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The Consequences of Teenage Childbearing before Roe v. Wade†

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Using five cycles of the National Survey of Family Growth, we estimate the effect of teen motherhood on education, labor market, and marriage outcomes for teens conceiving from 1940 through 1968. Effects vary by marital status at conception, socioeconomic background, and year. Effects on teens married at conception were limited. However, teen mothers conceiving premaritally obtained less education and had a weaker marriage market. Teen mothers of the 1940s–1950s, affected by subsequent economic and social changes, were disadvantaged in the labor market of the 1970s. In the 1960s, teens for whom motherhood would be costly increasingly avoided pregnancy. (*JEL* I21, J13, J16, J23, J24, N32)

There is a growing consensus among economists that teen motherhood has a small, possibly zero, causal impact on the mother's outcomes.[1] But the supporting evidence comes almost entirely from a period when teen conceptions and childbearing were nonmarital, abortion was legal, and effective contraception readily available. Teens who anticipate that motherhood would have significant adverse consequences can avoid pregnancy even if they engage in sex, and, if they become pregnant, can terminate the pregnancy. It would not be surprising if the teens who give birth are those who anticipate that motherhood will not adversely affect their lives.

We study the consequences of teen motherhood for the mother from the 1940s through the late 1960s, a period that has received much less attention.[2] This is a particularly interesting period over which to study teen motherhood. First, unlike today, many teen conceptions during this period were marital, though this proportion decreased over time. Second, limited access to abortion and contraception may

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[1]For example, deriving consistent estimates of the effect of teen motherhood when abortion is available, Ashcraft, Fernández-Val, and Lang (2013) find modest, generally statistically insignificant effects on adult outcomes. The classic reference is Geronimus and Korenman (1992).

[2]Bailey (2013) examines changes in individuals' legal and financial access to contraception (though not abortion), and finds suggestive evidence of long-run consequences for the individuals' children.

have changed who gave birth as a teenager. If the effect of teen motherhood varies by family background, the types of teens who gave birth in our period may have been affected differently from those who get pregnant today. Third, it enables us to study how women made important investment decisions amidst the changing economic and social landscape of the 1940s to 1960s. We can analyze the long-term consequences of those investment decisions when the economic role of women changed dramatically, which few teens in the 1940s and 1950s could have expected.

We draw on five cycles of the National Survey of Family Growth (1973, 1976, 1982, 1988, and 1995) to study adult outcomes among women who conceived as teenagers (before turning 18) from 1940 through 1968. The last three of these surveys are the earliest data of which we are aware on pregnancy outcomes for a representative sample of teens. We argue below that, while not fully representative, the two early surveys depart only modestly from this standard.

We follow a standard approach in the recent literature, limiting our sample to women who first conceived as teens. We compare those whose first conception ended in a live birth with those for whom it ended in a miscarriage.[3] Ashcraft and Lang (2006) show pregnant teenagers who have abortions tend to be drawn from more favored backgrounds than those who do not. Consequently, they show that if abortion is common, this approach overestimates the true costs of teen motherhood since miscarriages preempt some abortions. We provide evidence that abortion was rare for our sample and therefore that the bias from abortions is small. Consequently, comparing women who gave birth to those who miscarried as teens provides us with (nearly) unbiased estimates of the effects of teen motherhood on adult outcomes.

We find that the effects of teen motherhood vary by marital status at the time of conception, socioeconomic background, and time period. For teens who were married at the time of conception, teen motherhood had limited effects on labor market investments and outcomes, although there is some evidence of variation by socioeconomic background. The most striking effect is a reduction in the probability of remarrying conditional on the first marriage ending.

In contrast, teen mothers who conceived premaritally were more likely to drop out of school and marry earlier than those who miscarried; they also were more likely to have never married. If they did marry, teen mothers were more likely to still be in their first marriage. These results suggest that a birth weakened the mother's position in the marriage market. The significant effects of motherhood for teens conceiving premaritally sharply contrast with the modest and statistically insignificant effects for teen mothers in more recent years (Ashcraft, Fernández-Val, and Lang 2013; Geronimus and Korenman 1992). We provide some evidence that the cost of premarital conceptions was particularly high if they culminated in a nonmarital birth. This result contrasts sharply with studies of more recent teen births, which are almost all nonmarital. In addition, among premarital conceptions, the education effects are particularly pronounced among advantaged teens, while marriage effects were more notable among disadvantaged teens.

[3] We use nontechnical language. We refer to spontaneous abortions as miscarriages and induced abortions as abortions.

We also find that those giving birth early in the period experienced more adverse effects. We conjecture that women who gave birth as teens in the early part of our period were not expecting the economic and social changes of the 1960s and 1970s. Dropping out of school in the 1950s may not have seemed costly for a teen who planned to marry. However, by the time of our surveys in the 1970s, 1980s, and 1990s, divorce was much more common, female labor force attachment had intensified, and the market for high school dropouts had deteriorated. Teen mothers who dropped out of school in the 1950s had spent 20 years out of the labor force and were at a disadvantage in the labor and marriage market of the 1970s and later.

While teens in the 1940s and 1950s may not have anticipated the changes of the 1960s, these changes were arguably much more apparent to the teens in the later part of our sample. We speculate that this affected who became pregnant, and as a result, our estimates of the costs of teen motherhood. The percent of premarital conceptions to white teens fell by an average of 1.3 percentage points per year from 1960 to 1968 (statistically significantly). In addition, pregnant teens were increasingly drawn from those who were less likely to graduate high school in the absence of a birth. Specifically, among teens who conceived premaritally and miscarried, the probability of completing twelfth grade fell by an average of 1.2 percentage points per year from 1960 to 1968 (although the sample size is small and the estimate statistically insignificant). As educational and labor market opportunities for women grew, along with the divorce rate, advantaged teens may have abstained from sex or used more effective contraception even though the pill was not readily available.[4]

In some ways our conclusions for the period we study resemble those of studies using more recent data: teens for whom motherhood would be costly take steps to mitigate these costs. With limited access to abortion and contraception, teens in the 1940s through 1960s mitigated costs of motherhood through marriage. Most notably, teens married before pregnancy but may have also extracted a promise of marriage in the event of pregnancy. Strikingly, from 1950 through 1964, nearly 80 percent of teen pregnancy outcomes occurred following marriage (even though many conceptions had not). Despite these marriages, we still find significant effects of teen motherhood on adult outcomes. We argue that as divorce became more common and labor market opportunities for women increased, marriage no longer insulated women from the cost of their foregone investments due to a teen birth.

We find that teen births were especially costly for those who conceived premaritally. We cannot determine quasi-experimentally whether premarital conceptions were especially costly because they were, by definition, more likely to lead to nonmarital births. However, our nonexperimental results show that shotgun marriages were associated with better adult outcomes than were nonmarital births. This suggests that teens who gave birth nonmaritally suffered notable adverse consequences. These results contrast sharply with the relatively benign effects of teen

[4] Goldin and Katz (2002) find a negligible fraction of college graduate women (with no births before age 23) who first used the pill in the years preceding 1968, when they were less than 18 years old. They find that zero percent of college graduate women born in 1945 (and not married by age 22) received their first family planning services before the age of 18. For women born in 1950, that percentage had increased slightly to around 5 percent. Bailey (2006) finds very small changes in the first birth rates of mothers aged 15 to 17 over the course of the 1960s.

motherhood found in more recent studies, in which virtually all teen births are nonmarital.

I. Teen Motherhood in a Changing Landscape for Women

In order to interpret our results, it is necessary to understand the environment facing teens in our sample period. In this section, we discuss marital trends among teens, the availability of abortion and contraception, educational and labor market opportunities for women, and the prevalence of adoptions.

A. *Marriages, with and without Shotguns*

While today teen motherhood is nearly always nonmarital, teen marriages were much more prevalent during the period we study. Median age at first marriage for women was 21.5 in 1940, fell to between 20.3 and 20.5 during the first two post-war decades, before starting to rise in the mid-1960s and reaching 20.8 by 1968. Thereafter it rose steadily, reaching 22.1 in 1980 and 26.6 in 2013 (US Census Bureau 2013). In 1960, one-fourth of 18-year-old women were married, but this figure had fallen to one-sixth by 1968–1970 (United States Bureau of the Census 1971). Today the figures are not even reported separately for 18-year-olds. Only 2.5 percent of 18- and 19-year-old women are married.

The minimum age at which women could marry with parental or court permission increased over our sample period.[5] As of 1940, the unweighted mean minimum age for 40 states was 14.95 (Dahl 2005). Half the states had a minimum age of 16 but 4 had a minimum age of 12 and one of 13. By 1969, the mean had risen to 15.66, with two states establishing minimum ages above 16 and none permitting marriage even with parental consent at age 12. In line with changing social attitudes, in 1970, the Commissioners on Uniform State Laws proposed a Uniform Marriage and Divorce Act that would permit individuals to marry without parental permission at age 18 and with either parental or court permission at age 16. Those seeking to marry before 16 would require *both* parental and court permission (Minnesota Law Review 1972).

