; contraceptive use among childless women who had intercourse in the three months before the interview and were neither pregnant nor sterilized, measured in the rounds fielded while the cohort was at those ages; the failure rate is the share of women who conceive within the first year of typical use of the method mix of users aged 15–21, with method-specific failure rates for the period in which the cohort was young (Appendix A). *Source:* author's calculations from National Center for Health Statistics (2026a), Chiu et al. (2024) and the NSFG, 1982–2019 rounds (National Center for Health Statistics, 2020).

105.4 to 55.8.

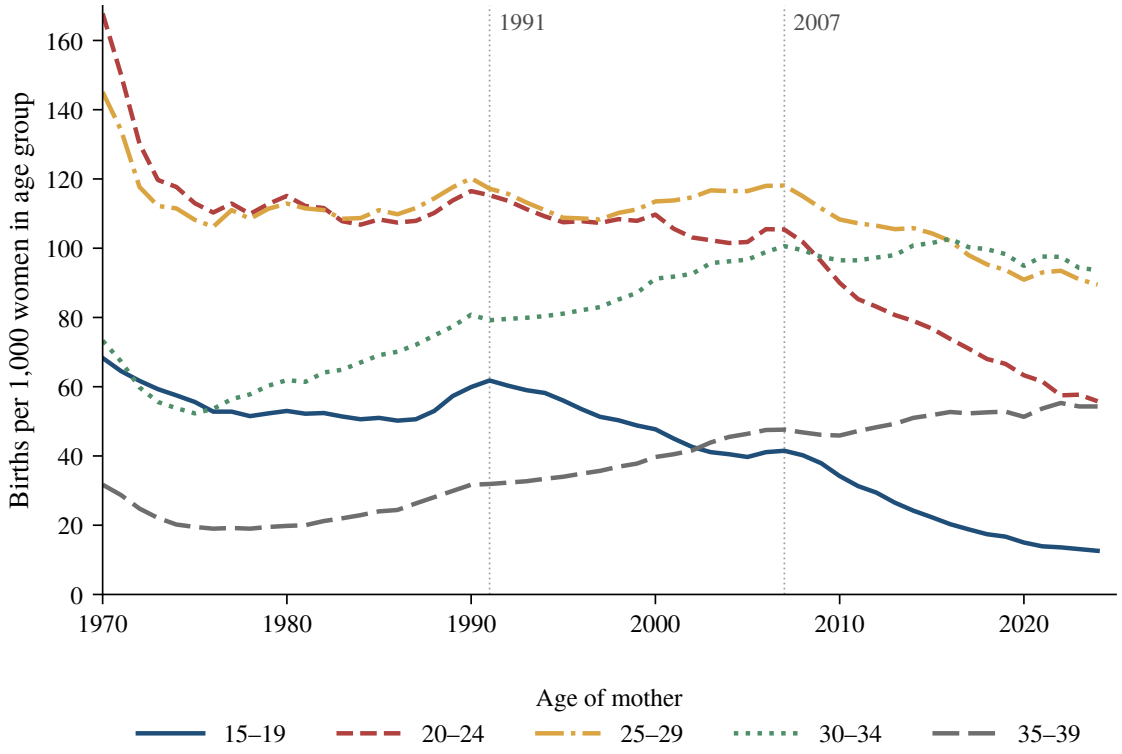


Figure B.1. U.S. Birth Rates by Age of Mother, 1970–2024

Notes: Births per 1,000 women in each age group. Rates at ages 40 and over are small and not shown. *Source:* National Center for Health Statistics, National Vital Statistics System (National Center for Health Statistics, 2026a).

Contributions to the change in the TFR. The total fertility rate (TFR), the number of children a woman would have if she experienced the birth rates of a given year over her life, adds the rates up across ages, so its change between two years splits exactly into the contribution of each age group, independent of the age structure of the population.[1] Figure B.2 reports the split and Table B.2 the numbers, in children per woman and as a percent of the change in the TFR. Between 1991 and 2024 the TFR fell from 2.06 to 1.60 children per woman, by 0.46. Lower birth rates before age 20 reduced it by 0.25 (54% of the fall) and lower rates at ages 20–24 by 0.30 (64%). Together these two groups account

[1] A woman spends five years in each five-year age group, so TFR $= 5 \sum_a r_a/1{,}000$ children per woman, where r_a is the birth rate of age group a per 1,000 women. The contribution of group a to the change in the TFR is $5\,\Delta r_a/1{,}000$, and the contributions sum exactly to ΔTFR. Because every age group enters with the same weight, the decomposition does not depend on the age structure of the population, unlike a decomposition of the general fertility rate.

for more than the entire fall, because rising birth rates after age 30 raised the TFR by 0.22. Between 1991 and 2007, lower birth rates before age 20 reduced the TFR by 0.11 and lower rates at 20–24 by 0.05, but rising birth rates after age 30 raised it by 0.21, so the TFR rose, from 2.06 to 2.12. Between 2007 and 2024 the TFR fell by 0.52, to 1.60; women under 20 account for 28% of the fall, women aged 20–24 for 48% and women aged 25–29 for 27%, while rising birth rates after age 35 offset 10% of it. Had birth rates before age 20 stayed at their 1991 level, the TFR would be 1.85 in 2024 rather than 1.60. Because women who delay a birth lower the TFR of the years in which they delay, part of these contributions reflects the timing of births rather than their number (Bongaarts and Feeney, 1998); the cohort measures of Section 3.2 of the paper do not have this problem.

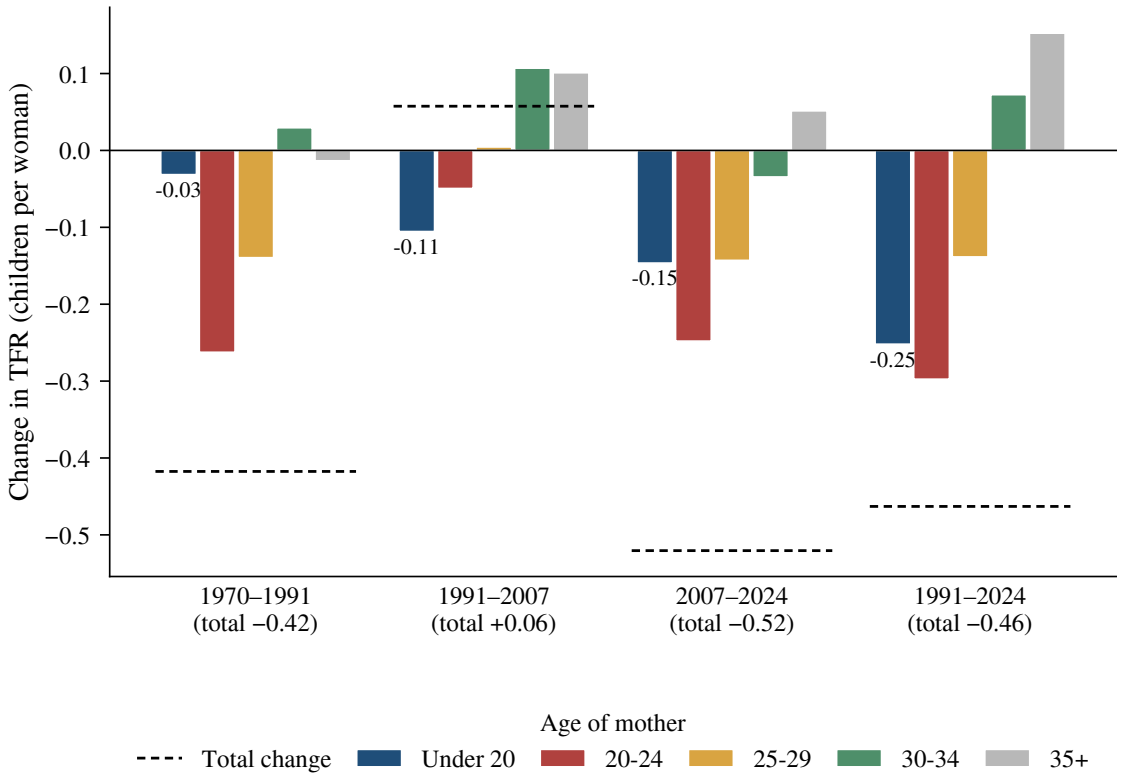


Figure B.2. Which Ages Account for the Change in U.S. Fertility

Notes: Contribution of each age group to the change in the total fertility rate, in children per woman: five times the change in the group's age-specific birth rate. Bars below zero are declines. The dashed line marks the total change in the TFR, which equals the sum of the bars. *Source:* author's calculations from National Center for Health Statistics (2026a).

Table B.2. Contributions to the Change in the U.S. Total Fertility Rate, by Age of Mother

Age of mother	1970–1991	1991–2007	2007–2024	1991–2024
TFR, start → end	2.48 → 2.06	2.06 → 2.12	2.12 → 1.60	2.06 → 1.60
A. Contribution to the change in TFR, children per woman				
Under 20	−0.03	−0.11	−0.15	−0.25
20–24	−0.26	−0.05	−0.25	−0.30
25–29	−0.14	+0.00	−0.14	−0.14
30–34	+0.03	+0.11	−0.03	+0.07
35+	−0.01	+0.10	+0.05	+0.15
Total	−0.42	+0.06	−0.52	−0.46
B. Contribution, % of the change in TFR				
Under 20	8		28	54
20–24	63		48	64
25–29	33	*TFR rose*	27	30
30–34	−7		7	−16
35+	3		−10	−33
Total	100		100	100

Notes: The contribution of an age group is five times the change in its age-specific birth rate; contributions sum to the change in the TFR up to rounding. Panel A reports contributions in children per woman and Panel B as a percent of the change in the TFR. A group's share exceeds 100% in absolute value, or is negative, when other groups move in the opposite direction. Panel B is not reported for 1991–2007, when the TFR rose. "Under 20" includes births at ages 10–14 and "35+" births at ages 35–49. *Source:* author's calculations from National Center for Health Statistics (2026a).

Reconciliation with Kearney et al. (2022). Kearney, Levine and Pardue decompose the change in the general fertility rate (GFR), births per 1,000 women aged 15–44, which weights each age group by its share of the population. I rebuild the GFR from the age-specific rates and Census estimates of the female population by age (U.S. Census Bureau, 2024) and split its change into a rate effect, $\sum_a \bar{s}_a \Delta r_a$, and an age-structure effect, $\sum_a \bar{r}_a \Delta s_a$, with midpoint weights so that the two sum exactly to the change. Table B.3 reports the result. The rebuilt GFR is within 0.2 of the published series. Between 2007 and 2019 the rate effect is −13.8 and the age-structure effect is +2.7: the population shifted toward ages with higher fertility. The teen rate decline equals 38% of the net change in the GFR, which matches the 37% that Kearney et al. (2022) attribute to the three teen race and ethnicity groups, and 30% of the rate effect, which is also its share of the change in the TFR.

Table B.3. The Teen Contribution under Alternative Fertility Measures

	2007–2019	2007–2024
GFR, rebuilt	69.3 → 58.2	69.3 → 53.8
GFR, published	69.1 → 58.3	69.1 → 53.8
Rate effect	−13.8	−17.1
Age-structure effect	+2.7	+1.7
Teen rate decline, % of change in GFR	38	32
Teen rate decline, % of rate effect	30	29
Teen decline, % of change in TFR	30	28
Kearney et al. (2022): teen groups, % of GFR change	37	–

Notes: Teens are women aged 10–19. The GFR numerator includes births to women aged 10–14 and 45–49, and the denominator is women aged 15–44. Population weights from Census national estimates (intercensal 2000–2010 for 2007; Vintage 2019 for 2019; Vintage 2024 for 2024). NCHS computes the published rates on its own population series, which explains the small differences with the rebuilt GFR.

The NLSY against the NSFG. Table B.4 compares early first births in the two NLSY cohorts with the NSFG for the same birth years, using the NLSY's definition of age at first birth (the child's birth year minus the mother's) in both surveys. This definition gives slightly lower shares than completed age, the measure used for the NSFG in Section 3 of the paper. On it, 27% of the women in each NLSY cohort had a first birth by age 21, against 29% of the same birth cohorts in the NSFG; the two sources agree within 2.3 percentage

points in every cell. Table B.5 reports first births by mother's education in the NLSY. As in the NSFG, mothers' education rose between the two NLSY cohorts and early births rose within groups.

Table B.4. Early First Births in the NLSY and the NSFG, Same Birth Cohorts

	Born 1957–1964		Born 1980–1984	
First birth by age	NSFG	NLSY79	NSFG	NLSY97
17	5.7	6.6	6.4	6.4
19	18.2	16.3	16.9	16.0
21	29.3	27.0	29.0	27.1

Notes: Percent of women with a first live birth by the given age, where age at first birth is the child's birth year minus the mother's birth year in both surveys. NSFG: 2002–2013 cycles (the cycles that release birth dates), women interviewed after the given age, cycle weights. NLSY79: civilian cross-section and black and Hispanic supplements, 1979 weights, reported year of birth. NLSY97: women observed after the given age, round-1 panel weights.

