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Author(s): George A. Akerlof, Janet L. Yellen and Michael L. Katz

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## AN ANALYSIS OF OUT-OF-WEDLOCK CHILDBEARING IN THE UNITED STATES\*

GEORGE A. AKERLOF

JANET L. YELLEN

MICHAEL L. KATZ

This paper relates the erosion of the custom of shotgun marriage to the legalization of abortion and the increased availability of contraception to unmarried women in the United States. The decline in shotgun marriage accounts for a significant fraction of the increase in out-of-wedlock first births. Several models illustrate the analogy between women who do not adopt either birth control or abortion and the hand-loom weavers, both victims of changing technology. Mechanisms causing female immiseration are modeled and historically described. This technology-shock hypothesis is an alternative to welfare and job-shortage theories of the feminization of poverty.

### I. INTRODUCTION

When Daniel Moynihan wrote his famous report, *The Negro Family* [U. S. Department of Labor 1965] the black out-of-wedlock birth rate was 24 percent. Twenty-five years later this

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rate, defined as the percentage of births to unmarried women, had more than doubled, to 64 percent. Over the same period the white out-of-wedlock birth ratio experienced yet faster growth—albeit from a lower-level—more than quintupling, from 3.1 percent to 18 percent.<sup>1</sup> Rising out-of-wedlock birthrates are of social policy concern because children reared in single-parent households are more likely to be impoverished and to experience difficulties in later life.<sup>2</sup>

A major role in the increase in out-of-wedlock births has been played by the declining practice of “shotgun marriage.” Until the early 1970s it was the norm in premarital sexual relations that the partners would marry in the event of pregnancy. The disappearance of this custom has been a major contributor to the increase in the out-of-wedlock birth ratio for both whites and blacks. In fact, about three-fourths of the increase in the white out-of-wedlock first-birth ratio, and about three-fifths of the black increase, between 1965–1969 and 1985–1989 are explicable by the decrease in the fraction of premaritally conceived first births that are resolved in marriage. By that we mean that if the fraction of premaritally conceived births resolved by marriage had been the same from 1985 to 1989 as it had been over the comparable period twenty years earlier, the increase in the white out-of-wedlock birth ratio would have been only a quarter as high, and the black increase would have been only two-fifths as high.<sup>3</sup>

1. The simultaneous rise of out-of-wedlock births and other forms of social/economic distress such as crime, drug abuse, and poverty, especially in black urban ghettos, well documented by Anderson [1990], Wilson [1987], and others, is consistent with Moynihan's gloomy predictions.

2. A substantial literature documents that single parenthood results in a variety of adverse consequences for children (see, for example, Manski, Sandefur, McLanahan, and Powers [1992]).

3. The data for this calculation are taken from retrospective marital and fertility histories of the Current Population Survey, with a shotgun marriage defined as one occurring within seven months prior to the birth of the baby. The data are described in the Appendix. The CPS fertility supplements were first used to estimate shotgun marriage ratios by O'Connell and Moore [1980] and O'Connell and Rogers [1984]. The proportion of the change in out-of-wedlock births due to the change in the shotgun marriage rate is calculated as follows. If  $oow_t$  and  $oow_{t+1}$  are the fractions of out-of-wedlock births,  $bcoow_t$  and  $bcoow_{t+1}$  are the fraction of births conceived out-of-wedlock, and  $sr_t$  and  $sr_{t+1}$  are the shotgun marriage rates at  $t$  and  $t + 1$ , respectively, then the formula for the change in the out-of-wedlock birth ratio due to the change in the shotgun marriage ratio is  $((1 - sr_{t+1})bcoow_{t+1} - (1 - sr_t)bcoow_t)/(oow_{t+1} - oow_t)$ . The denominator is the change in the out-of-wedlock birth ratio. The first term in the numerator is the fraction of out-of-wedlock births at  $t + 1$ . The second term is what the fraction would have been at  $t + 1$  if the shotgun marriage ratio had been the same at  $t + 1$  as at  $t$ . The difference between the first and the second term of the numerator is the change in the out-of-wedlock birthrate due to the change in the shotgun marriage rate.

Ethnographic studies describe shotgun marriage in the late 1960s. For example, Rubin [1969], who studied working-class whites in San Francisco in the late 1960s, found that courtship was brief and quite likely to involve sexual activity. In the event of pregnancy, marriage occurred. One of her subjects expressed the matter succinctly and with the absence of doubt with which many social customs are unquestionably observed: "If a girl gets pregnant you married her. There wasn't no choice. So I married her." The norms regarding pregnancy and marriage were apparently much the same among blacks, although perhaps with greater ambiguity and more doubt since out-of-wedlock birth-rates for blacks were much higher than for whites.<sup>4</sup>

For whites the shotgun marriage ratio began its decline at almost the same time as the advent of female contraception for unmarried women and the legalization of abortion. In the late 1960s and very early 1970s, many major states including New York and California clarified their laws regarding abortion (significantly prior to *Roe v. Wade* in January 1973). At about the same time it became easier as well as more common for unmarried people to obtain contraceptives. In July 1970 the Massachusetts law prohibiting the distribution of contraceptives to unmarried individuals was declared unconstitutional in the landmark case *Eisenstadt v. Baird*. (See Garrow [1994, p. 457].) This paper will explain why there might be a link between female contraception and the legalization of abortion and the declining shotgun marriage rate.

Why should there be such a link? Both the advent of female contraception and the legalization of abortion are analogous to technical change: each has shifted out the frontier of available choices. While the morality of using these options generates heated debate, family planners have viewed female contraception and abortion as welfare-improving for women: they have made women free to choose. But technological innovation creates both winners and losers. A cost-saving innovation almost invariably penalizes producers who, for whatever reason, fail to adopt it. The hand-loom weavers of Britain in the early nineteenth cen-

4. Thus, in the very poor Pruitt-Igoe public housing project in St. Louis, Rainwater [1970] reports, "marriage is considered the most attractive solution [to an unwanted pregnancy]." But the custom of marriage, at least in Pruitt-Igoe, was not unquestioned, for Rainwater also observes: "But it [marriage] is not automatic; shotgun weddings are to be carefully considered, because if the couple is not compatible, they are not likely to stay married."

tury are the classic illustration of this point. In the case of female contraception and abortion, women who want children, and women who, because of indecision or religious conviction have failed to adopt the new innovations, have lost disproportionately.<sup>5</sup> Technological change may also benefit those who are not directly affected. For example, the development of yield-increasing varieties of wheat will lower wheat prices and benefit consumers. Analogously, in the case of female contraception and abortion, men may have been beneficiaries. Finally, it is conceivable that technological innovation could even harm those who choose to implement it. For example, if wheat is inelastically demanded, the availability of a new variety that costlessly increases yields will benefit consumers; but the returns to farmers will decline as long as they plant the same wheat acreage.

The first task of this paper is to illustrate, through two theoretical models, how analogous mechanisms could operate with respect to increased availability of abortion and female contraception for women. These models will show how the legalization of abortion and the availability of female contraception could result in a decline in the competitive position of women relative to men—especially if they do not use contraception or abortion.

In the first model a decline in the cost of abortion (or increased availability of contraception) decreases the incentives to obtain a promise of marriage if premarital sexual activity results in pregnancy. Those women who will obtain an abortion or who will reliably use contraception no longer find it necessary to condition sexual relations on such promises. Those women who want children, who do not want an abortion for moral or religious reasons, or who are unreliable in their use of contraception, may want marriage guarantees but find themselves pressured to participate in premarital sexual relations without any such assurance. They have been placed at a competitive disadvantage: in this case analogous to farmers who do not switch to the new varieties of wheat. Sexual activity without commitment is increasingly expected in premarital relationships, immiserizing at least some women, since their male partners do not have to assume parental responsibility in order to engage in sexual relations.

5. According to the 1982 National Survey of Family Growth, mothers of children born out of wedlock in 1970 reported that 19 percent were wanted at the time; 65 percent were mistimed or neither wanted nor unwanted; 15 percent were unwanted. These numbers reflect the commonly perceived indecision of women giving birth out of wedlock and ambiguity as to whether the children are wanted or unwanted.

A second model illustrates another reason why the previous support system could have been eroded by the advent of female contraception and legal abortion. The fact that the birth of the baby is now a *choice* of the mother has implications for the decisions of the father. The sexual revolution, by making the birth of the child the *physical* choice of the mother, makes marriage and child support a *social* choice of the father. This second model explores how the decisions of the father depend upon the decisions and options of the mother. The logic of this model corresponds to what one contributor to the Internet wrote to the Dads' Rights Newsgroup: "Since the decision to have the child is solely up to the mother (see *Roe v. Wade*) I don't see how both parents have responsibility to that child. . . . When one person has the decision-making power, they alone have the responsibility to provide and care for that decision."

In this second model, out-of-wedlock birth is the consequence of a sequence of decisions: about male-female relationships, about sexual activity, about the use of contraceptives, about abortion in the event of pregnancy, and about marriage in the event of birth. This work extends that of Becker [1981] by incorporating out-of-wedlock births and the sexual participation decision into a rational choice framework.<sup>6</sup>

The major economic theories for increased out-of-wedlock births are based on changes in job availability (see Wilson [1987]) and changes in welfare incentives (see Murray [1984]),<sup>7</sup> but as will be discussed, empirically neither of these factors explains more than a small fraction of the change. The alternative hypothesis offered in this paper thus fills a void. In the absence of any better theory, despite econometric evidence to the contrary, the welfare theory serves as the primary rationale for reducing welfare support. However, if the rise in out-of-wedlock births is mainly due to technical change or has occurred for yet some further reason, currently envisioned cuts in welfare will fall far short of their proponents' expectations.

This paper offers theoretical reasons why the technological shock of abortion and female contraception may have played a major role in the rise of out-of-wedlock childbearing. If the simplest versions of our models totally explained the data, then arguably the repeal of abortion and the denial of female contra-

6. This paper also extends to premarital states the work on the distribution of returns between men and women in marriage. For a recent review see Lundberg and Pollak [1994].

7. These are the two main theories reviewed by Ellwood and Crane [1990].

ception to unmarried women could reverse this trend. But the change in sexual customs and the subsequent rise in out-of-wedlock births have been accompanied by a decline in the stigma attached to out-of-wedlock childbearing. Because there is no reason to believe that destigmatization is reversible, it does not follow that the prohibition of abortion or of the pill and other contraceptive devices to unmarried women would be effective in reducing out-of-wedlock births. Instead of decreasing out-of-wedlock childbearing, the denial of choice would, in all likelihood, further increase the number of out-of-wedlock births as women who would have obtained abortions or used contraceptives instead give birth to unwanted babies.