Not only was teen marriage more prevalent from 1940 through 1968, but most teens were married at the time of the pregnancy outcome (birth or miscarriage). Before 1950, this percentage was approximately 73 percent in our data, rising to 77 percent in 1950–1954 and remaining roughly constant for 1955–1959 and 1960–1964. This percentage fell to 61 percent for the period from 1965–1968.[6]

[5] Dahl (2005) suggests that this was a more important factor in determining age at marriage than the minimum age at which women could marry without parental consent.

[6] The high rate of marital births among teens is consistent with data from the National Vital Statistics System, as shown in Ventura and Bachrach (2000). They show that in 1940, 13.5 percent of teens age 15–19 giving birth were unmarried. By 1955, this proportion had risen only slightly to 14.2 percent. Not surprisingly, their data show that nonmarital childbearing rates declined with age among teens, standing at 43 percent, 26 percent, 18 percent, and 12 percent for 15-, 16-, 17-, and 18-year-old mothers in 1955, the first year for which data is available by one-year age group. By 1968, the last year in our study, these figures had climbed to 62 percent, 45 percent, 35 percent, and 26 percent. To put these numbers in perspective, by 1980, the corresponding figures were 79 percent, 66 percent, 55 percent, and 45 percent, and in 2012 approximately 90 percent for 15–19-year-olds as a group (Martin et al. 2013).

Of course, pregnancy outcomes can be postmarital either because the child was conceived postmaritally or because the teen marries between conception and the outcome. Before 1950, 52 percent of the conceptions in our sample occurred after marriage, and this percentage stayed at 50 percent for 1950–1954. For 1955–1959 this percentage fell to 41 percent, for 1960–1964 it fell to 38 percent, and for 1965–1968 it fell to 23.5 percent.[7]

In our data the percentage of marital pregnancy outcomes remained constant through 1964, despite a declining proportion of marital conceptions. This is explained by a greater proportion of premarital conceptions leading to a preoutcome marriage. Before 1950, approximately 44 percent of premarital conceptions in our sample led to a preoutcome marriage. This increased to 55 percent for 1950–1954 and to over 60 percent for 1955–1959 and 1960–1964. This percentage fell to 49 percent for 1965–1968, which likely explains the decline in the percentage of marital pregnancy outcomes in this period.[8]

Trends in the timing of conception and marriage are potentially important for understanding the costs of teen motherhood. Shotgun marriages suggest that educational and labor market investments may have been altered in response to an upcoming birth. This may create significant differences in investments between those who give birth and those who miscarry. In contrast, teens who conceived while married are likely to have determined their investments at the time of marriage. For these teens, we would expect fewer differences in labor market outcomes between those giving birth and those miscarrying. To allow for these differential effects, we separate our results by whether the conception was premarital.

B. *Abortion and Contraception*

Access to abortion was very limited until shortly before the 1973 Roe v. Wade decision legalizing abortion throughout the United States. Before 1969, legal abortion was available in only two states and then only under fairly restrictive conditions. According to data compiled by Johnston (2013), reported abortions grew from 1,028 in 1966 to 2,061 in 1967, to 6,211 in 1968, to 27,512 in 1969, and 193,491 in 1970, leading us to end our analysis in 1968.[9]

Nevertheless, women did have legal and illegal abortions before 1969. By its nature, the incidence of illegal abortion is difficult to estimate. Wiehl (1938) reviewed the available evidence and concluded that among married white women in the general population, a reasonable estimate was that 4–5 percent of pregnancies

[7] The percentage of postmarital conceptions in our sample is fairly consistent with estimates from the Current Population Surveys (CPS) (Bachu 1999). Using the CPS, in the 1940s roughly 70 percent of births to 15–19-year-old women were estimated to be postmaritally conceived. This fell to 43 percent for 1965–1969. The somewhat higher estimates relative to those from our sample probably reflect the younger age cutoff we use.

[8] These trends are consistent with estimates from the CPS, which show that the proportion of premarital conceptions resulting in postmarital births increased until the mid-1960s. In 1960–1964, almost six-tenths of premarital conceptions were followed by a marriage prior to birth (Bachu 1999).

[9] Before Roe v. Wade, "therapeutic abortions" were generally performed if psychiatrists believed that the mother would commit suicide if the abortion was not performed. Interpretation of this law was inconsistently applied, with the legal therapeutic abortion rate higher on private services than on ward services (Calderone 1960). Calderone quotes a participant at a conference of the American Public Health Association as saying that the difference between an illegal abortion and a legal therapeutic abortion was "$300 and knowing the right person" (Calderone 1960).

ended in illegal abortion. Much less is known about the rate among the nonwhite population. The Indianapolis study of married couples (Whelpton and Kiser 1948) found an overall abortion rate of 3.1 percent of which roughly 70 percent were illegal. However only 0.4 percent of first pregnancies in the Whelpton and Kiser study ended in illegal abortions and 1.0 percent in therapeutic abortions.[10]

In our data about 1.1 percent of first teen pregnancies were terminated by an induced abortion. This may be downward biased if respondents in the 1973 and 1976 cycles were less likely to report illegal abortions, since they had only recently been legalized. Furthermore, the 1973 and 1976 cycles exclude childless never married women, who may have been more likely to have aborted a pregnancy. If we limit ourselves to first teen pregnancies in our sample period that were reported in the 1982, 1988, and 1995 cycles of the NSFG, and thus avoid these potential downward biases, the estimate is about 1.7 percent. Ashcraft, Fernández-Val, and Lang (2013) estimate that roughly 75 percent of legal abortions are reported in cycle V of the NSFG for a closely related sample. So a plausible estimate of the frequency of abortion among teens during our period is in the range of 1.5 percent to 3 percent, similar to estimates from the literature. We show below that this rate is sufficiently small to mitigate concerns about bias.

The FDA first approved the pill in 1957 and its use for contraception in 1960. Before this period, contraception was less convenient and effective for all couples. Even in the 1960s, unmarried teens had limited access to effective contraception. Only in 1972, did *Eisenstadt v. Baird* guarantee unmarried *adults* legal access to contraception. Not until 1977 did *Carey v. Population Services International* strike down a New York State law prohibiting the sale or distribution of contraceptives to individuals less than 16 years old and permitting the sale of contraceptives only by pharmacists.[11] While other forms of contraception, notably condoms, were widely available, before 1969 only nine states allowed unmarried, childless women under the age of 18 to obtain the pill legally without parental consent (Guldi 2008). Such laws were followed closely because the pill required a prescription from a licensed physician and sale by a licensed pharmacist, and violation of the laws was subject to significant penalties (Bailey 2006).

C. *Women, Education, and the Labor Market*

The most immediate effect of pregnancy during our period may have been to make the teen leave school. Before Title IX of the 1972 Educational Amendments, pregnant teens could be expelled from school or required to enter a special program. However, if dropping out of school did not seem costly, pregnant teens may have left voluntarily.

While school enrollment among 14- and 15-year-old girls was nearly universal at the beginning of our period (93 percent in 1947) and increased over the next two

[10] It is not obvious whether abortions should be more or less common among the teens experiencing their first pregnancy than among married couples. On the one hand, teens may have had less access to abortion. On the other hand, by definition, they were less likely to be married. Still, 38 percent of the teens in our sample were married at the time of conception and approximately 72 percent were married at the time of the outcome.

[11] See Maradiegue (2003) for more detail.

decades, attendance among 16- and 17-year-olds was much less universal. In 1947 only two-thirds of girls in this age group were enrolled in school although by 1968 this figure had reached 89 percent (United States Bureau of the Census 2013, "Table A-2"). These figures are not substantially different from those for men. Consistent with the enrollment data, high school graduation was much lower, especially at the beginning of our period. High school graduates as a proportion of 17-year-olds in the population stood at 51 percent in 1940, and 77 percent in 1968 (National Center for Education Statistics 1993). Female college enrollment began catching up to that of males in the 1950s and 1960s, but the most dramatic catch-up would not begin until the 1970s (Goldin, Katz, and Kuziemko 2006).

Perhaps more importantly, most women who graduated from high school did not invest in training for careers but instead took jobs with less attachment to the labor force (Goldin, Katz, and Kuziemko 2006). In 1950, the labor force participation rate of married women 35–44 was only 25 percent. By 1970, shortly after the end of our period, it was 46 percent (Goldin 2006). This contrasts with participation rates of over 60 percent in the 1980s when many of the teens in previous studies would have experienced pregnancy. Most strikingly, in 1948, only 17 percent of married mothers were in the labor force (Cohany and Sok 2007). Since most women, especially those anticipating marriage and children, could expect to be employed in jobs (not careers) that required lower levels of human capital investment, foregone education was likely to be perceived as less costly in this period.

However, those same teens may have found it had become very costly in the 1970s and afterwards, when more married women were working and there was a growing need for females to be financially independent, given the doubling of the divorce rate from the mid-1960s to mid-1970s (Stevenson and Wolfers 2007). Teens in the late 1960s may have already begun to realize the costs of not investing in education. This may have changed who got pregnant as a teen, or changed the investment responses for those who gave birth.

D. *Adoptions*

If teen mothers who place their child for adoption do not report the pregnancy, and these mothers are nonrandomly selected, then this could bias the results. In this section, we explain why such bias is likely minimal in our sample.

