Unmarried fertility, crime, and cocial stigma

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Abstract. Children born to unmarried parents may receive lower human capital investments in youth, leading to higher levels of criminal activity as adults. Therefore, unmarried fertility may be positively associated with future crime. On the other hand, in an environment in which social stigma attached to non-marital fertility is high, many low match quality parents will choose (or be forced) to marry, and children reared in these families may actually be worse off than had their parents not married. We explore these effects empirically, finding that over the long run, unmarried fertility is positively associated with murder and property crime, but that the degree of social stigma has affected this relationship. For instance, our results suggest that some marriages in the 1940s and 1950s were of such low quality that the children involved would have been better off in single-parent households; however, this finding is reversed for marriages in the 1960s and thereafter – many marriages that would have benefited children have since been foregone. We also discuss implications for the debate over the "abortion-crime" link of Donohue and Levitt (2001).

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I. Introduction

Some of the most salient questions in the social sciences deal with the social effects of family structure. In this paper, we focus on one such question which has received little attention, the long-run relationship between unmarried fertility and crime. Using state-level data from the United States over the period 1923-2002, we find that a steady-state increase of 10 non-marital births per 1,000 live births is associated with increases of between 2.5% and 5% in murder and property crime rates. This effect is important since Levitt (2004) finds that over the 1973-1991 period, predicted murder rates should have fallen by 20%, when in fact they rose by 5%. Our analysis shows that the rise in unmarried fertility predicts a *ceteris paribus* increase of between 14% and 28% in murder over this period, thus explaining most of the otherwise unexplained crime trend.

Using our long time series, we also find the correlation between out-of-wedlock childbirth and future crime seems to have grown larger over time, to be stronger among nonwhites than among whites, and to be more important in areas where social norms are weaker. We argue that these effects may be due to variation in the parental match quality of the marginal out-of-wedlock childbirth. In particular, when unmarried parents face high levels of social stigma against non-marital childrearing, only the lowest quality parental matches fail to marry – ones in which children may not have been much better off, or possibly even worse off, had the parents married. On the other hand, when non-marital fertility is more culturally acceptable, some marriages that would have benefited children will then be foregone, implying a positive relationship between unmarried fertility and future crime.[1]

[1] Similarly, but with respect to divorce, Becker (1981) writes, "[t]he expected gain from remaining married was generally quite large in the nineteenth and early twentieth centuries….Consequently, persons divorcing then must have been *very* badly matched or temperamentally *very* unsuited to marriage….The average divorced person is now considered temperamentally more normal than in the past."

In general, stigma and similar social norms may serve as a substitute for legal restrictions on non-marital childbirth (see the discussion in Posner, 2000, chapter 5). Stigma-based restriction is more flexible, potentially punishing those who impose greater costs on society to a greater extent; however, legal restrictions may avoid unfavorable forms of discrimination in the application of stigma. In general, our findings illustrate how the level of social stigma in a society can change the outcomes of formal laws and policies regarding marriage and childbirth.

An additional contribution of the paper is to help clarify the relationship between abortion and future crime rates, as hypothesized by Donohue and Levitt (2001) – hereafter, "DL" – who argue that legalization of abortion in the 1970s improved family planning and timing decisions, and reduced unwanted childbirths, thus reducing future crime rates as the impacted cohorts moved into adulthood in the 1990s. However, while the number of abortions may respond to declines in the cost of abortion (such as after legalization), much variation in abortion rates may simply be due to greater levels of preventative sexual behavior. If so, then low abortion rates would actually be associated with *lower* future crime rates, since they signify a low number of unwanted childbirths. By analyzing directly a measure of unwanted childbirth, we can therefore provide a clearer test of the hypothesis. We focus on unmarried childbirth; 88% of pregnancies to unmarried women were cited as "unwanted" by their mothers, in the sense of being undesired or mistimed as late as 1987, one of the last birth cohort years to be relevant for our analysis (Ventura and Bachrach, 2000).[2] Since we find that unmarried fertility is strongly related to future crime, our results support the DL hypothesis.

While a number of previous studies have found that unmarried fertility is associated with unfavorable childhood outcomes, our analysis is one of the first to measure the long-run effect on

[2] Data is unavailable for earlier periods, but for 1994, the percentage of unwanted pregnancies to unmarried women is 78%. Thus, it seems unlikely that unwantedness was substantially lower than 88% before 1987. For married women, the equivalent number in 1987 is 40%.

crime when these children reach adulthood. For instance, Comanor and Phillips (1999) and McLanahan and Harper (1999) show heightened rates of juvenile delinquency among children born to unmarried mothers, using longitudinal data from cohorts born in the 1970s. Also similar to our research are Hunt (2003) and Sen (2003), who focus on teen birth rates (most teens are unmarried) and find positive correlations between having a teen mother and adult criminal propensities, and Stevenson and Wolfers (2006), who examine the relationship between divorce and crime. While the individual-level data used in many of these studies is highly important for some purposes, our state-level analysis allows us to analyze the relationship between unmarried fertility and the overall crime *rate*, to examine this relationship over a longer time period, and to control fully for the effects of abortion. We are also able to examine how and why these effects change over time, and to analyze how social stigma against unmarried fertility interacts with the effect of unmarried fertility on future crime; nevertheless, our findings are broadly consistent with this literature.[3]

II. Theory

1. Unmarried Fertility

The "unmarried fertility ratio"[4] for state *i* in year *t* is defined as:

$$UFR_{it} = 1{,}000\left[\frac{births\ to\ unmarried\ women_{it}}{total\ live\ births_{it}}\right]$$

As Figure 1 shows, the national UFR rose slowly until the early 1960s, then increased rapidly after. The cause-in-fact of any change in the UFR must be either: (a) a change in the

[3] See, however, footnote 39 below for more detail.
[4] An alternative measure of unmarried fertility is the birth rate for unmarried women, ages 15-44. However, this latter measure is not generally available for subnational regions over long time series, and, moreover, UFR is thought to be more relevant for the social consequences of unmarried fertility (Cutright and Smith, 1988).

population share of unmarried women; or (b) a change in the fertility of unmarried women relative to married women. There seems to be some evidence for both, as may be expected given the large increases visible in Figure 1.[5] Proximate causes for increases in the unmarried fertility ratio are many and controversial, including important government policies such as welfare payments for unmarried mothers and child support laws.[6] Our findings show that the social value of policies that affect marriage and childbirth incentives may depend on the level of social stigma prevalent in society.

Children born to unmarried mothers generally receive lower human capital investments because the contractual partnership between the parents is less stable, and sometimes non-existent (Becker, 1981). A child born to an unmarried mother may spend her childhood in a variety of different circumstances. Among other possibilities, she may be raised by: a single parent alone; both parents, who married shortly after the birth; both parents, who cohabitate without marrying; one parent, married or cohabitating with a step-parent; one parent and a grandparent, or any combination of these at different times during youth. Most research suggests that all of these arrangements generally involve a decline in childhood outcomes relative to a household with two parents married before birth.[7] Our research asks whether these effects continue to have an impact into adulthood, focusing on criminal behavior in particular.

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[5] Gray, et al, (2004) show that the population share of unmarried women has increased significantly, while Smith, et al (1996) find an increase in unmarried fertility, and Ventura and Bachrach (2000) cite declines in birth rates for marrieds and increases in intercourse frequency among unmarrieds.

[6] There is a substantial literature. Some proximate causes that have been suggested include: lower returns from specialization in marriage (Becker, 1981); the legalization of abortion (as discussed in the following subsection) (Akerlof, et al, 1996); changes in racial composition (Korenman et al, 2004); changes in social norms regarding premarital sex (Nechyba, 2001); generosity of welfare programs towards unmarried women (Ellwood and Bane, 1994); loosening of child support rules (Aizer and McLanahan, 2005); increases in male unemployment and imprisonment rates (Wilson, 1987); and declines in religiosity (Berggren, 1997).

[7] Hofferth (2003) and McLanahan and Sandefur (1994) find that children living with a step-parent suffer lower academic and mental health outcomes relative to those with married biological parents, and Gordon (1999) provides evidence that they are at higher risk for sexual abuse. Cohabitating parents are less educated (Carlson, et al, 2004), more likely to have drug and alcohol abuse problems, suffer mental depression, and serve time in correctional

A number of scholars have noted that outcomes apparently attributable to incomplete family structure may also be caused by other economic and social factors, such as poverty, which themselves may affect family structure.[8] Given the limitations inherent in our data, we cannot fully rule out the possibility that other factors driving unmarried fertility may in fact be the root cause of future crime, although given the dramatic rise in the UFR visible in Figure 1, it seems unlikely that poverty alone is driving much of this change.[9] Nevertheless, the appropriate policy recommendation from our results – whether to target unmarried fertility directly or the root factors that cause it – is a larger question than we are able to address in this paper.

Based on the above discussion, consider a model in which individuals live two periods. In the first period, pregnancy happens to a unit measure of parents, and these parents then decide whether to marry. In the second period, children born in the first period are adults. Since we are interested in the relationship between out-of-wedlock childbirth and future crime, we ignore parents who are married before pregnancy. Moreover, we also assume that each parental match has only one child, though this assumption is not generally restrictive (see footnote 11).

We write a parent's utility function as:

$$U = U(Z, C)$$

where Z is marital output and C refers to children's life prospects. For the purposes of our analysis, let $C = 1 - p$, where p is the probability that a child becomes a criminal as an adult; thus, we assume U is strictly increasing in both arguments.

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institutions compared to married parents (Rector and Johnson, 2004). Cohabitations are also highly unstable, as less than 20% of them survive their third anniversary intact, as compared to 80% of marriages (Brien, et al, 1999).

[8] Some recent literature has attempted to address these issues directly. Using longitudinal data on families, McLanahan and Harper (1999) show heightened rates of juvenile delinquency among children born to unmarried mothers, and Lillard et al (1995) find no evidence that cohabitation improves the future stability of child-rearing partners relative to marriage, even accounting for the self-selection of divorce-prone persons into cohabitations. By contrast, Korenman, et al (2001) find little evidence of adverse effects from non-marital fertility, with the exception that unmarried mothers are less likely to breastfeed.

[9] Moreover the state-level correlation between the poverty rate and UFR is only 0.20. In a regression with fixed state and year effects, the estimated effect of poverty on UFR is not statistically significant, even at the 10% level.

Let a parent's marital output be increasing in their marriage quality, if they have one. Specifically, denote output *Z* as:

$$Z = \begin{cases} g(m) & if \ married \\ q - s & otherwise \end{cases}$$

where *g* is an increasing function, $m \in [0,1]$ denotes parental match quality, *q* denotes utility from being single, and *s* denotes utility loss from social stigma associated with single parenthood.

Given the discussion and literature review above, let the probability *p* that a child becomes a criminal as an adult be given by

$$p = \begin{cases} f(m) & if \ parents\ married \\ c & otherwise \end{cases}$$

with *f* as a decreasing function, implying that higher match quality allows for greater human capital investments in children. Given $c > 0$, having married parents reduces the probability of becoming a criminal for all children born to parents of match quality $m > m^* = f^{-1}(c)$. Thus, children born to parents of very low match quality may be worse off if their parents marry, since low match quality parents may fight often, be substance-abusers, or otherwise be unreliable in rearing children.

Therefore, parents of match quality *m* will marry if and only if

[1] $$U(g(m), 1 - f(m)) \geq U(q - s, 1 - c)$$

Denote the match quality *m* for which equation [1] binds as $\overline{m}$. Then all matches $m \geq \overline{m}$ will marry in the first period.

First consider the simplest case, in which match quality is uniformly distributed among parents. In this case, the number of non-marital births is simply $\overline{m}$.[10] Then given the definition of the probability of criminality, *p*, crime in period 2 can be written as

$$Crime = c\overline{m} + \int_{\overline{m}}^{1} f(m)dm .$$

Figure 2 illustrates the implied relationship between period 2 crime and period 1 unmarried fertility. Note that crime is *decreasing* in the number of unmarried births for $\overline{m} < m^*$. This is so because these children's parents are of such low match quality that they are actually less likely to become criminals if their parents do not marry. In general, the effect of unmarried fertility on crime is convex.

Now suppose that the social stigma attached to unmarried parenthood, *s*, varies between locations over some reasonably small interval, $[\underline{s}, \overline{s}]$. From equation [1], it can be seen that $\overline{m}$ will differ across locations, depending on the value of *s*. Therefore, denote the number of out-of-wedlock childbirths in a location with social stigma *s* as $\overline{m}(s)$. Comparative statics then implies that locations with greater social stigma will have fewer out-of-wedlock children, since

$$\frac{d\overline{m}}{ds} = \left[\frac{-\frac{dU}{dZ}}{\frac{dU}{dZ}\frac{dg}{dm} - \frac{dU}{dC}\frac{df}{dm}} \right] < 0 .$$

Then if social stigma in all locations is quite high, such that $\overline{m}(\underline{s}) < m^*$, cross-sectional comparisons will show that states with more unmarried fertility in period 1 have *lower* crime rates in period 2. On the other hand, if social stigma is quite low across most states – say if

[10] Note that $\overline{m}$ is not the UFR; all of the parents in our model conceive before deciding whether to marry, but obviously many other parents are already married at the time of conception. Nevertheless, under weak assumptions, UFR would be monotonic in $\overline{m}$.