If Humpty Dumpty cannot be put back together again, what can be done? In the old days a private system of contracting between sexual partners insured that children received the financial and emotional support of two parents. Although the old system may be impossible to reconstruct, social policy can still create incentives that make it costly for fathers to abrogate parental responsibility for their offspring. Ellwood [1988] has suggested administrative ways of making fathers pay. Such a system would not only directly contribute to the well-being of children born out of wedlock, but it would also tax men for fathering such children, thereby offsetting at least partially the technology-shock-induced change in terms between fathers and mothers.

## II. BASIC TRENDS

Before presenting models of out-of-wedlock births, it is useful to describe some key facts concerning the magnitude and timing of out-of-wedlock births, total births, abortion, use of the pill, sexual experience as an indicator of sexual participation, shotgun marriage, and the living arrangements of children. These facts will serve as the relevant background both for the development of the models and for their interpretation. The Data Appendix describes the derivation of statistics dependent on our own calculations. Table I summarizes the trends in vital statistics, and Table II presents statistics concerning important decisions relating to women's fertility and childbearing histories.

Table III describes time series tests for jumps and changes in trends in the use of abortion and the pill, sexual participation, and the shotgun marriage ratio. All regressions were run in first-difference form after failure to reject unit roots in the underlying



TABLE I  
VITAL STATISTICS: BIRTHS, FERTILITY RATES, MARITAL STATUS, OUT-OF-WEDLOCK BIRTHS

	1965-1969	1970-1974	1975-1979	1980-1984	1985-1989
Births (in thousands) <sup>a</sup>					
Total	3599	3370	3294	3646	3809
White	2990	2760	2660	2915	3001
Black	542	538	540	590	636
Birthrates per 1000 married women 15-44 <sup>b</sup>					
White	119.4	103.6	93.1	94.5	90.2
Black	129.1 <sup>f</sup>	110.3	93.3	90.6	84.5
Birthrates per 1000 unmarried women 15-44 <sup>c</sup>					
White	12.7	12.6	13.7	18.9	24.1
Black	91.0 <sup>f</sup>	94.6	85.5	81.7	84.4
Women married, 15-44 (in percent) <sup>d</sup>					
White	67.8	65.3	61.6	58.8	57.9
Black	55.9 <sup>f</sup>	52.9	45.2	39.9	37.7
Men married, 15-44 (in percent) <sup>d</sup>					
White	60.9	58.7	54.9	52.1	51.4
Black	49.7 <sup>f</sup>	46.5	42.1	36.8	35.6
Out-of-wedlock births (in 1000s) <sup>a</sup>					
Total	322	406	515	715	911
White	144	166	220	355	485
Black	189 <sup>f</sup>	230	280	337	393
Percent of births out-of-wedlock <sup>e</sup>					
Total	9.0	12.1	15.6	19.6	23.9
White	4.8	6.0	8.2	12.2	16.1
Black	34.9 <sup>f</sup>	43.0	51.7	57.1	61.8

a. Source. *Vital Statistics of the United States, 1989: Volume I—Natality*, Tables 1-76 to 1-79 and Current Population Series P-20.

b. Source. *Vital Statistics of the United States, 1989: Volume I—Natality*, Tables 1-77.

c. Source. *Vital Statistics of the United States, 1989: Volume I—Natality*, Table 1-76.

d. Source. Current Population Reports, Series P-20, *Marital Status and Living Arrangements and Marital Status and Family Status*.

e. Source: *Vital Statistics of the United States, 1989: Volume I—Natality*, Tables 1-77 and 1-78.

f. Based only on 1969 figures.

series, but not in their first differences. In each case we fit ARMA models to characterize the relevant time series processes including year dummies (the dummy in levels is 0 prior to the relevant year and 1 thereafter) to capture discrete changes in the level of a series at one or more dates or trend dummies (the dummy is 0 prior to the relevant data and increases by 1 per annum thereafter) to allow for changes in trends. In the case of abortion, use of



**TABLE II**  
**EXPERIENCE OF UNMARRIED WOMEN: SEXUAL PARTICIPATION, USE OF PILL, SHOTGUN**  
**MARRIAGE, LIVING ARRANGEMENTS OF CHILDREN, AND ADOPTIONS**

	1965-1969	1970-1974	1975-1979	1980-1984
Women age 16 with sexual experience (percent) <sup>a</sup>				
White	13.8	23.2	28.1	32.8
Black	35.0	42.3	50.8	49.9
Unmarried women using pill on first intercourse (in percent) <sup>b</sup>	5.7	15.2	13.4	NA
Abortions of unmarried women 15-44 (1000s) <sup>c,d</sup>	88	561	985	1271 <sup>h</sup>
Per 1000 unmarried women 15-44	6.7	35.3	50.0	54.2
First birth shotgun marriage rate (percent) <sup>e</sup>				
White: marriage before birth	59.2	55.4	45.7	42.0
Marriage before first birthday	70.9	65.6	57.6	53.3
Black: marriage before birth	24.8	19.5	11.0	11.4
Marriage before first birthday	34.7	29.3	18.1	16.4
Children age 3 to 5 living with never married mother (percent) <sup>f</sup>				
White	NA	0.5 <sup>i</sup>	1.5 <sup>i</sup>	2.2
Black	NA	13.5 <sup>i</sup>	23.4 <sup>i</sup>	28.6
Children age 3 to 5 living with neither parent (percent) <sup>f</sup>				
White	NA	1.5 <sup>i</sup>	1.9 <sup>i</sup>	1.5 <sup>i</sup>
Black	NA	5.0 <sup>i</sup>	5.6 <sup>i</sup>	6.5 <sup>i</sup>
Adoptions (in 1000s) <sup>h</sup>	158	156	129 <sup>j</sup>	142 <sup>j</sup>
Through agencies	83	69	48 <sup>j</sup>	51 <sup>j</sup>
By individuals	75	86	81 <sup>j</sup>	91 <sup>j</sup>
Ratio of adoptions to out-of-wedlock births (in percent)	49.0	38.4	29.0 <sup>j</sup>	19.8 <sup>j</sup>

a. *Source.* Women in given year who had ever had intercourse from retrospective data in the 1982 National Survey of Family Growth.

b. *Source.* Women using pill on first intercourse by year from retrospective data in the 1982 National Survey of Family Growth.

c. *Source.* 1965-1972: abortions for women 15 to 44 from retrospective reports in the 1982 National Survey of Family Growth, adjusted for age truncation, adjusted to conform to the Alan Guttmacher series for years 1973-1981.

d. *Source.* 1973-1984: *Abortion Factbook: 1992 Edition*, Alan Guttmacher Institute, Table 3, pp. 176-177.

e. *Source.* Authors' calculations based on data from June 1980, 1982, and 1990 Fertility Supplements of the Current Population Survey.

f. *Source.* Current Population Reports, Series P-20, *Marital Status and Family Status*.

g. *Source.* *Adoption Factbook*. Washington, DC: National Committee for Adoption, 1989. Table 11, p. 99.

h. Figure for 1983 is the average of 1982 and 1984.

i. Adjusted for increased coverage after 1982. Children with neither parent includes those living in group quarters or not in families.

j. 1975 to 1979 is based on 1975 adoption survey; 1980 to 1984 is based on 1982 adoption survey.

the pill, and sexual participation, there was a jump in levels, rather than a change in trend, whereas in the case of the white shotgun marriage ratio there was a change in trend, rather than a jump in the series. The table reports our preferred specifications. Key findings concerning the presence and estimated magnitudes of changes in levels and trends are robust with respect to alternative specifications, including the inclusion of lagged dependent variables, further moving average and autoregressive errors, changes in the sample period, and alternative methods of construction of the underlying series.<sup>8</sup> Precise dating of shocks is typically more difficult for nonwhites than for whites. The reported benchmark equations pass standard tests for the absence of autoregressive errors and heteroskedasticity.

### *A. Out-of-Wedlock Births*

The fraction of children born out of wedlock increased at an accelerated pace beginning in the middle 1960s, for both whites and blacks. This trend has continued almost to the present time. In 1970 there were about 400,000 out-of-wedlock births (out of 3.7 million total births); in 1990 there were 1.2 million out-of-wedlock births (out of 4.0 million total).

### *B. Fertility and Marriage Rates*

The number of births per unmarried woman aged 15 to 44 roughly doubled for whites from the late 1960s to the late 1980s. In contrast, for blacks this rate declined by 5 to 10 percent over the same period. For both whites and blacks the fraction of unmarried women rose dramatically: by slightly more than 30 percent for whites and by slightly more than 40 percent for blacks. There were also rapid declines in the fertility rates of married women, by almost a third for blacks and a quarter for whites. The decline in the fertility rates of married women and the decrease in the fraction of married women contributed, along with the decline in the shotgun marriage ratio, to the rise in the out-of-wedlock birth ratio.<sup>9</sup>

### *C. Abortions*

Abortions to unmarried women prior to legalization were fairly small in number; our estimates show them to be less than

8. See Akerlof, Yellen, and Katz [1994] for further details.

9. Nathanson and Kim [1989] have devised a decomposition that has shown the importance of decreasing marriage and increasing sexual experience for teenagers for the period 1971 to 1979.