Data on adoptions during our sample period are very incomplete.[12] The National Survey of Family Growth is the best source for information on adoption because of its rich individual-level data (Chandra et al. 1999), and yet it is still woefully inadequate.

We calculate the percentage of teen births in our sample that were placed for adoption (with observations weighted by the sampling weights of the survey),

[12] While the federal government collected these data starting in 1944, this collection relied upon voluntary contribution of the states. The number of states reporting in the earlier part of this sample was particularly low, though reporting was complete for a few years in the 1960s. The data show a general increasing trend in the number of adoptions (Maza 1984).

conditional on the adoption variable not being missing:[13] 2 percent (1973), 2 percent (1976), 3 percent (1982), 3 percent (1988), and 0 percent (1995). Details of the construction of the adoption variable are in the data Appendix.

These estimates imply that the proportion of children who were placed for adoption was small and probably ignorable. However, there is reason for caution. It is difficult to know what proportion of missing answers are due to unreported adoptions. Some other living arrangements may be de facto adoptions. Finally, in the first two surveys we are missing women who were never married and not living with their own children. This is a group that is likely to have a higher rate of children placed for adoption.

II. Data

We use cycles I (1973), II (1976), III (1982), IV (1988), and V (1995) of the National Survey of Family Growth (NSFG), a survey of noninstitutionalized women aged 15–44, administered by the National Center for Health Statistics, an agency of the United States Department of Health and Human Services. Personal interviews were used to collect data on pregnancy history; family planning; and many social, economic, and demographic characteristics. Following Ashcraft, Fernández-Val, and Lang (2013), we define teen pregnancies as first conceptions occurring before age 18. The 1973 and 1976 cycles were limited to married women, previously married women, or women who were never married but living with their own children. These earlier cycles therefore do not include never married women whose pregnancies all ended in miscarriage, or who were not living with their own children. In the three later cycles there are only 21 women who became pregnant as a teenager, never married, and were not living with one of their own children. We also show in Appendix Table 1 that limiting the later samples in this way does not change the results. Because a greater proportion of pregnant teens were already married in the earlier period, and because there was pressure to marry following pregnancy, we are confident that there is very little bias from the sample restriction.

As we extend the sample to later pregnancies, we risk both more bias due to the rising abortion rate and including years where the growing availability of abortion and the pill changed who gave birth as a teen. Our analysis of state abortion laws and abortion rates in the previous section showed a dramatic increase in the availability of abortion in 1969. Accordingly, we restrict the sample to women who first conceived before 1969.

As the survey year increases, there are fewer women who could have become pregnant as a teen before 1969. Therefore, more than 75 percent of our sample comes from cycles I and II. We define "miscarriages" as any pregnancy reported to have resulted in a miscarriage or a stillbirth within the first 22 weeks or five months of pregnancy. Thus, we exclude reported miscarriages if the pregnancy lasted more than five months. We include the one pregnancy reported to end in a stillbirth at

[13] The number of respondents with missing values for the adoption variable is not large in most surveys (between 5 and 6 percent in 1976 and 1982, and 0 percent in 1988 and 1995). In 1973, the variable is missing for 68 percent of respondents, though those with missing values include women who responded that the child was living in her household.

five months.[14] Twenty weeks is a more standard cutoff for distinguishing between miscarriage and other forms of fetal death, but respondents often report pregnancy duration in months. Moreover, as the Supreme Court noted in Roe v. Wade, at that time viability before 28 weeks was rare and the Court felt it safe to declare that a fetus was not viable before 24 weeks. Extending the definition of miscarriage to the 22 stillbirths reported at 6 months might be problematic since a live birth is also reported at 6 months.[15] Our sample consists of 4,520 first pregnancies that result in birth and 293 in miscarriage. We drop 31 that end in an abortion.[16]

Miscarriages are likely to be underreported. Many miscarriages occur very early in pregnancy and are often asymptomatic (Pandya et al. 1996). Moreover, since this paper uses recall data, women may forget miscarriages that happened long ago. Lang and Nuevo (2012) find no evidence that the reported miscarriage rate in a given year is higher in more recent cycles of the NSFG, for either all miscarriages or just for early miscarriages. We confirm below that the miscarriage rate for a given year is independent of survey year.

Nonreporting of miscarriages, because the woman was never aware of being pregnant, has forgotten the miscarriage, or simply chooses not to report it, will be problematic only if the tendency to recognize and report a miscarriage is related to future outcomes. Below we will confirm that reported miscarriage is only weakly related to measured background characteristics in our data.

We focus on 10 outcome variables: years of educational attainment, an indicator for at least 12 years of education, age at first marriage, still in first marriage conditional on marrying, ever remarried conditional on first marriage ending, never married, total number of live births, working, log family income and family income relative to the poverty line. However, the income data are somewhat problematic because they are reported in intervals. We impute income using these intervals as described in the online data Appendix. Observations are weighted by the sampling weights of the survey, normalized so that the weighted sample equals the actual sample size for each survey.

III. Empirical Strategy

If reported miscarriages are random with respect to adult outcomes, there are no abortions, and miscarriage does not directly affect adult outcomes, comparing mean outcomes for women who gave birth with those who miscarried provides an

[14] Starting in the 1982 cycle, women who do not remember the number of weeks at which the miscarriage or stillbirth occurred are asked for the month or trimester in which this outcome occurred. We treat miscarriages or stillbirths reported to have occurred in the first and second trimesters as "miscarriages." Of the women who reported that their first teen pregnancy ended in a miscarriage (with conceptions before 1969), all but a few reported the miscarriage in the first 22 weeks. Thus, assuming that reported second trimester miscarriages occur in the first 22 weeks is reasonable. Respondents in the 1973 cycle were not asked to distinguish between miscarriages and stillbirth. However, they are asked for the length of the pregnancy, enabling us to code miscarriage in the same way as in the other cycles.

[15] There are four stillbirths reported at six months in both the 1976 and 1982 cycles. There are 14 fetal losses reported at 6 months in the 1973 cycle—there is no distinction in the 1973 cycle between miscarriage and stillbirth. In contrast with "miscarriage," late fetal death is predicted in our data by socioeconomic factors, which makes it important to restrict the sample in this way.

[16] Respondents in 1973 are not asked whether pregnancies ended in abortion.

unbiased estimate of the causal effect of teen motherhood on adult outcomes, for women like those who become pregnant as teens. We argue below that the frequency of abortion during the period we study is sufficiently low to be inconsequential. We will provide additional evidence that miscarriage is largely random with respect to the characteristics of the teen that we observe. And if miscarriage affects adult outcomes directly, we measure the effect of a pregnancy ending in a birth relative to a pregnancy ending in miscarriage.

However, controlling for other factors that affect adult outcomes can increase the precision of our estimates.[17] Moreover, if reported miscarriages are correlated with our controls, and the controls are correlated with the outcomes, then including these controls will generally reduce omitted variables bias. Our principal specification allows the effect of a teen birth to differ by whether the teen was married before conception:

$$(1) \qquad y = \alpha + \mathbf{X}\beta + \gamma_1 Birth + \gamma_2 Birth \times MarryPreConception + \gamma_3 MarryPreConception + \varepsilon,$$

where subscripts are dropped to ease presentation. **X** includes the respondent's current age, age at first conception, a dummy if this age was less than 15, respondent's mother's education, 4 indicators for the survey cycle, Hispanic, black, white, Protestant, Catholic, whether mother worked (either full- or part-time) during most of the respondent's childhood, and whether the respondent lived with both parents at age 14.[18] *Birth* is an indicator equal to one if the first pregnancy resulted in a birth, and zero if it resulted in a miscarriage.

To check whether the costs of teen motherhood were greater for more advantaged teens, we need to interact *Birth* with measures of socioeconomic advantage. Because our sample of miscarriages is relatively small, it is not feasible to interact *Birth* with each background measure. Instead, we use predicted education as a proxy for socioeconomic background. Thus, for individuals born before 1951 and who first conceived at age 18 or older, and are thus not in our sample, we regress education on the explanatory variables in **X** above, excluding age at first conception and the indicator for age at conception less than 15. We use the coefficients from this regression to predict education for respondents in our teen pregnancy sample.[19] Predicted education for our sample ranges from about 8 to 17 years. The 90/10 range is roughly 11 to 13. For ease of interpretation, we have rescaled predicted education to

[17] Of course, controlling for factors unrelated to adult outcomes would increase the standard errors.

[18] The indicator for whether the respondent lived with both parents at the age of 14 is not available in the 1995 survey. We set the variable equal to zero in 1995, and include indicators for survey cycle in the regressions. Since the education of the respondent's mother, and whether the respondent's mother is working, are missing for some of the respondents, we include indicators for whether these variables are nonmissing, and set the variables to zero for those for whom it is missing.

[19] We note that if teens who expect to get less education are more likely to become pregnant, this is not a consistent estimate of each teen's expected education in the absence of a teen birth. Indeed, we find that teens who miscarry get almost two years less education than "predicted." However, their actual education is strongly increasing in their predicted education. We estimate the slope to be a relatively precise 0.88, which we cannot reject is different from one.

(predicted education—12). Therefore, the coefficient on *Birth* should be interpreted as the effect of teen motherhood for someone with 12 years of predicted education.