C The Model: Full Recursive Problem

This appendix gives the complete recursive problem of a woman in cohort g. The problem is identical across cohorts; cohorts differ only in the parameters of Table 3 of the paper. To keep the notation light I drop the cohort index g wherever it adds nothing.

C.1 Environment, timing and state space

Time is discrete, $t \in \{1, \ldots, T\}$ with $T = 41$: periods $1, \ldots, 32$ are the years from age 14 to age 45, periods $33, \ldots, 37$ the four-year working periods from 46 to 65, and $38, \ldots, 41$ the four-year retired periods from 66 to 81. Let ℓ_t be the length of period t in years. The state at the start of t is $\Omega_t = \{a_t, M, u, e_t, x_t, m_t, n_t, k_t, \tau_t\}$: assets $a_t \in [0, \bar{a}]$; mother's education $M \in \{1, 2, 3, 4\}$; unobserved heterogeneity (type) $u \in \{1, 2\}$; schooling $e_t \in \{D, H, C, \text{in HS}, \text{in college}\}$; experience $x_t \in \{0, \ldots, 20\}$ in years of work; marital status $m_t \in \{0, 1, 2\}$ (single; married before any birth; married after a birth); parity $n_t \in \{0, 1, 2, 3+\}$; the youngest child's age group $k_t \in \{\text{none}, 0\text{–}1, 2\text{–}5, 6\text{–}17\}$; and, for single women under TANF,

Table B.5. Early Childbearing by Mother's Education, NLSY79 and NLSY97

	Share of women		First birth by 17		First birth by 21	
Mother's education	NLSY79	NLSY97	NLSY79	NLSY97	NLSY79	NLSY97
Less than high school	0.32	0.18	0.132	0.138	0.443	0.506
High school	0.46	0.36	0.044	0.066	0.234	0.283
Some college	0.11	0.26	0.021	0.048	0.119	0.224
Bachelor's or more	0.10	0.20	0.013	0.014	0.069	0.093
All women	1.00	1.00	0.066	0.064	0.270	0.271
NLSY97 shares, NLSY79 rates				0.048		0.210
Women (N)	4,718	4,139				

Notes: Weighted shares of women and shares with a first birth by ages 17 and 21, by the highest grade completed by the respondent's mother (NLSY79: 1979 report; NLSY97: biological mother, else residential mother). "NLSY97 shares, NLSY79 rates" holds the rate of each group of mother's education at its NLSY79 value and uses the NLSY97 shares. NLSY79: civilian cross-section and black and Hispanic supplements, 1979 sampling weights. NLSY97: round-1 panel weights. Age at first birth is the child's birth year minus the mother's reported birth year. NLSY97 shares with a first birth use women observed after the given age.

years of cash-welfare receipt since age 18, $\tau_t \in \{0, \ldots, \bar{\tau}_g\}$. The number of children at home is $n_t^h = n_t \mathbf{1}\{k_t \neq \text{none}\}$. The controls are next-period assets $a_{t+1} \geq 0$, consumption $c_t \geq 0$, work $l_t \in \{0, 1\}$ (not for students or retirees), contraceptive use $d_t \in \{0, 1\}$ (if exposed, $n_t < 3$ and $t \leq 32$), abortion after a conception, and schooling continuation while enrolled.

Transitions. Experience: $x_{t+1} = \min\{x_t + \ell_t l_t, 20\}$. Children: a conception in t carried to term gives $n_{t+1} = \min\{n_t + 1, 3\}$ and $k_{t+1} = 0$–1; otherwise $n_{t+1} = n_t$ and the age group advances, $k_{t+1} = \text{next}(k_t)$, with probability $\ell_t / L(k_t)$, where L is the length of the age group in years (2, 4, 12) and next(6–17) = none. This stochastic ageing keeps the state free of a within-group counter; the expected time in each age group is exact. Schooling: a student who continues keeps her enrollment state, becomes H after the fourth high-school year and C after the fourth college year; a student who leaves becomes D (from high school) or H (from college) in the same year.

C.2 Income, taxes and transfers

Gross annual earnings are $y_t = l_t\, w(M, e_t, x_t, t) + \mathbf{1}\{m_t > 0\}\, w^h(e_t, t, m_t)$, with the woman's own earnings $y_t^f = l_t\, w(M, e_t, x_t, t)$; a student's own income is her allowance net of tuition. Disposable annual income is given by equation (10) of the paper, with the maximum cash benefit $\bar{B}_g(n^h)$ by family size and the EITC schedule

$$\mathrm{EITC}(y, n^h) = \begin{cases} \varsigma^{in}_{n^h}\, y & y \le \bar{y}^{in}_{n^h}, \\ E^{\max}_{n^h} & \bar{y}^{in}_{n^h} < y \le \bar{y}^{po}_{n^h}, \\ \max\{E^{\max}_{n^h} - \varsigma^{out}_{n^h}(y - \bar{y}^{po}_{n^h}), 0\} & y > \bar{y}^{po}_{n^h}, \end{cases}$$

for one and for two or more qualifying children, as in force for the cohort. Period income is ℓ_t times annual income. The budget constraint is

$$\ell_t\, \nu(m_t, n^h_t)\, c_t + a_{t+1} = (1 + r)^{\ell_t}\, a_t + \ell_t\, y^{net}_t,$$

with $\nu(m, n^h) = 1 + \nu_a \mathbf{1}\{m > 0\} + \nu_k n^h$ and c_t in annual units. After retirement, gross income is Social Security, $ss(e)$ times the earnings in the last working period of a woman of her schooling group with sixteen years of experience, averaged over mother's education, plus the analogous benefit of the husband if married; the replacement rates are 0.548, 0.408 and 0.336 for D, H and C. Experience accumulates as $x_{t+1} = x_t + \ell_t l_t$, up to twenty years.

Program details. $\mathcal{T}_g$ applies the rate schedule of the filing status (single, head of household for a single mother, joint for a couple), the standard deduction and personal exemptions, the child tax credit with its refundable part, and the employee payroll tax on each earner's wages up to the wage base; state income taxes are not modeled. Food stamps are available to every working-age household from age 18 except college students without a child at home: the maximum allotment for the household size minus 30% of net income (earnings net of the earned-income deduction, plus cash welfare, minus the standard deduction), for households below the gross-income limit. A minor mother (under 18) belongs to her parents' food-stamp household; where her parents' income is deemed to her unit, her cash benefit is scaled by

$\varsigma_g(M)$, the share of families with mother's education M whose income is below the deeming threshold, the benefit she can expect before her parents' income is known. Under TANF a woman can claim only while $\tau_t < \bar{\tau}_g$, and each year in which she claims from age 18 raises τ_t by one (months received as a minor do not count; there is no limit under AFDC), so a woman who expects to need the benefit later weighs claiming it now against keeping that option. Family size is the channel through which parity raises transfers: a second child raises the AFDC/TANF maximum by about a quarter, the food-stamp allotment by about 40%, and, since 1991, the maximum EITC by about two-thirds.

C.3 Discrete choices and taste shocks

Every discrete choice $\delta \in \mathcal{D}$ except claiming, which is the better of the two options, carries i.i.d. type-I extreme value shocks with scale $\sigma_{\mathcal{D}}$. With choice-specific values $v(\Omega, \delta)$, the ex-ante value is $\sigma_{\mathcal{D}} \log \sum_{\delta} \exp(v(\Omega, \delta)/\sigma_{\mathcal{D}})$, up to a constant, and choice probabilities are logit. The scales are σ_l (work), σ_s (contraceptive use), σ_a (abortion), σ_m (accepting a marriage offer), σ_H (high-school continuation), σ_C (college entry) and σ_{CD} (college continuation).

C.4 Retired households ($t = 38, \ldots, 41$)

Apart from the marriage stage, which works as in Stage 1 below with the meeting rate of ages 34–45, the only choice is saving:

$$V_t(\Omega_t) = \max_{a_{t+1} \geq 0} \Big\{ \ell_t \big[u(c_t) + \pi_n n_t \big] + \beta^{\ell_t} V_{t+1}(\Omega_{t+1}) \Big\},$$

subject to the budget constraint, and in $t = T$ the household consumes its resources.

C.5 Working households after the fertile window ($t = 33, \ldots, 37$)

There is no fertility risk. A single woman meets a potential husband as in Stage 1 below, with the meeting rate of ages 34–45. For $l \in \{0, 1\}$,

$$v_t(\Omega_t, l) = \max_{a_{t+1} \geq 0} \Big\{ \ell_t \big[u(c_t) + \Psi_g(t, e_t, m_t, n_t, k_t)\, l + \pi_n n_t + \mathbf{1}\{k_t \leq 5\} n_t \omega_y \big] + \beta^{\ell_t}\, \mathbb{E}_k\, V_{t+1}(\Omega_{t+1}) \Big\},$$

and $V_t = \ell_t \sigma_l \log \sum_l \exp(v_t(\Omega_t, l)/(\ell_t \sigma_l))$, where the expectation is over the ageing of the youngest child. The scale of the work shock is multiplied by the period length, so that a choice made for four years is not more deterministic than an annual one. The work disutility adds ψ_{ret} for each four-year period from age 58 on (once at 58–61, twice at 62–65).

C.6 Years in the fertile window after schooling ($t \leq 32$)

Decisions within the year are ordered in three stages.

Stage 3: work, consumption and saving. Given the conception outcome $b \in \{0, 1\}$ (carried to term), with Ω'_{t+1} the next-year state implied by b,

$$v_t^3(\Omega_t, b, l) = \max_{a_{t+1} \geq 0} \Big\{ u(c_t) + \Psi_g(t, e, m, n, k)\, l + \big(\omega_0 + A(t) + \omega_u \mathbf{1}\{u = 2\}\big)\, b + \big(\pi_n + \omega_y \mathbf{1}\{k \leq 5\}\big)\, n + \beta\, \mathbb{E}_k V_{t+1}^1(\Omega'_{t+1}) \Big\},$$

subject to the budget constraint, and

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

Stage 2: exposure, contraception and abortion. For a woman with $n < 3$, let $\Delta V = V_t^3(\Omega_t, 1) - V_t^3(\Omega_t, 0)$ be the value of an additional birth, $P^{ab} = \Lambda((-\Delta V - \phi_a(t, M))/\sigma_a)$ the abortion probability after a conception, and $G = \sigma_a \log[\exp(\Delta V/\sigma_a) + \exp(-\phi_a(t, M)/\sigma_a)]$

the value of a conception. Then

$$V_t^2(\Omega_t) = V_t^3(\Omega_t, 0) + \alpha(M, t, n)\,\sigma_s \log\Big[\exp\big(p^0 G/\sigma_s\big) + \exp\big((\rho(M)\,p^0 G - \phi_s(t, M, n))/\sigma_s\big)\Big],$$

with $p^0 = p^0(t, e, k)$ from equation (3) of the paper, $\alpha(M, t, n) = \alpha(M, t)$ for a childless woman and 1 for a mother, and $V_t^2 = V_t^3(\Omega_t, 0)$ for a woman with three children.

Stage 1: marriage. For a single woman not enrolled in school, from age 18, with $\Omega_t(m)$ the state with marital status m and $m^* = 1$ if $n_t = 0$, 2 otherwise,

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

and $V_t^1 = V_t^2$ otherwise. Marriage is absorbing.

C.7 College years (ages 18–21)

A single high-school graduate at 18, after the marriage stage, chooses whether to enroll; an enrolled student in each of the four years chooses, after the conception outcome, whether to continue. Students do not work, receive the allowance $a^C s(M) + g\,\mathbf{1}\{M = 1\}$ net of tuition TC, and face the fertility stage as above. With v^S the stage-3 value of a year as a student (no work, the student's budget) and $v^3(\cdot \mid e = H)$ the value of leaving and working as a high-school graduate this year,

$$V_t^3(\Omega \mid b) = \sigma_{CD} \log\Big[\exp\Big(\tfrac{v_t^S(\Omega \mid b) + \mathbf{1}\{n>0\}\phi_{CD}^k + \mathbf{1}\{t=8\}\phi_G}{\sigma_{CD}}\Big) + \exp\Big(\tfrac{v_t^3(\Omega \mid b, e=H)}{\sigma_{CD}}\Big)\Big],$$

for the continuation years, and the entry decision at 18 replaces σ_{CD} by σ_C and the continuation cost by $\kappa_C(M, n)$ of Section 4.4 of the paper. Completing the fourth year gives $e = C$ at 22.

C.8 High-school years (ages 14–17)

All women are single and enrolled at 14. In each year the order is: exposure, contraception and abortion; the schooling decision; consumption and saving. A woman who stays receives

the allowance h and does not work; a woman who leaves works as a dropout from the same year. The value of each conception outcome at the fertility stage is the logsum over the schooling decision that follows it,

$$V_t^3(\Omega \mid b) = \sigma_H \log \Big[\exp\Big(\frac{v_t^S(\Omega \mid b) + \phi_H(M) + \mathbf{1}\{n^h > 0\}\phi_H^k + \mathbf{1}\{k = 0\text{–}1\}\phi_H^{k,0}}{\sigma_H} \Big) + \exp\Big(\frac{v_t^3(\Omega \mid b, e = D)}{\sigma_H} \Big) \Big],$$

so a teenager's contraceptive decision accounts for the effect of a birth on her schooling. Completing the fourth year gives $e = H$ at 18 and the college-entry decision.