TABLE III  
TIME SERIES PROPERTIES OF ABORTION, USE OF PILL, SEXUAL EXPERIENCE, AND SHOTGUN MARRIAGE

Dependent variable	Years	Constant	Change in 1970 dummy	Change in 1971 dummy	MA(1)	AR(1)	AR(2)	Adjusted $R^2$
Change in abortions per 1000 women 15 to 44 <sup>a</sup>								
White women	1960-1987	-0.013 (0.45)	10.90*** (2.31)	—	-0.60*** (0.17)	—	—	0.55
Nonwhite women	1960-1987	-0.170 (0.28)	6.24** (2.87)	7.51** (2.86)	0.40 (0.29)	-1.07*** (0.22)	-0.46** (0.17)	0.55
Change in percentage of all women using pill on first intercourse <sup>b</sup>	1961-1980	-0.0038 (7.10)	9.60** (3.82)	—	-0.96*** (0.30)	—	—	0.58
Change in percentage of 16- year-old women with sexual experience <sup>c</sup>								
White women	1955-1981	0.41 (0.97)	10.20*** (3.58)	—	-1.00*** (0.12)	—	—	0.40
Black women	1955-1981	0.21 (1.29)	—	13.63** (6.27)	-0.94 (0.15)	—	-0.51*** (0.15)	0.45

TABLE III  
(CONTINUED)

Dependent variable	Years	Constant	1968 change in trend dummy	MA(1)	Adjusted $R^2$
Change in first-birth shotgun marriage ratio <sup>d</sup>					
White women	1955-1989	0.0083 (0.0069)	-0.021** (0.0089)	-0.90*** (0.11)	0.48
Black women	1955-1989	-0.0037 (0.013)	-0.0057 (0.017)	-0.75*** (0.13)	0.40

a. *Source.* Abortions per 1000 women 15 to 44 from retrospective reports in the 1982 and 1988 National Survey of Family Growth, adjusted for age truncation, combined. See Data Appendix.

b. *Source.* Percent of women using the pill on first intercourse by year of first intercourse from retrospective reports in the 1982 National Survey of Family Growth. See Data Appendix.

c. *Source.* Percentage of 16-year-old women in the given year who had ever had intercourse from retrospective data in the 1982 National Survey of Family Growth. See Data Appendix.

d. *Source.* Authors' calculations based on data from the June 1980, 1982, and 1990 Fertility Supplements of the Current Population Survey. The dependent variable is the percentage of women who conceived their first child out of wedlock and married within seven months prior to the birth of the child. A child is considered to be conceived out of wedlock if the mother was unmarried eight months prior to the birth. See Data Appendix.

Standard errors are in parentheses. \*Significance at the 10 percent level. \*\*Significant at the 5 percent level. \*\*\*Significant at the 1 percent level.

100,000 per year in the late 1960s.<sup>10</sup> This compares with an annual average of 322,000 out-of-wedlock births from 1965 to 1969. Abortion, both in absolute and in relative terms, increased rapidly in the 1970s. From 1980 to 1984 abortions to unmarried women averaged more than 1.25 million, while out-of-wedlock births had risen to 715,000.

As shown in the preferred regression in Table III, there appears to have been a discrete abortion shock in 1970 just at the time of legalization of abortion in New York and the liberalization in California under the Beilensen Act. Many other states liberalized their abortion laws at about this time (see Luker [1984, p. 272]).

#### *D. The Pill*

Use of the pill by unmarried women on first intercourse became a significant factor in the 1970s. According to retrospective self-reports in the National Survey of Family Growth, use of the pill on first intercourse averaged 15 percent from 1970 to 1974, more than double the fraction of the previous five years. The preferred regression equation (reported in Table III) shows that a jump occurred between 1969 and 1970. Given the significant fraction of unmarried women using the pill on first intercourse, it is likely that a sizable fraction of all sexually active unmarried women were using the pill in the 1970s.

#### *E. Sexual Experience*

Our index of sexual experience—the fraction of women retrospectively reporting having had sexual intercourse prior to age sixteen—jumped in precisely 1970 for whites and possibly one year later for blacks as shown by the regression results in Table III. Due to greater noise in the black data than in the white data, however, this jump is more difficult to date for blacks.

#### *F. Shotgun Marriage*

The white shotgun marriage ratio began to fall in the late 1960s. In 1969 the first-birth shotgun marriage rate peaked at 0.61; by 1988 it had fallen to 0.35. There has been a similar fall in the black shotgun marriage ratio, beginning earlier, however, than the negative trend for whites. In the late 1960s the black shotgun marriage ratio was about 0.25; by the late 1980s it had

10. For a discussion of the accuracy of abortion statistics, see the Data Appendix.

fallen to about 0.085. If the shotgun marriage rate had remained at its 1965–1969 level, the rise in the out-of-wedlock first-birth ratio for whites would have been 85 percent smaller over the ensuing fifteen years, and 76 percent smaller over the ensuing twenty. The decline in the shotgun marriage ratio also played an important role in the increase in the out-of-wedlock first-birth ratio for blacks, although the corresponding contributions, 50 percent and 58 percent, respectively, are not as large.

### *G. Births and Abortion*

There was a drop in births both to black and white teenage women in New York immediately following the legalization of abortion in New York in 1970. However, recent studies, which are discussed below, have surprisingly found a positive relation between teenage births and abortion availability.

### *H. Living Arrangements of Children*

In the old days, prior to the 1970s, only a small fraction of children born out of wedlock were kept by mothers who never married. In contrast, today only a small fraction are put up for adoption or given to other relatives. Consider the disposition of the 360,000 out-of-wedlock children born in 1969, just before the technology shock. According to our own estimate, the mothers of 135,000 of these children married within the next three years.<sup>11</sup> Of the remaining 225,000 children, 65,000 were reported living with never married mothers three years later. Seventy thousand children in the 1969 cohort were reported in 1972 as living with neither parent, a figure that entails some double counting since not all of these children were born out of wedlock. These figures are roughly consistent with the high rate of adoption at the time. In 1969 there were 170,000 adoptions, including some children whose mothers had been married at the time of birth.<sup>12</sup> The frac-

11. We calculated an extended shotgun marriage ratio, defined as the fraction of births conceived out of wedlock resulting in marriage before the child's third birthday. Applying these rates to the number of out-of-wedlock births reported in *Vital Statistics* yielded estimates of the fraction of out-of-wedlock children whose mothers had married before the age of three.

12. Because of reporting error, double counting, and children whose mothers were married at the time of birth, the sum of adoptions, children living with neither parent, children living with never married mothers, and children with mothers who later married do not add to the total number of out-of-wedlock births. Four different sources of data were used, each with its own reporting error. The total number of out-of-wedlock births is from *Vital Statistics*. Estimates of the fraction of mothers who had married within three years of birth come from the Current Population Survey's Fertility Supplements, which contain retrospective questions regarding women's dates of marriage and birth dates of their chil-

tion of children kept by the mothers who had not married within three years was roughly 0.28.

In contrast, fifteen years later a much larger fraction of children born out of wedlock were kept by their mothers. In 1984 there were 770,000 of these births. We estimate that the mothers of 200,000 of these children were married within three years. Of the remaining 570,000 about 320,000 were reported living with mothers who had never married three years later, and there were 60,000 with neither parent. Annual adoptions had fallen to 105,000. The ratio of children living with never married mothers to those born out of wedlock whose mothers had not married had doubled to 0.56.

### III. A RUDIMENTARY MODEL OF FEMALE IMMISERATION

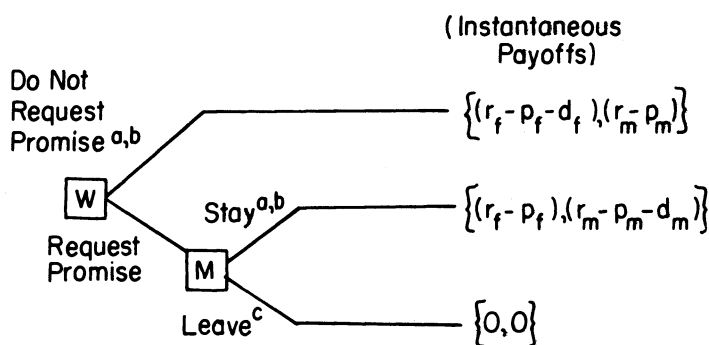
We shall now present a rudimentary model of shotgun marriage. In this model, prior to sexual relations, women may or may not ask for a promise of marriage in the event of pregnancy. If they ask for such a guarantee, they are afraid that their partners will seek other relationships. When the cost of abortion is low, or contraceptives are readily available, potential male partners can easily obtain sexual satisfaction without making such promises and will thus be reluctant to commit to marriage. Thus, women who, in the absence of contraception and abortion, would not engage in premarital sexual activity without assurance of marriage will feel pressured to participate in uncommitted relationships once contraception and abortion become available. In this model the implicit or explicit promise to marry is viewed as an enforceable contract. Men will, if necessary, meet their prior commitments.

Prior to sexual relations a woman may or may not ask for an implicit or explicit promise of marriage in the event of pregnancy.

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dren. The number of children living with never married mothers and the number of those with neither parent are from the annual March CPS surveys on living arrangements. Adoption statistics come from the National Committee for Adoption. The number of children in the one-year cohort living with a never married mother or living with neither parent was estimated as one-third of the children aged three to five in these respective categories. Those classified as living with neither biological nor adoptive parents correspond to the Census categories "living in households with neither parent" and "not in families." Both the series on children living with never married mothers and those living with neither parent were adjusted for the change in coverage in 1982. Of course, children with neither parent and adoptions include some whose mothers had been married at the time of birth. Adoptees also include children whose parents have remarried and have been adopted by a new spouse.





- a.  $p_f$  takes on the two values  $p_f^+ > 0$  and  $p_f^- < 0$
- b. with probability  $\theta$  random mating occurs in the next period
- c. with probability  $\iota$  random mating occurs in the next period

FIGURE I  
Marriage Request Game Tree with Payoffs

We saw that 25 years ago among white working-class youths in San Francisco such a promise was the norm.<sup>13</sup> Our own survey (described below) of University of California at Berkeley undergraduates in the summer of 1994 suggests that today premarital sexual activity does not usually entail such a commitment.

### A. Decisions in the Game

Figure I presents the tree for a simple game that focuses on the role of “competition” as it affects the choices of women whether or not to exact a promise to marry as a condition for premarital sexual activity. The decision of the woman is whether or not to ask for such a promise. If she asks for this assurance, she runs the risk that her boyfriend will exit. The basic decision for the man is whether or not to leave the relationship when such a guarantee is the prerequisite for sexual relations with his cur-

13. Luker [1991, p. 78] writes: “Yet even these statistics [on the growth of teen sexuality from the 1950s to 1979–1981] do not capture how profoundly different [current] teen sexuality is from that of earlier eras. As sources such as the Kinsey Report suggest, premarital sex for many American women before the 1960s was ‘engagement’ sex. The woman’s involvement, at least, was exclusive and she generally went on to marry her partner in a relatively short period of time. Almost half of the women in the Kinsey data who had premarital sex had it with their fiancés.”

rent partner. We shall proceed to describe the payoffs to the woman and to the man.

### *B. Payoffs to the Woman*

If the woman chooses to engage in premarital sex but does not exact the contingent marriage promise, she receives an instantaneous payoff ( $r_f - p_f - d_f$ ).  $p_f$  is the expected per period cost of pregnancy if there is a marriage promise prior to sexual relations.  $d_f$  is the expected per period additional loss if she does not obtain a promise of marriage from her partner.  $r_f$  is the per period value to her of her relationship with her partner. We assume that, if both parties have agreed to the relationship, then the relationship will continue in the next period with probability  $1 - \theta$  and will terminate with probability  $\theta$ . If the relationship terminates, there will be random pairing of available men and women in the next period. For tractability it is assumed that there are equal numbers of men and women.<sup>14</sup> The payoff to such a game will be  $v_f$ , the value of the game to this woman with random mating. In either event—if the woman begins a new relationship or if she continues the old—the future payoffs will be weighted with a discount factor  $\gamma$ .