Thus, we estimate

$$
\begin{aligned}
(2) \qquad y = {} & \alpha + \mathbf{X}\beta + \gamma_1 Birth + \gamma_2 Birth \times MarryPreConception \\
& + \gamma_3 MarryPreConception + \gamma_4 Birth \times \widehat{Ed} \\
& + \gamma_5 Birth \times \widehat{Ed} \times MarryPreConception \\
& + \gamma_6 \widehat{Ed} \times MarryPreConception + \varepsilon,
\end{aligned}
$$

where $\widehat{Ed}$ is the predicted education level of the respondent minus 12. We are not able to control for $\widehat{Ed}$ in (2) since it includes all the variables used to predict $\widehat{Ed}$. We bootstrap the standard errors for this specification since $\widehat{Ed}$ is a generated regressor.

A. *Potential Bias from Abortions*

In our data, the miscarriage rate is about 6 percent. This is lower than currently estimated, but as Lang and Nuevo (2012) show, miscarriage rates have been rising, probably because home pregnancy tests have increased awareness of pregnancy.

Suppose miscarriage is random and thus medically unrelated to whether the teen would choose to have an abortion, 6 percent of teens miscarry, 3 percent have abortions, and about 50 percent of teens who would have an abortion and would also have a miscarriage (and recognize it) actually have the abortion (they abort their pregnancy before the miscarriage occurs).[20] Then a little algebra shows that about 1.6 percent of the teens who miscarry are girls who would have had an abortion. Any bias is very small and is mitigated by our ability to control for differences in observables.

B. *Are Reported Miscarriages Random?*

Ashcraft, Fernández-Val, and Lang (2013) review the medical literature on miscarriage and conclude that the evidence for large behavioral effects on miscarriage is weak. Ashcraft and Lang (2006), however, point out that if abortion is available, miscarriage will be nonrandom, since the decision to have an abortion is nonrandom. And Lang and Nuevo (2012) show that reported miscarriages are drawn from a more advantaged population, presumably because of greater awareness of pregnancy.

The top half of Table 1 presents weighted means and standard deviations for the explanatory variables in the empirical specification, by birth outcome and marital status at the time of conception. If miscarriage is random, we should see few statistically significant differences between miscarriages and births. Teens who give birth are more likely to be black and less likely to be white. Those giving birth are less

[20] This is a rough estimate from Ashcraft, Fernández-Val, and Lang (2013).

TABLE 1—SUMMARY STATISTICS BY BIRTH OUTCOME

	Married before conception		Not married before conception	
	Birth	Miscarriage	Birth	Miscarriage
Age at first conception	16.69	16.89**	16.35	16.25
	(1.03)	(0.82)	(1.21)	(1.36)
Age at first conception < 15	0.07	0.01***	0.14	0.17
	(0.25)	(0.12)	(0.34)	(0.38)
White	0.90	0.95***	0.61	0.68
	(0.31)	(0.22)	(0.49)	(0.47)
Catholic	0.21	0.09***	0.18	0.14
	(0.40)	(0.29)	(0.39)	(0.35)
Working mother	0.45	0.30	0.57	0.65
	(0.50)	(0.47)	(0.49)	(0.48)
Mother's education	8.93	10.09	9.80	9.10
	(3.55)	(2.60)	(3.49)	(3.80)
Lived with both parents at 14	0.67	0.63	0.63	0.60
	(0.47)	(0.49)	(0.48)	(0.49)
Predicted education	12.13	12.26	12.35	12.38
	(0.99)	(0.75)	(0.99)	(1.05)
Outcome variables:				
Education	9.81	10.04	10.55	10.93*
	(2.43)	(2.53)	(2.22)	(2.30)
Education ≥ 12	0.30	0.35	0.40	0.55***
	(0.46)	(0.48)	(0.49)	(0.50)
Age at first marriage	16.10	16.27	18.03	18.63*
	(1.07)	(0.98)	(3.09)	(3.51)
In first marriage | Ever married	0.51	0.51	0.47	0.35**
	(0.50)	(0.50)	(0.50)	(0.48)
Remarried	0.71	0.89***	0.56	0.68**
	(0.46)	(0.31)	(0.50)	(0.47)
Never married			0.08	0.03***
			(0.27)	(0.18)
Number of live births	3.64	2.85***	3.47	2.67***
	(1.87)	(1.69)	(1.92)	(1.99)
Working	0.49	0.37**	0.50	0.54
	(0.50)	(0.48)	(0.50)	(0.50)
Family income	15,905.54	14,344.27	15,865.85	16,077.57
	(13,711.24)	(11,017.67)	(15,100.02)	(14,201.08)
Observations	1,193	110	3,268	179

Notes: Observations are weighted using the sampling weights of the survey. Standard deviations are in parentheses. The means for "Lived with both parents at 14" are calculated over the 1982 and 1988 surveys, as the variable is not available in the 1973, 1976, and 1995 surveys. The means for working mother, mother's education, education, education ≥ 12, age at first marriage, and family income are calculated over the nonmissing values. Stars in the second column denote statistically significant differences between columns 1 and 2. Stars in the fourth column denote statistically significant differences between columns 3 and 4. The regression samples additionally include individuals for whom it was not possible to determine if they were married preconception, and a variable denoting whether there is data on marriage preconception.

likely to be Protestant and more likely to be Catholic, and they are more likely to have conceived before 15. These differences may reflect either differential awareness of miscarriage or differential willingness to report a miscarriage. To mitigate concerns that reported miscarriages are not truly random we control for these variables, as well as the others presented in this table.

TABLE 2—PREDICTORS OF MISCARRIAGE

Dependent variable: birth	OLS	Probit	Logit
Age at first conception	−0.003	−0.003	−0.003
	(0.007)	(0.006)	(0.007)
Age at first conception < 15	−0.007	−0.007	−0.006
	(0.023)	(0.026)	(0.027)
Hispanic	0.012	0.013	0.012
	(0.022)	(0.023)	(0.024)
Black	0.013	0.013	0.016
	(0.042)	(0.044)	(0.046)
White	−0.018	−0.018	−0.016
	(0.040)	(0.042)	(0.045)
Protestant	−0.020	−0.018	−0.019
	(0.018)	(0.018)	(0.018)
Catholic	0.020	0.022	0.022
	(0.021)	(0.021)	(0.021)
Working mother	−0.003	−0.005	−0.003
	(0.021)	(0.022)	(0.022)
Mother's education	0.001	0.001	0.001
	(0.003)	(0.003)	(0.003)
Lived with both parents at 14	0.014	0.014	0.015
	(0.011)	(0.011)	(0.012)
Married before conception	−0.031**	−0.029**	−0.029**
	(0.012)	(0.011)	(0.012)
Year of conception	−0.001	−0.001	−0.001
	(0.001)	(0.001)	(0.001)
Observations	4,813	4,813	4,813

Notes: Robust standard errors are in parentheses. Probit and logit marginal effects are reported. Dependent variable is an indicator for first pregnancy resulted in a birth, and is zero if first pregnancy resulted in a miscarriage. Working mother refers to whether the respondent's mother worked either full- or part-time while the respondent was growing up. Mother's education refers to the education of the respondent's mother. The regressions also include indicators for whether each of the following variables has missing values: working mother, mother's education, married before conception. The coefficients on the indicators for survey year are not reported because they are difficult to interpret given collinearity with the indicators for mother's education and working mother nonmissing. The omitted category for race is "other" (the two included categories are white and black), the omitted categories in 1976–1995 for religion are "none," Jewish, "other," and in 1995, "no specific denomination." The omitted religion categories in 1973 are: Jewish, other/unspecified, Eastern Orthodox, nontraditional and semi-Christian, non-Christian, none/atheist/agnostic, Mormon, and Christian Scientist. In 1973 and 1976, Catholic includes both Roman Catholic and Old Catholic/Polish National. Religion is missing for some respondents in 1976.

In Table 2, we report the results of regressing a dummy variable for birth on our controls (substituting year of conception for respondent's age).[21] Although the R^2 is 0.01, the explanatory variables are jointly significant. Those married before conception are less likely to report a birth. This may reflect that those not married before conception are less willing to report or less aware of miscarriages. There is also no

[21] We include year of conception because if miscarriages trend over time, any other variable that changes over time will appear to cause miscarriages. We exclude age assuming that it does not directly affect memory of pregnancy. We cannot separately identify the coefficients on year of conception as well as age because year of conception = survey_year + age_conception − age.

evidence of recall bias; the coefficients on survey year are neither individually nor jointly significant.[22] Because the probability of miscarriage is only about 6 percent, different distributional assumptions might give different results. The second and third columns of Table 2 show probit and logit estimates. These are virtually identical to those from the linear probability model.

We note that if either nonreporting of miscarriages were nonrandom or the abortion rate were much higher than we report, miscarriages would be predictable. Our inability to predict miscarriage supports the view that unreported, previously illegal, abortions are not a major factor.[23]

IV. Results

A. *Comparison of Means*

If miscarriages are random both medically and socially (due to the absence of abortions), comparing mean outcomes provides an unbiased estimate of the effect of teen motherhood, for women like those who become pregnant as teens. The second half of Table 1 presents weighted means and standard deviations for outcomes, by birth/miscarriage and marital status at the time of conception.