$\overline{m}(\bar{s}) > m^*$ – then cross-sectional comparisons will show that states with more unmarried fertility in period 1 have *higher* crime rates in period 2. In general, as social stigma falls globally, the cross-sectional relationship between unmarried fertility and crime will grow more positive. It can also be shown that this pattern is evident even if the assumptions of one child per couple and uniformly distributed match quality are relaxed.[11]

For instance, if social opprobrium towards unwed mothers has waned over time, we should then observe a more positive relationship between out-of-wedlock childbirth and future crime when analyzing later birth cohorts relative to earlier ones; and if social stigma towards non-marital fertility is higher among whites than non-whites, the relationship between unmarried fertility and future crime should be more positive among non-whites; and if sexual mores are looser in particular regions of the country, again, the relationship between unmarried fertility and future crime should be larger in those areas. We will see in the following section that all of these statements appear to be empirically supportable.

2. Abortion

[11] A simple, though indirect way to allow for both of these effects in the model is by relaxing the assumption of a uniform distribution of match quality. That is, we still model each family as having one child, but now allow for more families of certain match quality than others – and so indirectly affect the distribution of children across match types. Therefore, let the probability distribution of match quality be given by $\vartheta(m)$, with support [0,1]. Then crime in period 2 can be written as $\int_0^{\overline{m}} c\,\vartheta(m)dm + \int_{\overline{m}}^1 f(m)\vartheta(m)dm$ while the number of non-marital births is now $\int_0^{\overline{m}} \vartheta(m)dm$. Note that the relationship between period 2 crime and the cut-off level of match quality for marriage, $\overline{m}$, is U-shaped as before, since $\frac{d(Crime)}{d\overline{m}} = \vartheta(\overline{m})\left[c - f(\overline{m})\right]$. As in Figure 2, crime is decreasing for $\overline{m} < m^* = f^{-1}(c)$, and increasing in $\overline{m}$ thereafter. Therefore, crime is also U-shaped in the number of non-marital births, with crime decreasing (increasing) in unmarried fertility for levels of unmarried fertility less (greater) than $\int_0^{f^{-1}(c)} \vartheta(m)dm$. This minimum point is reached at a higher (lower) level of unmarried fertility when $\vartheta(m)$ places more mass on low (high) levels of match quality. Therefore, the level of social stigma needed to induce a negative relationship between unmarried fertility and crime will be lower when there are relatively more children from low match quality parents.

According to Donohue and Levitt (2001), abortion may decrease future crime if it reduces the number of children reared in unfavorable family circumstances. Parents may use abortion as a form of birth control, eliminating unwanted pregnancies and favorably changing the timing of wanted pregnancies. The children from unwanted pregnancies, had they been born, would have likely grown up in circumstances which may be breeding grounds for future criminality. For instance, Gruber, et al (1999) find that children on the margin of abortion face higher poverty and worse health than the median, Angrist and Evans (1999) find that abortion liberalization reduced teen childbirth, and Levine, et al (1999) show that those seeking abortions are more likely to be poor and teenaged.[12]

However, there are two important biases in identifying such an effect empirically, one measurement-based and one structural. The measurement issue relates to the fact that it is actually "wantedness", not abortion, that influences future crime. Or as Levitt and Dubner (2005) write in their popularization of the DL hypothesis, "Legalized abortion led to less unwantedness; unwantedness leads to high crime; legalized abortion, therefore, led to less crime." If parents use abortion as a way of reducing unwantedness, then abortion will reduce crime; however, abortion is also a substitute for other forms of birth control, such as prophylactics and abstention. Therefore, some variation in the number of abortions may simply signify variation in the use of substitute birth control methods, in which case lower levels of abortion will actually correlate with less unwantedness, and therefore, *less* crime. In other words, it is difficult to distinguish shifts in the demand curve for abortions from movements along the demand curve. Therefore, to find the true effect of a policy change that liberalizes

[12] See Sailer (1999), Lott and Whitley (2001), and Joyce (2003, 2004) for some evidence that disputes the DL hypothesis, and see Leigh and Wolfers (2000), Sen (2003), Pop-Eleches (2006), and Ananat, et al (2006) for evidence that corroborates DL. Kahane, et al (2005) find ambiguous results.

abortion, looking directly at a measure of unwantedness, such as the unmarried fertility ratio, may be more appropriate.

Analyzing abortion in concert with unmarried fertility also addresses an important structural issue, first raised by Akerlof, et al (1996). They consider a model with two groups of unmarried women: those who are morally opposed to abortion, and those who are not. When abortion availability increases, the cost of sexual activity for women not opposed to abortion falls, and so they increase their frequency of intercourse. However, this also lowers the marriage market prospects of those women opposed to abortion, so they must increase their sexual activity as well.[13] This latter effect means that abortion availability may actually increase the rate of unmarried fertility. As evidence for this effect, Ventura and Bachrach (2000) report national survey evidence that at least 88% of out-of-wedlock pregnancies were unwanted in 1987,[14] long after the legalization of abortion. If, as suggested above, unwantedness is positively associated with future crime, abortion may then cause *increases* in future crime.[15]

We expect to find empirically that, after controlling for contemporaneous unmarried fertility, the effect of abortion to reduce crime should be stronger. This is because the effect of abortion on crime, conditional on contemporaneous unmarried fertility, is estimated through variation in unwanted or mistimed pregnancies in *married* households, untempered by abortion's potential for causing increases in unwantedness.

III. Data and Empirical Methods

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[13] Chiappori and Oreffice (2005) allow potential partners to bargain over household surpluses, and so endogenize the payoffs to each partner from marriage. They show that the Akerlof, et al (1996) results are not robust to some specifications of underlying parameter values.
[14] The equivalent number for 1994 is 78%.
[15] Lott and Whitley (2001) also discuss the Akerlof, et al (1996) results in their impact on crime, though they do not explicitly test any hypothesis related thereto.

Following the theory presented above, we seek to estimate the effects of unmarried fertility and abortion on crime. We have already defined the unmarried fertility ratio in the previous section. The "abortion ratio" for state *i* in year *t* is defined as:

$$Abortion\ Ratio_{it} = 1{,}000\left[\frac{abortions_{it}}{total\ live\ births_{it}}\right]$$

Following the method of Donohue and Levitt (2001), we estimate the fraction of the criminal population "missing" due to abortion in state *i* in year *t* as a weighted sum of previous years' abortion ratios, with the weights given by the age distribution of arrests for crime *c* in year *t*. In other words, we calculate the "effective" abortion rate for state *i* in year *t* as:

$$Eff.\ Abortion\ Ratio_{itc} = \sum_{a=8}^{\infty}\left[\frac{arrests_{act}}{arrests_{ct}}\right]\left[abortion\ ratio_{i,t-a}\right]$$

where $arrests_{act}$ is the number of arrests of individuals of age *a* for crime *c* in year *t*.[16]

Our calculations of the effective abortion rate differ from those of Donohue and Levitt (2001) in three ways. First, we use as weights the age distribution of arrests in each contemporaneous year, as opposed to using one year's age distribution to proxy the age distribution of criminals in all years.[17] Second, in some cases, FBI data provide only the number of arrests for 5-year age groups, not each age separately. DL assume that this arrest rate is constant across all ages in the 5-year group; in contrast, we assume that the arrest rate for a 5-year age group is an accurate measure of the arrest rate for the median age in that group. Then, we calculate the arrest rates for other ages in the group by linear extrapolation between age groups. Thus, our arrest distribution does not have any discreet steps between ages. Thirdly, we

[16] By assumption, but also because FBI data do not separate out ages of very young criminals, there are no arrests of individuals under age 8.

[17] Donohue and Levitt (2001) use the 1985 arrest distribution. In personal correspondence, the authors suggested that they wished to abstract away from abortion's affect on the age distribution of arrests; however, this may be inappropriate over long periods of time, and so may affect the measurement of the full effect of abortion, even over small periods.

use a different set of data on abortion ratios. There are two sources of state-level data on abortion: surveys of abortion providers from the Alan Guttmacher Institute (AGI), and state health department reports collected by the Centers for Disease Control (CDC). DL use the former source, while Joyce (2003) argues that the CDC data is more reliable, since it includes estimates as early as 1970, while AGI data begin with national legalization in 1973. The drawback of CDC data is that some states do not mandate reporting of abortion data, so missing data is problematic. However, due to limitations in the data on unmarried fertility, as described below, the missing CDC abortion data will not limit our analysis;[18] moreover, our results do not change when we substitute AGI data, supplemented with CDC data from 1970-1972.

We similarly calculate an "effective" unmarried fertility ratio as:

$$Eff.UFR_{itc} = \sum_{a=8}^{\infty}\left[\frac{arrests_{act}}{arrests_{ct}}\right]\left[UFR_{i,t-a}\right]$$

One problem with this calculation is that state-level data on out-of-wedlock childbirth is first reported in 1923, and then only for a limited number of states (see discussion below). Thus, the ideal of calculating a weighted sum of UFR observations lagged 8 to *lifetime* years is infeasible, and there is a tradeoff between the number of lagged years included in the calculation and the number of years of crime data that can be explained. Since the age distribution of arrests is generally heavily weighted towards young people, estimating the effective UFR by excluding relatively older cohorts will not affect the calculation much, and so for the work below, we include lagged UFR statistics from 8 to 34 years.[19] Consistent with this hypothesis, our results are robust to experimentation with shorter and longer lags.

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[18] Another drawback of both data sources is that no reliable data on illegal abortions before legalization is available. Following previous literature, we assume a zero abortion ratio before legalization in all states, though see Joyce (2003) for a critique of this assumption.

[19] These ages constitute more than 80% of arrests in most years for most crimes. In our calculations of the age distribution of arrests, the denominator is total arrests for all ages, not arrests 8-34; therefore, the age distribution

Unmarried fertility ratios are calculated based on data from birth certificates. A serious measurement problem is that many states historically have not required a statement of marital status on the birth certificate, and the number of states that do require such information varies slightly over time.[20] Since 1980, computer technology has allowed for inference of marital status based on paternity acknowledgements or by matching surnames of father and child; however, before 1980, data is simply missing for a significant number of states. With minimal interpolation between years in a small number of cases, reliable time series data is available for 32 states over most of the years between 1923 and 2002.[21] Figure 3 presents a map of these states, which are geographically diverse, although several well-populated states, including California, New York, and Massachusetts are unfortunately missing.[22]

Acknowledging the limitations discussed above, panel data for between 20 and 32 states is available to explain variations in crime rates between 1957 and 2002 (see the Data Appendix for details).[23] For each crime, estimates of the following equation can be made:

$$[2]\ \ln(\textit{crime rate})_{it} = \beta_1(\textit{Eff.UFR}_{it}) + \beta_2(\textit{Eff. Abortion Ratio}_{it}) + \Gamma X_{it} + \alpha_i + \delta_t + \varepsilon_{it}$$

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will not sum to one. This helps to avoid bias due to changes in the fraction of crimes committed by 35+ year olds. Nevertheless, we have also estimated our results using an age distribution conditional on ages 8-34, and find no relevant differences.

[20] Another source of unreliability in the data is the systematic underreporting of out-of-wedlock childbirth in Texas and Michigan over the 1990-1993 period due to legislation passed in those states. We make no attempt to correct for this problem because children born during this period are, at most, 13 years old in 2002, the last year for which crime data is used in estimation, and the fraction of arrests accruing to individuals under age 13 for most crimes is small.

[21] While the number of interpolated observations is small, the analysis of Murphy and Topel (1985) suggests interpolation may bias estimated standard errors. Our results are robust to exclusion of all interpolated data.

[22] Alternatively, states may be grouped into census regions and race-specific unmarried fertility ratios for other states within the same region may be applied to states with missing data. This procedure has been generally used to estimate national trends in unmarried fertility, though less so in recent years as the break in trend between 1979 data calculated in this way and 1980 data calculated using the computerized inferral methods described in the text seem to imply significant flaws in the grouping procedure.

[23] The differences in the number of states available in each year is due to the fact that not all states required registration of births as early as 1923. Effective UFRs may be calculated for 20 states in 1957, but for 29 states by 1961, and 32 states after 1966. Selection based on the introduction of data from more states does not, however, drive the results below (see also footnote 49 below).

where α_i and δ_t represent state and year fixed effects, respectively, and *X* is a vector of state-level covariates including law enforcement measures, such as prisoners and police per capita, death penalty executions (Dezhbakhsh, et al, 2003, but see also Donohue and Wolfers, 2005) concealed handgun laws (Lott and Mustard, 1997, but see also Duggan, 2001); economic measures, such as the unemployment rate and output per worker; age demographics;[24] years of schooling in the labor force and school enrollment measurements, church membership rates, urbanization and gender ratios, a measure of racial heterogeneity[25], and proxies for consumption of alcohol and crack cocaine (Fryer, et al, 2005). The data appendix gives details on the collection of each of these variables, and Table 1 provides some summary statistics for reference.

IV. Results

1. Unmarried Fertility and Crime, 1957-2002

In any particular year, the effective UFR is generally strongly correlated with crime rates. Figure 4 illustrates a scatter plot of effective UFR and the murder rate per 1,000 residents (in natural log) for the 25 states for which data is available in 1960 and the 32 for which data is available in 2000. Note that, in 2000 (with the exception of District of Columbia), the effective UFRs are in the range of 50-200, representing 50-200 out-of-wedlock births for every 1,000 live births. Since most murders are committed by individuals aged 18-25, a state's effective UFR in

[24] We include separate variables for the percentage of a state's population in each five year age group from 0-4 through 70-74.