To continue the discussion of the payoffs, if the woman asks for an assurance of marriage in the event of pregnancy, the man may then either remain in the relationship, or leave. If the man remains, the woman's payoff is ( $r_f - p_f$ ) in the current period. She keeps the relationship, whose per period return is  $r_f$ . She also continues to bear the potential costs of pregnancy,  $p_f$ , but without the extra costs of single motherhood because of the promise. Next period with probability  $1 - \theta$  she will continue the same relationship with the same instantaneous payoffs, and with probability  $\theta$  she will begin a new relationship with value  $v_f$ .

If the man leaves, the woman receives an instantaneous payoff of zero. She has forgone the relationship this period and, with it, the complications of a possible pregnancy. Next period she will begin another relationship whose expected value is  $v_f$ .

### *C. Payoffs to the Man*

If the woman does not exact a promise prior to premarital sex, the man's instantaneous payoff is  $r_m$ , the per period value of

14. Other authors have emphasized that changes in the ratio of men to women will affect the equilibrium number of men who would rather marry than remain single. (See, for example, Willis [1994].)

the relationship. For convenience we assume that  $p_m$ , the man's pregnancy cost, is zero if he has not promised to marry the woman. As in the case of the woman, the relationship will continue with probability  $1 - \theta$ , and with probability  $\theta$  the man will begin a new game with random mating of women seeking partners. The value of such a game to the man is  $v_m$ . If the woman exacts the promise and the man stays in the relationship, he receives an instantaneous payoff ( $r_m - d_m$ ). Again, with probability  $1 - \theta$  the relationship will continue, and with probability  $\theta$  he returns to the matching pool. Analogous to the notation for the woman's payoff,  $d_m$  is the expected per period cost of the promise of potential marriage. If the man leaves, in the next period he will begin a new game with value  $v_m$ . Of course, future returns are discounted by the factor  $\gamma$ .

#### *D. A Simple Example*

In principle, all of the payoffs,  $p_f$ ,  $p_m$ ,  $r_f$ ,  $r_m$ ,  $d_f$ , and  $d_m$ , have distributions across individuals. We shall make the minimal assumptions necessary to illustrate the earlier analogy with the hand-loom weavers. Such an illustration requires two types of women. One of these types will adopt the technologies of abortion or contraception or both when they become available, with a probable increase in welfare, while the other type will not adopt the new technologies and will consequently become impoverished. Men are all of the same type.

Women in this example fall into two classes depending on their expected costs of pregnancy. For a fraction  $\alpha$  the expected cost of pregnancy is positive, denoted  $p_f^+$ . For these women pregnancies will be terminated by abortion if this option is available at sufficiently low cost. In order to model what we consider the norm in the old days, we shall assume that  $p_f^+$  is not only positive but also less than  $r_f$  so that  $p_f^+$  women would be willing to participate in sexual activity if their boyfriends promise to marry them. In addition, we shall assume that the sum  $p_f^+ + d_f$  exceeds  $r_f$  so that, in the absence of contraception and abortion,  $p_f^+$  women will not engage in sexual activity without an assurance of marriage.

In contrast to the women for whom a pregnancy without marriage would lead to a decrease in utility, we assume that there is a second group of women, a fraction  $(1 - \alpha)$  of the population, for whom the cost of pregnancy, denoted  $p_f^-$ , is negative. We also assume that  $r_f > p_f^- + d_f$ , so that these women are willing to engage in premarital sex and bring the baby to term even without an assurance of marriage.  $d_f$  is also assumed to be positive. As a

result,  $p_f^-$  women prefer a baby without a husband to neither baby nor husband, but, better yet, they would prefer both baby and husband.

While two types of women are necessary to illustrate the analogy with the hand-loom weavers, our example requires only one type of man. For simplicity, we shall assume that  $p_m$  is zero and that  $d_m$ , which is the same for all men, is positive but less than  $r_m$ . Men would prefer not to make a marriage promise, but they would be willing to do so if that is their only way to maintain their relationships.

### *E. The Equilibrium*

We can now describe the equilibria in this model both before and after the technology shock. Before the technology shock it is clear that no woman with positive pregnancy costs will engage in sexual activity without a promise of marriage. There will always be an equilibrium in which women with negative pregnancy costs will also demand a promise of marriage before engaging in sexual activity. Indeed, this will be the unique equilibrium as long as  $\alpha$ , the fraction of  $p_f^+$  women, is sufficiently high. With  $\alpha$  sufficiently high, even if no  $p_f^-$  women were demanding a promise of marriage, it would pay a man to stay with any  $p_f^-$  individual woman who decided to demand such a promise.<sup>15</sup> In this equilibrium  $p_f^+$  women, who would be unwilling to bear children in the absence of marriage, demand a marriage assurance in the event of pregnancy, while  $p_f^-$  women, who would be willing to bear children even in the absence of marriage, demand the same, since they know the man will accept. For the man it is not worthwhile to seek another relationship because he would forfeit current utility and, ultimately, do no better.

Let us now see how this game and its equilibrium will be altered by the development of inexpensive and easily available contraception and abortion. Let us assume that the cost of abortion to  $p_f^+$  women is less than the cost of pregnancy. For simplicity, let the cost of the abortion be zero. Empirically, the financial cost of an abortion is extremely low relative to the financial cost of raising a child. (Alternatively, we could assume that reliable con-

15. The man's stay/leave decision will be affected by the ratio of promise/do not promise women to be encountered in the random mating process. This ratio in the next period's random matching, however, will always be greater than  $\alpha/(1-\alpha)$  since all  $p_f^+$  women demand promises (of whom a fraction  $\theta$  will be searching for new partners in the next period) and all the  $p_f^-$  women who are deserted by their partners and are therefore looking for new mates in the next period have decided on the demand-promise strategy.

traception becomes available.) With the advent of abortion a  $p_f^+$  woman has no need to request a promise in the event of pregnancy. And even if she were to ask for such a promise, her partner would know that he would have no cost in fulfilling it, since the woman would obtain an abortion rather than bring the baby to term. The payoff to the  $p_f^+$  women becomes  $r_f$ , with the payoff to the man in such a relationship, symmetrically,  $r_m$ . In this example, the new technology enhances the welfare of  $p_f^+$  women and their partners.

Let us now consider the decision of a  $p_f^-$  woman and of her partner. This woman may ask for a promise of marriage, but if she does, her partner may leave. With abortion and the range of  $p_f^+$  and  $d_f$  in our example, we know that the man will get  $r_m$  next period if he encounters a  $p_f^+$  woman. Indeed, he will always leave if parameter values are such that the random mating of the next period yields him a  $p_f^+$  woman with sufficiently high probability and if his disutility of marriage and discount factor are also sufficiently high. Under these conditions, the  $p_f^-$  woman therefore will not ask the man for a promise because she knows he would leave, and the man will stay in the relationship without making a commitment since he will not fare better elsewhere. The consequence is that after abortion and contraception become easily available, there is a new equilibrium in which no woman—even if she wants children and marriage—asks for a promise of marriage. In this equilibrium if any woman did ask for such a promise, her partner would leave, and she would lose the relationship. The  $p_f^-$  women, like the hand-loom weavers, suffer a reduction in welfare.<sup>16</sup>

16. If  $\alpha$ , the fraction of  $p_f^+$  women, is sufficiently low, there will also be equilibria in which all  $p_f^-$  women ask men to stay, and no man paired with such a woman will leave. In addition, in this very simple model there may be mixed equilibria with some women demanding marriage promises and other women forgoing them over a wide range of parameter values. This occurs, however, for an implausible reason. If a large number of  $p_f^-$  women ask men for marriage promises but a significant fraction of those men leave, disappointed  $p_f^-$  women who ask men for a promise to marry may dominate the random pairings in the next period. A high probability of encountering such a partner in the next stage of the game can be sufficient inducement for a fraction of the men to stay even when asked for a marriage commitment. This fraction of men staying will in turn be the incentive for some women to ask for a promise of marriage. We believe that this flooding of the random pairings with women asking for commitments after the technology shock is only a curiosity. For simplicity, we assumed that the exogenous probability of the relationship's termination,  $\theta$ , did not depend upon the type of relationship between the couples. It seems reasonable, however, that the probability of a breakup is higher for couples in "uncommitted" relationships than for those in committed ones. As a result, with just a bit more realism, the equilibrium with no  $p_f^-$  women asking for marriage assurances is likely to be unique.

A slight modification of this example illustrates the possibility that all women, like the wheat farmers, could lose from implementing the new technology. Suppose that the advent of contraception/abortion decreases pregnancy costs without eliminating them. This may cause a switch from a unique equilibrium, with all women obtaining marriage commitments, to dual stable equilibria. In one equilibrium, as before, every woman obtains a marriage promise, and welfare is unchanged, but in the other equilibrium no woman obtains a marriage guarantee because each correctly foresees that such a demand would cause the breakup of her relationship. A move to this no-commitment trap is likely to reduce welfare for all women. In this example the gains from the advent of abortion and contraception accrue totally to the men.

Although we have used the model to analyze the effect of changes in abortion and contraceptive availability, other changes can easily be incorporated. Increases in welfare benefits payable only to single mothers will decrease the value of  $d_f$ , as will changes in the stigma of single motherhood. Better labor market opportunities for women, so that there is less dependence on male financial support, will likewise decrease the value of  $d_f$ . Higher wages for women will also increase the cost of pregnancy,  $p_f$ , because of the increased opportunity cost of own child care. Increased financial obligation by unmarried fathers for their biological offspring will increase  $p_m$  if the father does not marry the mother, and it will also decrease the value of  $d_m$ .

### *E. Isomorphic Model of Sexual Participation*

Under a slight reinterpretation the previous game structure illustrates how increased competition may affect sexual participation. In this analogous model, women decide whether or not to engage in premarital sex at all, and men then decide whether to remain in relationships without sexual activity. This model is isomorphic to the previous one, with participate/do not participate substituting for promise/do not promise. Before the technology shock abstinence would be the norm for all women. After the technology shock those women who would use contraception or would be willing to obtain an abortion in the event of pregnancy or both engage in premarital sexual activity. However, those women who are not willing to use contraception or obtain an abortion will also engage in sexual activity, since they correctly fear that if they abstain their partners would seek satisfaction

elsewhere. The advent of contraception and abortion used by others may result in an unwanted increase in sexual participation for those who reject the new technology.