C.9 Functional forms and numerical solution

Utility is $u(c) = c^{1-\gamma}/(1-\gamma)$. The schooling costs ($\phi_H$, ϕ_H^k, $\phi_H^{k,0}$, ξ_C, ϕ_C^k, ϕ_{CD}^k and ϕ_G) are utility terms added to the value of continuing, so each is non-positive; the costs of contraception and abortion are subtracted from the value of the option. The cohort levels of both costs are restricted to be non-negative; the age and family-background terms are not, so the cost of a daughter of a college graduate can be below the cohort level. Marriage offers continue after 45 at the meeting rate of ages 34–45, once per four-year period; these marriages matter only through later-life income and are not targeted. Assets live on a 30-point grid on $[0, 1000]$ (thousands of 2016 dollars), cubically spaced toward zero, and experience on an 11-point grid of years $\{0, 1, 2, 3, 4, 6, 8, 10, 13, 16, 20\}$ with linear interpolation of continuation values. Every period is solved by grid search over next-period assets and closed-form logsums for every discrete choice; unreachable states (enrollment outside the schooling ages, experience exceeding age minus 14) are skipped. One solution of the 41 periods takes about 25 seconds on two threads (50 with the TANF time-limit state). I simulate 10,000 women per cohort with common random numbers across cohorts and across parameter vectors: the same uniform draw assigns a woman's mother's education under every distribution π_g, a second draw her unobserved type, and the same draws govern exposure, contraceptive use, conception, marriage meetings and every discrete choice. Common random numbers make the simulated moments smooth in the parameters and make the decomposition's counterfactual economies

differ only through behavior.

D The Contraception Choice

Write $W \equiv -\Delta V$ for the value of avoiding a birth, $p \equiv p^0(t,e,k)$ and $\alpha \equiv \alpha(M,t)$. An exposed childless woman uses contraception with probability $P = \Lambda(z)$, $z = [(1-\rho)pW - \phi_s]/\sigma_s$, where ϕ_s is the total cost of use $\phi_{s,g}(t,M,n)$ of Section 4.3 of the paper and ρ the failure rate $\rho_g(M)$, and the probability of a birth this period is $p^b = \alpha p[1-(1-\rho)P]$. Using $\Lambda' = P(1-P)$:

$$\frac{\partial P}{\partial \phi_s} = -\frac{P(1-P)}{\sigma_s} < 0, \qquad \frac{\partial p^b}{\partial \phi_s} = \alpha p\,(1-\rho)\,\frac{P(1-P)}{\sigma_s} > 0,$$

$$\frac{\partial P}{\partial \rho} = -\frac{pW\,P(1-P)}{\sigma_s} < 0 \text{ if } W > 0, \qquad \frac{\partial p^b}{\partial \rho} = \alpha p\Big[P + (1-\rho)\frac{pW\,P(1-P)}{\sigma_s}\Big] > 0 \text{ if } W > 0,$$

$$\frac{\partial P}{\partial W} = \frac{(1-\rho)p\,P(1-P)}{\sigma_s} > 0, \qquad \frac{\partial p^b}{\partial \alpha} = \frac{p^b}{\alpha} > 0.$$

Three properties matter for the decomposition. First, the cost and the incentive enter use only through the index z, so a fall in ϕ_s and a rise in W of $\Delta\phi_s/[(1-\rho)p]$ have the same effect on use and on births in a given cell; what distinguishes them is that the cost is common to every woman in the cohort while W varies across schooling, marital status, age and mother's education with the continuation values. Second, better efficacy (lower ρ) lowers births through two effects that reinforce each other when a birth is unwanted: it protects existing users, αpP, and it draws new users in, because it raises the return to use. A cost reduction has only the second effect, so the effect of an efficacy gain is largest where use is already high, while the effect of a cost reduction is largest where use is near one half and most elastic. Third, exposure scales births proportionally in every cell and leaves use among exposed women unchanged; for this reason it is measured outside the model and the contraception moments are defined among sexually active women.

E Estimation: Parameters and Model Fit

This appendix reports the parameters set outside the model (Tables E.1 and E.2), the estimates (Table E.3) and the targeted moments (Table E.4). Section 5 of the paper describes the sources, the moments and the identification argument. Tables E.1 and E.4 are built from the NSFG and CPS inputs of the three cohorts and the validation cohort.

E.1 Parameters set outside the model

The discount factor, the interest rate and risk aversion follow Adda et al. (2017). The equivalence scale is the OECD-modified scale, 0.5 for a second adult and 0.3 per child (Hagenaars et al., 1994), the scale Adda et al. (2017) start from; the Social Security replacement rates are standard. The yearly utility of a young child, ω_y, is fixed at 0.18, the value that, together with ω_0, minimizes the criterion at the starting values of the estimation; the estimation then frees ω_0 but not ω_y. The annual conception probability of an exposed woman using no method is at most $\lambda_{\max} = 0.85$, the first-year conception rate of women using no method (Trussell, 2011), which is also the rate against which the efficacy ρ_g is defined.

The measured cohort-specific blocks are set cohort by cohort. Women's earnings combine two sources. The CPS sets each cohort's level and age profile by education: the median wage income of employed women of the cohort and education group, fitted as a quadratic in age. The NLSY equations (the NLSY79 for the baseline cohort, the NLSY97 for the later cohorts) supply what a cross-section cannot identify, the return to experience and the family-background premia, as deviations around that profile: a woman of average family background with the experience typical of employed women of her cohort, education and age earns the CPS median (Appendix F). Husbands' earnings are the NLSY husband equation scaled, by the wife's education and age, to the CPS median earnings of the husbands of married women of the cohort. At age 30 the CPS medians of employed women are \$20,200, \$29,900 and \$46,500 for dropouts, high-school graduates and college graduates in the baseline cohort and \$24,600, \$29,800 and \$51,300 in the decline cohort.

Tuition and fees are the average for all institutions in the academic years the cohort was 18–21, from the NCES Digest of Education Statistics, plus books: \$5,570, \$8,340 and

$12,600 a year.

Treating every woman as at risk from her first intercourse would overstate exposure by a third to a half in the teenage years, because teenage sexual activity is intermittent, and would push the estimated fecundity below its biological level; the measure below is the NSFG's own definition of being at risk and the one the contraception moments use. Exposure $\alpha_g(M,t)$ is the share of woman-years at risk among childless women with mother's education M at age t, by single year of age from 14 to 45: the share who have had intercourse by the middle of the year, from the age at first intercourse in the NSFG (cells with fewer than 30 women filled from the nearest cohort), times the share of those who have initiated who report intercourse in the three months before the interview, measured by mother's education and age in the rounds fielded when the cohort was that age (1982 and 1988, 1995 and 2002, or 2006–2019; cells pool adjacent ages and, where thin, groups of mother's education). At age 15, 16%, 12%, 12% and 9% of women in the four groups of mother's education, from less than high school to a bachelor's degree, are at risk in the baseline cohort, 17%, 19%, 17% and 12% in the peak cohort and 11%, 12%, 9% and 8% in the decline cohort; at 17 the shares are 38%, 32%, 33% and 27%; 35%, 42%, 40% and 30%; and 29%, 36%, 32% and 30%; at 21 between 53% and 71%, and 65% to 80% through the thirties. Among women who have had intercourse, the share currently active at 15–17 falls from about 80% in the baseline cohort to 50–70% in the decline cohort, so the decline cohort's lower exposure at 15–16 comes from both later first intercourse and less activity afterwards.

The postpartum reduction in fecundity δ_{pp} is 0.25 while the youngest child is aged 0–1, a state that lasts two years in expectation, so it amounts to six months of postpartum infecundity.

Efficacy ρ_g is the typical-use first-year failure rate of each cohort's method mix relative to $\lambda_{\max}$. The mix is that of the cohort's own childless current users at ages 15–21, in the NSFG rounds fielded at those ages: 1982 and 1988 for the baseline cohort (521 users), 1995 and 2002 for the peak cohort (297) and 2006–2019 for the decline cohort (867). The pill accounts for 62%, 49% and 57% of use, the condom for 19%, 36% and 21%, and injectables, implants and IUDs for 2%, 8% and 14%. Each method is weighted by its typical-use failure rate, corrected for the underreporting of abortions, from the series that begins with the 1995 NSFG, whose

estimates use one methodology and are comparable over time (Sundaram et al., 2017): the 1995 rates (Fu et al., 1999) and the 2002 rates (Kost et al., 2008; Trussell, 2011) for the baseline and peak cohorts, and the 2006–10 rates of Sundaram et al. (2017) for the decline cohort. The failure rates of the three mixes are 12.0%, 12.8% and 8.7%, so $\rho_g = 0.141$, 0.151 and 0.102. The gradient in mother's education, $\rho_g(M) = \rho_g\,\mu(M)$, applies the ratio of the failure rates of poor and non-poor users of Sundaram et al. (2017) to the share of girls aged 14–17 in poverty by mother's education in the CPS, with $\mu(M)$ normalized to a share-weighted mean of one, so that ρ_g is the cohort's average; in the decline cohort $\rho_g(M)$ runs from 0.140 for daughters of mothers without a diploma to 0.078 for daughters of college graduates. Efficacy therefore worsened slightly from the baseline to the peak, as the condom replaced part of the pill, and improved for the decline cohort: ρ_g falls by 0.048, of which about 0.029 is lower failure within method and 0.020 the shift toward more effective methods. The published rates are by survey period, not by age, and Sundaram et al. (2017) find no significant differences across age groups in 2006–10, so the same rates apply at every age. I report two robustness checks: the 1982 rates of Jones and Forrest (1989), chained to the 1995 series, for the baseline cohort ($\rho = 0.119$), and the rates of Trussell (2011) held fixed for every cohort ($\rho_g = 0.141$, 0.151 and 0.131).

Taxes and the safety net follow the rules in force when the cohort's mean birth year turned 20 (1984, 1998 and 2014). Federal income taxes use the rate schedules, standard deductions and exemptions of that tax year, and the child tax credit and its refundable part (Internal Revenue Service, 2014); a single woman earning \$30,000 pays 18% of it in federal income and payroll taxes under the 1984 rules and 16% under the 2014 rules, at marginal rates of 25% and 23%. The EITC is the federal schedule for one and for two or more children (Tax Policy Center, 2016); its maximum credit for one child is \$1,100 in 1984 and \$3,350 in 1998 and 2014 (2016 dollars). The cash maximum $\bar{B}_g(n)$ is the median state's AFDC/TANF maximum benefit for the family size, from the Welfare Rules Database (the 1999 and 2014 databooks, rules of July 1998 and July 2014) (Urban Institute, 2024) and, for the baseline cohort, from the AFDC schedules of January 1985, the nearest date with state schedules by family size (Office of the Assistant Secretary for Planning and Evaluation, 1998): for a mother with one child it falls from \$7,070 to \$5,380 and \$4,090 a year. The rate χ_g and the

flat disregard D_g are those of the median state after the first year of work, when time-limited disregards have expired: a rate of one and $1,950 a year under AFDC, 0.74 in 1998 and 0.51 in 2014 as TANF states extended their disregards. Food stamps follow the federal allotments, deductions and income limits of the same fiscal years; the earned-income deduction is 18% in 1985 and 20% afterwards. The TANF lifetime limit $\bar{\tau}_g$ is the federal five years, the limit of the median state, for the peak and decline cohorts; in July 2014, 13 states had shorter limits, of 21 to 48 months, and Massachusetts and New York had none (Urban Institute, 2024). Years of receipt are counted from age 18 for the peak cohort as well, although it turned 18 in 1994–1998, partly before the TANF clock started. The minor-parent rules follow the years each cohort was 14–17, not the reference year: the baseline cohort's teenage mothers could head their own AFDC unit before the 1984 law that deemed co-resident parents' income to it (Social Security Administration, 1984); the peak cohort's were subject to deeming; and the decline cohort's to deeming and the school-attendance requirement of the 1996 reform (U.S. Congress, 1996); its living-arrangement requirement is not modeled. The share $\varsigma_g(M)$ is the share of CPS families with a child aged 14–17 whose income is below the deeming threshold, the poverty guideline for four persons plus a $90 monthly disregard: 0.43 for daughters of mothers without a diploma and 0.04 for daughters of college graduates at the peak.

The claiming cost η_g^w is estimated from the share of single mothers who claim (Low et al., 2022): the share of unmarried women with an own child under 18 who report AFDC/TANF income for the previous year in the CPS, at ages 18–21, 22–25, 26–29 and 30–33 (unmarried women include the divorced and separated, whom the model, in which marriage is absorbing, does not have). At 18–21 it falls from 0.49 in the baseline cohort to 0.24 at the peak and 0.07 in the decline cohort, and at 26–29 from 0.39 to 0.10 and 0.05. The rules alone, including the fall in real benefits, do not account for the decline in claiming, and a single cost common to all cohorts cannot fit it. The CPS understates welfare receipt, and increasingly so over time (Meyer et al., 2015), which η_g^w also absorbs.