[25] Calculated as a "Herfindahl"-style index, racial heterogeneity = 1-[(%black)^2+(%non-black)^2]. Thus, larger values are associated with greater heterogeneity, with a maximum value of 0.5 (perfect heterogeneity), and a minimum value of 0 (perfect homogeneity).

a given year should be of a similar magnitude as its actual UFR roughly 20 years earlier (the national UFR in 1980 was 159).[26]

Figure 4 illustrates a positive relationship between murder rates and the effective UFR in both years (similar relationships hold for other crimes as well). Of course, this analysis is purely cross-sectional, and does not account for any omitted variables that could create a spurious correlation; nevertheless, we will see that with a more sophisticated analysis this relationship generally holds in later years. However, we find that the relationship disappears for early years, consistent with our theory regarding the fall in stigma.

Table 2 presents estimates of the coefficients in equation [2] for murder. All available data from 1957-2002 is employed to estimate the equation, and year- and state-fixed effects are included in all regressions, in order to control for national secular trends in crime and invariant state-level characteristics.[27] The t-statistics, presented in parentheses below each coefficient, are derived from a panel-data Prais-Winsten approach that adjusts for heteroskedasticity, temporal correlation across states, and an AR(1) process for within-state autocorrelation. The first column presents an estimate of the effect of unmarried fertility on future crime, not controlling for any covariates.[28] The magnitude of this coefficient implies that a steady-state increase in the effective UFR of 10 per 1,000 live births is associated with a long run 1.4% increase in murder rates. The second column in Table 2 includes all covariates except for the effective abortion rate. Including these covariates helps to control for omitted variables; however, to the extent that unmarried fertility has indirect effects on crime by changing the level of the covariates, their

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[26] Larger states tend to have higher UFRs, making the national rate higher than the simple median state's rate.
[27] Data from 32 states over this period, constituting 1,472 observations are available. Of these, the fact that not all states began registering births as early as 1923 lowers the number of observations on effective UFR to 1,423. Moreover, for some states in the 1950s, state-level unemployment figures are unavailable, leaving 1,409 observations. For the purposes of comparison, we exclude the observations with missing unemployment figures from the regressions without covariates; however, their inclusion does not change the results appreciably.
[28] State and year fixed effects are still included, however.

inclusion may be inappropriate. It can be seen that inclusion of these covariates strengthens the measured relationship between unmarried fertility and future crime, more than doubling it in magnitude.[29]

In column 3, we attempt to replicate Donohue and Levitt (2001)'s analysis by regressing the murder rate on the effective abortion ratio, while not including any measure of unmarried fertility. Like DL, we find that abortion reduces future murder rates in a statistically significant way. The magnitude of our result is similar to theirs as well, although recall that our calculations differ slightly from theirs, and we include more covariates and a longer time-series of data.

In column 4, we estimate the effects of unmarried fertility and abortion jointly on murder, and column 5 extends this model to include all the other covariates.[30]

Later, we will consider the robustness of these results, but here we will use these results to engage in counterfactual policy experiments. Between 1973 and 1991, the effective UFR for murder rose from 32.09 to 88.32, a change of 56.23. Multiplying this difference by the estimates in columns 4 and 5, our results imply a *ceteris paribus* increase in murder rates over this period of roughly 14% to 28%. In a meta-analysis of crime literature, Levitt (2004) argues that the combined effects of demographic changes, increases in police forces and imprisonment rates, and the crack epidemic imply an overall fall in murder rates of 20% over this period. In actuality, murder rose by 5%, leaving an unexplained increase of 25%. Therefore, our estimates of the effects of unmarried fertility can explain most, or perhaps even all, of the unexplained rise

[29] R^2 is high in these regressions, though this is not unusual given the inclusion of state and year fixed effects. Nevertheless, even without these fixed effects, the covariates explain roughly 96% of the variation in murder rates.
[30] A concern with the inclusion of both abortion and UFR is that both are proxies for measures of unwantedness, potentially measurements with error, and it is difficult to definitively sign any biases associated with measurement error when the error may be correlated across regressors.

in crime during the 1970s and 1980s. Our results are also broadly consistent with national crime trends in the 1990s.[31]

For policy purposes, a comparison in the relative sizes of the coefficients on unmarried fertility and abortion suggests that abortion is quite a blunt policy lever for reducing crime, relative to policies that promote effective family formation directly. Using the standard deviations listed in Table 1 for the 1985-2002 period, and the coefficients in the fifth column of Table 2, an increase of one standard deviation in the effective abortion ratio (102.40) is associated with a 17.4% decline in long-run murder rates; while a one standard deviation increase in the effective UFR (39.52) is associated with a 19.8% increase in long-run murder rates.[32] In 1985, a one standard deviation increase in the abortion ratio corresponds to roughly 385,000 abortions. Since there were 16,137 murders in 2004, this means that for every 137 abortions in 1985, one murder was averted in 2004. A similar calculation for unmarried fertility implies that each 47 non-marital births in 1985 are associated with one additional murder in 2004.[33] To be clear, this does not mean that one in every 47 children of a broken home becomes a murderer, since a small number of criminals commit a large proportion of crimes. Nevertheless, from these comparisons, policies that would incentivize more marriage seem to have higher productivity than those that would incentivize more abortion. However, this

[31] Levitt (2004) shows that the combined effects of police, imprisonment, and crack imply a fall in murder of 26% over the 1991-2001 period. Using our estimates of the effect of abortion on murder, the rise in the effective abortion rate implies a fall in murder of 34%, while the rise in the effective UFR implies a rise in murder of between 12% and 22%. Therefore, the overall effect of increases in police presence, imprisonment, abortion, and unmarried fertility, plus the effects of crack, imply a net decline in murder over this period of between 38% and 48%. The actual decline in murder in the 32 states we analyze between 1991 and 2002 was 47.5%.

[32] Using the coefficients from column 4, (-0.17 x 102.40) = 17.41 and (0.50 x 39.52) = 19.76.

[33] There were 3,761,000 live births in 1985. Therefore 148,634 non-marital births represents one standard deviation, and 19.8% of 16,137 murders in 2004 is 3,195 murders. 148,634/3195 = 46.52.

analysis is highly incomplete since it does not take into account the potentially different costs of such policies.[34]

As discussed earlier, abortion may affect crime in two structural ways: it may reduce the number or timing of unwanted children (as in DL), leading to a long run decline in crime, and it may cause some women who do not wish to make use of abortion technology to have more unwanted children, leading to a long run increase in crime (as in Akerlof, et al, 1996). The inclusion of both effective UFR and the effective abortion ratio allows us to separate these effects in the data, thus estimating the effects of abortion on crime through changes in the fertility behavior of married parents only. Noticeably, it is evident that the inclusion of both variables increases the measured effect of abortion in comparison to specifications that exclude unmarried fertility, and also increases the measured effect of unmarried fertility in comparison with specifications that exclude abortion.

Thus, as the theory suggests, holding constant unmarried fertility, abortion has a stronger effect on crime reduction. Specifically, the results of columns 3 and 5 may be interpreted to mean that a steady-state increase of 10 abortions per 1,000 live births is associated with a long run decline of 1.7% in murder rates; however, this decline is dampened to only a 1% decline due to the fact that abortion is correlated with increases in non-marital fertility. Column 5 also implies that an increase of 10 unmarried childbirths per 1,000 live births is associated with a 5%

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[34] One very straightforward, if incomplete, way of doing so is by using a median representative of the statistical "value of life" of $7,000,000. The analysis therefore implies that each abortion "saves" $51,095 worth of future (statistical) lives, assuming the fetus is valued at $0, while each marriage among unmarried parents saves roughly $152,174 worth of future lives. The analysis of Simon and Tamura (2006) finds that the marginal child is worth roughly $60,000 to parents; therefore, a policy that subsidizes abortion (such as through Medicaid) would not be expected to pass a cost-benefit test with respect to crime, particularly if the subsidy led to moral hazard in fertility behavior. On the other hand, the analysis of Blanchflower and Oswald (2004) finds that a happy marriage is worth roughly $100,000. Since parents who choose not to marry must expect a relatively unhappy marriage, an upper bound on the cost of marrying two parents who do not wish to marry might be estimated at $100,000. Therefore, a policy that subsidized marriage (or taxed out-of-wedlock births, as suggested by Ellwood, 1988) among unmarried parents *would* likely pass a cost-benefit test, given the long-run benefit of $152,174 savings in future lives, although all of this analysis assumes no social discounting of the future.

increase in murder; therefore, a "back-of-the-envelope" analysis implies that an increase of 10 abortions per 1,000 live births is associated with an increase of roughly 1.4 non-marital births per 1,000 live births (given the 7% difference between the estimates for abortion in columns 3 and 5). Therefore, while the overall effect of abortion on crime is negative, if non-marital births have other social effects besides those on crime, policy-makers should consider carefully both effects when deciding abortion policy.

We now turn to the final two columns in Table 2, which have further suggestive implications for policy. In column 6, we include several lagged measures of marriage and divorce behavior in an attempt to address the question of whether illegitimacy is a fundamental cause of future criminal behavior as presented in the model, or if it is a proxy for the effect of two parent households on child development. In the latter case, marriage may have an ameliorative effect on children's future prospects even if the children were initially unwanted. To distinguish these effects in a simple way, we collected additional data on the share of adults 16 and older who were married in each state, from census records from 1940-2000, inclusive. We also collected annual new marriages and divorces by state over this time period. We then constructed the new marriage rate, defined as the number of marriages in a state in year t divided by the stock of existing marriages in the state in year t, and similarly the new divorce rate, defines as the number of divorces in a state in year t divided by the stock of existing marriages in the state in year t.[35] We lagged the percent married variable 10 years to get a measure of married households during childhood, and lagged the new married rate and new divorce rate 5 years assuming that children are already born and that most marriages fail within the first few years.[36]

[35] In order to compute these rates we interpolated the marriage stock for each state between census years. Also we excluded Indiana and Louisiana from the analysis as they stopped reporting divorce data in the 1980s.
[36] Almost half of all first marriages that end in divorce occur by year 5 compared to year 15, 20 percent by year 5 of the marriage versus a cumulative 43 percent by 15 years. This is more true for younger wives, 29 percent versus 59

The results of including these regressors are contained in column 6 of Table 2. All of these additional regressors have the expected sign. The divorce rate is strongly positively related to future murders and is significant at the 5 percent level; marriage stock is negatively related to future murders and is significant at the 6 percent level, and new marriage rate is negatively related to future murders and is significant at the 11 percent level. These variables reduce the estimated effect of illegitimacy and abortion by nearly the same amount, roughly 36 percent, however illegitimacy (abortion) remains significantly positively (negatively) related to future murders.[37]

Finally, in column 7, we include a quadratic term in UFR in order to test in a simple way the implication of our model that the relationship between UFR and future crime should be convex. Simply including a quadratic term may be inappropriate if the effects of the covariates on the crime rate differ over time, and later we will analyze the effects of UFR on crime across different periods to control for such problems. Nevertheless, the results from column 7 strongly support a convex relationship between effective UFR and murder rates. The implied minimum point from the quadratic occurs when the effective UFR is 77.61. In other words, the first 7.76% of parents who choose not to marry seem to improve the welfare of their children for this choice, at least in terms of future criminality. Additional unmarried fertility beyond this point, however, is crime-increasing. Averaging across the states in our sample, national UFR first exceeds this minimum point in 1965 (see Figure 1).

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percent for those married before 18; 24 percent versus 49 percent for those married at 18 or 19, and 17 percent versus 36 percent for those married between 20 and 24 inclusive (National Center for Health Statistics, 2001). Furthermore we assume that most marriages of unwed mothers would likely occur for younger aged children.

[37] Ideally we would have used the share of households with two parents, children present, but unmarried as well as the share of households with two married parents, children present, and share of single headed households in order to estimate the ameliorative effect of marriage. If illegitimacy is fundamental, then greater shares of households like the former would still predict higher future crime, although perhaps less than those in single parent headed households. Unfortunately the census combines the numbers of common law marriage households with married households and hence we are not able to better identify the effects of illegitimacy and marriage on future crime.

Another way of viewing our results is to ask, counterfactually, what the crime rate would be today if unmarried fertility had, instead of increasing, remained constant at the crime-minimizing level (77.61) after 1965. The 2002 murder rate was 5.64 murders per 100,000 persons. Our analysis suggests that, ceteris paribus, if UFR had remained at 77.61 since 1965, the murder rate in 2002 would have been between 5.26 per 100,000 murders, for a savings of 1,094 murders in 2002.[38]

Table 3 replicates the analysis in column 5 of Table 2 for each of the seven "index" crimes for which the FBI collects systematic state-level offense data. It can be seen that unmarried fertility is associated with future crime for murder, burglary, larceny, and auto theft. A similar relationship is also evident for robbery, although only at lower significance level. Unmarried fertility seems to be negatively correlated with rape and assault (although the effect on assault is statistically indistinguishable from zero).[39]

One possible explanation for the inconsistent results for rape and assault is that these crimes are widely believed to be subject to serious underreporting, primarily because many are committed between romantic partners, family members, or other ostensible friends (Koss 1985). If, for example, women who were raised in fatherless households are less likely to report violence committed against them by their romantic partners, this could partially explain the apparent negative effect of unmarried fertility on reported rates of these crimes.[40]

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[38] The effective UFR in 2002 is 133.07. Using the coefficients in column 7, the difference in ln(homicide rate) between an effective UFR of 133.07 and one of 77.61 is:
$[(-0.0034*133.07) + (0.000022*133.07^2)] – [(-0.0034*77.61) + (0.000022*77.61^2)] = 0.07$.
Thus, the log crime rate would have been 0.07 points lower, and exp(Ln(5.64)-0.07) = 5.26.
[39] Interestingly, while our results are broadly consistent with those of Sen (2003) and Hunt (2003), who examine the effects of teen births on crime, both authors find most of their effects through assault and relatively little through homicide.
[40] Another possible explanation is based on the hierarchical nature of FBI uniform crime reporting (Levitt and Miles, 2004). If two crimes occur simultaneously in the same incident, such as a rape and a murder, only the more serious crime (homicide in this case) is reported. Thus, the fact that unmarried fertility is associated with long run increases

In Table 4, we present several checks on the robustness of the measured effects in the previous two tables. For readability, only the coefficient on effective UFR is presented, although the regression specification from which these coefficients are derived is the same as in Table 3, where all covariates are included. Moreover, we also group burglary, larceny, and auto theft into a general "property crimes" category.