#### IV. SEXUAL PARTICIPATION, ABORTION, AND SHOTGUN MARRIAGE

The previous section illustrated the consequences of competition in games with only one major decision. In reality, however, shotgun marriage is the outcome of a sequence of decisions: about premarital sexual activity, abortion, and marriage. In this section we model this sequence of decisions, with one significant change from the previous game. In that model the promise to marry was considered enforceable. In contrast, we now assume the man's willingness to marry just prior to the birth of the child depends upon a comparison of his own cost of getting married with his perception of the cost to his partner of becoming a single mother.

The previous model showed that advances in reproductive technology could lead to the immiseration of women through increased competition. The model in this section illustrates another mechanism whereby the technology shock could lead to the feminization of poverty. In the old world, before the sexual revolution, women were less free to choose, but men were expected to assume responsibility for their welfare, an expectation that was more often fulfilled than breached. Nowadays women are freer to choose, but men are affording themselves the comparable option. In the model we present, the man reasons: "If she is not willing to obtain an abortion or use contraception, why should I sacrifice myself to get married?" This model accurately predicts a decline in shotgun marriage: with abortion readily available, many relationships that previously ended in shotgun marriages now end in abortion. When, instead, the woman carries the baby to term, the man can also rationalize remaining single. The model also realistically predicts a decline in the fertility rate (see Wilson and Neckerman [1986]) and an increase in the out-of-wedlock birthrate. However, as shall be discussed later, we think that the factors emphasized in the last section are probably more important empirically in explaining the increase in out-of-wedlock births in the United States.

##### *A. Description of the Model*

Figure II is a tree diagram showing the sequence of decisions and their payoffs for a couple deciding whether or not to initiate



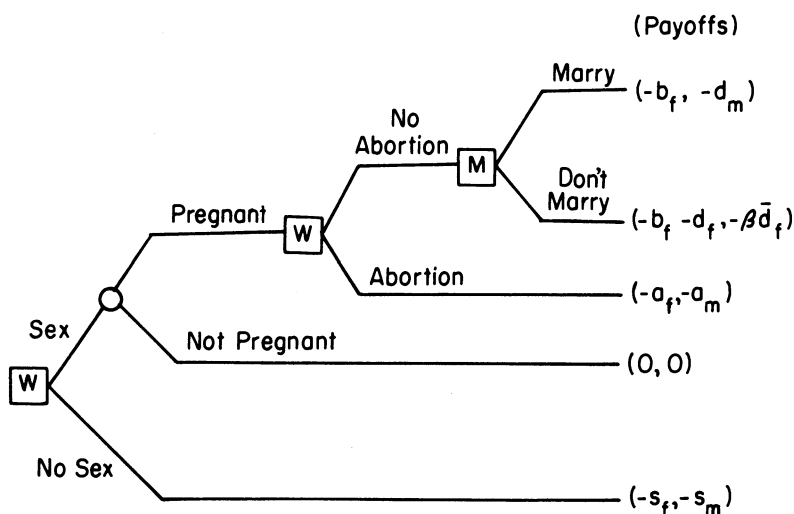


FIGURE II  
Sequence of Decisions and Payoffs Confronting a Couple  
Initiating a Sexual Relationship

a sexual relationship.<sup>17</sup> We omit from this model the value of the relationship to the woman and the man,  $r_f$  and  $r_m$ , respectively, but we shall describe in greater detail than in the previous model the sequence of decisions that each partner faces and then the payoffs attached to the various outcomes. In the beginning, the woman decides whether or not to initiate a sexual relationship with her partner. If she decides to have sex, there are potential future consequences. With probability  $q$  the woman becomes pregnant. This probability obviously depends on whether or not the partners use contraception, but for simplicity we ignore contraception and take  $q$  as fixed. If the woman becomes pregnant, we assume that she next chooses whether or not to have an abortion. If she chooses not to have an abortion, her partner must then decide whether or not to marry her (and she has to decide whether or not to marry him). Interestingly, a model in which the woman chooses whether or not to use contraception, rather than to obtain an abortion, is exactly isomorphic and yields results analogous to those obtained in the present model.

17. The same decision tree is used by Lundberg and Plotnick [1990, p. 247] in their study of the effects of state policies on pregnancy, abortion, and marriage.

The payoffs corresponding to each path of the tree determine the equilibrium outcomes of the game, including the shotgun marriage rate. We first describe the payoffs to the woman and then to the man.

### *B. Payoffs to the Woman*

For notational convenience we shall normalize the payoffs so that the woman's payoff if she engages in sex and does not become pregnant is 0. If she decides to forgo the relationship entirely, her payoff is  $-s_f$ . If the woman agrees to the sexual relationship and a pregnancy occurs, she has the further choice of whether or not to obtain an abortion. The financial and emotional cost of the abortion to the woman is  $a_f$ , so her payoff if she chooses an abortion is  $-a_f$ . If she does not choose to have an abortion, there are two possibilities: either her partner marries her, or she is left as a single mother. We let  $b_f$  be the cost of having a child even if she does get married, so that her payoff as a married mother is  $-b_f$ . In contrast to our previous model, we assume for simplicity that  $b_f$  is positive for all women, so that no women want children, even with marriage. If she does not get married, there is an additional cost (both financial and emotional) in the amount  $d_f$ , so that her payoff in this state is  $-b_f - d_f$ . (For simplicity, we assume that  $d_f > 0$  so that all women prefer marriage to single motherhood. With  $d_f < 0$ , a woman prefers single parenthood to marriage to the partner, and the game tree must include the woman's decision whether or not to marry as well.)

### *C. Payoffs to the Man*

We normalize the man's payoffs by assuming that the reward from sex is 0 if no pregnancy occurs. Assuming that the man gains enjoyment from sex equal to  $s_m$ , his payoff if the woman chooses not to initiate a sexual relationship is  $-s_m$ . In the event of a pregnancy the man's payoff depends on whether or not the woman chooses an abortion and, if not, whether the man marries her. To allow for the possibility that the woman's choice of an abortion may be costly to the man, we denote the man's payoff in the event that the woman chooses an abortion as  $-a_m$ . If the man's partner chooses not to abort, the man's payoff depends on whether or not he marries her. We assume for simplicity that marriage imposes a cost of  $d_m$  on the man, so that his payoff if he marries is  $-d_m$ . Survey research by Marsiglio [1988] suggests that the major costs which men attach to forming households

with their partners as a consequence of unplanned pregnancy stem from the loss of interaction with friends and inability to date other women. Men also strongly believe that they would be required to obtain steady work. But to explain why men may nevertheless marry, we assume that there is also a cost to be borne in the event that the man fails to marry the mother of his child. We let this cost depend on the concern of the man with his partner's (and child's) well-being as reflected in the parameter  $\beta$  and on the amount of suffering that the man expects to impose on the woman by his failure to tie the knot, denoted  $\bar{d}_f$ , where  $\bar{d}_f$  is the mean value of  $d_f$  in the population of women who choose not to have abortions following unplanned pregnancies. The man's payoff is thus  $-d_m$  if he marries the woman and  $-\beta\bar{d}_f$  if he does not. An important assumption is that the man's feeling of guilt depends on  $\bar{d}_f$  and not on the woman's own  $d_f$ , which we assume is unobservable. The importance of guilt as a motive for marriage is consistent with Marsiglio's findings. In the words of one respondent: "I wouldn't want to marry my girlfriend but since it was *my fault* I couldn't leave her in the cold" (*italics added*).

#### D. A Simple Example

In principle, virtually all of the payoffs along the tree differ among individuals, and therefore should be characterized by a joint distribution in the population. However, a simple example illustrates how the decline in the cost of abortion can induce a rise in the out-of-wedlock birthrate. We shall analyze the outcomes of this game in the simple case in which women differ only with respect to their values of  $d_f$ , the disutility of being single—rather than married—mothers, and men differ only with respect to  $d_m$ , the disutility of marrying. We assume that for all women,  $d_f$  is uniformly distributed from 0 to  $D_f^{\max}$ . Because there is the possibility that some women—those with high values of  $d_f$ —may not engage in sex at all, the distribution of  $d_f$  for pregnant women may not occur over this entire range. We let  $D_f$  denote the maximum value of  $d_f$  for those women who engage in sex, with the possibility of pregnancy. We assume that  $d_m$  is uniformly distributed from 0 to  $D_m$ . The remaining parameters are assumed to be the same for all individuals. These include  $a_f$ , the cost of abortion;  $b_f$ , the cost of having a child;  $\beta$ , the man's degree of empathy;  $s_f$  and  $s_m$ , the returns to sex for the woman and man;  $a_m$ , the man's distaste for abortion; and  $q$ , the odds of pregnancy. This simple

model allows a surprisingly rich description of the interactions between the woman's decision and the man's.<sup>18</sup>

### *E. Equilibria of the Game*

If the cost of abortion is less than the cost of single motherhood, this game has a trivial solution: all pregnant women obtain abortions. Since in this case there are no births whatsoever, we focus on the more relevant case in which  $a_f > b_f$ . In this instance the frequency of abortions, legitimate births, and out-of-wedlock births depend on parameter values.

With  $a_f > b_f$ , the game contains a basic simultaneity: abortion is sufficiently costly that any pregnant woman would prefer to carry her baby to term if she could be sure that her partner would marry her. But men differ in the disutility of marriage ( $d_m$ ). Some will, and others will not, marry partners who forgo abortion. Thus, the woman's decision whether or not to abort depends on her perceived probability that the man will marry her if she carries the baby to term. For a given probability of marriage, those women with  $d_f$  in excess of a critical value,  $d_f^{\text{crit}}$ , choose to abort. For these women the disutility of single parenthood is too high to risk bearing a child. In contrast, women with  $d_f$  below  $d_f^{\text{crit}}$  carry their babies to term, gambling on the prospect that, having decided against abortion, their partners will legitimate the child. These decisions of the women determine the average  $\bar{d}_f$  of those women choosing not to abort. This value is  $\bar{d}_f$ ; with the uniform distribution assumed,  $\bar{d}_f = d_f^{\text{crit}}/2$ . The higher the probability of marriage, the higher is  $d_f^{\text{crit}}$ .