The distribution of mother's education $\pi_g(M)$ comes from the NSFG: 0.28, 0.43, 0.15 and 0.14 in the baseline cohort, 0.22, 0.33, 0.23 and 0.22 at the peak and 0.16, 0.28, 0.29 and 0.27 in the decline cohort. The family-income profile $s_g(M)$ is the income of the CPS families of girls aged 14–17, by the co-resident mother's education, relative to the cohort

mean: the gap between daughters of college graduates and of mothers without a diploma widens from 1.56/0.68 in the baseline cohort to 1.62/0.43 in the decline cohort.

Money amounts of each cohort are divided by an index of aggregate real income, real nonfarm-business hourly compensation averaged over the years the cohort was 18–35 (1.00, 1.18 and 1.33 relative to the baseline cohort; the index is normalized to one over 1979–1995, so the baseline cohort's own value is 1.03), so that utility costs are in consumption-equivalent units and level growth common to all incomes does not by itself move choices. Tables E.1 and E.2 report all the measured inputs.

E.2 Moments, weights and incomplete life cycles

For each cohort I build the same moments, with identical definitions, from the NSFG and the CPS (Appendix A). From the NSFG: high-school dropout (no diploma or GED by age 20) and college attendance by teen birth; college attendance by mother's education; a bachelor's degree by 25 by birth at 18–21; the stock of first births by mother's education at each age from 17 to 41; the share married by schooling and age; contraceptive use among sexually active, childless, non-pregnant women not relying on sterilization at ages 15–17 and 18–21, overall and by mother's education, and, by schooling, at each four-year age group from 22; and, for the quantity margin, births per woman at each single year of age from 14 to 24 (all births, and first births), children ever born by ages 25, 30 and 35 by mother's education, the share of mothers with a second birth within four years of the first by age at first birth, and the share of births at 15–19 that are second or higher order. From the CPS: employment by schooling and age from 22, and, by schooling and age, employment of women without children, of mothers whose youngest child is 0–1, 2–5 and 6–17, and of married women. The abortion share of first pregnancies at 15–17 and 18–21 combines the Guttmacher series with the NSFG pregnancy histories, and so does its ratio across groups of mother's education at 15–21. Ages in the NSFG are completed ages at dated events, the convention of the vital statistics and of the model: a conception at age a in the model is a birth at $a + 1$, and a stock "by age a" counts births at completed ages up to a in the model as in the data; the NSFG birth rates at 15–17 and 18–19 are 28 and 72 per 1,000 for the baseline cohort, 35 and 77 at the peak and 13 and 48 in the decline cohort, against

32 and 79, 36 and 84, and 18 and 49 in the vital statistics for the same years. Teen cells by mother's education pool the two highest groups (some college and a bachelor's degree or more), which are thin at 15–17 and 18–21. The employment cells condition on current education, as the CPS records it; the marriage and use cells on final education. A cell is targeted when it has at least 30 observations and ends at or before the cohort's last observed age, which leaves 250 targeted moments for the baseline cohort, 240 for the peak and 153 for the decline cohort. The criterion is the sum over cohorts and cells of squared proportional deviations with equal weight on every cell, $\sum_g \sum_j [(m_j^{\text{model}} - m_j^{\text{data}})/s_j]^2$, where the scale s_j is the Bernoulli standard deviation $\sqrt{d_j(1-d_j)}$ of a share d_j, floored at 0.10, the level $|d_j|$ of a birth rate or a first-birth stock, floored at 0.02, and the level of a count, floored at 0.10; a 20% miss of a birth rate of 0.05 therefore counts as much as a 20% miss of a share of one half. The fifteen cells per cohort that define the paper's objects (births per woman at each age from 15 to 19 and the stock of first births by 17 and by 21 for each mother's education) have their scale divided by $\sqrt{10}$, which gives them ten times the weight of the other cells; the sandwich standard errors use the same weighting matrix. A targeted cell that the model leaves empty, for instance because no simulated woman drops out of high school, is charged as a miss of its full value, so the optimizer cannot improve the fit by emptying a conditioning group. The bootstrap standard errors of the moments are not used in the criterion; they enter the sandwich standard errors of Appendix Table E.3, with a floor of 0.005 (0.01 for the CPS employment cells). The intended and use-at-conception moments are computed in the model among first births conceived at the cell's ages: a birth is intended when the conception occurred without a method to a woman for whom the value of an additional birth, before the abortion option, was positive, and a conception is under a method when the woman used one that year. The abortion-response moment is computed for the peak cohort: the proportional change in its births at 15–17 when the minors' abortion cost rises by 25%; its data value is zero, the estimated effect of parental-involvement laws on births, with a scale of 0.10. The parameter vector has 65 common parameters and 24 cohort-specific ones per cohort (eleven marriage-meeting rates, the two allowances and the need-based aid, three child penalties, three shifts in the taste for work, the cost of contraception and its premium for minors, the cost of abortion, and the cost of claiming cash welfare); the shifts in the taste for work are

zero for the baseline cohort. The marriage-meeting rates of age bands that start after a cohort's observation window, or for which the cohort has no targeted marriage moment, are held at the previous cohort's values rather than estimated. With the shifts in the taste for work of the baseline cohort normalized to zero and the decline cohort's meeting rates from age 26 on held, 128 of the 137 coordinates are estimated. The sandwich standard errors use a central-difference Jacobian of the targeted moments at a step of 1% of each parameter's range, computed with 50,000 simulated women per cohort and checked against a step of 2%; a parameter on a bound of its range gets a one-sided difference.

The cost of abortion is estimated from the share of the births and abortions of women aged 15–17 and 18–21 that end in abortion, cohort by cohort (Chiu et al., 2024), and κ_a from the abortion share of first pregnancies at 15–21 by mother's education. The model moment is computed among childless women, whose pregnancies are first pregnancies, over the conceptions whose outcome falls at those ages (conceived at 14–16 and 17–20); the published series covers all pregnancies, so each level is rescaled by the ratio of the nulliparous to the all-pregnancy abortion share measured in the NSFG pregnancy files for the same ages and years.

The NSFG observes the baseline and peak cohorts to their mid-forties and the decline cohort to about age 27, and the CPS observes them to 63, 49 and 33, so the later wages, marriages and completed fertility of the younger cohorts are not in the data. I follow the practice of cohort studies in three parts (Attanasio et al., 2008; Eckstein et al., 2019; Keane and Wolpin, 2010). First, each cohort is scored only on the ages it is observed at: cells ending after a cohort's observation window are untargeted. Second, later-life parameters are extrapolated with a common age profile and cohort-specific levels: beyond its window, a cohort's earnings profile follows the baseline cohort's age profile from its own level; and the marriage-meeting rates of age bands that start after the window, or that no marriage moment of the cohort covers (the decline cohort's at 26–33), are held at the previous cohort's estimates rather than estimated. Third, women are assumed to know their cohort's parameters over the whole life cycle, with uncertainty only over idiosyncratic shocks, as in these papers; beliefs formed on the previous cohort's profile are a robustness check. Completed fertility beyond the window is therefore a forecast of the model, reported as such and never targeted.

Table E.1. Parameters Set Outside the Model

A. Common to all cohorts				
Discount factor β (annual)	0.959			
Interest rate r (annual)	0.040			
Risk aversion γ	1.98			
Maximum conception probability $\lambda_{\max}$ (annual)	0.85			
Equivalence scale ν_a, ν_k (OECD-modified)	0.5, 0.3			
Social Security replacement, $D/H/C$	0.548, 0.408, 0.336			
B. Cohort-specific, measured				
Women born in	Baseline 1962–66	Peak 1976–80	Decline 1992–96	Validation 1984–88
Tuition and fees TC_g	5.57	8.34	12.60	10.48
Efficacy of the method mix ρ_g	0.141	0.151	0.102	0.135
Exposure at 15–17, $\alpha_g(M, 15\text{–}17)$, by mother's education				
no diploma	0.27	0.26	0.20	0.29
high school	0.21	0.30	0.23	0.29
some college	0.22	0.29	0.20	0.24
college degree	0.17	0.20	0.19	0.17
Shares $\pi_g(M)$, by mother's education				
no diploma	0.28	0.22	0.16	0.18
high school	0.43	0.33	0.28	0.31
some college	0.15	0.23	0.29	0.26
college degree	0.14	0.22	0.27	0.25
Family income $s_g(M)$ (mean = 1), by mother's education				
no diploma	0.68	0.52	0.43	0.50
high school	1.02	0.90	0.74	0.80
some college	1.23	1.10	0.94	1.02
college degree	1.56	1.60	1.62	1.59
Earnings equations	NLSY79	NLSY97	NLSY97	NLSY97
Women's earnings at 30, by education				
dropout	20.2	20.1	24.6	20.3
high school	29.9	29.7	29.8	28.4
college	46.5	49.5	51.3	49.7
Husbands' earnings at 30, by wife's education				
dropout	27.4	28.8	32.8	29.0
high school	45.7	45.2	45.1	43.0
college	58.1	61.3	67.0	60.8
Aggregate income index (baseline = 1)	1.00	1.18	1.33	1.28
Last age observed, NSFG / CPS	44 / 63	43 / 49	27 / 33	35 / 41

Notes: Thousands of 2016 dollars a year; D/H/C: dropout, high school, college. Tuition: mean tuition and fees, all institutions, when the cohort was 18–21, plus books (NCES). Efficacy: the cohort's method mix at 15–21 times typical-use failure rates; the gradient by mother's education is in Appendix E.1. Exposure: share of childless women sexually active in the three months before the interview, averaged over ages 15–17 (NSFG; the model uses the single-age table from 14 to 45). Family income: CPS families of girls aged 14–17 by the co-resident mother's education, relative to the cohort mean. Earnings: the CPS median wage income of employed women (of the husbands of married women) by own (wife's) education at age 30, thousands of 2016 dollars; the fitted CPS age profile sets the level and shape of the earnings functions at every age, the NLSY equations the returns to experience and the family-background gradient (Appendix F). $\lambda_{\max}$ is the first-year conception rate of women using no method (Trussell, 2011). Income index: real nonfarm-business hourly compensation over the years the cohort was 18–35; each cohort's money amounts are divided by it. Taxes and the safety net are in Table E.2. The validation cohort is not targeted.

Table E.2. Taxes and the Safety Net by Cohort

Women born in	Baseline 1962–66	Peak 1976–80	Decline 1992–96	Validation 1984–88
Safety-net rules of	Jan. 1985	July 1998	July 2014	July 2006
Federal tax year	1984	1998	2014	2006
Tax at $30k, single: average/marginal	0.18/0.25	0.18/0.23	0.16/0.23	0.16/0.23
AFDC/TANF maximum $\bar{B}_g(1)/\bar{B}_g(2)$	7.07/8.64	5.38/6.87	4.09/5.21	4.52/5.77
Rate on earnings χ_g; disregard D_g	1.00; 1.95	0.74; 1.59	0.51; 1.10	0.60; 1.29
TANF lifetime limit $\bar{\tau}_g$ (years)	none	5	5	5
Food stamps, maximum for 1/2 persons	2.03/3.72	2.16/3.97	2.30/4.22	2.18/3.98
Minor mothers: deeming/school rule	no/no	yes/no	yes/yes	yes/yes
Minor mothers below deeming threshold $\varsigma_g(M)$				
no diploma	1.00	0.43	0.44	0.38
high school	1.00	0.17	0.23	0.17
some college	1.00	0.12	0.15	0.10
college degree	1.00	0.04	0.05	0.03
EITC phase-in rate, 1/2+ children	0.10/0.10	0.34/0.40	0.34/0.40	0.34/0.40
EITC maximum credit, 1/2+ children	1.10/1.10	3.35/5.54	3.35/5.54	3.28/5.41
EITC phase-out start	13.2	18.1	18.1	17.7
EITC phase-out rate, 1/2+ children	0.125/0.125	0.160/0.211	0.160/0.211	0.160/0.211
Single mothers claiming, 18–21/26–29	0.49/0.39	0.24/0.10	0.07/0.05	0.12/0.07
Claiming cost η_g^w		estimated		

Notes: Thousands of 2016 dollars a year. Rules: those in force when the cohort's mean birth year turned 20 (federal taxes and EITC: that tax year; AFDC/TANF and food stamps: the nearest date with state schedules by family size). Taxes: federal income tax (rate schedules, standard deduction, exemptions, child tax credit and its refundable part) and employee payroll tax (IRS); state taxes not modeled. AFDC/TANF: median state's maximum for a mother with one (two) children, and its rate on earnings and flat disregard after the first year of work (Welfare Rules Database; ASPE). TANF lifetime limit: federal 60 months, the median state's, counted from age 18 (42 U.S.C. 608(a)(7)). Food stamps: federal maximum allotments (USDA). Minor-parent rules: those in force when the cohort was 14–17; ς_g: share of CPS families with a child aged 14–17 whose income is below the deeming threshold (all minors eligible before the 1984 deeming rule). EITC: Tax Policy Center. Claiming: share of unmarried women with an own child under 18 who report AFDC/TANF income for the previous year (CPS ASEC).