The "baseline" row presents results from regressions identical to those in Table 3 (note the coefficient for murder is the same as in column 1 of Table 3). To the extent one is concerned that effective UFR is highly correlated with current UFR, and thus in some complicated way might simply be a proxy for current social conditions in a state, inclusion of the contemporaneous value for UFR would ameliorate these concerns. Row 2 shows that controlling for contemporaneous UFR does not have much effect on the relationship between effective UFR and crime.[41]

Next, eliminating the population-based weighting scheme treats all states equally. As seen in the third row, this moderately lowers the estimated effects of unmarried fertility, although it remains significant both for murder and property crime. Changing our assumptions regarding the structure of the regression errors to ignore autocorrelation and cluster only at the state level does not seem to change the measured effects substantially either. The inclusion of a state-specific time trend soaks up almost all of the variation in the regressions; nevertheless, the estimated effect of unmarried fertility on murder is still statistically significant, although smaller in magnitude, and the effect on property crimes becomes of marginal statistical significance. Excluding Nevada and New Jersey, two states where a large proportion of the crime is

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in murder, but not with long run changes in rape or assault, suggests that perhaps the effect of unmarried fertility is to cause rape and assault offenders to kill their victims.

[41] The coefficient on contemporaneous UFR is insignificant. Alternatively, a falsification test by which we simply replace effective UFR with the contemporaneous UFR reveals the same result: a small and insignificant coefficient on the contemporaneous UFR variable.

committed by visitors and tourists from other states, does not seem to affect the coefficients much.

Excluding Washington, D.C., however, reduces substantially the estimated effect on murder, though with no apparent effect on property crimes. Thus, almost half of the estimated effect of unmarried fertility on murder is driven by Washington, D.C. It might be argued that, since D.C. is an outlier in the distribution of unmarried fertility in later years (see Figure 4), it should be excluded and the coefficient in Table 4 should be preferred to those in Tables 2 and 3. On the other hand, it might also be argued that such outliers are especially useful in understanding true effects since they provide substantial variation in the causal variable. Even in the former case, however, unmarried fertility still appears to have an important and statistically significant effect on murder on the order of 2.7% for every 10 non-marital births per 1,000.

Next, one may be concerned about how moments of the income distribution other than the mean might affect crime. Controlling for the percentage of the state population in poverty does not change the coefficient for murder, although it lowers it somewhat for property crimes.[42] Controlling for racial population shares does not affect the results substantially either. Finally, the inclusion of region-year fixed effects controls for any unmeasured factors that vary over time within census regions. It does not appear that such effects bias our results.

Region-year fixed effects may not fully control for omitted variables that vary over time and across states *within* those regions, however. Since all of our previous analysis used the state-year as the unit of observation, inclusion of state-year fixed effects is not possible. Ideally, one could disaggregate the state-level crime data by some other variable, such as age, and then estimate the effects of unmarried fertility on crime by comparing crimes committed by different

[42] We do not include the poverty rate in regressions in Table 2 because it is not available at the state level before 1969, except for the (t-1) census year, 1959. Thus, this row in Table 4 uses fewer data points than those in Tables 2 and 3.

age cohorts within a given state and year. Unfortunately, crime incidence data is not so detailed. However, data on arrests by age within each state and year is available, although the relationship between arrests and crimes committed may not be one-to-one (see Levitt and Miles, 2004 for details on the problems associated with arrest data).[43] Nevertheless, if our results differed strongly using data on arrests with state-year fixed effects, it might cast doubt on the results estimated above.

Table 5 performs just such an analysis. Coefficients are estimated for each crime from the following regression specification, based on DL and Foote and Goetz (2005):

$$[3]\ \ln(arrests)_{ait} = \sum_{a=15}^{24} \beta_{1a}(UFR_{i,t-a}) + \sum_{a=15}^{24} \beta_{2a}(Abortion\ Ratio_{i,t-a-1}) + \alpha_{it} + \delta_{ia} + \lambda_{at} + \varepsilon_{ait}$$

where *a* indexes single years of age between 15 and 24, and *s* and *t* index states and years, respectively. Note that fixed effects for state-year, state-age, and age-year are included.[44] Since our data is now differentiated by age, the use of "effective" rates for unmarried fertility and abortion is unnecessary – we can simply use the UFR in that cohort's birth year, and the abortion ratio in the year before that cohort's birth year.[45] Note further that, given the richness of the data, we can estimate the effects of unmarried fertility and abortion on crime separately for each single year of age; thus, the coefficients on these terms are subscripted by *a*. Moreover, for

[43] Moreover, arrest data is not available for years before 1960, so we use only data from 1960-2002 in the analysis that follows.
[44] Thus, we control for any variables that affect, e.g., everyone in Alabama in 1991, or all 22 year-olds in Texas over time, or all 18 year-olds across the country in 1995.
[45] Technically, an individual of age *a* arrested in year *t* could have been born in three possible years: *t-a-1*, *t-a*, or *t-a+1* (and similarly, an aborted fetus in years *t-a-2*, *t-a-1*, or *t-a* could have been arrested in year *t*, had it been born). Therefore, following the suggestion in Donohue and Levitt (2006), we include once lag and one lead for each of the two variables specified in equation [3], and report the sum of the three coefficients in Table 5, and measure statistical significance by the joint significance of the three coefficients. Excluding the leads and lags, however, does not change either the size or significance of the estimated results substantially.

readability, we also aggregate murder, rape, assault, and robbery into an omnibus "violent crimes" category, and burglary, larceny, and auto theft into "property crimes".[46]

As can be seen in Table 5, unmarried fertility significantly increases future arrests for most ages in the murder and property crimes columns. The results for violent arrests are not as strong, perhaps owing to the same factors that led to the surprising findings in our earlier rape and assault analyses. For murder and property crimes, 18 out of 20 coefficients suggest that unmarried fertility leads to higher levels of future arrests, and 14 out of these 18 are statistically significant.[47] The results for abortion are also generally consistent with our previous findings, with most estimated effects suggesting that abortion reduces future arrests.

Since the dependent variable has changed, the coefficients in this table are not strictly comparable to those in previous analyses; however, the sign and significance of the results suggests that state-level time-varying omitted variables are not causing significant spurious correlations in our analysis.

To summarize, based on our analysis of the 1957-2002 period, we find that unmarried fertility has robust long-run effects on crime, leading to an increase in murders and property crimes on the order of 2.5% – 5%, depending on the specification and data used.

2. Social Stigma and Unmarried Fertility

The theory presented in Section II implied that as social stigma against unmarried childbirth decreases, the estimated relationship between unmarried fertility and future crime

[46] In this analysis, our dependent variable is the count of arrests. Population data by single year of age involves significant measurement error; thus, we do not use arrests per capita. In unreported results, we find very similar effects on arrests per capita. See Foote and Goetz (2005) and Donohue and Levitt (2006) for discussions of the use of arrests versus arrests per capita in such analyses.
[47] There is only one case in which unmarried fertility seems to significantly reduce future arrests: for sixteen year-old murder arrests. Since there are very few sixteen year-olds arrested for murder, the number of cells with positive values in this category is quite small. As the dependent variable is estimated with natural log, the estimates for the young ages in the murder category are thus based on very few observations, and so may be unreliable.

should become more positive, since the marginal child born to unmarried parents becomes more likely to have benefited from having married parents. In this sub-section, we look for evidence of this theory in three places. First, we consider how the effect of unmarried fertility on crime differs over time, since social opinions towards unwed mothers have changed substantially in the U.S during the last 50 years. Second, we look at how the effect differs across racial groups, since stigma against unmarried fertility has generally been higher among whites than among nonwhites. Finally, we look at how the effect differs across regions within the U.S., which vary in the severity of social norms.

Table 6 considers the effect of unmarried fertility on crime as before by estimating coefficients from equation [2], but divides the sample into two time periods or epochs, 1957-1984, and 1985-2002. Before 1985, the hypothesized effect of legalized abortion on crime before 1985 cannot be important, as children born after national legalization in 1973 are only 11 years old in 1984 and have not had much opportunity to commit crimes. For this reason, the effective abortion rate is excluded in regressions over the 1957-1984 period.[48]

The first two columns consider the effect of unmarried fertility on murder. The results suggest that unmarried fertility is *negatively* correlated with future murder in the 1957-1984 period, but *positively* correlated with murder in the 1985-2002 period.[49] These results are consistent with the theory presented above, which implied that measured out-of-wedlock

[48] While there is some variation in the effective abortion ratio over this period, due largely to the few states that legalized abortion as early as 1969, inclusion of the variable does not change any results appreciably. Furthermore, we estimated earlier that the crime-minimizing level of UFR occurred in 1965, implying that UFR should be positively associated with future crime for births after 1965. Assuming a roughly median criminal age of 20, this implies that the positive relationship between effective UFR and crime should begin around 1985.

[49] These results also show that the positive results in Tables 2-4 are not driven by selection effects from the few early years (1957-1966) when data for less than 32 states is available (see data appendix). On the same note, further analysis (not presented) shows that the differences over time evident in Table 6 are robust to excluding all but the 20 states for which data is available in every year.

childbirth should be less pernicious in early years when the social stigma against it was high, leading to only the lowest-quality parental matches not marrying.

Again, it should be remembered that the epoch listed refers to the years of crime being explained; the effective UFR is a weighted sum of lagged unmarried fertility ratios, with the largest weights centered around 18-25 year lags. Thus, the relevant variation in unmarried fertility driving the results in column 1 occurred primarily in the 1930s, 1940s, and 1950s (the national UFR in 1950 was 41.23 per 1,000 births), while the relevant variation driving the results in column 2 occurred primarily in the 1960's and 1970's (the national UFR in 1970 was 108.59). Recalling Figure 1, a major increase in UFR began in the mid-1960s. If declines in social stigma against unmarried fertility led to many marriages that would have benefited children being foregone, this may explain the fact that the effective UFR is positively associated with murder in the 1985-2002 period, and negatively associated with murder in the 1957-1984 period. These results also imply that many marriages in the 1940s and 1950s were of such low match quality that the children involved would have been better off had their parents never married.

Columns 3 and 4 perform a similar analysis for violent crimes generally.[50] Again, we see that unmarried fertility seems to be negatively correlated with violent crime in the 1957-1984 period, while there seems to be little or no effect on crime in the later period.[51]

Finally, columns 5 and 6 perform the same analysis for property crimes. Unmarried fertility seems to have little correlation with future property crime in the early epoch, but is strongly and positively related with property crime in the latter epoch.

[50] We argued before that biases in reporting for rape and assault may lead to biases in the estimated effect of unmarried fertility on these crimes; to the extent that this bias is constant over time, however, we can still use these data to test comparisons over time, and across races and geographic regions, as we do in this subsection.
[51] The lack of apparent positive effect on violent crime in the latter period is, again, largely due to rape and assault.

In all three crimes, the measured effect of unmarried fertility on crime increases over time, consistent with the theory. Since it might be argued that the 1985 cutoff year is arbitrary, Table 7 performs the same analysis as in Table 6 for murder rates, using a wide variety of periods of different lengths between 1957 and 2002 for analysis. The row indicates the starting year, while the columns represent the ending year of the analysis, and each cell contains the estimated effect of the effective UFR on murder. Estimates on abortion and other covariates are suppressed for readability. Estimates close to the "diagonal" use fewer years of data, and so should be treated as less reliable. In general, the clear impression from Table 5 is one of an increasing effect for later years in comparison with early years.[52] Interestingly, there is an apparently positive effect visible in epochs dominated by data from the early 1960s (see the 1966 and 1969 columns, e.g.). This suggests that out-of-wedlock childbirth in the early 1940s was more pernicious for future crime than that in the late 1940s and 1950s, although this may be an artifact of the small sample sizes used to estimate these results. Another, highly speculative, hypothesis is that this effect is due to the short-lived spike in unmarried fertility in the 1940s directly after World War II; these children may have been raised in particularly poor environments.

An alternative explanation for these results is a change in the composition of unmarried fertility towards parents in lower socio-demographic strata. However, if anything, the opposite seems to be the case – unmarried fertility has become less concentrated among teen mothers, less concentrated among nonwhites, and more children of unwed mothers are now living with both parents in a cohabitive home, as opposed to in single-parent homes (Ventura and Bachrach, 2000). All of these trends are, however, consistent with falling social stigma.