Among those not married before conception, teen births reduce educational attainment by approximately 0.4 years and the probability of obtaining at least 12 years of education by 15 percentage points. Teens who give birth marry 0.6 years earlier, are more likely to never marry, are 12 percentage points more likely to be in their first marriage (conditional on marrying), and are 12 percentage points less likely to have remarried if their first marriage ended.

Among those married before conception, the effect of teen motherhood on education is small and statistically insignificant. However, teen mothers in this group are 18 percentage points less likely to have remarried if their first marriage ended. They were also 12 percentage points more likely to be working, and their family income was higher (though this effect is not statistically significant). If miscarriage is truly random, it should not affect age at first marriage among those married at the time of conception. Reassuringly, it does not.

Among both those who conceived premaritally and postmaritally, miscarriage is associated with 0.8 fewer live births (statistically significant at the 0.01 level) at the time of the survey.

[22] These coefficients are not shown because collinearity with indicators for mother's education and working mother nonmissing make them difficult to interpret in this regression. For ease of interpretation, we estimate another regression in which we omit mother's education, working mother, and the indicators for these variables nonmissing to determine whether there is evidence of recall bias. The coefficients on the indicators for survey year are all small in this regression and not jointly significant. This tells us that women who miscarried in, for example, 1964, are as likely to recall the miscarriage in 1982 or 1988 as in 1976 or 1973.

[23] This also mitigates concerns that illegal abortions were reported as miscarriages. If there was nonrandom selection into illegal abortions, and these were reported as miscarriages, then reported miscarriages would no longer be socially random.

TABLE 3—EFFECTS OF TEENAGE MOTHERHOOD

	Education (1)	Education ≥ 12 (2)	Age at first marriage (3)	In first marriage (4)	Remarriage (5)
Panel A					
Birth	−0.42**	−0.16***	−0.73**	0.12***	−0.08
	[0.21]	[0.05]	[0.29]	[0.05]	[0.05]
Birth × marry preconception	0.40	0.13*	0.54*	−0.10	−0.07
	[0.34]	[0.07]	[0.31]	[0.07]	[0.07]
Birth + birth × marry preconception	−0.02	−0.03	−0.19**	0.02	−0.14***
	[0.27]	[0.05]	[0.09]	[0.06]	[0.05]
Observations	4,807	4,807	4,318	4,363	2,428
R^2	0.19	0.11	0.28	0.06	0.18
Mean (dependent variable)	10.28	0.37	17.30	0.48	0.63

	Never married (6)	Number live births (7)	Working (8)	ln(family income) (9)	Percent poverty level (10)
Panel B					
Birth	0.04**	0.80***	−0.04	0.07	−10.55
	[0.02]	[0.19]	[0.05]	[0.08]	[23.68]
Birth × marry preconception		−0.27	0.15**	0.04	2.58
		[0.26]	[0.07]	[0.12]	[34.59]
Birth + birth × marry preconception		0.53***	0.11*	0.11	−7.97
		[0.18]	[0.06]	[0.10]	[25.42]
Observations	3,447	4,813	4,812	4,383	4,534
R^2	0.15	0.21	0.06	0.27	0.12
Mean (dependent variable)	0.077	3.48	0.49	9.32	243.52

Notes: Robust standard errors are in brackets. See Appendix for coefficients on covariates. Birth is an indicator for first pregnancy resulted in a birth, and is zero if first pregnancy resulted in a miscarriage. Educational attainment was not ascertained for six individuals in the sample, all surveyed in 1976. Age at first marriage is missing for those who are never married and additionally was not ascertained for 51 individuals in the sample (all in 1976). The regression with In first marriage as an outcome is conditional on ever marrying, and was additionally not ascertained for six individuals in the sample (all in 1976). Remarriage is an indicator variable equal to one if the respondent has been married at least twice, and equal to zero if the respondent has been married once and is not currently married. This variable was additionally not ascertained for six individuals in the sample (all in 1976). The regression with never married as an outcome variable is conditional on married before conception = 0. Working is not ascertained for one individual in the sample (in 1976). Family income is missing for a number of individuals in the sample because they do not report it in the survey. Percent poverty level denotes the family income relative to the poverty level, which accounts for composition of the household. This variable is missing for fewer respondents than family income because of imputation procedures employed by the survey; it continues to be missing only for respondents in 1976 for whom it was not ascertained.

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

B. *Regression Results*

Table 3 presents the results from (1). Each column of panel A and panel B represents a separate regression, with the dependent variables listed across the top of each panel.

Premarital Conceptions.—Teens who give birth attain approximately 0.4 fewer years of education and are 16 percentage points less likely to complete twelfth

grade than those who miscarry. Studying more recent pregnancies, Ashcraft, Fernández-Val, and Lang (2013), hereafter AFL, find that teen mothers obtain 0.26 fewer years of education and are 2 percentage points more likely to have a high school diploma (neither statistically significant).[24]

Perhaps to avoid social stigma, teens who gave birth married about 0.73 years earlier than those who miscarried. However, they were also 4 percentage points more likely never to have married, despite the fact that nearly 60 percent of teen mothers not married before conception married before the birth. Similarly, conditional on no longer being in their first marriage, teen mothers are less likely to have remarried, though this effect is not statistically significant. Teen mothers are 12 percentage points more likely to still be in their first marriage. The effects on the stability of the first marriage, and on the probability of remarriage, do not disappear if we control for the number of children (results not shown).

The effect of a live birth on the total number of live births by the time of the survey is less than 1, suggesting that at least part of the effect of a birth is on timing. The positive estimate need not be causal. Women with a history of miscarriage are more likely to miscarry during subsequent pregnancies. AFL find that teen mothers in more recent years have 0.65 more births.

There is no statistically significant effect of teen motherhood on whether the respondent is working at the time of the survey. Family income is the one outcome with substantial missing data and has been converted from a categorical variable (the data Appendix explains in detail the coding of this variable). Still, family income is higher for those giving birth than for those who miscarry, though this effect is statistically insignificant. This partially reflects that those giving birth are more likely to be married; controlling for marital status reduces the coefficient magnitude (results not shown). Because women who gave birth are more likely to be married and have more children, and there was little difference in their family income, their income relative to the poverty level (which is adjusted for household composition) is lower. However, this difference is also statistically insignificant. AFL find that teen mothers in more recent years are 5 percentage points less likely to be working, their family income is lower by about 0.1 percent, and their income relative to the poverty level is lower by 8.76 percentage points (all effects are statistically insignificant).

In sum, teen mothers who conceived premaritally were more likely to drop out of school and marry earlier, but were also more likely to never marry. Teens who gave birth may have married earlier to avoid the social stigma of nonmarital childbearing. If they did not marry the baby's father, then stigma may have made future marriage less likely. Reduced labor market investments probably raised the cost of divorce by the time of the survey, translating into greater stability of the first marriage and lower likelihood of remarriage conditional on the first marriage ending. While the point estimates suggest that such teen mothers were less likely to be working and had higher income, these effects are not significant.

[24] Results referenced come from table 6, column 1 of Ashcraft, Fernández-Val, and Lang (2013).

Postmarital Conceptions.—The adverse effects of teen motherhood on educational attainment and twelfth grade completion are less pronounced and statistically insignificant for those married before conception. The effect on twelfth grade completion is statistically significantly smaller in magnitude (at the 0.1 level) for those conceiving after marriage. Table 1 suggests this is because women who conceived after marriage had already dropped out of school at the time of their marriage.

The positive effect of teen motherhood on whether the respondent is still in her first marriage is smaller among those married before conception (although again neither the difference nor the effect is statistically significant). Because such women tended to leave school at an earlier age regardless of whether they gave birth or miscarried, divorce in the late 1960s or later would be costly for both groups. Conditional on no longer being in their first marriage, teen mothers are 14 percentage points less likely to have remarried. This effect is statistically significant at the 0.01 level; however, it is not statistically significantly different from the effect for those not married before conception.

Teens who gave birth are 11 percentage points more likely to be working than those who miscarried (significant at the 0.01 level). Recall that there was no difference in educational attainment between these groups. However, their births occurred earlier, perhaps allowing them to return to the workforce at lower cost.

The positive effect of teen motherhood on family income is larger for those married before conception (again, neither the difference nor the effect is statistically significant). This positive estimate is driven by the more positive effect of teen motherhood on working among those married before conception (not shown). There is no statistically significant effect of teen motherhood on income relative to the poverty level, though the coefficient suggests that women who gave birth as teens are poorer.

If miscarriage is truly random, it cannot affect age at first marriage among those already married. While giving birth lowers the age at first marriage by about three quarters of a year among those conceiving premaritally, it is reassuring that the estimated effect on those who were already married is statistically significantly smaller, a precise effect of less than 0.2 years.

We do not discuss the remaining explanatory variables except to note that they generally enter in the expected way. In sum, Table 3 shows that teen mothers who conceived after marriage did not alter their educational investments as a result of a birth. The effects of teen motherhood on future outcomes appear to have been positive for this group. Arguably because earlier timed births made entering the labor market less costly, teen mothers were more likely to be working and to have higher family incomes (not statistically significantly) than those who miscarried. However, women who had been teen mothers were less likely to have remarried if their first marriage ended.