Table E.3. Estimated Parameters

Parameter	Common	1962–66	1976–80	1992–96
Fecundity				
Fecundity index θ_0 (intercept)	0.388 (0.438)			
$\theta_{26\text{–}33}$ (ages 26–33)	0.332 (0.425)			
$\theta_{34\text{–}45}$ (ages 34–45)	-0.649 (0.458)			
θ_H (high-school graduate or less)	0.772 (0.500)			
θ_D (dropout, ages 14–25)	0.249 (0.547)			
Preferences over children				
ω_0 (value of a birth)	-0.819 (0.109)			
π_n (parity taste, per child-year)	-0.042 (0.003)			
ω_u (value of a birth, preference type 2)	1.552 (0.221)			
q_0 (type-2 probability, intercept)	-0.542 (0.192)			
q_1 (type-2 probability, slope in M)	-0.430 (0.102)			
$\omega_{a,1}$ (value of a birth, age term z)	-0.057 (0.497)			
$\omega_{a,2}$ (value of a birth, age term z^2)	-0.012 (1.023)			
$\omega_{a,3}$ (value of a birth, age term z^3)	-0.074 (1.222)			
$\omega_{a,4}$ (value of a birth, age term z^4)	0.557 (0.790)			
ω_y *(young child, per year), fixed*	*0.181*			
Schooling				
ϕ_H^k (stay in high school with a child)	-0.008 (0.342)			
ϕ_{CD}^k (continue college with a child)	-0.689 (0.122)			
ϕ_C^k (enter college with a child)	-0.314 (0.243)			
ϕ_G (college graduation)	-0.169 (0.131)			
ξ_C (college entry cost, mother < HS)	-0.892 (0.211)			
ξ_M (college cost slope in M)	0.502 (0.102)			
$\phi_{H,0}$ (high-school continuation cost)	-0.225 (0.086)			
$\phi_{H,M}$ (slope in M)	-0.003 (0.042)			
σ_C (college entry)	0.796 (0.119)			
σ_{CD} (college continuation)	0.771 (0.133)			
σ_H (high-school continuation)	0.543 (0.110)			

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Table E.3, continued

Parameter	Common	1962–66	1976–80	1992–96
$\phi_H^{k,0}$ (stay in high school with a child aged 0–1)	-0.350 (0.398)			
High-school allowance h_g		21.764 (8.774)	34.906 (3.179)	34.268 (4.674)
College allowance a_g^C		36.990 (7.612)	23.124 (7.427)	73.252 (37.458)
Need-based aid g_g (mother < HS)		1.494 (38.635)	19.354 (42.677)	35.688 (64.233)
Contraception and abortion				
κ_M (use-cost slope in M)	-0.032 (0.010)			
σ_s (contraceptive use)	0.061 (0.012)			
$\Delta\phi_a$ (abortion cost, ages 18 and older)	0.233 (0.131)			
σ_a (abortion)	0.621 (0.128)			
κ_a (abortion-cost slope in M, through age 21)	-0.207 (0.042)			
$\Delta\phi_s^{mom}$ (use cost, mothers aged ≤ 21)	-0.070 (0.015)			
$\phi_{s,1}$ (use cost, linear in age − 14)	6.43e-04 (0.003)			
$\phi_{s,2}$ (use cost, quadratic in age − 14)	-2.06e-05 (1.28e-04)			
Cost of contraception $\phi_{s,g}$		0.056 (0.030)	0.058 (0.027)	0.031 (0.029)
Cost of contraception of minors $\Delta\phi_{s,g}^m$ (ages 14–17)		0.010 (0.038)	0.037 (0.035)	4.86e-05 (0.050)
Cost of abortion $\phi_{a,g}$		0.737 (0.147)	0.998 (0.173)	1.187 (0.201)
Marriage market				
σ_m (accepting a marriage offer)	0.124 (0.094)			
μ_g, D 18–21		0.133 (0.028)	0.096 (0.026)	0.032 (0.037)
μ_g, D 22–25		0.085 (0.060)	0.083 (0.046)	0.136 (0.065)
μ_g, D 26–33		0.069 (0.045)	0.062 (0.029)	*0.062*
μ_g, D 34–45		0.004 (0.047)	0.138 (0.086)	*0.138*
μ_g, H 18–21		0.205 (0.055)	0.170 (0.044)	0.036 (0.086)
μ_g, H 22–25		0.122 (0.034)	0.058 (0.038)	0.153 (0.058)
μ_g, H 26–33		0.099 (0.016)	0.079 (0.019)	*0.079*
μ_g, H 34–45		0.028 (0.028)	0.018 (0.032)	*0.018*

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Table E.3, continued

Parameter	Common	1962–66	1976–80	1992–96
μ_g, C 22–25		0.149 (0.059)	0.131 (0.051)	0.025 (0.025)
μ_g, C 26–33		0.118 (0.031)	0.102 (0.029)	*0.102*
μ_g, C 34–45		0.122 (0.062)	0.093 (0.038)	*0.093*
Labor supply				
ψ_l D, ages 14-25	-0.135 (0.011)			
ψ_l D, ages 30-37	-0.086 (0.012)			
ψ_l D, ages 50-53	-0.082 (0.013)			
ψ_l D, ages 54-65	-0.098 (0.016)			
ψ_l H, ages 14-25	-0.034 (0.008)			
ψ_l H, ages 30-37	-0.011 (0.009)			
ψ_l H, ages 50-53	-0.012 (0.010)			
ψ_l H, ages 54-65	-0.027 (0.008)			
ψ_l C, ages 14-25	0.001 (0.008)			
ψ_l C, ages 30-37	0.031 (0.010)			
ψ_l C, ages 50-53	0.036 (0.015)			
ψ_l C, ages 54-65	0.012 (0.010)			
ψ_{ret} (per four-year period from 58)	-0.003 (0.003)			
σ_l (work)	0.050 (0.005)			
ψ_l D, ages 26-29	-0.105 (0.011)			
ψ_l H, ages 26-29	-0.020 (0.009)			
ψ_l C, ages 26-29	0.023 (0.010)			
ψ_l D, ages 38–45	-0.067 (0.014)			
ψ_l H, ages 38–45	-0.005 (0.009)			
ψ_l C, ages 38–45	0.039 (0.011)			
ψ_l D, ages 46–49	-0.073 (0.015)			
ψ_l H, ages 46–49	-0.002 (0.009)			
ψ_l C, ages 46–49	0.046 (0.013)			
ψ_{lm}, D (married)	0.022 (0.015)			
ψ_{lm}, H (married)	0.022 (0.009)			
ψ_{lm}, C (married)	0.015 (0.007)			
$\psi_{lc,g}$, D (cohort shift)		*0.000*	-0.002 (0.006)	-0.025 (0.015)

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Table E.3, continued

Parameter	Common	1962–66	1976–80	1992–96
$\psi_{lc,g}$, H (cohort shift)		*0.000*	-0.013 (0.005)	-0.004 (0.006)
$\psi_{lc,g}$, C (cohort shift)		*0.000*	-9.76e-05 (0.005)	0.020 (0.006)
Child penalty				
$\varrho_{2\text{-}5}$ (child penalty, youngest 2–5, relative to 0–1)	0.804 (0.036)			
$\varrho_{6\text{-}17}$ (child penalty, youngest 6–17, relative to 0–1)	0.354 (0.044)			
υ_2 (child penalty, two or more children)	1.411 (0.282)			
$\psi_{lk,g}(D)$		-0.030 (0.009)	-0.044 (0.011)	-0.055 (0.016)
$\psi_{lk,g}(H)$		-0.049 (0.010)	-0.030 (0.007)	-0.035 (0.011)
$\psi_{lk,g}(C)$		-0.071 (0.013)	-0.058 (0.010)	-0.056 (0.011)
Safety net				
$\Delta\eta^w$ (claiming cost, ages ≤ 21)	-0.002 (0.003)			
Cost of claiming cash welfare η_g^w		0.020 (0.004)	0.022 (0.002)	0.025 (0.006)

Notes: Pooled SMM estimates on the three cohorts. "Common" parameters are shared by all cohorts; the cohort columns report the estimated cohort-specific parameters of Table 3. Utility parameters are in the units of $u(c)$ with c in thousands of 2016 dollars a year divided by the cohort's index of aggregate real income; allowances in the same units. Entries in italics are not estimated: marriage-meeting rates of age bands that start after a cohort's last marriage moment are held at the previous cohort's values, and the cohort shift of the work taste is normalized to zero for the 1962–66 cohort. Sandwich standard errors in parentheses (moment Jacobian by central differences; weights are those of the proportional criterion of Appendix E.2; the bootstrap variances of the data moments, floored at 0.005, enter the meat; simulation error included); held coordinates have none. Preliminary estimates, October 2026.

Table E.4. Targeted Moments: Data and Model

	Born 1962–66		Born 1976–80		Born 1992–96		1984–88 (validation)	
Moment	Data	Model	Data	Model	Data	Model	Data	Model
Schooling								
HS dropout, no birth at 14–17	0.131	0.173	0.143	0.183	0.081	0.076	0.129	0.110
HS dropout, birth at 14–17	0.563	0.542	0.472	0.465	0.358	0.305	0.505	0.354
College attendance, no birth at 14–17	0.568	0.579	0.673	0.594	0.710	0.761	0.711	0.697
College attendance, birth at 14–17	0.168	0.166	0.343	0.161	0.379	0.310	0.319	0.251
College attendance, mother < HS	0.304	0.321	0.398	0.377	0.548	0.534	0.408	0.458
College attendance, mother HS	0.510	0.545	0.587	0.512	0.586	0.681	0.615	0.609
College attendance, mother some college	0.783	0.717	0.774	0.692	0.711	0.821	0.796	0.768
College attendance, mother BA+	0.839	0.858	0.855	0.670	0.891	0.866	0.857	0.795
College graduation, no birth by 21	0.463	0.407	0.525	0.495	0.566	0.522	0.580	0.509
College graduation, birth at 18–21	0.107	0.146	0.099	0.170	0.252	0.195	0.056	0.187
First births by mother's education								
First birth by 17, mother < HS	0.138	0.139	0.156	0.140	0.095	0.074	0.128	0.122
First birth by 21, mother < HS	0.472	0.471	0.486	0.452	0.479	0.344	0.495	0.426
First birth by 25, mother < HS	0.651	0.648	0.672	0.654	0.612	0.518	0.691	0.617
First birth by 29, mother < HS	0.796	0.756	0.815	0.779	—	—	0.803	0.741
First birth by 33, mother < HS	0.872	0.838	0.868	0.861	—	—	0.824	0.828
First birth by 37, mother < HS	0.901	0.904	0.912	0.920	—	—	—	—
First birth by 41, mother < HS	0.907	0.946	0.976	0.951	—	—	—	—
First birth by 17, mother HS	0.066	0.063	0.101	0.101	0.036	0.047	0.080	0.082
First birth by 21, mother HS	0.288	0.305	0.354	0.374	0.225	0.260	0.320	0.329
First birth by 25, mother HS	0.493	0.502	0.501	0.556	0.272	0.444	0.492	0.515
First birth by 29, mother HS	0.641	0.631	0.672	0.670	—	—	0.656	0.634
First birth by 33, mother HS	0.762	0.738	0.782	0.762	—	—	0.733	0.729
First birth by 37, mother HS	0.807	0.828	0.826	0.839	—	—	—	—
First birth by 41, mother HS	0.779	0.885	0.827	0.895	—	—	—	—
First birth by 17, mother some college or BA+	0.039	0.035	0.068	0.052	0.025	0.019	0.045	0.030
First birth by 21, mother some college or BA+	0.167	0.188	0.224	0.224	0.156	0.144	0.201	0.171
First birth by 25, mother some college	0.390	0.393	0.457	0.431	0.371	0.319	0.369	0.375
First birth by 29, mother some college	0.579	0.500	0.642	0.563	—	—	0.656	0.508
First birth by 33, mother some college	0.714	0.614	0.760	0.679	—	—	0.731	0.623
First birth by 37, mother some college	0.781	0.706	0.802	0.760	—	—	—	—
First birth by 41, mother some college	0.837	0.778	0.839	0.817	—	—	—	—
First birth by 25, mother BA+	0.299	0.312	0.307	0.351	0.191	0.269	0.295	0.299
First birth by 29, mother BA+	0.462	0.452	0.468	0.479	—	—	0.510	0.425
First birth by 33, mother BA+	0.667	0.554	0.667	0.594	—	—	0.598	0.545
First birth by 37, mother BA+	0.752	0.647	0.763	0.692	—	—	—	—