18. Pairs for whom  $(d_f, d_m)$  are not in the positive orthant will reveal their true values of  $d_f$  and  $d_m$  prior to the abortion decision and therefore will separate themselves from the game that we are describing here. The minimum values of  $d_f$  and  $d_m$  at 0 correctly reflect the information structure of the game for pairs of men and women for whom  $d_f > 0$  and men for whom  $d_m > 0$ . If the woman has a negative value of  $d_f$ , she has no reason not to reveal it to her partner prior to the abortion decision since she does not want to marry him in any case. She should then make up her mind whether or not to have a baby dependent upon whether  $a_f > b_f$  or  $a_f < b_f$  independent of the man's decision. If the man has a negative value of  $d_m$ , then he should reveal that to his partner prior to the abortion decision. If  $d_m$  is negative and  $d_f$  is positive, the couple should reveal their information and then get married if the woman does not prefer an abortion. The game we have described will take place, however, if both  $d_f$  and  $d_m$  are greater than 0. If  $d_m > 0$ , the man wants the woman to believe that  $d_m$  is as large as possible to maximize her willingness to obtain an abortion. Similarly, if  $d_f > 0$ , the woman wants the man to believe that  $d_f$  is as great as possible so he will marry her. In such a situation neither the man's statements about his value of  $d_m$  nor the woman's statements about her value of  $d_f$  are credible. In these circumstances our model correctly assumes that the man and the woman know the distribution of  $d_f$  and  $d_m$ , but not their values for their specific partners.

Simultaneity arises because the probability of marriage depends in turn on  $d_f^{\text{crit}}$ . The higher is  $d_f^{\text{crit}}$ , the more likely it will be that men will marry women who choose to forgo abortions. The decision of the men whether or not to marry, given their own distaste for it, depends on the perceived cost to their partners of single parenthood. Men marry if  $d_m < \beta \bar{d}_f$ . With  $d_m$  uniformly distributed from 0 to  $D_m$ , the odds of marriage,  $F$ , for women choosing not to abort is  $\beta \bar{d}_f / D_m$ . We assume that men have no information concerning the actual  $d_f$  of their partner but they do have an accurate assessment of the mean value of  $d_f$  of women choosing not to abort. Thus, their decision is positively conditioned on their estimated value of  $\bar{d}_f$ .

The rational expectations equilibrium requires that  $\bar{d}_f$  must be the actual mean value of  $d_f$  of those women choosing not to abort. In consequence,

$$(1) \quad \bar{d}_f = d_f^{\text{crit}}/2.$$

Provided that  $d_f^{\text{crit}}$  is below its ceiling of  $D_f$ , it will be determined so that the marginal woman with  $d_f = d_f^{\text{crit}}$  is exactly indifferent whether or not to abort. The payoff if a woman chooses abortion is  $-a_f$ , and the payoff if the woman chooses not to abort is  $-b_f$  with probability  $F$  (which is  $\beta \bar{d}_f / D_m$ ) and  $-b_f - d_f$  with probability  $1 - F$  (which is  $1 - \beta \bar{d}_f / D_m$ ). The value of  $d_f^{\text{crit}}$  such that the woman is exactly indifferent to getting an abortion satisfies the equation,

$$(2) \quad \frac{b_f \beta \bar{d}_f}{D_m} + (b_f + d_f^{\text{crit}}) \left( \frac{D_m - \beta \bar{d}_f}{D_m} \right) = a_f.$$

In the internal solution in which the limits on the value of  $d_f^{\text{crit}}$  are not binding, we can express  $d_f^{\text{crit}}/2$  as a function of  $\bar{d}_f$ .<sup>19</sup>

$$(3) \quad \frac{d_f^{\text{crit}}}{2} = \frac{a_f - b_f}{2(1 - \beta \bar{d}_f / D_m)}.$$

Equation (3) is a "reaction function" that shows how the decision of women whether or not to abort depends on the mean value of  $d_f$ . As  $\bar{d}_f$  rises, the odds of marriage rise, and thus  $d_f^{\text{crit}}$  rises, inducing more women to forgo abortion.

The equilibrium in this subgame is determined by the re-

19. If  $(a_f - b_f)/(1 - \beta \bar{d}_f / D_m) \geq D_f$ , then the limits on  $d_f^{\text{crit}}$  are binding, and  $d_f^{\text{crit}} = D_f$ .

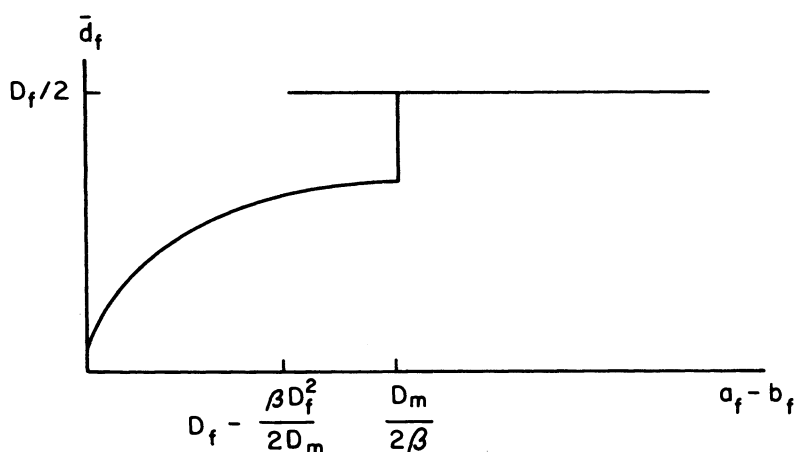


FIGURE III

The Relationship between the Cost of Abortion and the Mean Disutility of Single Parenthood among Women Who Bear Children Conceived out of Wedlock

quirements that (1) and (3) be simultaneously satisfied. The solution sets are somewhat complex, largely because of ceilings and the possibility of multiple equilibria when  $D_f$  is sufficiently large, but the nature of the solutions can be summarized by a graph, which plots the equilibrium value(s) of  $\bar{d}_f$  as a function of  $a_f - b_f$ .

Figure III shows that as the cost of abortion,  $a_f$ , falls, with the cost of bearing a child ( $b_f$ ) constant, the equilibrium value of  $\bar{d}_f$  will fall. A decrease in the cost of abortion raises both the abortion rate and the out-of-wedlock birthrate. With abortion less costly, the fertility rate is lower for sexually active women. With fewer women choosing to carry their babies to term, the mean disutility of single parenthood among women choosing to bear children declines, and there is a consequent decrease in the marriage rate ( $F$ ). The out-of-wedlock birthrate therefore rises.

For each equilibrium plotted in Figure III, the welfare (pay-offs) to women and to men can be easily calculated. Three comparative static results are obtained if we restrict our attention to "internal equilibria." First, as the cost of abortion falls, women who do not refrain from sexual activity and who will not obtain an abortion if they become pregnant will lose out, because their probability of marriage will decline. Second, the expected value of welfare for all women may rise, or decline, dependent on the

distribution of women's attributes. Third, as long as the parameter  $a_m$  (the man's own disutility of abortion) is sufficiently low, men's welfare will rise with a decline in the cost of abortion.<sup>20</sup>

The model may be expanded to include AFDC payments which are paid only to single mothers. The simplest way in which to incorporate such payments is to let the payoff to the woman in the event of single motherhood be equal to  $-b_f - d_f + w$ , where  $w$  is the level of AFDC payments. The payoff to the man who does not marry, in this case, is  $-\beta(\bar{d}_f - w)$ . The effect of decreased stigma to out-of-wedlock birth is identical in the model to an increase in benefits to unwed mothers.

### *G. The Decision to Engage in Premarital Sex*

Our discussion so far has focused on the determinants of fertility and out-of-wedlock births for those women choosing to engage in premarital sex. Following the game tree in Figure II back to its initial node, we can also analyze the determinants of the original decision: whether or not to engage in premarital sex. A decrease in the cost of abortion or increased availability of contraception is likely to result in an increase in premarital sexual activity.

## V. DISCUSSION OF MODELS AND EXPERIENCE IN THE UNITED STATES

Neither of the leading economic theories, the welfare theory and the jobs theory, nor a third to be described, the mix effect hypothesis, is capable of explaining either the magnitude or the timing of the change in out-of-wedlock births. In contrast, the technology shock explanation, particularly when realistically

20. In addition to "internal" equilibria with a positive abortion rate, equilibria are also possible with  $\bar{d}_f = D_f/2$ , implying that no abortion occurs in spite of its availability. In such an equilibrium, there is, however, a positive out-of-wedlock birth rate. Figure III shows that this outcome may occur in two ways. (1) For costs of abortion in the range  $\{b_f + D_f - (\beta D_f^2/2D_m) \leq a_f \leq b_f + D_f/2\beta\}$ , there are dual equilibria. The two solutions correspond to the respective branches of equation (3)—one in which the ceiling on  $d_f^{\text{crit}}$  is binding, so that  $\bar{d}_f = D_f/2$ , and the other in which it is not, so that an internal equilibrium occurs. (2) For yet larger values of the cost of abortion, ( $a_f > b_f + D_f/2\beta$ ), the only equilibrium occurs with  $\bar{d}_f$  at its ceiling of  $D_f/2$ . These solutions suggest that, as the cost of abortions fall, there may be discontinuous shifts in the levels of marriage and out-of-wedlock births. This discontinuity reflects the possibility of a rapid unraveling of men's willingness to marry due to their changing perception of the cost to women of their failure to do so—a process that may be triggered by a small change in the cost of abortion. Such a discontinuous fall in marriage and rise in out-of-wedlock births may in fact correspond to the abrupt decline in marriage and rise in the out-of-wedlock birthrates in the United States. These changes have occurred very rapidly in comparison with the usual sluggish pace of changes in family structure.



amended to include endogenous changes in stigma, is consistent with the facts documented in Section II concerning the magnitude and timing of changes in sexual participation, abortion, contraceptive use, shotgun marriage, and the living arrangements of children.

#### *A. Welfare Theory, Jobs Theory, and Mix Effect*

Despite their prominence in the literature, neither the welfare theory (see Murray [1984]) nor the job-shortage theory (see Wilson [1987]) can explain the size and timing of the increase in out-of-wedlock births. For example, Ellwood and Summers [1986] argue that AFDC could not have played a major role in the rise of out-of-wedlock births because AFDC rose a great deal in the 1960s and fell in the 1970s (when eligibility requirements also became more stringent), while out-of-wedlock births rose continually. Moffitt [1992, p. 29] reaches similar conclusions. He also finds that the effects of welfare benefits estimated with cross-section and panel data are too small to account for more than a very small fraction of the rise in the out-of-wedlock birth ratio.