Heterogeneity by Predicted Education.—Table 3 imposes that teen births had similar effects regardless of family background and future prospects. However, the effects may have been more adverse for more advantaged teens. Alternatively, advantaged teens may have been able to overcome any adverse effects. As we have noted, studies of teen mothers in more recent years have found small effects of teen motherhood. If teen mothers in more recent years have been drawn from more

disadvantaged groups, then differential effects by socioeconomic background could explain those results.

Therefore, in Table 4 ,we present the results from specification (2), which includes the same explanatory variables as in Table 3 and interactions between birth and predicted education minus 12.

The coefficient on *Birth* is the effect of teen motherhood for someone with 12 years of predicted education, who was not married prior to conception. The top rows of each panel present the coefficients on the birth variables. The last rows of each panel show the estimated effects of a birth for individuals with predicted education of 10 and 14 years, again both for premarital and postmarital conceptions.

Premarital Conceptions.—A teen birth has no effect on the average education of those with low predicted education. However, for those with high predicted education, a teen birth lowers average education by about 0.7 years. The large and significant adverse effect of teen motherhood on high school completion (in Table 3) appears to be strongest among those with high predicted education. Among teens with 14 years of predicted education, those giving birth are 22 percentage points less likely to complete high school than those who miscarried. Teens with low levels of predicted education were arguably less likely to graduate high school anyway, and so a birth had little effect on high school completion.

The effect on age at first marriage is largely unrelated to predicted education. The interaction between birth and predicted education is small and statistically insignificant. Regardless of background, teens who gave birth married early to avoid single motherhood. However, the greater likelihood of never marrying is much stronger for those with lower levels of predicted education (a difference of 16 percentage points between teens with high and low predicted education, statistically significant at the 0.05 level).

Conditional on ever marrying, teen mothers with 12 years of predicted education are 14 percentage points more likely to still be in their first marriage. This effect is stronger for teens with low predicted education and disappears for teens with high predicted education, though the differences are statistically insignificant. Similarly, conditional on their first marriage ending, teen mothers with 12 years of predicted education are 8 percentage points less likely to have remarried ($p = 0.11$). This effect is stronger for those with low predicted education, though the differences are not statistically significant.

Among those with low predicted education, teen mothers are 9 percentage points less likely to be working. This effect goes to zero for those with high predicted education. However, neither the effects nor their differences are statistically significant.

Finally, and with a reminder about the caveat regarding the family income data, we continue to see a small, positive, though statistically insignificant, effect of teen births on family income that is larger in magnitude for higher levels of predicted education. This is consistent with the negative effect of motherhood on working disappearing for this group. While teen mothers with 10 and 12 years of predicted education have lower incomes relative to the poverty level, those with 14 years of predicted education have higher income relative to the poverty level compared to those who miscarry. The magnitudes of these effects are not trivial, but they are

TABLE 4—EFFECTS OF TEENAGE MOTHERHOOD BY PREDICTED EDUCATION

	Education (1)	Education ≥ 12 (2)	Age at first marriage (3)	In first marriage (4)	Remarriage (5)
Panel A					
(1) Birth	−0.35	−0.15***	−0.71**	0.14***	−0.08
	[0.23]	[0.05]	[0.36]	[0.05]	[0.05]
(2) Birth × predicted education	−0.18	−0.04	−0.04	−0.04	0.01
	[0.18]	[0.04]	[0.31]	[0.05]	[0.05]
(3) Birth × predicted education × marry preconception	0.18	0.03	0.08	0.06	−0.02
	[0.56]	[0.08]	[0.33]	[0.08]	[0.07]
(4) Birth × marry preconception	0.34	0.12	0.54	−0.13	−0.06
	[0.43]	[0.08]	[0.37]	[0.08]	[0.07]
Effects by predicted education					
Not married preconception					
10 years	0.02	−0.08	−0.64	0.22*	−0.10
	[0.52]	[0.11]	[0.89]	[0.13]	[0.12]
14 years	−0.72**	−0.22***	−0.78	0.06	−0.06
	[0.30]	[0.08]	[0.50]	[0.10]	[0.09]
Married preconception					
10 years	0	−0.03	−0.27	−0.03	−0.12
	[1.30]	[0.17]	[0.26]	[0.16]	[0.13]
12 years	−0.01	−0.03	−0.17*	0.01	−0.14***
	[0.34]	[0.06]	[0.09]	[0.06]	[0.05]
14 years	−0.02	−0.04	−0.07	0.06	−0.17**
	[0.86]	[0.14]	[0.22]	[0.12]	[0.08]
Observations	4,807	4,807	4,318	4,363	2,428

	Never married (6)	Number live births (7)	Working (8)	ln(family income) (9)	Percent poverty level (10)
Panel B					
(1) Birth	0.05***	0.80***	−0.05	0.06	−21.31
	[0.01]	[0.23]	[0.05]	[0.09]	[28.24]
(2) Birth × predicted education	−0.04*	−0.01	0.02	0.01	26.65
	[0.02]	[0.15]	[0.04]	[0.07]	[19.01]
(3) Birth × predicted education × marry preconception		−0.37	0.02	0.11	−10.82
		[0.27]	[0.09]	[0.18]	[35.65]
(4) Birth × marry preconception		−0.18	0.15*	0.02	9.87
		[0.30]	[0.08]	[0.13]	[37.59]
Effects by predicted education					
Not married preconception					
10 years	0.13***	0.82*	−0.09	0.04	−74.62
	[0.05]	[0.49]	[0.12]	[0.20]	[61.46]
14 years	−0.03	0.79***	−0.01	0.08	32.00
	[0.04]	[0.24]	[0.08]	[0.13]	[26.60]
Married preconception					
10 years		1.37***	0.02	−0.17	−43.12
		[0.52]	[0.19]	[0.37]	[68.41]
12 years		0.62***	0.10	0.08	−11.44
		[0.18]	[0.06]	[0.10]	[25.14]
14 years		−0.12	0.17	0.33	20.24
		[0.40]	[0.14]	[0.31]	[62.38]
Observations	3,447	4,813	4,812	4,383	4,534

Notes: Bootstrapped standard errors (from nonparametric bootstrap estimation) in brackets in rows 1–4. See notes in Table 3, as well as the text, for details.

***Significant at the 1 percent level. **Significant at the 5 percent level. *Significant at the 10 percent level.

not statistically significant. Finally, the increase in the total number of live births is independent of predicted education.

Postmarital Conceptions.—We continue to find no clear effects of teen motherhood on average education or twelfth grade completion among those married before conception, regardless of their predicted education level. This suggests that even those with high predicted education levels were likely to leave school at the time of marriage.

For this group, teen motherhood had no discernible effect, at any level of predicted education, on the probability of still being in the first marriage. However, conditional on the first marriage ending, women who had been teen mothers were less likely to have remarried. This effect is stronger for those with higher predicted education, though the difference is not statistically significant. Teen motherhood increases the total number of live births, although for those with 14 years of predicted education the effect is much smaller (actually negative) and not statistically significant.

The effect of teen motherhood on the probability of working is stronger for those with high predicted education. While the magnitude of this effect is quite large (teen mothers with 14 years of predicted education are 17 percentage points more likely to be working than those who miscarried), it is statistically insignificant.

Finally, the effect of a teen birth on family income and income relative to the poverty level are highly imprecisely estimated. The point estimates suggest adverse effects for those with low predicted education and positive effects for those with high predicted education.[25]

In sum, Table 4 shows that among teens conceiving premaritally, teen motherhood reduced the educational attainment of those predicted to be on, or above, the margin of high school completion. However, those with the highest predicted education did not experience any other negative effects. Those with low predicted education were more likely to have never married, to have greater marital stability, and lower likelihood of remarriage conditional on the first marriage ending. Labor market success and/or remarriage may have been more difficult for this group, making divorce more costly. Among teens who were married before conception, motherhood had no effect on educational investments at any level of predicted education. However, motherhood did reduce the probability of remarriage, especially for those with high predicted education. There is suggestive evidence that the positive effect of motherhood on working and family income is concentrated among those with higher predicted education.

[25] To check that the results are not biased by immigrants who had access to abortion in their teens, we perform the estimation but excluding Hispanics. Interpretation of the results is generally unchanged (not shown). Among those who were not married before conception, we see a stronger impact of teen motherhood for those predicted to be on the margin of high school completion and those with low predicted education (and a less strong effect for those with high predicted education) when Hispanics are excluded.