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Table E.4, continued

	Born 1962–66		Born 1976–80		Born 1992–96		1984–88 (validation)	
Moment	Data	Model	Data	Model	Data	Model	Data	Model
First birth by 41, mother BA+	0.751	0.717	0.819	0.771	—	—	—	—
Birth rates								
Births per woman at age 14	0.003	0.000	0.004	0.000	0.002	0.000	0.004	0.000
Births per woman at age 15	0.011	0.015	0.019	0.017	0.006	0.007	0.011	0.012
Births per woman at age 16	0.028	0.026	0.028	0.030	0.017	0.011	0.023	0.021
Births per woman at age 17	0.046	0.044	0.058	0.051	0.017	0.019	0.040	0.034
Births per woman at age 18	0.067	0.070	0.069	0.079	0.035	0.039	0.058	0.060
Births per woman at age 19	0.078	0.077	0.086	0.075	0.061	0.046	0.088	0.059
Births per woman at age 20	0.097	0.092	0.107	0.090	0.076	0.062	0.094	0.074
Births per woman at age 21	0.114	0.101	0.101	0.095	0.064	0.069	0.101	0.080
Births per woman at age 22	0.095	0.101	0.098	0.098	0.094	0.077	0.089	0.088
Births per woman at age 23	0.119	0.109	0.110	0.111	0.082	0.077	0.093	0.094
Births per woman at age 24	0.109	0.111	0.108	0.108	0.075	0.080	0.096	0.096
First births per woman at age 14	0.003	0.000	0.004	0.000	0.002	0.000	0.003	0.000
First births per woman at age 15	0.011	0.015	0.017	0.017	0.006	0.007	0.010	0.012
First births per woman at age 16	0.025	0.024	0.026	0.028	0.016	0.011	0.022	0.020
First births per woman at age 17	0.037	0.038	0.049	0.044	0.016	0.018	0.035	0.030
First births per woman at age 18	0.055	0.056	0.053	0.062	0.028	0.034	0.047	0.049
First births per woman at age 19	0.054	0.057	0.057	0.054	0.051	0.037	0.063	0.043
First births per woman at age 20	0.060	0.066	0.070	0.062	0.060	0.051	0.059	0.055
First births per woman at age 21	0.060	0.064	0.047	0.059	0.036	0.052	0.054	0.056
First births per woman at age 22	0.044	0.062	0.038	0.060	0.041	0.057	0.040	0.060
First births per woman at age 23	0.052	0.044	0.049	0.044	0.033	0.040	0.039	0.043
First births per woman at age 24	0.042	0.042	0.042	0.043	0.046	0.038	0.040	0.041
Parity								
Children ever born by 25, mother < HS	1.155	1.096	1.136	1.110	0.826	0.812	1.174	1.021
Children ever born by 30, mother < HS	1.768	1.709	1.794	1.771	—	—	1.792	1.631
Children ever born by 35, mother < HS	2.251	2.150	2.152	2.214	—	—	—	—
Children ever born by 25, mother HS	0.729	0.719	0.801	0.843	0.502	0.595	0.781	0.735
Children ever born by 30, mother HS	1.256	1.217	1.341	1.373	—	—	1.319	1.240
Children ever born by 35, mother HS	1.676	1.675	1.728	1.807	—	—	—	—
Children ever born by 25, mother some college	0.488	0.503	0.731	0.574	0.542	0.377	0.534	0.470
Children ever born by 30, mother some college	1.118	0.870	1.291	0.981	—	—	1.198	0.841
Children ever born by 35, mother some college	1.570	1.251	1.657	1.410	—	—	—	—
Children ever born by 25, mother BA+	0.403	0.356	0.417	0.418	0.267	0.289	0.386	0.332
Children ever born by 30, mother BA+	0.797	0.672	0.890	0.749	—	—	0.846	0.642
Children ever born by 35, mother BA+	1.443	1.006	1.488	1.115	—	—	—	—

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Table E.4, continued

	Born 1962–66		Born 1976–80		Born 1992–96		1984–88 (validation)	
Moment	Data	Model	Data	Model	Data	Model	Data	Model
Second birth within 4 years, first birth at 14–17	0.549	0.600	0.598	0.568	0.448	0.482	0.624	0.530
Second birth within 4 years, first birth at 18–21	0.603	0.536	0.567	0.524	0.544	0.451	0.533	0.495
Second birth within 4 years, first birth at 22–25	0.595	0.454	0.522	0.442	—	—	0.521	0.402
Share of births at 15–19 of order 2 or higher	0.213	0.185	0.215	0.189	0.133	0.134	0.199	0.169
Contraceptive use (sexually active, childless)								
Contraceptive use at 15–17	0.670	0.604	0.735	0.693	0.845	0.863	0.828	0.790
Contraceptive use at 18–21	0.783	0.752	0.829	0.821	0.852	0.878	0.825	0.862
Contraceptive use at 22–25, HS graduates	0.866	0.894	0.891	0.917	0.845	0.933	0.890	0.930
Contraceptive use at 26–29, HS graduates	0.824	0.925	0.759	0.944	0.859	0.967	0.867	0.961
Contraceptive use at 30–33, HS graduates	0.853	0.873	0.845	0.910	—	—	0.773	0.926
Contraceptive use at 34–37, HS graduates	—	—	0.724	0.776	—	—	—	—
Contraceptive use at 38–41, HS graduates	0.594	0.698	0.673	0.726	—	—	—	—
Contraceptive use at 22–25, college	0.902	0.897	0.879	0.927	0.898	0.942	0.910	0.937
Contraceptive use at 26–29, college	0.959	0.931	0.874	0.951	0.993	0.974	0.939	0.966
Contraceptive use at 30–33, college	0.936	0.905	0.929	0.946	—	—	0.954	0.966
Contraceptive use at 34–37, college	—	—	0.932	0.839	—	—	—	—
Contraceptive use at 38–41, college	0.866	0.797	0.787	0.844	—	—	—	—
Contraceptive use at 15–17, mother < HS	0.593	0.539	0.640	0.610	0.802	0.733	—	—
Contraceptive use at 18–21, mother < HS	0.774	0.704	—	—	0.887	0.820	0.814	0.801
Contraceptive use at 15–17, mother HS	0.738	0.643	0.772	0.690	0.818	0.847	0.809	0.781
Contraceptive use at 18–21, mother HS	0.758	0.769	0.835	0.817	0.785	0.861	0.788	0.851
Contraceptive use at 15–17, mother some college or BA+	0.679	0.625	0.752	0.740	0.863	0.912	0.895	0.842
Contraceptive use at 18–21, mother some college or BA+	0.836	0.765	0.826	0.856	0.871	0.900	0.845	0.886
Contraceptive use at 15–17, mother some college	—	—	0.759	0.770	0.905	0.905	0.923	0.852
Contraceptive use at 18–21, mother some college	0.812	0.791	0.803	0.869	0.844	0.897	0.883	0.887
Contraceptive use at 15–17, mother BA+	—	—	—	—	0.782	0.921	0.860	0.825
Contraceptive use at 18–21, mother BA+	0.866	0.736	0.861	0.840	0.903	0.905	0.807	0.884
Abortion								
Abortions per first pregnancy, ages 15–17	0.527	0.436	0.385	0.372	0.314	0.345	0.358	0.355
Abortions per first pregnancy, ages 18–21	0.459	0.376	0.354	0.300	0.259	0.245	0.291	0.280
Abortions per first pregnancy, ages 15–21, mother < HS	0.247	0.281	0.196	0.213	0.121	0.167	0.163	0.199

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Table E.4, continued

	Born 1962–66		Born 1976–80		Born 1992–96		1984–88 (validation)	
Moment	Data	Model	Data	Model	Data	Model	Data	Model
Abortions per first pregnancy, ages 15–21, mother HS	0.553	0.382	0.343	0.296	0.275	0.238	0.336	0.275
Abortions per first pregnancy, ages 15–21, mother some college	0.633	0.522	0.466	0.417	0.389	0.324	0.312	0.378
Abortions per first pregnancy, ages 15–21, mother BA+	0.773	0.636	0.675	0.469	0.397	0.381	0.537	0.426
Marriage								
Married by 21, dropouts	0.479	0.480	0.327	0.348	0.135	0.206	0.271	0.267
Married by 25, dropouts	0.615	0.629	0.465	0.498	—	—	0.378	0.494
Married by 29, dropouts	0.684	0.726	0.538	0.596	—	—	0.502	0.582
Married by 33, dropouts	0.744	0.779	0.576	0.685	—	—	—	—
Married by 37, dropouts	0.776	0.783	0.562	0.791	—	—	—	—
Married by 41, dropouts	0.856	0.785	—	—	—	—	—	—
Married by 21, HS graduates	0.426	0.414	0.287	0.343	0.188	0.188	0.214	0.261
Married by 25, HS graduates	0.649	0.637	0.522	0.491	0.443	0.546	0.424	0.508
Married by 29, HS graduates	0.777	0.753	0.649	0.629	—	—	0.556	0.642
Married by 33, HS graduates	0.821	0.819	0.722	0.714	—	—	0.603	0.725
Married by 37, HS graduates	0.852	0.838	0.726	0.733	—	—	—	—
Married by 41, HS graduates	0.858	0.855	0.686	0.750	—	—	—	—
Married by 25, college	0.439	0.465	0.410	0.442	0.156	0.163	0.361	0.299
Married by 29, college	0.650	0.651	0.664	0.619	—	—	0.617	0.517
Married by 33, college	0.798	0.770	0.776	0.735	—	—	0.825	0.663
Married by 37, college	0.850	0.848	0.819	0.806	—	—	—	—
Married by 41, college	0.892	0.905	0.898	0.868	—	—	—	—
Employment								
Employed at 22–25, dropouts	0.231	0.231	0.286	0.341	0.232	0.354	0.204	0.347
Employed at 26–29, dropouts	0.271	0.276	0.309	0.339	0.304	0.310	0.243	0.324
Employed at 30–33, dropouts	0.294	0.327	0.285	0.331	0.345	0.288	0.299	0.310
Employed at 34–37, dropouts	0.402	0.333	0.292	0.276	—	—	0.317	0.253
Employed at 38–41, dropouts	0.425	0.426	0.324	0.321	—	—	0.379	0.281
Employed at 42–45, dropouts	0.386	0.442	0.380	0.304	—	—	—	—
Employed at 46–49, dropouts	0.349	0.389	—	—	—	—	—	—
Employed at 50–53, dropouts	0.333	0.358	—	—	—	—	—	—
Employed at 54–57, dropouts	0.299	0.289	—	—	—	—	—	—
Employed at 58–61, dropouts	0.339	0.278	—	—	—	—	—	—
Employed at 62–65, dropouts	0.199	0.250	—	—	—	—	—	—
Employed at 22–25, HS graduates	0.548	0.575	0.517	0.499	0.457	0.498	0.447	0.487
Employed at 26–29, HS graduates	0.569	0.582	0.572	0.565	0.573	0.568	0.524	0.562
Employed at 30–33, HS graduates	0.564	0.572	0.544	0.560	0.591	0.581	0.556	0.574
Employed at 34–37, HS graduates	0.595	0.561	0.553	0.555	—	—	0.573	0.563

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Table E.4, continued

	Born 1962–66		Born 1976–80		Born 1992–96		1984–88 (validation)	
Moment	Data	Model	Data	Model	Data	Model	Data	Model
Employed at 38–41, HS graduates	0.621	0.587	0.583	0.582	—	—	0.606	0.592
Employed at 42–45, HS graduates	0.623	0.575	0.613	0.577	—	—	—	—
Employed at 46–49, HS graduates	0.589	0.568	—	—	—	—	—	—
Employed at 50–53, HS graduates	0.594	0.572	—	—	—	—	—	—
Employed at 54–57, HS graduates	0.556	0.522	—	—	—	—	—	—
Employed at 58–61, HS graduates	0.521	0.527	—	—	—	—	—	—
Employed at 62–65, HS graduates	0.453	0.534	—	—	—	—	—	—
Employed at 22–25, college	0.657	0.673	0.619	0.698	0.615	0.671	0.584	0.667
Employed at 26–29, college	0.768	0.726	0.743	0.749	0.775	0.769	0.726	0.755
Employed at 30–33, college	0.693	0.707	0.712	0.727	0.794	0.787	0.744	0.765
Employed at 34–37, college	0.654	0.657	0.696	0.682	—	—	0.735	0.737
Employed at 38–41, college	0.643	0.680	0.713	0.699	—	—	0.746	0.756
Employed at 42–45, college	0.675	0.653	0.736	0.686	—	—	—	—
Employed at 46–49, college	0.679	0.656	—	—	—	—	—	—
Employed at 50–53, college	0.707	0.678	—	—	—	—	—	—
Employed at 54–57, college	0.690	0.621	—	—	—	—	—	—
Employed at 58–61, college	0.624	0.644	—	—	—	—	—	—
Employed at 62–65, college	0.532	0.641	—	—	—	—	—	—
Employed at 22–25, childless, dropouts	0.356	0.398	0.358	0.436	0.243	0.438	0.244	0.440
Employed at 26–29, childless, dropouts	0.355	0.413	0.403	0.447	0.399	0.393	0.305	0.435
Employed at 30–33, childless, dropouts	0.347	0.424	0.323	0.424	0.401	0.377	0.299	0.405
Employed at 34–37, childless, dropouts	0.406	0.394	0.288	0.385	—	—	0.365	0.331
Employed at 38–41, childless, dropouts	0.407	0.498	0.277	0.408	—	—	0.395	0.386
Employed at 22–25, childless, HS graduates	0.647	0.671	0.558	0.565	0.464	0.542	0.471	0.533
Employed at 26–29, childless, HS graduates	0.739	0.698	0.676	0.646	0.642	0.630	0.603	0.628
Employed at 30–33, childless, HS graduates	0.700	0.699	0.612	0.645	0.658	0.657	0.631	0.649
Employed at 34–37, childless, HS graduates	0.705	0.677	0.609	0.620	—	—	0.615	0.633
Employed at 38–41, childless, HS graduates	0.682	0.699	0.598	0.652	—	—	0.633	0.665
Employed at 22–25, childless, college	0.669	0.722	0.628	0.740	0.618	0.710	0.587	0.711
Employed at 26–29, childless, college	0.842	0.804	0.802	0.813	0.802	0.822	0.769	0.817
Employed at 30–33, childless, college	0.841	0.811	0.821	0.813	0.855	0.848	0.825	0.836
Employed at 34–37, childless, college	0.836	0.777	0.789	0.782	—	—	0.807	0.815
Employed at 38–41, childless, college	0.796	0.803	0.803	0.793	—	—	0.821	0.829
Employed at 22–25, youngest child 0–1, dropouts	0.135	0.132	0.177	0.248	0.163	0.242	0.125	0.250