Wilson's joblessness hypothesis has also been questioned. Mare and Winship [1991, p. 194], using cross-section data, estimate that at most 20 percent of the decline in marriage rates of blacks between 1960 and 1980 can be explained by decreasing employment. Jencks [1992, p. 133] has noted that the decline in the fraction of married unemployed black men aged 30 to 44 between 1960 and 1980 was only slightly higher (13 percent) than the decline in the fraction of married employed black men (11 percent).<sup>21</sup> In confirmation of these suspicions, Wood [1995] estimates that only 3 to 4 percent of the decline in black marriage rates can be explained by the shrinkage of the pool of eligible black men.

A third theory, which we term the mix-effect hypothesis, posits a relationship due to selection between the legalization of abortion and the out-of-wedlock birthrate. If anything, this theory fares worse than either the joblessness theory or the welfare theory. According to the mix-effect hypothesis, the shotgun marriage rate might have declined following the legalization of abortion because the type of couples who would have been especially likely to marry in the event of a premarital pregnancy prior to legalization would have been especially likely to obtain an abortion and avoid shotgun marriage after legalization. (O'Connell

21. Also see Lerman [1988].

and Rogers [1984] suggest this explanation for the decline in the shotgun marriage ratio.) Akerlof, Yellen, and Katz [1994] test for such an effect through cross-section regressions of an individual's probability of terminating a premarital pregnancy by abortion after legalization on that individual's predicted probability of shotgun marriage in the pre-abortion era. Education, which would be correlated with a tendency to plan ahead, and measures of religious practice (Catholic/non-Catholic, rate of attendance at services) were included in the various prediction equations.<sup>22</sup> Given the robust absence of any significant, positive association between the odds of shotgun marriage and abortion, it is unlikely that the mix effect played any serious role in the decline in shotgun marriage.

In sum, the failure of the job-shortage theory, the welfare theory, and the mix-effect hypothesis leaves a void in explaining the increase in out-of-wedlock births.

### *B. Relative Magnitudes of Technology Shock and Out-of-Wedlock Births*

The models of the previous section have shown why the total impact of abortion and female contraception on the out-of-wedlock birthrate could have been positive—contrary to the natural supposition that the direct effects of abortion and contraception would dominate by reducing the number of unwanted out-of-wedlock babies. If the change in abortion and the use of female contraception were all quantitatively large relative to the number of births and relative to the number of unmarried women, it would then seem plausible that the technology shock could have been a very significant factor causing the large rise in out-of-wedlock births.

As we documented in Section II, both the use of the pill and the increase in the number of abortions were indeed very large relative to the numbers of unmarried women and out-of-wedlock births. The use of the pill at first intercourse by unmarried women jumped from 6 to 15 percent in just a few years, and the number of abortions to unmarried women, which were less than half the number of out-of-wedlock births in the 1960s, grew ten-fold, or more. Indeed, the number of abortions grew yet faster than out-of-wedlock births over the 1970s so that, by the end of the decade, unmarried women had 75 percent more abortions than out-of-wedlock births.

22. For details see Akerlof, Yellen, and Katz [1994].

The technology shock hypothesis thus meets the test that changes in the use of the technology are of sufficient magnitude to be a potential propagator of the subsequent and very substantial changes in out-of-wedlock births and family structure—provided that the effect has the right sign.

### *C. The Technology Shock Explanation for Rising Out-of-Wedlock Childbirth*

A very simple theory, which builds on the models of the previous sections, suffices to explain not only the increase in the out-of-wedlock birthrate but also the related changes in family structure and sexual practice. According to this theory, the legalization of abortion, starting in the late 1960s, induced a large fraction of unmarried women, who were willing to obtain an abortion if pregnant, to engage in premarital sexual relations while forgoing the promise of marriage in the event of a premarital conception. Similarly, the invention of the pill and increased availability of contraception enhanced the willingness of unmarried women to participate in uncommitted, premarital sex by reducing the odds of a pregnancy in the first place. The technology shock thereby triggered the behavioral shifts depicted in our two static models. Women who wanted to bear children were immiserized because their competitive position, and thereby their ability to bargain for the marriage guarantee, deteriorated, as in our first model. Moreover, their partners' degree of empathy and willingness to marry after the fact, may also have declined once it was apparent that the woman herself was unwilling to obtain an abortion. This causation mechanism is illustrated by our second model.

The technology shock hypothesis, like Wilson's job shortage theory, relates the increase in out-of-wedlock childbearing to a decline in the supply of eligible males. However, this decline occurs because there are fewer men who are willing to get married, and not just because there is a shortage of jobs. The technology shock theory explains the reduced marriage rates of both educated men with low unemployment and uneducated men with high unemployment. The technology shock model also predicts, and our survey results described below confirm, a decline in intimacy between sexual partners, since relations are likely to be short term, reinforcing the unwillingness to marry.

The technology shock theory suffices to explain why there was such a large rise in the rate of retention of children born out of wedlock. In the old days, if the woman wanted a child, she was typically able to exact a promise that the man would marry her.

Thus, most premaritally conceived first births (about 60 percent for whites and 35 percent for blacks by our tabulations) resulted in marriage before the birth of the baby who was then, of course, kept by the woman. If the woman did not get married soon after the birth of the baby, the chances were less than 30 percent that the child would be kept. In the new world, however, after the legalization of abortion, there were two reasons why the baby would more likely be kept. First, unmarried women who wanted children would find it increasingly difficult to make (and also to enforce) a contract in which marriage was promised in the event of pregnancy. Since these women wanted children, they would naturally keep them. Furthermore, because women who would not want to keep a child born out of wedlock had easy access to contraception and the option to abort an unwanted pregnancy, a greater fraction of the children born out of wedlock would be wanted. It is then no surprise that, despite the very large rise in sexual participation, the number of agency adoptions was halved from 86,000 to 43,000 in the five years following the introduction of abortion, or that 1970, the year of our shock, was the peak year for adoptions.

The question remains why the decline in the shotgun marriage ratio, following the technology shocks of the early 1970s occurred gradually over time rather than abruptly and all at once. For example, the time series results reported in Table III indicate a significant change in the shotgun marriage trend for white women beginning around 1968. Starting in the late 1960s, the white shotgun marriage ratio began a long and steady decline.

There are two different factors that probably account for the gradual decline in the white shotgun marriage rate. The first is simply that, in reality, shifts between equilibria take time to complete. The second, complementary factor, is that the stigma associated with out-of-wedlock motherhood has declined endogenously.

Focusing first on the transition between equilibria in our models, it is easy to appreciate why such moves would, in actuality, be gradual. Consider, for example, the attitudes of  $p_f^-$  women in the first "immiserization model"—those who would bring the baby to term with or without marriage—and their male partners. It would most likely have taken time for men to recognize that an implicit or explicit promise of marriage in the event of a pregnancy was too high a price to pay for sexual relations because men could fare better elsewhere. It may also have taken time for

women to perceive the increased willingness of men to move if such marriage promises are demanded. As new expectations formed, social norms readjusted, and the shotgun marriage rate declined, albeit gradually. In the end, however, men who wanted sexual activity but did not want to promise marriage in case of pregnancy, were neither expected nor required to do so.

A second, important reason, why the decline in the shotgun marriage ratio occurred gradually, rather than abruptly, relates to stigma. Declining stigma of out-of-wedlock childbirth was a natural, endogenous consequence of the technology shock. A decline in stigma, represented in both models by a decrease in  $d_f$ , further reinforced the technology-driven causes for the decline in shotgun marriage and increased retention of out-of-wedlock children.

As we have documented, the norm of premarital sexual abstinence all but vanished in the wake of the technology shock. With premarital sex the rule, rather than the exception, an out-of-wedlock childbirth could no longer serve as a sign that society's sexual taboos had been violated. The stigma attached to out-of-wedlock childbearing thus gradually but, ultimately greatly, eroded. A reduction in  $d_f$  in our first model augments the willingness to engage in uncommitted premarital sex. In our second model, a reduction in  $d_f$  is an additional factor working to reduce the pressure on fathers to do their duty in the case of an unwanted pregnancy. Since out-of-wedlock childbirth no longer resulted in social ostracism, literally and figuratively, shotgun marriage no longer occurred at the point of the shotgun. Reduction in stigma provides an additional reason why women who, in previous times would have put up their baby for adoption, chose to keep the baby instead. As we have seen, in 1970 most children whose mothers did not get married in the first three years after their birth were put up for adoption (commonly by relatives). In contrast, by the late 1980s about two-thirds of these babies were kept by the mothers.

There can be little doubt that the stigma of out-of-wedlock childbearing has declined enormously. Even the name of the phenomenon has been changed over the last fifteen years: children born out-of-wedlock are no longer referred to as "illegitimate." The willingness of officials to ask, and of citizens to answer, questions about out-of-wedlock childbearing is a further indicator of the decline in stigma. For example, in the CPS fertility supplement, retrospectively questioned white mothers revealed 32 per-

cent higher rates of out-of-wedlock first births when queried in 1990 than when queried ten years earlier (1980) about the very same births.<sup>23</sup> In former times high school students would quit school in the event of pregnancy. In 1958 the high school completion rate of mothers who became pregnant at seventeen or younger was 19 percent. By 1986 it was 56 percent. In 1972 Federal law made it illegal for schools to expel students for pregnancy or parenthood. The *New York Times* has described the transformation of attitudes underlying these changes:

In the "old days" of the 1960s, 50s and 40s, pregnant teenagers were pariahs, banished from schools, ostracized by their peers or scurried out of town to give birth in secret. Today, pregnant teen-agers are even beginning to be viewed by their peers as role models. No longer are they shunned or ridiculed, but supported and embraced in their decisions to give birth, keep their babies, continue their education and participate in school activities [Williams 1993, p. C1].

A final paradox that requires explanation is why the black shotgun marriage ratio began to fall earlier than the white ratio and exhibits no significant change in trend around 1970. Here, welfare may play a role. For women whose earnings are sufficiently low that they are potentially eligible for welfare, an increase in welfare benefits has the same effect on out-of-wedlock births as a decline in the stigma to bearing a child out of wedlock. The difference in eligibility between whites and blacks and the patterns of change in welfare benefits—rising in the 1960s and falling thereafter—may then explain why the decline in the black shotgun marriage ratio began earlier than that for whites. That blacks will be more affected by changes in welfare benefits than whites goes almost without saying because of their lower incomes. Ellwood [1988, p. 201] has calculated that a full third of black children will live in poverty more than 70 percent of the time, in contrast to only 3 percent of white children. As a result, the rise in welfare benefits in the 1960s may have had only a small impact on the white shotgun rate but resulted in a significant decrease in the black shotgun marriage rate.