C. *The Consequences of Teen Motherhood over Time*

Conceptions in our sample range from 1940 to 1968, a period of dramatic social change in the United States. To determine how the effect of motherhood changed over time, we interact a time trend (*DateConception* − 1960) with *Birth*, and continue to allow for the effects of motherhood to vary by whether the teen conceived premaritally:

$$
\begin{aligned}
(3) \qquad y = {} & \alpha + \mathbf{X}\beta + \gamma_1 Birth + \gamma_2 Birth \times MarryPreConception \\
& + \gamma_3 MarryPreConception + \gamma_4 Birth \times (DateConception - 1960) \\
& + \gamma_5 Birth \times (DateConception - 1960) \times MarryPreConception \\
& + \gamma_6 (DateConception - 1960) \times MarryPreConception \\
& + \gamma_7 (DateConception - 1960) + \varepsilon .
\end{aligned}
$$

Results are shown in Table 5.[26] The coefficient on *Birth* × (*DateConception* − 1960) indicates how the effect of a teen birth changes over time for those not married before conception. The coefficient on *Birth* × (*DateConception* − 1960) × *MarryPreConception* indicates how the differential effect of a birth for those married before conception changed over time. Only the first of these interaction terms ever attains statistical significance and then only when the outcome is "in first marriage" and, at the 0.1 level, when the outcome is "working." Nevertheless, the magnitude of some of the coefficients suggest large changes. The lower part of the table shows estimated effects by year, which we describe in greater detail below.

Premarital Conceptions—For premarital conceptions, the point estimates suggest a modest decline in the adverse effects of a teen birth on education. However, in 1968 teens who gave birth were still 14 percentage points less likely to complete high school.

The effect of a birth on age at first marriage may have grown over time. In 1952, teens who gave birth married 0.33 years earlier than those who miscarried (not statistically significant). By 1968, they married over a year earlier (statistically significant at the 0.05 level). Recall that median age at first marriage rose in the mid-1960s, which may explain the increasing effect of a birth on age at first marriage.

The effect of giving birth on never marrying also may have risen over time. While the effect was minimal in 1952, by 1968 those who gave birth were 6 percentage points more likely to never marry ($p = 0.019$). This is consistent with the evidence presented earlier that in the mid-to-late 1960s, the proportion of premarital conceptions ending in a preoutcome marriage declined. In contrast, the effect of a teen birth on whether the respondent was still in her first marriage diminished by

[26] Because DateConception = Survey_year + Age_conception − Age, we exclude Age in this specification since we include DateConception.

TABLE 5—EFFECTS OF TEENAGE MOTHERHOOD WITH TIME TREND

	Education (1)	Education ≥ 12 (2)	Age at first marriage (3)	In first marriage (4)	Remarriage (5)
Panel A					
(1) Birth	−0.438**	−0.167***	−0.695**	0.135***	−0.075
	[0.217]	[0.052]	[0.313]	[0.043]	[0.047]
(2) Birth × (DateConcept-1960)	0.024	0.003	−0.046	−0.014***	0.009
	[0.038]	[0.009]	[0.057]	[0.005]	[0.007]
(3) Birth × (DateConcept-1960) × marry preconception	−0.048	−0.011	0.048	0.014	−0.004
	[0.052]	[0.011]	[0.058]	[0.010]	[0.010]
(4) Birth × marry preconception	0.380	0.122	0.537	−0.117*	−0.060
	[0.345]	[0.074]	[0.328]	[0.070]	[0.072]
Not married before conception:					
Effect of a teen birth in 1952	−0.63	−0.19*	−0.33	0.25***	−0.15**
	[0.45]	[0.10]	[0.68]	[0.06]	[0.06]
Effect of a teen birth in 1968	−0.24	−0.14**	−1.06***	0.02	−0.002
	[0.28]	[0.07]	[0.38]	[0.07]	[0.08]
Married before conception:					
Effect of a teen birth in 1952	0.13	0.02	−0.18	0.02	−0.18***
	[0.38]	[0.07]	[0.13]	[0.09]	[0.05]
Effect of a teen birth in 1960	−0.06	−0.04	−0.16*	0.02	−0.14**
	[0.27]	[0.05]	[0.09]	[0.06]	[0.05]
Effect of a teen birth in 1968	−0.25	−0.11	−0.14	0.02	−0.09
	[0.40]	[0.09]	[0.15]	[0.09]	[0.10]
Observations	4,807	4,807	4,318	4,363	2,428

	Never married (6)	Number live births (7)	Working (8)	ln(family income) (9)	Percent poverty level (10)
Panel B					
(1) Birth	0.033**	0.842***	−0.052	0.046	−18.693
	[0.014]	[0.213]	[0.047]	[0.079]	[27.015]
(2) Birth × (DateConcept-1960)	0.003	−0.05	0.011*	0.017	7.195
	[0.002]	[0.041]	[0.006]	[0.012]	[5.402]
(3) Birth × (DateConcept-1960) × marry preconception		0.05	−0.004	0.012	−4.726
		[0.051]	[0.010]	[0.019]	[6.596]
(4) Birth × marry preconception		−0.276	0.162**	0.094	10.625
		[0.275]	[0.072]	[0.125]	[37.056]
Not married before conception:					
Effect of a teen birth in 1952	0.01	1.24**	−0.14*	−0.09	−76.25
	[0.02]	[0.51]	[0.08]	[0.14]	[66.42]
Effect of a teen birth in 1968	0.06**	0.44**	0.03	0.18*	38.87
	[0.03]	[0.22]	[0.06]	[0.11]	[27.99]
Married before conception:					
Effect of a teen birth in 1952		0.57	0.06	−0.09	−27.82
		[0.35]	[0.09]	[0.13]	[39.64]
Effect of a teen birth in 1960		0.57***	0.11**	0.14	−8.07
		[0.17]	[0.05]	[0.10]	[25.27]
Effect of a teen birth in 1968		0.57**	0.16*	0.37**	11.69
		[0.24]	[0.09]	[0.17]	[39.67]
Observations	3,447	4,813	4,812	4,383	4,534

Notes: Robust standard errors are in brackets. See notes in Table 3, as well as the text, for details.
***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

1.4 percentage points per year. In 1952, those who gave birth were 25 percentage points more likely to still be in their first marriage (significant at the 0.05 level), but by 1968 this effect had disappeared. Similarly, the negative effects on remarriage disappear over time.

Among teens who conceived in 1952, those giving birth were 14 percentage points less likely to be working. By 1968 the effect of a birth was positive, though statistically insignificant. Consistent with this, the effect on family income is negative but insignificant in 1952 but positive and marginally statistically significant at the end of the period. The effect on income relative to the poverty level goes from large but insignificantly negative to large but insignificantly positive.

Postmarital Conceptions.—Among those married before conception, all of the trends are statistically insignificant and in most cases the point estimates do not suggest substantive changes over time. To the extent that they do, they reinforce the results for premarital conceptions. The adverse effect on remarriage declines from 18 percentage points in 1952 to a statistically insignificant 9 percentage points in 1968. The effect on the probability of working rises from a statistically insignificant 6 percentage points to 16 percentage points. Similarly, the effect on family income goes from negative 9 log points (statistically insignificant) to positive 37 log points. The point estimates show a shift from a negative to a positive effect on income relative to the poverty level although the effects are less dramatic than for premarital conceptions.

Changing Composition of Pregnant Teens.—We find minimal adverse effects of teen motherhood by the late 1960s, suggesting that teens for whom pregnancy would be costly may have been less likely to get pregnant or give birth by the end of our sample period.

To check whether the composition of pregnant teens did, in fact, change, we regress the teens' socioeconomic characteristics on the year of conception. Because many of the adverse effects were concentrated among teens who were not married before conception, we include only these teens in the regressions. Because the pill was approved for contraceptive use in 1960, and because the 1960s were a decade of dramatic social change, we look at changes in the characteristics of pregnant teens from 1960 through 1968.

First, we look at changes in the fraction of premarital teen pregnancies for which the mother was black, an even stronger proxy for economic disadvantage in the 1960s than it is currently. We find that among pregnant teens not married before conception, the proportion of white teens fell, on average, by 1.3 percentage points per year (statistically significant at the 0.01 level) from 1960 to 1968. This is consistent with the view that teen mothers who conceived premaritally came from increasingly disadvantaged backgrounds over this period.

Next, we consider trends in the prepregnancy educational prospects of pregnant teens. Ideally, we would like to test whether the teens who got pregnant in 1960 had better prepregnancy educational prospects than those who got pregnant in 1968. If miscarriage is random and does not affect educational attainment, then the prepregnancy educational prospects of teen mothers are captured by the educational

attainment of teens who miscarried. We regress educational attainment on year of conception, including only the teens who miscarried. Educational attainment is rising during this period, and so a negative coefficient would present strong evidence that the composition of pregnant teens is changing over time. We find that the probability of completing twelfth grade among those who conceived premaritally and miscarried fell by an average of 1.2 percentage points per year over this period. Because we look only at teens who miscarried, the sample size falls to 111 and the coefficient is not statistically significant. However, it provides suggestive evidence that by the late 1960s the teens getting pregnant were more likely to be those with worse educational prospects.

D. *Shotgun Weddings*

Were shotgun marriages good or bad for pregnant teens? We cannot answer this question quasi-experimentally since we have no arguably exogenous source of variation in whether the mother marries between conception and birth. Instead we limit the sample to women who report a premarital conception ending in birth and compare outcomes for those marrying and not marrying prior to the birth.[27] The results are presented in Table 6.