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Table E.4, continued

	Born 1962–66		Born 1976–80		Born 1992–96		1984–88 (validation)	
Moment	Data	Model	Data	Model	Data	Model	Data	Model
Employed at 26–29, youngest child 0–1, dropouts	0.166	0.208	0.177	0.252	0.168	0.246	0.146	0.217
Employed at 30–33, youngest child 0–1, dropouts	0.195	0.262	0.170	0.248	0.234	0.194	0.183	0.229
Employed at 34–37, youngest child 0–1, dropouts	0.224	0.237	0.141	0.187	—	—	0.148	0.154
Employed at 38–41, youngest child 0–1, dropouts	0.254	0.300	0.156	0.217	—	—	0.251	0.190
Employed at 22–25, youngest child 0–1, HS graduates	0.361	0.399	0.388	0.405	0.374	0.392	0.354	0.401
Employed at 26–29, youngest child 0–1, HS graduates	0.417	0.436	0.420	0.480	0.436	0.458	0.417	0.484
Employed at 30–33, youngest child 0–1, HS graduates	0.428	0.439	0.439	0.496	0.482	0.483	0.431	0.502
Employed at 34–37, youngest child 0–1, HS graduates	0.443	0.400	0.443	0.463	—	—	0.456	0.454
Employed at 38–41, youngest child 0–1, HS graduates	0.433	0.427	0.437	0.473	—	—	0.462	0.480
Employed at 22–25, youngest child 0–1, college	0.510	0.449	0.460	0.498	0.530	0.462	0.566	0.456
Employed at 26–29, youngest child 0–1, college	0.568	0.538	0.581	0.603	0.645	0.610	0.586	0.595
Employed at 30–33, youngest child 0–1, college	0.530	0.506	0.602	0.558	0.675	0.633	0.648	0.610
Employed at 34–37, youngest child 0–1, college	0.487	0.447	0.610	0.493	—	—	0.671	0.567
Employed at 38–41, youngest child 0–1, college	0.488	0.467	0.642	0.539	—	—	0.665	0.616
Employed at 22–25, youngest child 2–5, dropouts	0.200	0.182	0.297	0.285	0.242	0.289	0.229	0.275
Employed at 26–29, youngest child 2–5, dropouts	0.276	0.243	0.310	0.302	0.257	0.243	0.236	0.280
Employed at 30–33, youngest child 2–5, dropouts	0.270	0.294	0.258	0.286	0.338	0.250	0.311	0.261
Employed at 34–37, youngest child 2–5, dropouts	0.325	0.288	0.253	0.223	—	—	0.277	0.200
Employed at 38–41, youngest child 2–5, dropouts	0.351	0.353	0.282	0.256	—	—	0.221	0.207
Employed at 22–25, youngest child 2–5, HS graduates	0.427	0.458	0.507	0.431	0.478	0.428	0.457	0.428

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Table E.4, continued

	Born 1962–66		Born 1976–80		Born 1992–96		1984–88 (validation)	
Moment	Data	Model	Data	Model	Data	Model	Data	Model
Employed at 26–29, youngest child 2–5, HS graduates	0.459	0.505	0.533	0.525	0.489	0.517	0.472	0.514
Employed at 30–33, youngest child 2–5, HS graduates	0.485	0.491	0.497	0.514	0.516	0.518	0.496	0.524
Employed at 34–37, youngest child 2–5, HS graduates	0.485	0.472	0.489	0.510	—	—	0.506	0.510
Employed at 38–41, youngest child 2–5, HS graduates	0.464	0.483	0.489	0.517	—	—	0.521	0.525
Employed at 22–25, youngest child 2–5, college	0.520	0.506	0.625	0.552	0.608	0.491	0.560	0.501
Employed at 26–29, youngest child 2–5, college	0.553	0.585	0.622	0.641	0.671	0.647	0.622	0.652
Employed at 30–33, youngest child 2–5, college	0.544	0.569	0.610	0.634	0.694	0.697	0.635	0.688
Employed at 34–37, youngest child 2–5, college	0.513	0.514	0.636	0.577	—	—	0.684	0.639
Employed at 38–41, youngest child 2–5, college	0.509	0.533	0.635	0.579	—	—	0.689	0.650
Employed at 22–25, youngest child 6–17, dropouts	0.308	0.225	0.414	0.387	0.347	0.370	0.238	0.387
Employed at 26–29, youngest child 6–17, dropouts	0.285	0.326	0.371	0.389	0.340	0.353	0.295	0.361
Employed at 30–33, youngest child 6–17, dropouts	0.320	0.374	0.345	0.374	0.366	0.317	0.351	0.347
Employed at 34–37, youngest child 6–17, dropouts	0.452	0.350	0.347	0.282	—	—	0.370	0.273
Employed at 38–41, youngest child 6–17, dropouts	0.459	0.424	0.365	0.322	—	—	0.408	0.277
Employed at 42–45, youngest child 6–17, dropouts	0.413	0.449	0.393	0.304	—	—	—	—
Employed at 22–25, youngest child 6–17, HS graduates	0.534	0.586	0.623	0.513	0.593	0.541	0.460	0.529
Employed at 26–29, youngest child 6–17, HS graduates	0.579	0.621	0.617	0.592	0.622	0.600	0.528	0.596
Employed at 30–33, youngest child 6–17, HS graduates	0.604	0.628	0.583	0.599	0.615	0.608	0.592	0.612
Employed at 34–37, youngest child 6–17, HS graduates	0.626	0.613	0.579	0.577	—	—	0.611	0.592
Employed at 38–41, youngest child 6–17, HS graduates	0.640	0.630	0.605	0.606	—	—	0.618	0.618

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Table E.4, continued

	Born 1962–66		Born 1976–80		Born 1992–96		1984–88 (validation)	
Moment	Data	Model	Data	Model	Data	Model	Data	Model
Employed at 42–45, youngest child 6–17, HS graduates	0.619	0.612	0.608	0.591	—	—	—	—
Employed at 22–25, youngest child 6–17, college	0.584	0.669	0.705	0.688	0.735	0.646	0.555	0.613
Employed at 26–29, youngest child 6–17, college	0.677	0.744	0.711	0.766	0.720	0.746	0.685	0.761
Employed at 30–33, youngest child 6–17, college	0.778	0.742	0.710	0.746	0.730	0.775	0.737	0.777
Employed at 34–37, youngest child 6–17, college	0.703	0.692	0.723	0.710	—	—	0.731	0.759
Employed at 38–41, youngest child 6–17, college	0.647	0.722	0.712	0.733	—	—	0.750	0.785
Employed at 42–45, youngest child 6–17, college	0.652	0.691	0.736	0.718	—	—	—	—
Employed at 22–25, married, dropouts	0.242	0.145	0.237	0.174	0.214	0.138	0.171	0.148
Employed at 26–29, married, dropouts	0.289	0.224	0.240	0.213	0.234	0.164	0.177	0.186
Employed at 30–33, married, dropouts	0.311	0.282	0.249	0.229	0.232	0.175	0.272	0.204
Employed at 34–37, married, dropouts	0.390	0.286	0.258	0.214	—	—	0.270	0.187
Employed at 38–41, married, dropouts	0.392	0.380	0.300	0.276	—	—	0.347	0.236
Employed at 42–45, married, dropouts	0.389	0.391	0.342	0.274	—	—	—	—
Employed at 46–49, married, dropouts	0.342	0.330	—	—	—	—	—	—
Employed at 22–25, married, HS graduates	0.527	0.485	0.491	0.410	0.450	0.448	0.449	0.419
Employed at 26–29, married, HS graduates	0.528	0.518	0.526	0.471	0.521	0.509	0.466	0.490
Employed at 30–33, married, HS graduates	0.525	0.524	0.502	0.485	0.538	0.522	0.501	0.504
Employed at 34–37, married, HS graduates	0.543	0.526	0.512	0.497	—	—	0.527	0.504
Employed at 38–41, married, HS graduates	0.577	0.556	0.553	0.531	—	—	0.574	0.543
Employed at 42–45, married, HS graduates	0.604	0.547	0.593	0.527	—	—	—	—
Employed at 46–49, married, HS graduates	0.585	0.544	—	—	—	—	—	—
Employed at 22–25, married, college	0.700	0.604	0.644	0.616	0.679	0.667	0.587	0.639
Employed at 26–29, married, college	0.727	0.667	0.692	0.681	0.733	0.748	0.690	0.710
Employed at 30–33, married, college	0.624	0.663	0.660	0.680	0.744	0.758	0.690	0.719
Employed at 34–37, married, college	0.581	0.626	0.656	0.646	—	—	0.702	0.703
Employed at 38–41, married, college	0.577	0.660	0.673	0.678	—	—	0.724	0.736
Employed at 42–45, married, college	0.626	0.639	0.708	0.668	—	—	—	—
Employed at 46–49, married, college	0.643	0.647	—	—	—	—	—	—
Welfare claiming								
Single mothers claiming AFDC/TANF at 18–21	0.493	0.590	0.235	0.171	0.069	0.079	0.119	0.099
Single mothers claiming AFDC/TANF at 22–25	0.465	0.485	0.142	0.137	0.054	0.043	0.100	0.070

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Table E.4, continued

	Born 1962–66		Born 1976–80		Born 1992–96		1984–88 (validation)	
Moment	Data	Model	Data	Model	Data	Model	Data	Model
Single mothers claiming AFDC/TANF at 26–29	0.393	0.391	0.095	0.169	0.052	0.033	0.072	0.077
Single mothers claiming AFDC/TANF at 30–33	0.260	0.325	0.074	0.132	0.050	0.031	0.053	0.070
Validation: abortion response								
Births at 15–17 under a 25% higher minors' abortion cost (proportional change)	—	—	0.000	-0.018	—	—	—	—
Wantedness and use at conception								
First births at 14–17 reported wanted at conception	0.287	0.378	0.250	0.274	0.183	0.190	0.205	0.167
First births at 18–21 reported wanted at conception	0.476	0.335	0.434	0.326	0.374	0.388	0.409	0.310
First births at 14–17 reported wanted at conception, mother < HS	0.340	0.510	0.351	0.365	0.215	0.384	0.179	0.319
First births at 18–21 reported wanted at conception, mother < HS	0.438	0.368	0.491	0.414	0.385	0.358	0.498	0.305
First births at 14–17 reported wanted at conception, mother HS	0.273	0.295	0.257	0.297	0.190	0.112	0.253	0.082
First births at 18–21 reported wanted at conception, mother HS	0.533	0.349	0.426	0.312	0.310	0.371	0.385	0.308
First births at 14–17 reported wanted at conception, mother some college or BA+	—	—	0.102	0.119	0.143	0.071	0.161	0.096
First births at 18–21 reported wanted at conception, mother some college or BA+	0.419	0.252	0.394	0.272	0.410	0.413	0.374	0.315
First births at 14–17 reported wanted at conception, mother some college	—	—	0.105	0.089	—	—	0.051	0.053
First births at 18–21 reported wanted at conception, mother some college	—	—	0.397	0.264	0.416	0.403	0.393	0.269
First births at 18–21 reported wanted at conception, mother BA+	—	—	—	—	0.400	0.428	0.344	0.381
First births at 14–17 conceived while using a method	0.167	0.133	0.331	0.191	0.391	0.292	0.409	0.247
First births at 18–21 conceived while using a method	0.158	0.235	0.334	0.342	0.363	0.344	0.338	0.381
First births at 14–17 conceived while using a method, mother < HS	0.142	0.144	0.251	0.202	0.235	0.241	0.376	0.243
First births at 18–21 conceived while using a method, mother < HS	0.098	0.242	0.153	0.322	0.368	0.349	0.335	0.385

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Table E.4, continued

	Born 1962–66		Born 1976–80		Born 1992–96		1984–88 (validation)	
Moment	Data	Model	Data	Model	Data	Model	Data	Model
First births at 14–17 conceived while using a method, mother HS	0.126	0.128	0.347	0.188	0.501	0.293	0.343	0.246
First births at 18–21 conceived while using a method, mother HS	0.199	0.238	0.399	0.354	0.389	0.325	0.298	0.370
First births at 14–17 conceived while using a method, mother some college or BA+	—	—	0.404	0.182	0.474	0.348	0.542	0.253
First births at 18–21 conceived while using a method, mother some college or BA+	0.215	0.217	0.434	0.344	0.346	0.355	0.378	0.388
First births at 14–17 conceived while using a method, mother some college	—	—	0.387	0.216	—	—	0.608	0.287
First births at 18–21 conceived while using a method, mother some college	—	—	0.412	0.369	0.302	0.372	0.458	0.399
First births at 18–21 conceived while using a method, mother BA+	—	—	—	—	0.409	0.333	0.268	0.372

Notes: Targeted moments of each estimation cohort and their simulated counterparts at the pooled estimates; the validation cohort (born 1984–88) is not targeted and its model column borrows the estimated cohort-specific parameters interpolated between the peak and decline cohorts. Schooling is final schooling; first births are stocks by the stated age (the two highest groups of mother's education pooled where cells are thin); contraceptive use is among sexually active women with no prior birth; employment is by current education. — marks a cell the cohort does not reach or that has fewer than 30 observations. Preliminary estimates, October 2026.