[52] Similar analyses of violent and property crimes evince essentially similar results, and so are omitted.

As a second test of the "social stigma" hypothesis, we decompose the effects of unmarried fertility on future crime by racial group. Unwed mothers have long faced lower levels of social stigma among nonwhite groups than among whites (Graefe and Lichter, 2002, Cutright and Smith, 1988, Hogan and Kitagawa, 1985). This may be part of the reason why unmarried fertility has generally been significantly higher among nonwhites: the averages over the 1923-1990 span are 89.29 per 1,000 live births for whites, but 264.99 per 1,000 live births for nonwhites.

Table 8 separates white and nonwhite out-of-wedlock births in their effects on crime. Problematically, some states, particularly in the 1920s and 1930s, did not report racially-disaggregated UFR data, leading to a reduction from the 1,409 observations previously employed over the 1957-2002 period to only 1,143 observations. Many of the states that did report such data were concentrated in the South. Thus, composition bias may cause these results to differ from the earlier analysis. To check for this possibility, the first three columns of Table 8 replicate the analysis from Table 3, using the total effective UFR for only the 1,143 observations for which racially-disaggregated data is available to analyze. Comparisons between these three columns and those in Tables 2 and 3 suggest a high degree of similarity.

The last three columns in Table 8 disaggregate the data by racial group.[53] The results suggest that white nonmarital births are uncorrelated with future murder and violent crime, and negatively associated with future property crime. On the other hand, nonwhite illegitimate births are positively correlated with all three crime categories.[54] This is unsurprising in light of our

[53] However, the weights used in construction of the effective illegitimacy ratio are based on overall arrests, not racially-disaggregated arrests.

[54] Since the total UFR is equal to a birth-weighted sum of the two racial UFRs, it is not the case that the two racial coefficients must sum to the total coefficient measured in columns 1-3. For instance, an increase in the nonwhite UFR of 10 would only be associated with an increase in the total UFR of 10 multiplied by the percent of nonwhite births – thus, the coefficient on nonwhite UFR would be expected to be much smaller than that on total UFR. Therefore, to compare the coefficient in column 1 with that in column 4, one would need to multiply the coefficient

earlier findings that the effect of unmarried fertility on future crime changes sign depending on the level of unmarried fertility. For instance, in Table 2, we estimated that the future crime-minimizing level of UFR was 77.61. The average across states in our sample exceeds this level in 1965, but non-white UFR exceeds this level in all years of our analysis, 1923-2002, while white UFR does not exceed this level until 1977.

These results support the hypothesis that higher levels of social stigma against unmarried mothers are associated with a weaker relationship between unmarried fertility and future crime.

As a final test of the theory, we exploit differences in social attitudes towards unmarried fertility across different regions of the U.S. during the early and mid-20th century. Dividing the states into four census regions, we rank these regions by strictness in social mores according to two metrics: the prevalence of church membership and divorce rates. Table 9 gives the results from a 1952 (the earliest available) survey of church membership, and 1938-1964 divorce rates per capita.[55] By both metrics, one would expect the strictest social norms in the Northeast, followed by the Midwest, South, and West.[56]

Table 10 presents estimates of the relationship between unmarried fertility and future crime for the years 1957-1984 (recalling that the most relevant birth cohorts for this era are roughly 1938-1964). We expect regions with stricter social norms to have a more negative relationship between unmarried fertility and crime. In fact, there seems to be some evidence that this is true for murder (see column 1), as the relationship is large and negative for the Northeast,

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in column 1 by the non-white share of the relevant population. If, for instance, the non-white share of the relevant population were 15% (roughly the non-white share of the total population in 2002), then column 1 would imply that an unit increase in non-white UFR would be expected to increase log crime by 0.09, which is roughly similar to the coefficient in column 4.

[55] More useful, perhaps, than divorce rates per capita are divorce rates per stock of marriage. Data on the stock of marriages is only available in decadal census years for this period; however, with interpolation between years, a rough measure of divorces per stock of marriage can be calculated. The relative rankings of the four regions are unchanged, however.

[56] In later years, the regions tend to converge, and cross-region mobility increases, making it more difficult to distinguish the regions. Therefore, we focus on only relatively early years for testing the hypothesis.

small and negative for the Midwest and South, and large and positive for the West. The same pattern holds for violent crimes, although we see little relevant spatial pattern for property crimes.[57]

Therefore, the regional analysis is generally supportive of the hypothesis that social stigma influences the observed relationship between unmarried fertility and crime.

V. Conclusion

We have analyzed the relationship between unmarried fertility and crime over the period 1957-2002. First, we find that an increase of 10 nonmarital births per 1,000 live births is associated with an increase in future murder and property crime rates of between 2.5% and 5%. Next, we find that these effects have generally increased over time across all classes of crime, that white unmarried fertility seems to be less correlated with future crime than nonwhite unmarried fertility, and that states with stronger social norms see a smaller correlation between unmarried fertility and crime. These effects we attribute to variation in the quality of the marginal parental match due to variations in social opprobrium towards unwed mothers. When such stigma is high, the marginal marriage may actually be worse for the children involved than a single parent household, while the opposite is true when stigma is low.

We also argue for the robustness of the results of Donohue and Levitt (2001) on the relationship between abortion and crime. However, we find that the effect of abortion on crime is substantially dampened by the contrary effect of abortion on unmarried fertility, and that abortion is a blunt policy lever for affecting crime rates.

[57] Effective UFRs for murder by census region, 1957-1984, are 23.08 (Northeast), 21.21 (Midwest), 51.44 (South), and 15.00 (West). Very similar patterns are observable for violent crime effective UFR and property crime effective UFR.

In general, it is important to understand the marginal benefits of various social policies in terms of crimes reduced, including policies that affect family structure. Given the costs of improving family structure in various ways, optimal policies can then be structured. Our hope is that this paper contributes to an understanding of the important role that family structure plays in affecting criminality.

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Data Appendix

Abortion ratio

Abortion data is from Centers for Disease Control, "Abortion Surveillance Report" [annual].

AFDC

Total payments divided by family receiving payments, from United States Statistical Abstract [annual]

Arrests by Age

From Federal Bureau of Investigation, produced and distributed by Inter-university Consortium for Political and Social Research, University of Michigan-Ann Arbor.

Beer Consumption

Consumption of malt beverages from the Beer Institute's Brewer's Almanac [annual], in gallons consumed per capita.

Church Membership

Number of church members declared by 114 religious bodies in each state, divided by the total population. Studies were performed in 1952, 1971, 1980, 1990, and 2000 (e.g., Quinn, et al, 1982). Data for other years is linearly interpolated.

Crack Cocaine Index

Crack index constructed by Fryer, et al (2005) as a weighted average of cocaine arrests, cocaine-related emergency room visits, cocaine-induced drug deaths, crack mentions in newspapers, and DEA drug arrests.

Crime

From Federal Bureau of Investigation, Crime in the United States [annual].

Enrollment Rates

Percent of population aged 14-17, and 18-24, enrolled in high school and college, respectively. See data appendix of Turner, et al (2007) for details.

Executions

Criminal executions by state from Espy and Smykla (2004).

Low Human Capital Population

Percent of state labor force members with fewer than 9 years of schooling, adjusted for migration, from Turner, et al (2007).

Marriages and Divorces

Percent of ages 15+ population married from Census of Population and Housing, Vol II: Characteristics of the Population [decadal]. Counts of new marriages and divorces from United States Statistical Abstract [annual].

Percent Urban

Percent of resident population living in metropolitan statistical areas, from Bureau of the Census United States Statistical Abstract [annual]

Police

From Federal Bureau of Investigation, Crime in the United States [annual].

Population by Age and Gender

From Estimates for the United States, Regions, Divisions, and States by 5 Year Age Groups and Sex: Annual Time Series Estimates, U.S. Census Bureau [annual].

Poverty

Fraction of residents below poverty level, by state, from Bureau of the Census, United States Statistical Abstract [annual]

Prisoners

Data on number of prisoners is from Correctional Populations in the United States, published annually by the Bureau of Justice Statistics. Washington, D.C. ceased holding prisoners in 2001. Data for 2003 in DC is linearly interpolated.

Real output per worker

Income per worker, from Bureau of Economic Analysis, converted to 2003 dollars with the consumer price index. See data appendix of Turner, et al (2007) for details.

Schooling, Average Years

Average years of schooling among labor force participants. See data appendix of Turner, et al (2007).

Shall-Issue Concealed Handgun Law

Dummy variable for whether the state had enacted a law requiring local law enforcement authorities to grant concealed weapons permits to anyone meeting certain pre-established criteria. Data come from Lott and Mustard (1997).

Unemployment

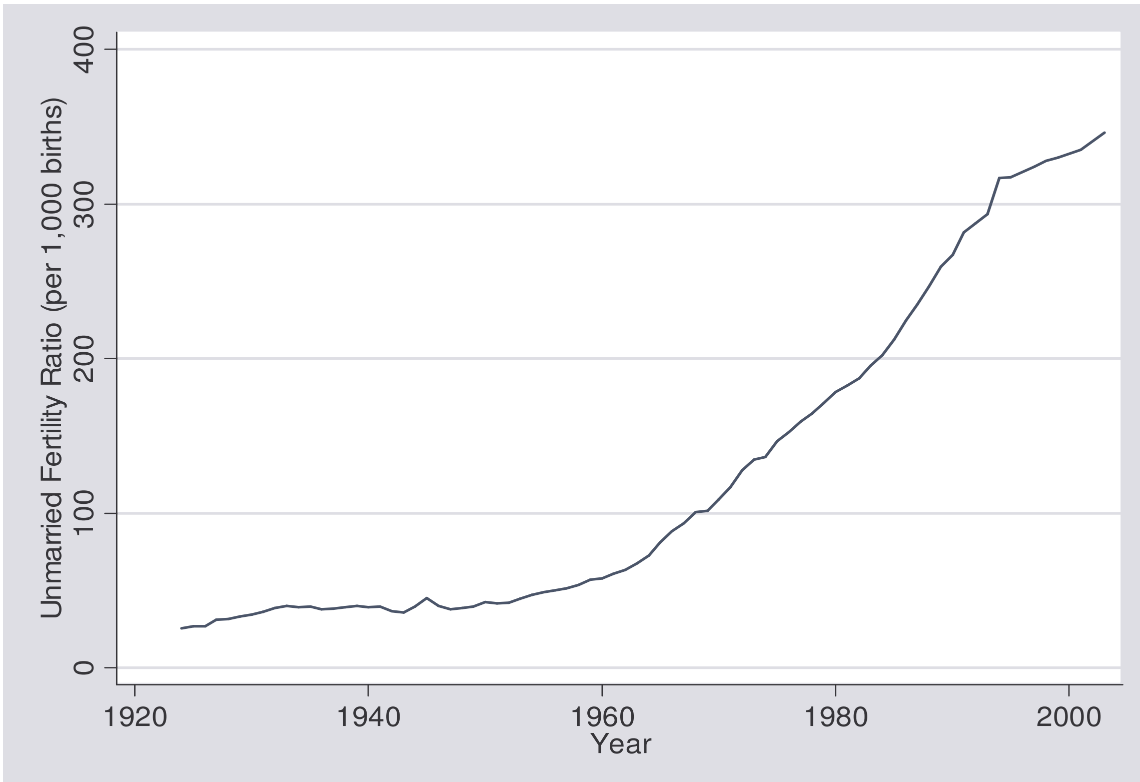
Figures used represent the percent unemployed among civilian non-institutional population 16 years and older, with total unemployment estimates based on the Current Population Survey, taken from Bureau of the Census United States Statistical Abstract [annual]. Some early years of state-level data employ the "Handbook" method.

Unmarried Fertility Ratio

Births to unmarried mothers, as a fraction of 1,000 live births. 1925-1936: Data are from Bureau of the Census, Statistical Abstract of the United States [annual]. Some states supply race-specific UFR data, particularly Southern states, but others do not. 1937-

2002: Data are from National Center for Health Statistics, Vital Statistics of the United States, Natality [annual], NCHS collected the data from birth certificate records, using either a 50% or 100% sample in each state. However, not all states ask about marital status on the birth certificate, and the number of states that do falls over the time period. With interpolation of fewer than 9 years in any particular state, UFRs lagged 8-34 years are available for calculating "effective" UFR for the following states starting in 1957: Delaware, District of Columbia, Illinois, Indiana, Kansas, Kentucky, Maine, Michigan, Minnesota, Mississippi, New Jersey, North Carolina, Oregon, Pennsylvania, Rhode Island, South Carolina, Utah, Virginia, Washington, Wisconsin, and Wyoming. In addition, effective UFRs are calculated beginning in years *after* 1957 for the following states: Alabama (1961), Florida (1958), Iowa (1958), Louisiana (1961), Missouri (1961), Nevada (1963), North Dakota (1958), South Dakota (1966), Tennessee (1961), Texas (1967), West Virginia (1959). The missing early data for these states is generally due to the fact that they did not require birth certification until some year after 1923.

Figure 1: Unmarried Fertility Ratio: 1923-2002



Notes: The unmarried fertility ratio (UFR), 1923-2002, calculated as births to unmarried women per 1,000 live births. Calculations are based on 32 states for which data on mother's marital status is available with relatively little interpolation (see data appendix for details).