Those having shotgun marriages obtained slightly more education, although the 4 percentage point effect on high school completion falls well short of statistical significance at conventional levels. If they married, teens without shotgun marriages married over three years later than those with a shotgun marriage. There is no difference in the probability of still being in the first marriage, or in remarrying after the first marriage ended. Teens who had shotgun marriages were 5 percentage points more likely to be working. Their family income is statistically significantly higher (11 percent) although this effect is fully explained by the higher probabilities of being married and working. While income relative to the poverty level is higher for those with shotgun marriages, the difference is not statistically significant. In short, subject to obvious concerns about selection bias, there is no evidence that it was bad for unwed pregnant teens to marry before the birth.

Finally, we checked for changes over time and found no significant change in the positive relation between shotgun marriage and educational attainment. In later years, the relation between shotgun marriages and age at first marriage becomes less negative (results not shown).

V. Conclusion

We study the consequences of teen motherhood in the 1940s through the late 1960s, an environment dramatically different from today's. Access to abortion and contraception were limited; many conceptions took place after marriage, and shotgun marriages were common. We provide insight into investment decisions of

[27] We test for "recall bias" by regressing an indicator for "married before conception" on the date of conception and the survey indicators both with and without our standard controls. In neither case are the coefficients on the survey indicators significant.

TABLE 6—EFFECTS OF TEENAGE MOTHERHOOD: SHOT-GUN MARRIAGES RELATIVE TO OUT-OF-WEDLOCK BIRTHS

Outcome	
Education	0.30**
	[0.12]
Education $\geq$12	0.04
	[0.03]
Age at first marriage	−3.52***
	[0.16]
In first marriage	0.04
	[0.03]
Married | First marriage over	0.06
	[0.04]
Number live births	0.09
	[0.09]
Working	0.05*
	[0.03]
ln(family income)	0.11**
	[0.05]
Percent poverty level income	10.69
	[9.33]
Controls for survey year, date of conception	Yes
Standard controls	Yes

Notes: Each row presents the coefficient, from separate regressions, on an indicator for shotgun marriage, on the sample of teens giving birth who conceived before marriage. Robust standard errors are in brackets. The number of observations for each outcome variable is listed in parentheses: Education (3,264), Education $\geq$ *12* (3,264), Age at first marriage (2,837), In first marriage (2,837), Married | first marriage over (1,598), Never married (3,268), Number live births (3,268), Working (3,267), ln(family income) (2,997), and Percent poverty level income (3,099).

teenagers amidst a changing landscape for women, and the long-term consequences of those decisions when the environment changed in arguably unanticipated ways. It is likely that many teens viewed the long-run consequences of teen motherhood as minimal provided they married. Dropping out of school may not have been considered costly when labor force participation rates of married mothers were very low.

We find limited effects of teen motherhood among teens who were married at the time of conception. Early marriage may have been costly; this is an issue we cannot address. However, presumably because marriage led them to drop out of school, births had little effect on the education of those already married. For this group, the principal effect of giving birth was a lower likelihood of remarriage conditional on the first marriage ending.

In contrast, teens who conceived premaritally and gave birth were more likely to drop out of school and marry earlier, or never marry, relative to those who miscarried. If they married, their first marriages lasted longer, but the teen mothers were less likely to remarry if their first marriage ended. The marriage effects are consistent with the view that teen motherhood weakened the position of teens in the later marriage market.

We find evidence that the effects of teen motherhood vary by socioeconomic background. The marriage effects were concentrated among those who were less

advantaged. In addition, the point estimates suggest that disadvantaged teens had lower incomes relative to the poverty line as a result of a birth.

At the same time, teen motherhood particularly affected the educational attainment of advantaged teens who conceived premaritally. Prior to Title IX pregnant teens could be expelled from school, and so leaving may have been involuntary. But failing to complete high school may also not have appeared costly. College enrollment rates were low among women in this period, as were levels of female labor force attachment and participation. And, consistent with this, there is little evidence that a teen birth adversely affected advantaged teens despite the lower education it entailed.

There are also important differences between those giving birth early and late in our period. Consider a 36-year-old woman in 1973 who first conceived at age 15 (in 1952), and a 36-year-old woman in 1988 who first conceived at age 15 (in 1967). Our point estimates suggest that the woman in 1973 may have been worse off than her counterpart who miscarried, especially if she conceived premaritally and even worse if she did not marry prior to the birth. In contrast, regardless of whether the conception was premarital or postmarital, the woman in 1988 would tend to have been better off financially than her counterpart who miscarried. This may be because her children were more likely to be fully grown relative to those of the woman who had miscarried in 1967, and she now lived in a world of very high female labor force participation.

We noted that teen motherhood does not have strong adverse effects in cohorts more recent than those we study here. One explanation is that teens for whom motherhood would be costly can avoid pregnancy by using effective contraception and can terminate the pregnancy if they do not avoid it. In our period, many teens who wanted to engage in sex married, either before conception or in the event of pregnancy. The teen in 1952 would reasonably have expected that marriage would mitigate the costs of teen motherhood. She would have expected to remain married following the birth, and also expected not to work. However, by 1967, both female labor force participation and divorce had risen noticeably.[28] Reducing labor market investments in this environment would be costly for some women. Unable to foresee these changes, the teen in 1952 got pregnant regardless of whether the decision would end up being costly. However, the teen in 1967 would arguably have made decisions about sexual activity with more awareness of the evolving costs of teen motherhood. We find that the probability that a pregnant teen was white and likely to graduate from high school in the absence of a birth declined over the course of the 1960s. We speculate that by the mid 1960s, teens for whom motherhood would be costly in this changed environment were less likely to get pregnant. Given that the pill was generally not available to teens in the late 1960s, these teens must have avoided pregnancy through abstinence or greater/more effective use of the contraceptives that were available to them.

We can only speculate about the consequences of hypothetical reductions in the availability of abortion and/or contraception in the current context. Our results

[28] The decline of shotgun marriages, which begins before teens have ready access to the pill, may have reflected a growing belief that the mother could support her family.

suggest that by the mid-to-late 1960s, with the higher value of women in the labor force and an elevated divorce rate, some teens understood that early marriage would no longer insulate them from the costs of teen motherhood. Given that women continue to be highly valued in the labor force, and that the divorce rate remains elevated, it is unlikely that we would return to a period of early marriage and high rates of shotgun marriages. However, teens would undoubtedly continue to engage in sex, albeit possibly at reduced rates. In this hypothetical environment, we would expect that teens engaging in sex would seek alternative mechanisms for reducing the risk of and the costs associated with pregnancy.

Appendix

Table A1—Bias from Excluding Never Married Women Not Living with Their Own Children

	No heterogeneity		Heterogeneity by predicted education			
	Nonrestricted	Restricted	Nonrestricted		Restricted	
	Birth	Birth	Birth	Birth*Pred. Education	Birth	Birth*Pred. Education
Education	−0.20	−0.16	−0.40	0.24	−0.37	0.29
	[0.30]	[0.31]	[0.43]	[0.25]	[0.41]	[0.25]
Education ≥12	−0.14**	−0.13*	−0.20**	0.07	−0.19**	0.08
	[0.07]	[0.07]	[0.09]	[0.06]	[0.09]	[0.06]
Age at first marriage	−0.58	−0.58	−0.87*	0.38	−0.86*	0.41
	[0.39]	[0.39]	[0.47]	[0.26]	[0.46]	[0.28]
In first marriage	0.17***	0.17***	0.19**	−0.02	0.19**	−0.03
	[0.06]	[0.06]	[0.09]	[0.06]	[0.08]	[0.06]
Remarriage	−0.07	−0.07	0.04	−0.12**	0.03	−0.13**
	[0.06]	[0.06]	[0.10]	[0.06]	[0.09]	[0.06]
Never married	0.003	0.01	0.04*	−0.04*	0.03	−0.04
	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]	[0.02]
Number live births	0.56***	0.55***	0.56***	0.0005	0.56**	−0.02
	[0.16]	[0.16]	[0.22]	[0.14]	[0.24]	[0.17]
ln(family income)	0.28**	0.28**	0.43**	−0.17	0.42*	−0.16
	[0.14]	[0.14]	[0.18]	[0.11]	[0.16]	[0.12]
Percent poverty level	52.00**	53.50**	48.79	3.95	48.41	6.94
	[26.32]	[26.56]	[35.17]	[23.17]	[35.51]	[23.72]
Working	−0.003	−0.001	−0.04	0.04	−0.03	0.04
	[0.07]	[0.07]	[0.09]	[0.05]	[0.09]	[0.06]
Observations	1,137	1,116	1,137		1,116	

Notes: The first column of results show the coefficient on birth when each outcome variable is regressed on the controls listed in the paper, and the sample is limited to the 1982, 1988, and 1995 surveys. The second column shows the same coefficient, but excludes never married women who were not living with their own children (this mimics the restriction in the 1973 and 1976 surveys). The third and fourth columns show the coefficients on Birth and Birth × Predicted Education when each outcome variable is regressed on these variables and the controls listed in the text, and limited to those surveyed in 1982, 1988, and 1995. The fifth and sixth columns show the same coefficients when the sample also excludes never married women not living with their own children. Predicted education is calculated using the relevant sample in each case. Sample sizes are as shown, except when the dependent variables are Age at first marriage (excludes never married), In first marriage (excludes never married), remarriage (excludes never married and those still in first marriage), and ln(family income), for which some values are missing.

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

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