23. These mothers may have had different recall bias in 1990 than in 1980 because of the lapse of time, but that recall bias would most likely have resulted in an increased number of forgotten children which would have decreased the number of out-of-wedlock births rather than increased them.

#### D. Survey Results

Our technology shock theory posits two distinct mechanisms whereby the shotgun marriage norm eroded. The first model emphasizes the role of the new technologies in increasing the willingness of women to participate in uncommitted premarital sex. The second emphasizes the diminished sense of responsibility of men to care for women who have passed up available contraception and abortion options. Our guess, based partly on the qualitative results of a survey we conducted of University of California at Berkeley undergraduates, is that the first mechanism is more important than the second. We attempted to see whether students would agree with the logic of the second choice model regarding the effect of abortion availability on a man's responsibility to marry his partner.

Students were asked to gauge the responsibility of a man to marry his sexual partner in two vignettes: one in which abortion is "easily available" and another in which abortion is "illegal, as it was in this country until the 1970s."<sup>24</sup> They were also asked to explain the reasoning underlying their responses. Differences in students' ratings of responsibility with and without easily available abortion had the expected sign, but were on average small—only 1.2 points on a scale of one to ten—a particularly surprising result given that the questionnaire had been designed to elicit such a reaction. In this sense, students implicitly conceded the logical point that abortion should have an impact on their responsibilities. Interestingly, however, not a single student volunteered any explanation whatever of the *difference* in his or her answer to the two different vignettes. In other words, no student commented on the availability of abortion as a factor governing the responsibility for marriage. Instead, students focused on the *level* of responsibility. The most common explanation, offered by both male and female respondents, was that the man is responsible to the child but not to the pregnant woman. Many emphasized the *financial* responsibility of the man for the child. Others explained

24. The first vignette concerned Michael, aged 20, and Sharon, aged 19, each of whom earns \$15,000 per year and is a department store clerk. After going out with Michael for a year, Sharon becomes pregnant. Michael makes it clear that he would prefer not to get married and that he wants Sharon to get an abortion. Abortions are easily available in their area, but Sharon says she would like to get married and wants to bring the baby to term. The second vignette is exactly the same as the first vignette except for the conditions under which abortion can be obtained. Rather than being "easily available," on the contrary, "abortion is illegal, as it was in this country until the early 1970s."



that a forced marriage was likely to end in an early divorce, so that the child would suffer more in a shotgun marriage than if born out of wedlock. Perhaps this folk wisdom is right. Nevertheless, such a response implicitly assumes that the couples in the vignettes—who had been going out together for a year and were clearly sexually intimate—would not be compatible. Consider the difference between Rubin's [1969] description of sexual and social mores in San Francisco 25 years earlier. Such a couple would surely have been considered sufficiently compatible to have gotten married even if the man had preferred to remain single. Indeed, sexual relations would have involved an implicit promise of marriage if the woman had become pregnant. We believe that the worldview of these UC Berkeley students in the summer of 1994 fits well with the description of behavior in our first model, in which unmarried partners have no commitment to marriage if a baby is the outcome of their sexual relations.

The students are probably a good gauge of the social mores regarding expectations of couples at the present time. If such questions had not arisen in a respondent's personal experience, he/she would still surely have heard numerous discussions of such matters. The respondents' implicit lack of enthusiasm for the second model as an explanation for the decline in shotgun marriage, however, should be viewed with some caution. An appreciation of social expectations regarding sexual and marital conduct five years prior to their own birth is likely to require unusual historic perspective, especially since those customs have, in fact, changed very greatly.

#### *F. Recent Studies of the Relation between Abortion and Motherhood*

Several recent studies have examined the relationship between abortion availability and births with surprising conclusions which support the basic tenet of this paper that the availability of abortion influences behavior, especially through sexual participation. If births decline less than one for one with the advent of abortion, then sexual participation or contraceptive use must be influenced by the availability of abortion. Jackson and Klerman [1993] and Levine, Trainor, and Zimmerman [1995] have shown that state restrictions of Medicaid funds for abortions have been associated with *declines* in birth rates. Kane and Staiger [1996] found that teen birthrates increase in a county

when the distance to the nearest abortion provider declines.<sup>25</sup> These studies thus show that births decline at a much lower rate than one to one with the number of abortions.

## VI. CONCLUSION

Over the last 25 years disturbing trends have occurred in the United States (and other Western countries as well). Just at the time, about 1970, that the permanent cure to poverty seemed to be on the horizon and just at the time that women had obtained the tools to control the number and the timing of their children, single motherhood and the feminization of poverty began their long and steady rise. As a result, United States poverty rates have been stubbornly constant for the last quarter century.

It is important to understand why these changes in family structure have occurred. Quantitative work by economists and sociologists suggests strongly that the magnitude of these changes is simply too great to be explained by the increase in welfare eligibility and benefits (which occurred in the 1960s and not the 1970s). Nor can it be explained by the decline in jobs for the less educated. Despite the lack of ambiguity from econometric work, misperceptions persist. On the right it is commonly believed that welfare did it, and on the left, that the deterioration of male jobs is the culprit.

There is, in consequence, a need for another explanation. That other explanation, which is also popular, centers on the vague notion that single parenthood increased because of a change in attitudes toward sexual behavior. This paper endorses that view, and attempts to explain the mechanisms whereby those changes in sexual and marital customs occurred. Although doubt will always remain about the ultimate cause for something as diffuse as a change in social custom, the technology shock theory of this paper does fit the facts. The new technology was adopted quickly and on a massive scale. It is therefore *prima facie* plausible that it could have accounted for a comparably large

25. These new results are particularly surprising in view of earlier studies that showed declines in teenage birthrates following the legalization of abortion—a decline in teenage birthrates in New York City after statewide legalization (see Joyce and Mocan [1980]) and a differential decline in out-of-wedlock birth ratios in states that legalized abortion in the late 1960s and early 1970s (see Sklar and Berkov [1974]).

change in marital and fertility patterns. The timing of the changes also seems, at least crudely, to fit the theory.

From a policy perspective, attempts to turn the technology clock backward by denying women access to abortion and contraception is probably not possible, and even if it were possible, it would almost surely be both undesirable and counterproductive. In addition to probably reducing the well-being of women who use the technology, along with that of men, such measures could lead to yet greater poverty. In the new equilibrium in which sexual abstinence is rare and the stigma of out-of-wedlock motherhood is small, denial of access would probably increase the number of children born out of wedlock and reared in impoverished single-parent families. On the contrary, efforts should be made to ensure that women can use the new technologies if they choose to do so. Finally, if the technology shock theory of this paper provides the correct explanation for the rise in single motherhood, cuts in welfare, as currently proposed, would only further immiserize the victims. Such cuts would have little impact on the number of out-of-wedlock children while impoverishing those already on welfare yet further. Instead, administrative measures, such as those suggested by Ellwood, to make fathers pay, deserve serious policy consideration.

## DATA APPENDIX

### *Abortion, Sexual Experience, and Use of Pill*

The time series on sexual experience, use of the pill, and abortion are derived from the 1982 and the 1988 panels of the National Survey of Family Growth. These surveys interviewed a nationally representative sample of women 15 to 44 of all marital statuses, with approximately 8000 respondents in each panel. Women were asked retrospectively about their fertility histories: pregnancies and their outcomes, infertility, contraceptive use, childbearing plans, adoption, sex education, and family composition.

Abortions were tabulated from answers to questions about the date of each pregnancy and its respective outcome, with the abortion series computed as the number of pregnancies terminated by that method. We used the age distribution of abortions in our data set and data from Vital Statistics on the age distribution of the population to impute the abortion experience of women

under 45 who were omitted from the sample in prior years because of age truncation. A single series was constructed from the two panels by using the data from the 1982 panel for the period 1960 to 1972, an average of the data in the 1982 and 1988 panels for the period 1973 to 1981, and the data from the 1988 panel thereafter. The later panel was omitted from the pre-1973 series because of the importance of age truncation. This series was used to perform the time series tests reported in Table III. However, the NSFG contains considerable underreporting of abortion, in comparison with the complete tabulations from medical providers available from the Alan Guttmacher Institute after 1972. For example, from 1973 to 1982 the NSFG third and fourth panels reported only 31.3 percent of the abortions to unmarried women reported in the Alan Guttmacher Institute survey. The aggregate abortions statistics in Table II are based on the Alan Guttmacher data after 1972. Before 1973 the table uses abortions from the 1982 NSFG, adjusted for reporting error.

The fraction of women aged 16 with sexual experience was compiled from the 1982 panel of the National Survey of Family Growth from answers to the following two questions: "At any time in your life, have you ever had sexual intercourse?" If yes, women were subsequently asked: "When did you have sexual intercourse for the first time—what month and year was that? How old were you at that time?"

The series on the use of the pill is the fraction of unmarried women reporting using the pill on first intercourse by date of first intercourse from the 1982 panel.

### *Shotgun Marriage Rate*

The shotgun marriage ratio, to recall, is the fraction of births conceived out of wedlock with marriage between conception and birth. To obtain an annual series and extended shotgun marriage ratios with marriage after the birth of the child, we followed the methodology of O'Connell and Moore [1980], O'Connell and Rogers [1984], and U. S. Department of Commerce [1991, p. 10, Table F]. The Fertility Supplements to the Current Population Survey taken in 1980, 1982, and 1990 asked women about the birth dates of their children and also their dates of marriage and divorce. The 1980 and 1990 surveys queried all women 15 to 65 about the first five births; the 1982 Supplement asked only about first births. The first birth shotgun marriage ratio is the fraction of *first* births taking place within seven months of marriage, where the

mother was unmarried at the time of conception. We concentrate our analysis on first-births, since a first-birth is much more likely to be a defining event in a woman's life than a second (or subsequent) birth to an unmarried woman who is already a mother. The time series data used to estimate the change in trend in Table III are composite series consisting of the data from the 1980 and 1982 panels of the CPS Fertility Supplements up to 1979, and the 1990 panel thereafter. Because the shotgun marriage ratio estimated from the 1980 and 1982 CPS surveys for the exact same period as the 1990 CPS survey was 32 percent lower—presumably because of the decline in stigma attached to out-of-wedlock births—the entire pre-1979 series was adjusted upward to conform to the later reports concerning the same births.

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