Figure 2: Predicted relationship between unmarried childbirth and future crime

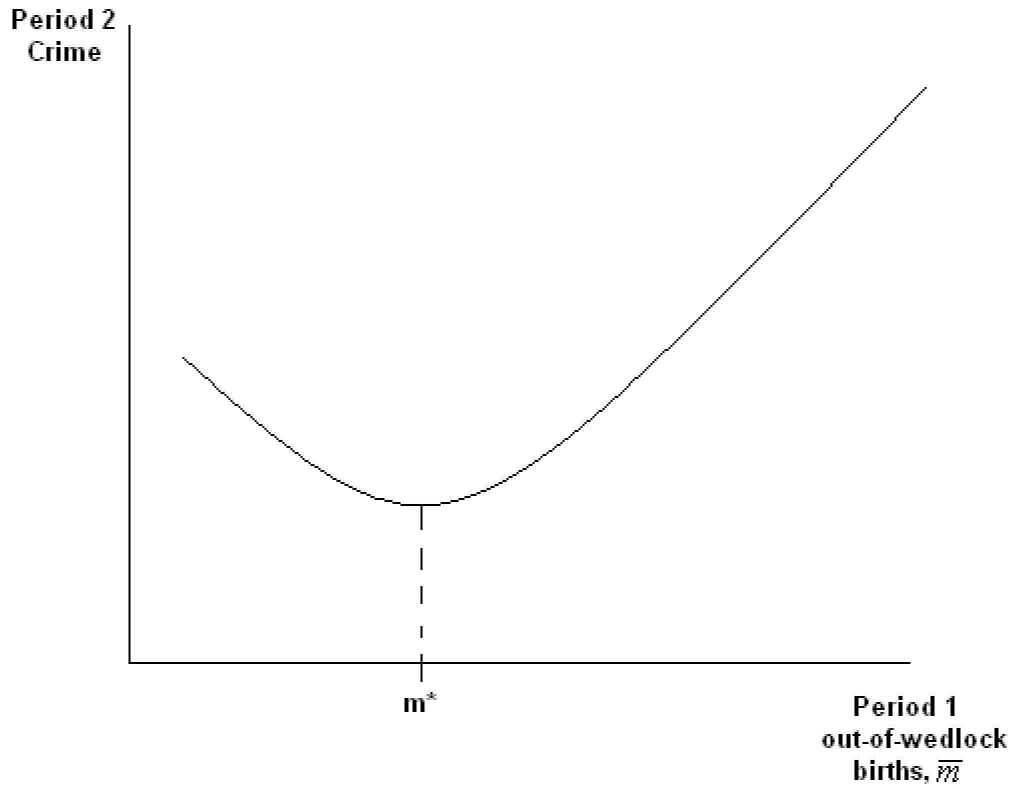
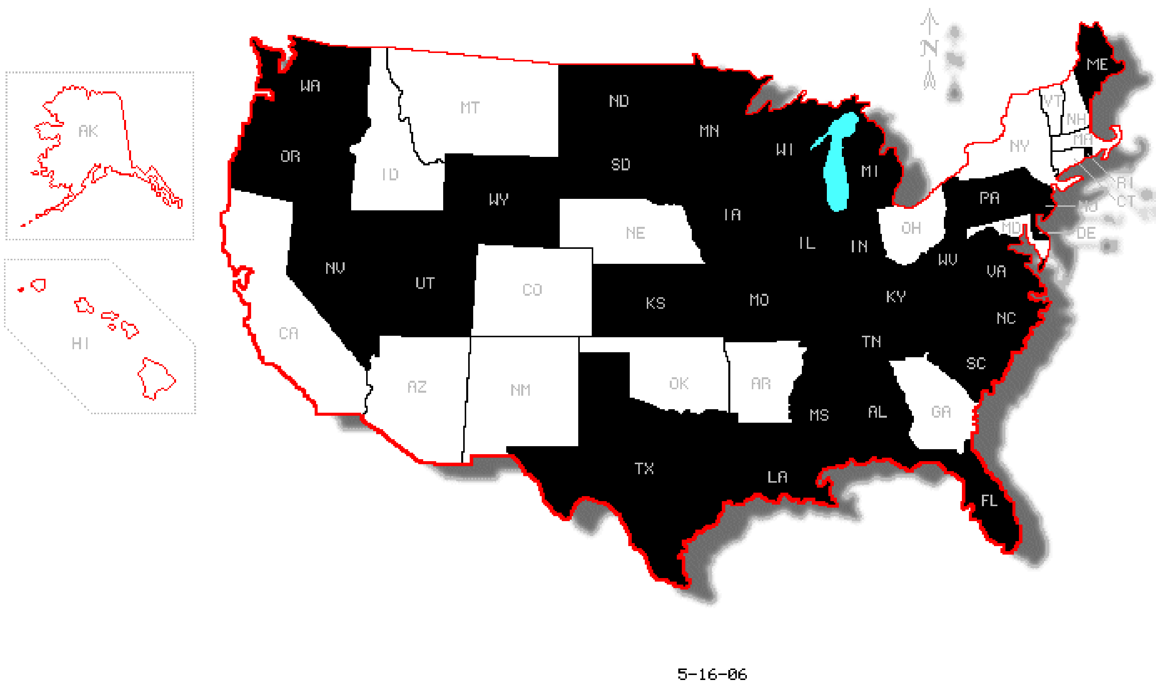
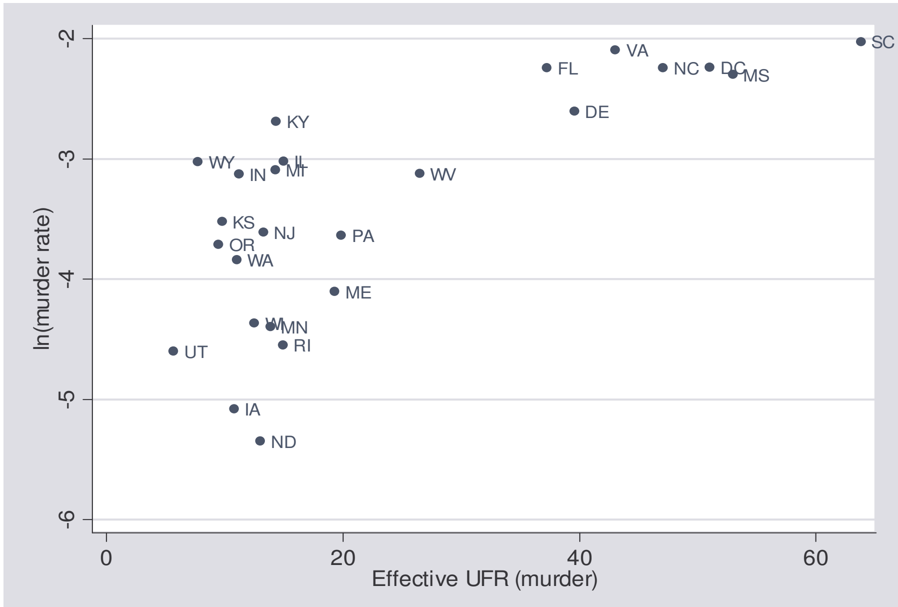


Figure 3: States that Report Mothers' Wedlock Status

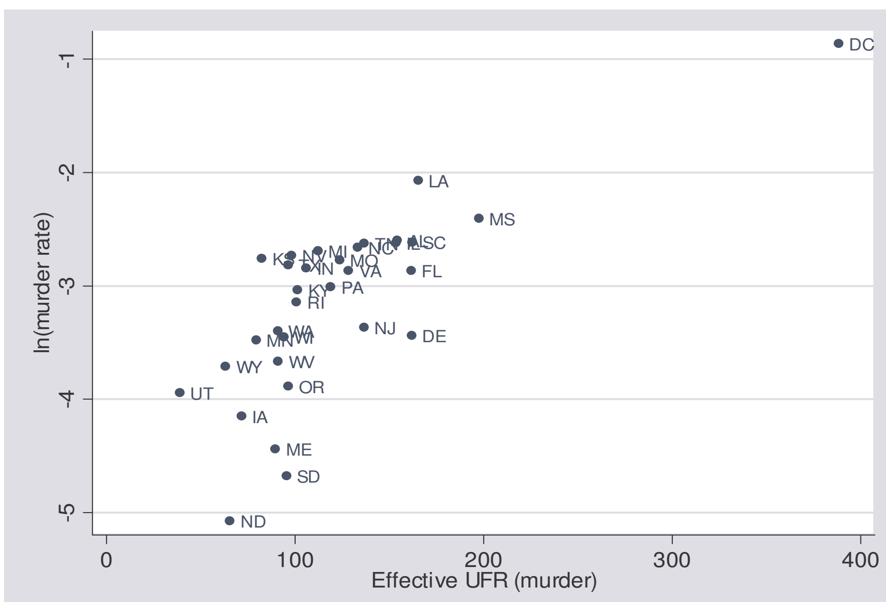


Notes: 32 states shaded in dark (including D.C.) are used for statistical analyses below, as these have reasonably consistent recording of unmarried fertility (see data appendix for details).

Figure 4: Effective UFR vs. Murder Rates, 1960 and 2000



1960



2000

Notes: 32 observations in each year represent states with available time-series data on unmarried fertility ratios (UFR), calculated as childbirths to unmarried women per 1,000 live births. "Effective" UFR is a weighted average of lagged UFR measurements intended to capture the extent of illegitimacy in the population of potential criminal offenders.

Table 1: Summary Statistics

	1957-1984 Mean	1957-1984 St. dev.	1985-2002 Mean	1985-2002 St. dev.
Murders per 100,000	7.58	4.30	7.63	4.53
Violent Crimes per 100,000	335.63	219.42	586.42	261.85
Property Crimes per 100,000	3302.78	1582.52	4500.68	1252.76
Unmarried fertility rate per 1,000 live births	125.70	63.49	293.62	65.78
White unmarried fertility rate per 1,000 live births	62.90	32.29	169.59	43.00
Non-white unmarried fertility rate per 1,000 live births	384.94	136.70	578.43	111.68
Effective UFR per 1,000 live births (murder)	32.95	20.35	98.35	39.52
Effective UFR per 1,000 live births (violent crimes)	39.61	23.58	93.31	34.11
Effective UFR per 1,000 live births (property crimes)	47.80	27.11	39.77	21.03
Effective Abortion Ratio per 1,000 live births (murder)	---	---	119.88	102.40
Effective Abortion Ratio per 1,000 live births (violent crimes)	---	---	107.28	82.58
Effective Abortion Ratio per 1,000 live births (property crimes)	---	---	149.84	98.83
Prisoners per 1,000	1.08	0.53	3.15	1.67
Police per 1,000	1.86	0.84	2.92	0.75
Executions per 100,000	0.004	0.018	0.02	0.04
Shall-issue concealed handgun law (1 = yes)	0.06	0.25	0.43	0.50
Unemployment rate	6.09	2.46	5.66	1.60
Real output per worker ($1997)	37,140.18	5,769.02	50,524.76	7,369.21
AFDC payments per family	6,735.59	3,420.53	5,998.29	2,670.29
Fraction population with < 8 years schooling	25.67	9.07	11.97	4.93
Average years of schooling	11.02	0.84	12.89	0.55
Secondary enrollment rate	91.09	8.24	90.45	4.80
Higher education enrollment rate	32.15	8.27	51.94	8.24

Beer consumption per capita (gal.)	19.95	5.44	23.45	3.35
Crack Cocaine Index	-0.00	0.13	1.62	1.05
% Urban	68.88	12.80	73.07	12.34
% Male	48.79	0.58	48.80	0.58
% of population church members	28.11	9.75	24.62	10.36
Racial Heterogeneity Index	0.19	0.11	0.20	0.11
% 15+ population married	63.42	3.21	55.96	2.47
New marriages per 100 marriage stock	2.24	2.24	2.22	1.88
Divorces per 100 marriage stock	0.80	0.40	1.06	0.29

Notes: Statistics based on 833 observations on 32 states between 1957 and 1984, and 576 observations on 32 states between 1985 and 2002. Out of a theoretical maximum of 896 observations between 1957 and 1984, missing data limits the number of observations. Data on prisoners, police, executions, and mental hospitalizations are lagged one year, and so correspond to 1956-1983 and 1984-2001. Data on AFDC payments per family are lagged 15 years, and so correspond to 1942-1969 and 1970-1987. "Effective" abortion and UFR are weighted averages of lagged vales of abortions and out-of-wedlock childbirths per 1,000 live births, respectively, with weights corresponding to the age distribution of the population of arrested criminals.