F Wage Process Estimation

The earnings opportunities that enter the model are measured outside the model in two parts. The returns to experience and the family-background premia require a panel, and come from equations estimated on the NLSY79 (used for the baseline cohort) and the NLSY97 (used for the later cohorts). The level and age profile of earnings by education are cohort-specific and come from the CPS, which observes every cohort.

The regression coefficients of this appendix (α, β, γ, δ, ρ, κ, λ, ζ with subscripts) are local to it and unrelated to the model's parameters of the same letters.

Samples and measures. The dependent variable is the log of real annual wage-and-salary income (2016 dollars), the Mincer form of Keane and Wolpin (2010), Eckstein et al. (2019) and Adda et al. (2017), with returns to experience that differ by education as in Blundell et al. (2016). The women's samples include woman-years meeting the employment definition in Appendix A. The husbands' samples are married women with a spouse present and positive spouse earnings; husbands' earnings are indexed by the woman's education to capture assortative mating.

Cohort levels and age profiles (CPS). For each cohort g and education group e, let $\widehat{W}_g^{\mathrm{CPS}}(e,a)$ be the fitted value of a weighted quadratic in age for the log median wage income of employed women aged a in the CPS, estimated on the cells with at least 30 workers and weighted by cell size (medians rather than means keep the thin dropout cells of the young cohorts from driving the level). The NLSY log-earnings equation (2) without its age terms, $\widehat{g}^{\mathrm{NLSY}}(M,e,x)$, carries the return to experience and the family-background premia. Women's earnings in the model are

$$\begin{aligned} \ln w_g(M,e,x,a) &= \widehat{g}^{\mathrm{NLSY}}(M,e,x) + \delta_g(e,a), \\ \delta_g(e,a) &= \ln \widehat{W}_g^{\mathrm{CPS}}(e,a) - \ln \sum_M \pi_g(M)\, \exp \widehat{g}^{\mathrm{NLSY}}\big(M,e,\bar{x}_g(e,a)\big), \end{aligned} \tag{1}$$

where $\bar{x}_g(e,a)$ is the experience of a typical employed woman of the cohort, education and age: the cumulative CPS employment rate of the group from age 16 to $a-1$, capped at

the model's twenty years. The offset δ_g makes the average woman of the cohort, over family background, with typical experience earn the CPS median at every age; the NLSY equation sets how earnings differ, proportionally, by experience and family background around it. Husbands' earnings are the NLSY husband equation (3) multiplied, by the wife's education and age, by the ratio of the fitted CPS median earnings of the husbands of married women of the cohort to the equation's prediction for a woman who married before her first birth. Beyond the last age at which a cohort is observed in the CPS (63 for the baseline, 49 at the peak, 41 for the validation and 33 for the decline cohort) the CPS profile follows the baseline cohort's fitted profile from the cohort's own level at that age, the convention of Section 5 of the paper; the baseline's own profile is held flat after 63. The NLSY age quadratic, estimated on panels observed to their mid-fifties, is not used: it peaks at 23 and would put the earnings of a high-school graduate without experience at zero by 55, while the CPS medians of the same cohort rise from 30 to 60. Table E.1 reports the CPS medians at age 30.

Experience and family background (NLSY). On the NLSY79 I estimate

$$\begin{aligned}\ln w_{it} = {} & \alpha_t + \beta_1 \mathrm{Age}_{it}^f + \beta_2 (\mathrm{Age}_{it}^f)^2 + \rho_1 \,\mathrm{CumExp}_{it} + \rho_2 \,\mathrm{CumExp}_{it}^2 \\ & + \sum_{e \in \{\mathrm{HSG},\mathrm{COL}\}} \big(\gamma_e + \delta_e \,\mathrm{CumExp}_{it}\big) \mathbf{1}\{\mathrm{Educ}_i^f = e\} \\ & + \sum_{q=2}^{4} \big(\gamma_q + \delta_q \,\mathrm{CumExp}_{it}\big) \mathbf{1}\{\mathrm{MomEd}_i = q\} \\ & + \sum_{e \in \{\mathrm{HSG},\mathrm{COL}\}} \sum_{q=2}^{4} \big(\gamma_{eq} + \delta_{eq} \,\mathrm{CumExp}_{it}\big) \mathbf{1}\{\mathrm{Educ}_i^f = e\} \mathbf{1}\{\mathrm{MomEd}_i = q\} + \varepsilon_{it},\end{aligned} \tag{2}$$

with calendar-year fixed effects α_t, where MomEd_i is the woman's mother's education. The equation is estimated on the NLSY79 women of the teen sample, weighted; the return to experience is quadratic, and the CumExp × Educ × MomEd interactions let it vary across education and family background. The same equation, without the age terms, is estimated on the NLSY97 women, whose panel is too young to identify an age profile. The baseline cohort uses the NLSY79 experience and family-background coefficients and the later cohorts

the NLSY97 ones; the age profile of either equation is replaced by the cohort's CPS profile through (1).

Husbands (NLSY). The premium for marrying before the first birth is estimated on the NLSY husbands,

$$\begin{aligned}\ln w_{it}^{m} = {} & \alpha_t^m + \zeta_{\text{HSG}}^m \mathbf{1}\{\text{Educ}_i^f = \text{HSG}\} + \zeta_{\text{COL}}^m \mathbf{1}\{\text{Educ}_i^f = \text{COL}\} \\ & + \beta_1^m \text{Age}_{it}^m + \beta_2^m (\text{Age}_{it}^m)^2 \\ & + \sum_{e \in \{\text{HSG,COL}\}} \left(\beta_{1e}^m \text{Age}_{it}^m + \beta_{2e}^m (\text{Age}_{it}^m)^2\right) \mathbf{1}\{\text{Educ}_i^f = e\} \\ & + \lambda^m \mathbf{1}\{\text{MarryBeforeBirth}_i = 1\} \\ & + \sum_{e \in \{\text{HSG,COL}\}} \kappa_e^m \, \mathbf{1}\{\text{Educ}_i^f = e\} \mathbf{1}\{\text{MarryBeforeBirth}_i = 1\} + u_{it},\end{aligned} \tag{3}$$

in logs, with year fixed effects and an indicator for marrying before first birth, estimated on each NLSY cohort; conditioning the husband's earnings on the wife's characteristics follows Van der Klaauw (1996) and Sheran (2007). Because of this premium the model tracks whether a married woman had a child before marrying (Section 4.5 of the paper): on the NLSY79, the husbands of high-school and college graduates who married before their first birth earn about 23 and 28 log points more a year than those of women who married after a birth.

G Decomposition: Method and Additional Results

G.1 The Shapley decomposition

Let N be the set of the $n = 10$ blocks of Table 3 of the paper and $v(S)$ the simulated outcome when the blocks in $S \subseteq N$ take the later cohort's values and the others the earlier cohort's, with the same simulated women and random draws in every economy. The contribution of

block i is its Shapley value,

$$\varphi_i = \sum_{S \subseteq N \setminus \{i\}} \frac{|S|!\,(n - |S| - 1)!}{n!} \big[v(S \cup \{i\}) - v(S)\big],$$

the marginal effect of switching block i, averaged over all $n!$ orders in which the blocks can be switched. The contributions add up to the total change, $\sum_i \varphi_i = v(N) - v(\varnothing)$, and do not depend on the order of the switches, the property for which Shorrocks (2013) proposes them as the path-independent solution to sequential decompositions; Fortin et al. (2011) discuss the same problem in decompositions of differences between groups. Recent applications to counterfactuals of structural models include Paz-Pardo (2024), Kwon et al. (2024) and Audoly et al. (2025). Computing all φ_i requires the $2^n = 1{,}024$ economies of each phase.

Two properties matter for reading the results. The interaction between two blocks is split equally between them, so a block's contribution includes half of each of its interactions with the others. The contributions also depend on how parameters are grouped into blocks (Sastre and Trannoy, 2002); each block therefore collects the parameters of one mechanism rather than one parameter. A sequential accounting in a fixed order, the approach of Eckstein et al. (2019), attributes each interaction entirely to the block switched later; a one-at-a-time accounting attributes it to neither, so its contributions need not add up to the total.

G.2 One-at-a-time and sequential accountings

Table G.1 reports the one-at-a-time accounting of both phases: each block is moved alone from the earlier to the later cohort's parameters, with the other nine at the earlier cohort's values. The gap between these contributions and the Shapley values of Table 7 of the paper is the interaction the Shapley value averages over. In the decline phase the two measured fertility-control blocks, exposure and efficacy, account for two-thirds of the fall in first births by 17 (-3.4 of -5.2 percentage points), and the improvement in family background for 0.6 of a point; in the rise phase exposure and the cost of contraception push first births by 17 up by 1.9 points, while family background, the child penalty and the safety net push them down by 1.5, so the net rise of 1.1 points hides offsetting forces, as the between- and within-group changes do in the data (Table 2 of the paper).

Table G.1. One-at-a-Time Cohort Accounting, Both Phases

	Births 15–19		FB by 17		FB by 21		College	
	Rise	Decline	Rise	Decline	Rise	Decline	Rise	Decline
Women's labor market	0.0	-2.3	0.0	-0.9	+0.4	-2.3	-0.7	+6.7
Schooling costs and support	+0.7	-1.6	0.0	-0.5	+1.1	-1.4	-2.5	+5.5
Cost of contraception	+1.1	-2.9	+0.3	-0.7	+0.8	-2.3	-0.3	+0.6
Efficacy of contraception	+0.5	-2.3	+0.1	-0.6	+0.6	-2.9	-0.2	+0.7
Exposure	+2.7	-4.2	+1.6	-2.8	+1.1	-1.7	-0.7	+1.0
Marriage market	+0.5	-0.4	+0.1	-0.2	+0.5	-0.1	-0.1	+2.0
Safety net	-0.7	-0.2	-0.4	-0.1	-0.3	-0.2	+0.6	-0.1
Child penalty	-0.2	-0.6	-0.3	-0.2	+0.4	-0.7	+1.3	+0.6
Family background (composition)	-2.6	-1.8	-0.8	-0.6	-2.6	-1.5	+4.9	+2.6
Cost of abortion	+0.3	+0.1	+0.1	0.0	-0.5	-0.3	+0.2	+0.1
Total change, model	+2.0	-12.9	+1.1	-5.2	+0.6	-11.6	+0.9	+18.9

Notes: Each entry is the change in the outcome when the block named is switched alone from the earlier cohort's values to the later cohort's. Births per 100 women over ages 15–19; the other outcomes in percentage points.

Table G.2. The Model's Causal Effect of a Birth Before 18

	Born 1962–66		Born 1976–80		Born 1992–96	
	Miscarriage	Effect	Miscarriage	Effect	Miscarriage	Effect
High-school diploma	0.619	-0.161	0.675	-0.139	0.817	-0.122
College attendance	0.370	-0.204	0.390	-0.229	0.604	-0.294
Bachelor's degree	0.105	-0.099	0.132	-0.120	0.216	-0.188
Employed, 20–24	0.421	-0.139	0.416	-0.056	0.399	-0.014
Employed, 25–29	0.430	-0.095	0.465	-0.063	0.488	-0.047
Employed, 30–34	0.469	-0.047	0.495	-0.046	0.556	-0.080
Cash welfare, 18–24	0.180	+0.250	0.059	+0.096	0.031	+0.070
Cash welfare, 25–29	0.149	+0.054	0.080	+0.029	0.014	+0.024
Married by 25	0.557	+0.034	0.430	+0.058	0.399	+0.094
Children ever born by 35	2.44	+0.47	2.45	+0.43	2.23	+0.57
Women with a first birth at 15–17	770		882		361	

Notes: Women whose first birth follows a conception at 14–16 (a birth at 15–17). "Miscarriage": the same simulated women, with the same draws, when that pregnancy ends in a miscarriage; later pregnancies proceed normally. "Effect": outcome with the birth minus outcome with the miscarriage, averaged over these women. Employment and cash welfare are shares of years in the age band.



Lines: model; hollow markers: data (employment: CPS ASEC, current education; marriage: NSFG, by age shown).

Figure G.1. Employment and Marriage by Age and Education: Data and Model

Notes: Employment: CPS ASEC, women by current education (worked 26 or more weeks, more than 20 hours a week and earned at least $10,500 of 2016), four-year age bins. Ever married: NSFG, by final education. Markers: data; lines: model. Lines beyond a cohort's last observed age are model forecasts and are not targeted.

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