Table 2: The Effects of Out-of-Wedlock Childbirth on Murder, 1957-2002

Dependent variable: Natural log murder rate per 100,000 population

Effective UFR	0.14	0.30		0.25	0.50	0.32	-0.34
(x 100)	(1.97)	(4.44)		(3.12)	(6.75)	(4.11)	(2.49)
Effective UFR^2							0.22
(x 10,000)							(7.77)
Effective Abortion			-0.10	-0.07	-0.17	-0.11	-0.23
Ratio (x 100)			(4.34)	(2.52)	(6.68)	(3.75)	(8.28)
Ln(prisoners per		-0.05	-0.04		-0.07	-0.07	-0.04
capita) [t-1]		(1.57)	(1.50)		(2.29)	(2.27)	(1.42)
Ln(police per capita)		-0.22	-0.25		-0.24	-0.27	-0.27
[t-1]		(4.68)	(5.60)		(5.41)	(5.94)	(6.02)
Executions per		-0.21	-0.27		-0.18	-0.16	-0.17
100,000 persons [t-1]		(1.52)	(1.89)		(1.34)	(1.16)	(1.31)
Shall-issue concealed		-0.02	-0.05		-0.03	-0.05	-0.07
gun law (x 10)		(1.03)	(2.55)		(1.52)	(2.36)	(3.08)
Ln(real output per		0.39	0.38		0.52	0.76	0.53
worker) [1997 $]		(2.23)	(2.27)		(2.87)	(3.99)	(3.00)
Unemployment rate		-0.87	-0.89		-0.89	-0.78	-0.94
		(1.69)	(1.78)		(1.80)	(1.49)	(1.95)
AFDC payments per		-0.00	-0.01		-0.00	-0.00	-0.00
family (x 10,000)		(0.23)	(0.41)		(0.19)	(0.13)	(0.27)
[t-15] [1997 $]							
Average years of		-0.20	-0.14		-0.17	-0.21	-0.25
schooling		(3.75)	(2.73)		(3.23)	(3.82)	(4.78)
fraction with < 8		-0.01	-0.56		0.08	0.66	-1.03
years schooling		(0.02)	(1.85)		(0.23)	(1.84)	(2.90)
Secondary		-0.90	-0.83		-0.87	-0.86	-0.98
enrollment rate		(4.91)	(4.49)		(4.88)	(4.83)	(5.48)
Higher education		0.06	-0.06		-0.07	0.37	-0.15
enrollment rate		(0.27)	(0.26)		(0.33)	(1.61)	(0.73)
Beer consumption per		0.00	0.00		-0.00	-0.00	-0.01
capita (gal.) (x 10)		(0.94)	(0.75)		(1.04)	(1.25)	(1.86)
Crack cocaine index		0.19	0.15		0.22	0.17	0.21
		(2.11)	(1.65)		(2.44)	(1.78)	(2.25)

Fraction church members		-1.48	-1.20		-1.58	-1.50	-1.20
		(5.15)	(4.47)		(5.60)	(5.21)	(4.38)
Fraction urban		-1.08	-1.16		-0.88	-1.13	-0.53
		(2.76)	(3.14)		(2.33)	(3.02)	(1.43)
Fraction male		-15.94	-10.44		-12.08	-	-7.48
		(2.61)	(1.80)		(2.13)	11.58	(1.34)
						(2.03)	
Racial heterogeneity: $1 - (\%black)^2 - (\%non\text{-}black)^2$		1.59	1.79		1.78	1.60	1.74
		(2.61)	(2.80)		(2.74)	(2.59)	(2.82)
Population percent married [t-10]						-1.36	
						(1.93)	
New marriages per marriage stock [t-5]						-1.83	
						(1.62)	
Divorces per marriage stock [t-5]						16.45	
						(2.27)	
Population Distribution (in 5-year age groups)	NO	YES	YES	YES	YES	YES	YES
R-squared	0.98	0.99	0.99	0.99	0.99	0.99	0.99
Obs.	1409	1409	1409	1409	1409	1321	1409

Notes: t-statistics in parentheses. Regressions based on 1,409 observations for 32 states over the 1957-2002 period, except column 6, which excludes Indiana and Louisiana observations (no divorce data is available for these states). Year and state fixed effects are included in all regressions, and observations are weighted by total state population. Standard errors are adjusted for heteroskedasticity, temporal correlation across states, and an AR(1) process for within-state autocorrelation using a panel-data Prais-Winsten approach. Variables measuring the fraction of a state's population in each five-year age group from 0-4 through 70-74 are also included in the latter three columns.

Table 3: The Effects of Out-of-Wedlock Childbirth on Seven Index Crimes, 1957-2002

	Murder	Rape	Robbery	Assault	Burglary	Larceny	Auto Theft
Effective UFR (x 100)	0.50 (6.75)	-0.20 (1.89)	0.18 (1.62)	-0.12 (1.00)	0.35 (4.87)	0.49 (7.07)	0.28 (2.66)
Effective Abortion Ratio (x 100)	-0.17 (6.68)	-0.17 (5.17)	-0.20 (5.79)	-0.19 (4.96)	-0.23 (9.86)	-0.23 (11.18)	-0.07 (2.34)
Ln(prisoners per capita) [t-1]	-0.07 (2.29)	-0.03 (1.17)	-0.04 (1.45)	0.03 (1.05)	-0.07 (3.64)	-0.04 (2.65)	-0.04 (1.67)
Ln(police per capita) [t-1]	-0.24 (5.41)	0.01 (0.15)	0.04 (0.89)	0.02 (0.45)	0.09 (2.73)	0.07 (2.80)	0.07 (1.56)
Executions per 100,000 persons [t-1]	-0.18 (1.34)	-0.19 (1.85)	0.02 (0.19)	-0.14 (1.44)	0.03 (0.44)	-0.03 (0.51)	0.05 (0.55)
Shall-issue concealed gun law (x 10)	-0.03 (1.52)	-0.02 (0.99)	0.01 (0.55)	-0.01 (0.05)	-0.11 (0.76)	0.02 (1.50)	0.34 (1.75)
Ln(real output per worker) [1997 $]	0.52 (2.87)	0.20 (1.47)	1.10 (6.48)	-0.04 (0.30)	0.40 (4.07)	0.54 (6.11)	0.30 (2.09)
Unemployment rate	-0.89 (1.80)	-0.39 (0.95)	0.47 (0.91)	-0.38 (1.09)	1.92 (6.48)	1.24 (5.05)	-0.02 (0.06)
AFDC payments per family (x 10,000) [t-15] [1997 $]	-0.00 (0.19)	-0.01 (1.27)	-0.03 (2.51)	-0.01 (1.42)	-0.01 (1.47)	-0.00 (0.37)	0.00 (0.22)
Average years of schooling	-0.17 (3.23)	-0.03 (0.59)	0.05 (0.67)	-0.21 (3.85)	0.02 (0.67)	0.05 (1.54)	0.06 (0.99)
fraction with < 8 years schooling	0.08 (0.23)	1.06 (3.06)	1.21 (2.67)	-1.15 (3.01)	0.83 (3.29)	1.00 (4.30)	0.77 (1.76)
Secondary enrollment rate	-0.87 (4.88)	-0.34 (2.15)	-0.12 (0.62)	0.03 (0.20)	-0.06 (0.54)	0.16 (1.57)	-0.10 (0.58)
Higher education enrollment rate	-0.07 (0.33)	-0.14 (0.68)	-0.05 (0.23)	-0.08 (0.42)	-0.06 (0.45)	-0.24 (2.01)	-0.40 (1.81)
Beer consumption per capita (gal.) (x 10)	-0.00 (1.04)	0.03 (0.95)	0.01 (2.18)	0.06 (2.39)	0.09 (3.95)	0.05 (2.83)	0.10 (3.21)
Crack cocaine index	0.22 (2.44)	-0.16 (2.40)	0.05 (0.64)	-0.14 (2.39)	-0.06 (1.23)	0.01 (0.24)	0.12 (1.75)

Fraction church members	-1.58 (5.60)	-0.75 (2.87)	-1.93 (5.24)	-0.43 (1.44)	-0.49 (1.98)	-0.68 (3.17)	-0.88 (2.46)
Fraction urban	-0.88 (2.33)	0.59 (1.68)	0.01 (0.02)	0.97 (2.03)	-0.12 (0.45)	-0.31 (1.27)	-0.62 (1.36)
Fraction male	-12.08 (2.13)	-15.71 (2.94)	1.65 (0.22)	5.62 (1.00)	-9.29 (2.28)	-7.77 (2.21)	9.29 (1.49)
Racial heterogeneity: $1 - (\%black)^2 - (\%non\text{-}black)^2$	1.78 (2.74)	-0.31 (0.90)	-0.22 (0.51)	1.00 (2.08)	0.00 (0.01)	-0.13 (0.69)	0.17 (0.36)
Population Distribution (in 5-year age groups)	YES	YES	YES	YES	YES	YES	YES
R-squared	0.99	0.97	0.83	0.88	0.99	0.99	0.92
Obs.	1409	1356	1409	1409	1409	1409	1409

Notes: t-statistics in parentheses. Regressions based on 1,409 observations for 32 states over the 1957-2002 period, except for rape, for which some data is missing before 1960. Year and state fixed effects are included in all regressions, and observations are weighted by total state population. Standard errors are adjusted for heteroskedasticity, temporal correlation across states, and an AR(1) process for within-state autocorrelation using a panel-data Prais-Winsten approach. Variables measuring the fraction of a state's population in each five-year age group from 0-4 through 70-74 are also included in the latter three columns.

Table 4: Robustness Checks

	Murder	Property Crimes
Baseline	0.50 (6.75)	0.40 (6.62)
Include contemporaneous UFR control	0.53 (7.08)	0.41 (6.61)
Unweighted regression	0.45 (4.40)	0.28 (4.11)
Assume no autocorrelation, cluster errors at state level	0.47 (3.55)	0.41 (2.59)
Include a state-specific linear time trend	0.39 (2.52)	0.20 (1.68)
Exclude Nevada and New Jersey	0.50 (6.49)	0.35 (5.53)
Exclude D.C.	0.27 (2.91)	0.41 (5.56)
Include poverty rate control	0.52 (6.50)	0.20 (2.76)
Include percent black control	0.43 (5.60)	0.40 (6.54)
Include (region x year) fixed effects	0.49 (6.21)	0.45 (7.28)

Notes: Each cell gives the coefficient on the "Effective UFR" variable in a regression of the form used in Table 3. Coefficients on other covariates are suppressed for readability. "Property Crimes" is an aggregate of burglary, larceny, and auto theft. t-statistics are presented in parentheses.

Table 5: The Effects of Unmarried Fertility and Abortion on Criminal Arrests, by Age

	ln(murder arrests)	ln(violent arrests)	ln(property arrests)
UFR **x** (age = 15)	-0.053	0.007	0.029
UFR **x** (age = 16)	-0.075**	-0.003	0.025
UFR **x** (age = 17)	0.064**	0.007**	0.033**
UFR **x** (age = 18)	0.058	0.031	0.023
UFR **x** (age = 19)	0.094**	0.028	0.043**
UFR **x** (age = 20)	0.123**	0.025*	0.050**
UFR **x** (age = 21)	0.149**	0.020	0.064**
UFR **x** (age = 22)	0.231**	0.009	0.070**
UFR **x** (age = 23)	0.241**	0.002**	0.079**
UFR **x** (age = 24)	0.204**	-0.009	0.061**
F-statistic	2.52**	1.73**	2.40**
Abortion rate **x** (age = 15)	-0.026	-0.062**	-0.040**
Abortion rate **x** (age = 16)	-0.060**	-0.035**	-0.015**
Abortion rate **x** (age = 17)	-0.050**	-0.035**	-0.014**
Abortion rate **x** (age = 18)	-0.043**	-0.054**	-0.026**
Abortion rate **x** (age = 19)	-0.043**	-0.051**	-0.026**
Abortion rate **x** (age = 20)	-0.036**	-0.048**	-0.019**
Abortion rate **x** (age = 21)	-0.010	-0.045**	-0.015**
Abortion rate **x** (age = 22)	0.039	-0.047**	-0.016**
Abortion rate **x** (age = 23)	0.021	-0.033**	-0.016**
Abortion rate **x** (age = 24)	0.035	-0.031**	-0.028**
F-statistic	2.61**	7.43**	4.09**
R^2	0.937	0.990	0.994
Observations	15,842	20,136	20,851

Notes: (**) indicates significance at the 5% level, while (*) indicates the 10% level. Regressions based on observations for single-years-of-age between 15 and 24 in each state over the years 1960-2002. Year-state, state-age, and year-age fixed effects are included in all regressions. Numbers of observations differ across crimes due to zeros and missing values in the data.

Table 6: Temporal Variation in Effect of Unmarried Fertility on Crime

Dependent variable: Natural log of specified crime rate

	Murder	Murder	Violent Crimes	Violent Crimes	Property Crimes	Property Crimes
	1957-1984	**1985-2002**	**1957-1984**	**1985-2002**	**1957-1984**	**1985-2002**
Effective UFR (x 100)	-0.28 (1.60)	0.68 (5.97)	-0.51 (2.50)	0.14 (1.09)	-0.01 (0.11)	0.61 (7.58)
Effective Abortion Ratio (x 100)	---	-0.12 (4.70)	---	-0.17 (5.64)	---	-0.17 (12.04)
Ln(prisoners per capita) [t-1]	0.05 (1.27)	-0.16 (3.28)	0.01 (0.46)	0.03 (1.11)	-0.05 (2.18)	-0.02 (1.09)
Ln(police per capita) [t-1]	-0.15 (2.98)	-0.14 (1.91)	-0.00 (0.02)	-0.10 (1.88)	0.15 (3.75)	-0.07 (1.95)
Executions per 100,000 persons [t-1]	-0.00 (0.00)	-0.16 (1.08)	-0.24 (1.61)	-0.00 (0.09)	0.12 (1.16)	-0.05 (0.69)
Shall-issue concealed gun law (x 10)	0.06 (1.42)	0.00 (0.11)	0.02 (0.74)	0.00 (0.24)	-0.03 (2.00)	0.01 (0.89)
Ln(real output per worker) [1997 $]	0.29 (1.21)	0.77 (2.95)	0.45 (2.76)	0.54 (2.89)	0.50 (5.17)	0.32 (2.64)
Unemployment rate	-0.74 (1.15)	-0.72 (0.93)	-0.08 (0.17)	-0.24 (0.46)	1.64 (5.77)	0.81 (2.40)
AFDC payments per family (x 10,000) [t-15]	0.00 (0.13)	-0.12 (2.44)	-0.03 (3.36)	0.03 (0.49)	-0.00 (0.82)	0.09 (2.46)
Average years of schooling	-0.09 (1.24)	-0.16 (1.89)	-0.29 (3.86)	-0.04 (0.67)	-0.15 (3.43)	-0.01 (0.32)
fraction with < 8 years schooling	-0.62 (1.29)	0.53 (0.87)	-0.40 (0.78)	0.58 (1.56)	0.21 (0.71)	0.58 (2.13)
Secondary enrollment rate	-0.69 (3.28)	-0.97 (3.08)	-0.22 (1.28)	0.43 (2.03)	0.07 (0.68)	-0.12 (0.90)
Higher education enrollment rate	-0.55 (2.17)	0.27 (0.68)	-0.52 (2.02)	0.38 (1.71)	0.45 (2.84)	0.38 (2.38)
Beer consumption per capita (gal.) (x 10)	-0.00 (0.75)	0.01 (1.10)	0.00 (1.16)	0.01 (1.70)	0.01 (2.05)	0.00 (0.39)

Crack cocaine index	-0.77 (1.46)	0.19 (1.95)	-0.28 (1.07)	-0.05 (1.05)	-0.14 (0.88)	0.02 (0.69)
Fraction church members	-0.48 (1.34)	-0.36 (0.49)	-1.42 (4.29)	0.25 (0.53)	-0.30 (1.58)	-1.90 (5.34)
Fraction urban	-1.56 (2.66)	0.83 (1.34)	1.66 (2.72)	1.42 (3.27)	-0.36 (0.97)	-0.10 (0.37)
Fraction male	8.27 (1.18)	-19.96 (1.64)	-4.40 (0.46)	1.56 (0.23)	-1.01 (0.23)	2.32 (0.47)
Racial heterogeneity: $1 - (\%\text{black})^2 - (\%\text{non-black})^2$			0.16 (0.40)	2.94 (2.03)	0.01 (0.04)	2.70 (2.17)
Population Distribution (in 5-year age groups)	YES	YES	YES	YES	YES	YES
R-squared	0.99	0.99	0.97	0.99	0.99	0.99
Obs.	833	576	833	576	833	576

Notes: t-statistics in parentheses. Regressions based on observations for 32 states over the time period listed in each column. Year and state fixed effects are included in all regressions, and observations are weighted by total state population. Standard errors are adjusted for heteroskedasticity, temporal correlation across states, and an AR(1) process for within-state autocorrelation using a panel-data Prais-Winsten approach. Variables measuring the fraction of a state's population in each five-year age group from 0-4 through 70-74 are included in all regressions.

Table 7: Temporal Variation in Effect of Unmarried Fertility on Murder
Row: Beginning Year; Column: Ending Year

	1963	**1966**	**1969**	**1972**	**1975**	**1978**	**1981**	**1984**	**1987**	**1990**	**1993**	**1996**	**1999**	**2002**
1957	-0.36	**1.93**	**2.07**	1.04	0.59	-0.22	-0.30	-0.29	**-0.31**	-0.03	**0.22**	**0.38**	**0.43**	**0.50**
1960		**11.45**	**3.69**	**1.66**	**0.83**	-0.23	-0.32	-0.29	**-0.30**	-0.02	**0.23**	**0.38**	**0.43**	**0.51**
1963			-1.07	**1.41**	0.88	-0.36	-0.31	-0.22	-0.24	0.01	**0.24**	**0.38**	**0.43**	**0.52**
1966				0.28	0.68	**-0.76**	**-0.49**	-0.24	-0.23	0.03	**0.24**	**0.37**	**0.42**	**0.51**
1969					-0.34	**-1.22**	**-0.69**	**-0.42**	-0.30	0.03	**0.26**	**0.38**	**0.44**	**0.53**
1972						0.01	-0.22	-0.07	0.03	**0.27**	**0.42**	**0.51**	**0.57**	**0.64**
1975							-0.21	0.25	**0.36**	**0.43**	**0.55**	**0.62**	**0.65**	**0.69**
1978								**1.09**	**0.88**	**0.60**	**0.65**	**0.63**	**0.63**	**0.66**
1981									0.92	**0.46**	**0.58**	**0.59**	**0.62**	**0.63**
1984										0.27	**0.60**	**0.74**	**0.68**	**0.66**
1987											**0.78**	**0.77**	**0.62**	**0.66**
1990												**0.71**	0.33	**0.48**
1993													0.04	**0.60**
1996														-0.12

Notes: Coefficients in bold are significant at 95% level. These are coefficients estimated on the relationship between effective UFR and murder, as illustrated in Table 2, for various time periods. Coefficients on other variables are suppressed for readability. The "row" year is the beginning year and the "column" year is the ending year. Regressions based on observations for 32 states over the indicated time period. Year and state fixed effects are included in all regressions, and observations are weighted by total state population. Standard errors are adjusted for heteroskedasticity, temporal correlation across states, and an AR(1) process for within-state autocorrelation using a panel-data Prais-Winsten approach. Variables measuring the fraction of a state's population in each five-year age group from 0-4 through 70-74 are included in all regressions.

Table 8: Racially-Disaggregated Effect of Unmarried Fertility on Crime

Dependent variable: Natural log of specified crime rate

	Murder	Violent Crimes	Property Crimes	Murder	Violent Crimes	Property Crimes
Effective UFR (x 100)	0.62 (8.54)	0.35 (3.29)	0.37 (5.91)			
Effective UFR [white] (x 100)	---	---	---	-0.05 (0.27)	0.05 (0.23)	-0.66 (6.03)
Effective UFR [nonwhite] (x 100)	---	---	---	0.08 (1.95)	0.14 (2.65)	0.07 (2.14)
Effective Abortion Ratio (x 100)	-0.19 (7.17)	-0.25 (9.22)	-0.20 (11.07)	-0.09 (3.49)	-0.21 (8.99)	-0.14 (7.55)
Ln(prisoners per capita) [t-1]	-0.09 (3.06)	-0.01 (0.58)	-0.04 (2.39)	-0.07 (2.20)	-0.01 (0.37)	-0.02 (1.59)
Ln(police per capita) [t-1]	-0.17 (3.33)	-0.04 (1.01)	0.02 (0.92)	-0.19 (3.45)	-0.03 (0.96)	-0.01 (0.53)
Executions per 100,000 persons [t-1]	-0.10 (0.74)	0.00 (0.02)	0.06 (0.81)	-0.23 (1.62)	-0.00 (0.07)	0.03 (0.51)
Shall-issue concealed gun law	-0.04 (2.21)	0.00 (0.25)	0.02 (1.62)	-0.06 (3.09)	0.00 (0.18)	0.01 (0.81)
Ln(real output per worker) [1997 $]	0.70 (3.47)	0.27 (2.08)	0.32 (3.51)	0.50 (2.65)	0.26 (1.95)	0.16 (1.82)
Unemployment rate	-1.03 (1.98)	-0.29 (0.87)	1.03 (4.15)	-0.93 (1.75)	-0.28 (0.82)	0.93 (3.77)
AFDC payments per family (x 1000) [t-15] [1997 $]	-0.03 (1.26)	-0.02 (2.43)	-0.00 (0.18)	-0.04 (1.73)	-0.02 (2.55)	-0.00 (0.51)
Average years of schooling	-0.20 (3.36)	-0.10 (2.08)	0.10 (3.00)	-0.14 (2.27)	-0.07 (1.38)	0.06 (1.82)
fraction with < 8 years schooling	-0.18 (0.50)	-0.41 (1.24)	1.13 (4.56)	-0.49 (1.20)	-0.31 (0.86)	0.53 (2.05)
Secondary enrollment rate	-0.81 (4.48)	0.07 (0.57)	0.02 (0.22)	-0.83 (4.33)	0.08 (0.62)	-0.01 (0.12)
Higher education enrollment rate	0.04 (0.18)	-0.22 (1.42)	-0.22 (1.90)	-0.04 (0.16)	-0.24 (1.53)	-0.19 (1.65)

Beer consumption per capita	0.01 (1.17)	0.01 (2.87)	0.01 (3.13)	0.02 (3.57)	0.01 (3.31)	0.01 (3.07)
Crack cocaine index	0.18 (2.08)	-0.08 (1.78)	0.01 (0.43)	0.13 (1.50)	-0.08 (1.86)	0.01 (0.29)
Fraction church members	-1.85 (4.04)	-1.07 (2.92)	0.45 (1.52)	-1.48 (3.89)	-0.94 (2.62)	0.50 (1.80)
Fraction urban	-0.70 (1.69)	-0.22 (0.47)	0.28 (0.95)	-1.07 (2.57)	-0.26 (0.55)	0.35 (1.28)
Fraction male	-8.91 (1.43)	11.28 (2.34)	-3.63 (0.98)	-9.45 (1.49)	10.98 (2.25)	-2.27 (0.61)
Population Distribution (in 5-year age groups)	YES	YES	YES	YES	YES	YES
R-squared	0.99	0.97	0.99	0.99	0.97	0.99
Obs.	1143	1143	1143	1143	1143	1143

Notes: t-statistics in parentheses. Regressions based on observations for 32 states over the 1957-2002 time period. Missing data limits the number of observations, however. Year and state fixed effects are included in all regressions, and observations are weighted by total state population. Standard errors are adjusted for heteroskedasticity, temporal correlation across states, and an AR(1) process for within-state autocorrelation using a panel-data Prais-Winsten approach. Variables measuring the fraction of a state's population in each five-year age group from 0-4 through 70-74 are included in all regressions.

Table 9: Church Membership and Divorce Rates, by Region

	Church Membership (%), 1952	Divorces per 1,000 Population, 1938-1964
Northeast	52.73	1.18
Midwest	48.12	2.20
South	42.54	3.08
West	24.84	5.63

Notes: "Northeast" region includes: ME, NJ, PA, RI. "Midwest" region includes: IL, IN, IA, KS, MI, MN, MO, ND, SD, WI. "South" region includes: AL, DE, DC, FL, KY, LA, MS, NC, SC, TN, TX, VA, WV. "West" region includes: NV, OR, UT, WA, WY.

Table 10: Geographically-Disaggregated Effect of Unmarried Fertility on Crime

Dependent variable: Natural log of specified crime rate

	Murder	Violent Crimes	Property Crimes
Effective UFR [Northeast] (x 100)	-1.42 (2.48)	-1.76 (3.19)	0.03 (0.12)
Effective UFR [Midwest] (x 100)	-0.34 (1.21)	-1.23 (4.10)	-0.33 (2.26)
Effective UFR [South] (x 100)	-0.23 (1.30)	-0.38 (1.90)	0.11 (0.93)
Effective UFR [West] (x 100)	1.58 (2.19)	-0.39 (0.72)	-0.35 (1.41)
Ln(prisoners per capita) [t-1]	0.04 (1.04)	0.02 (0.47)	-0.05 (2.44)
Ln(police per capita) [t-1]	-0.11 (2.25)	-0.01 (0.11)	0.13 (3.53)
Executions per 100,000 persons [t-1]	-0.02 (0.09)	-0.28 (1.86)	0.10 (0.92)
Shall-issue concealed gun law	0.06 (1.37)	0.03 (0.80)	-0.03 (1.83)
Ln(real output per worker) [1997 $]	0.48 (1.82)	0.36 (2.17)	0.34 (3.33)
Unemployment rate	-0.99 (1.50)	-0.29 (0.64)	1.65 (5.72)
AFDC payments per family (x 1000) [t-15] [1997 $]	0.01 (0.52)	-0.03 (3.19)	-0.00 (0.73)
Average years of schooling	-0.01 (0.17)	-0.29 (3.72)	-0.18 (4.02)
fraction with < 8 years schooling	-0.22 (0.41)	-0.80 (1.47)	-0.31 (0.97)
Secondary enrollment rate	-0.58 (2.81)	-0.19 (1.12)	0.03 (0.26)
Higher education enrollment rate	-0.46 (1.81)	-0.49 (1.95)	0.52 (3.08)

Beer consumption per capita	-0.00 (0.99)	0.00 (0.68)	0.00 (1.85)
Crack cocaine index	-0.77 (1.46)	-0.29 (1.07)	-0.18 (1.14)
Fraction church members	-0.62 (1.60)	-1.43 (4.05)	-0.19 (1.08)
Fraction urban	-2.15 (3.35)	1.43 (2.16)	-0.09 (0.23)
Fraction male	10.99 (1.52)	0.11 (0.01)	-1.57 (0.36)
Population Distribution (in 5-year age groups)	YES	YES	YES
R-squared	0.99	0.96	0.99
Obs.	833	833	833

Notes: t-statistics in parentheses. Regressions based on observations for 32 states over the 1957-1984 time period. Year and state fixed effects are included in all regressions, and observations are weighted by total state population. The "effective UFR" variable is interacted with four indicator variables, one for each census region on the U.S. to estimate the effect of unmarried fertility on crime by region. Standard errors are adjusted for heteroskedasticity, temporal correlation across states, and an AR(1) process for within-state autocorrelation using a panel-data Prais-Winsten approach. Variables measuring the fraction of a state's population in each five-year age group from 0-4 through 70-74 are included in all regressions.