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THE IMPACT OF LEGALIZED ABORTION ON CRIME*

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Abstract

We offer evidence that legalized abortion has contributed significantly to recent crime reductions. Crime began to fall roughly 18 years after abortion legalization. The 5 states that allowed abortion in 1970 experienced declines earlier than the rest of the nation, which legalized in 1973 with *Roe v. Wade*. States with high abortion rates in the 1970s and 1980s experienced greater crime reductions in the 1990s. In high abortion states, only arrests of those born after abortion legalization fall relative to low abortion states. Legalized abortion appears to account for as much as 50 percent of the recent drop in crime.

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I. Introduction

Since 1991, the United States has experienced the sharpest drop in murder rates since the end of Prohibition in 1933. Homicide rates have fallen more than 40 percent. Violent crime and property crime have each declined more than 30 percent. Hundreds of articles discussing this change have appeared in the academic literature and popular press.[1] They have offered an array of explanations: the increasing use of incarceration, growth in the number of police, improved policing strategies such as those adopted in New York, declines in the crack cocaine trade, the strong economy, and increased expenditures on victim precautions such as security guards and alarms.

None of these factors, however, can provide an entirely satisfactory explanation for the large, widespread, and persistent drop in crime in the 1990's. Some of these trends, such as the increasing scale of imprisonment, the rise in police, and expenditures on victim precaution, have been ongoing for over two decades, and thus cannot plausibly explain the recent abrupt improvement in crime. Moreover, the widespread nature of the crime drop argues against explanations such as improved policing techniques since many cities that have not improved their police forces (e.g. Los Angeles) have nonetheless seen enormous crime declines. A similar argument holds for crack cocaine. Many areas of the country that have never had a pronounced crack trade (for instance suburban and rural areas) have

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[1] For a sampling of the academic literature, see the articles appearing in the 1998 Summer issue (Volume 88) of the Journal of Criminal Law and Criminology, especially Blumstein and Rosenfeld [1998], Kelling and Bratton [1998], and Donohue [1998]. See Butterfield [1997a, 1997b, 1998] for a selection of articles appearing in the New York Times and Fletcher [2000] for a recent article in the Washington Post.

nonetheless experienced substantial decreases in crime. Finally, although a strong economy is superficially consistent with the drop in crime since 1991, previous research has established only a weak link between economic performance and violent crime [Freeman 1995] and in one case even suggested that murder rates might vary procyclically [Ruhm 2000].

While acknowledging that all of these factors may have also served to dampen crime, we consider a novel explanation for the sudden crime drop of the 1990s: the decision to legalize abortion over a quarter century ago.[2] The Supreme Court's 1973 decision in *Roe v. Wade* legalizing abortion nationwide potentially fits the criteria for explaining a large, abrupt, and continuing decrease in crime. The sheer magnitude of the number of abortions performed satisfies the first criterion that any shock underlying the recent drop in crime must be substantial. Seven years after *Roe v. Wade*, over 1.6 million abortions were being performed annually – almost one abortion for every two live births. Moreover, the legalization of abortion in five states in 1970, and then for the nation as a whole in 1973, were abrupt legal developments that might plausibly have a similarly abrupt influence 15 – 20 years later when the cohorts born in the wake of liberalized abortion would start reaching their high-crime years. Finally, any influence of a change in abortion would impact crime cumulatively as successive affected cohorts entered into their high-crime late adolescent years, providing a reason why crime has continued to fall year after year.

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[2] We are unaware of any scholarly article that has examined this effect. We have recently learned, however, that the former police chief of Minneapolis has written that abortion is "arguably the only effective crime-prevention device adopted in this nation since the late 1960s" [Bouza 1990]. In his subsequent 1994 gubernatorial campaign, Bouza was attacked for this opinion [Short 1994]. Immediately after Bouza's view was publicized just prior to the election, Bouza fell sharply in the polls.

Legalized abortion may lead to reduced crime either through reductions in cohort sizes or through lower per capita offending rates for affected cohorts. The smaller cohort that results from abortion legalization means that when that cohort reaches the late teens and twenties, there will be fewer young males in their highest-crime years, and thus less crime. More interesting and important is the possibility that children born after abortion legalization may on average have lower subsequent rates of criminality for either of two reasons. First, women who have abortions are those most at risk to give birth to children who would engage in criminal activity. Teenagers, unmarried women, and the economically disadvantaged are all substantially more likely to seek abortions [Levine et al. 1996]. Recent studies have found children born to these mothers to be at higher risk for committing crime in adolescence [Comanor and Phillips 1999]. Gruber et al. [1999], in the paper most similar to ours, document that the early life circumstances of those children on the margin of abortion are difficult along many dimensions: infant mortality, growing up in a single-parent family, and experiencing poverty. Second, women may use abortion to optimize the timing of childbearing. A given woman's ability to provide a nurturing environment to a child can fluctuate over time depending on the woman's age, education, and income, as well as the presence of a father in the child's life, whether the pregnancy is wanted, and any drug or alcohol abuse both in utero and after the birth. Consequently, legalized abortion provides a woman the opportunity to delay childbearing if the current conditions are sub-optimal. Even if lifetime fertility remains constant for all women, children are born into better environments, and future criminality is likely to be reduced.

A number of anecdotal empirical facts support the existence and magnitude of the crime-reducing impact of abortion. First, we see a broad consistency with the timing of legalization of

abortion and the subsequent drop in crime. For example, the peak ages for violent crime are roughly 18-24, and crime starts turning down around 1992, roughly the time at which the first cohort born following *Roe v. Wade* would hit its criminal prime. Second, as we later demonstrate, the five states that legalized abortion in 1970 saw drops in crime before the other 45 states and the District of Columbia, which did not allow abortions until the Supreme Court decision in 1973.

Third, our more formal analysis shows that higher rates of abortion in a state in the 1970s and early 1980s are strongly linked to lower crime over the period from 1985 to 1997. This finding is true after controlling for a variety of factors that influence crime, such as the level of incarceration, the number of police, and measures of the state's economic well-being (the unemployment rate, income per capita, and poverty rate). The estimated magnitude of the impact of legalized abortion on crime is large. According to our estimates, as shown on Table II, states with high rates of abortion have experienced a roughly 30 percent drop in crime relative to low-abortion regions since 1985. While one must be cautious in extrapolating our results out of sample, the estimates suggest that legalized abortion can account for about half the observed decline in crime in the United States between 1991 and 1997.

A number of factors lead us to believe that the link between abortion and crime is causal. First, there is no relationship between abortion rates in the mid-1970s and crime changes between 1972 and 1985 (prior to the point when the abortion-affected cohorts have reached the age of significant criminal involvement). Second, virtually all of the abortion-related crime decrease can be attributed to reductions in crime among the cohorts born after abortion legalization. There is little change in crime among older cohorts.

We should emphasize that our goal is to understand why crime has fallen sharply in the 1990s,

and to explore the contribution to this decline that may have come from the legalization of abortion in the 1970s. In attempting to identify a link between legalized abortion and crime, we do not mean to suggest that such a link is "good" or "just," but rather, merely to show that such a relationship exists. In short, ours is a purely positive, not a normative analysis, although of course we recognize that there is an active debate about the moral and ethical implications of abortion.[3]

The structure of the paper is as follows: Section II reviews the literature and provides a brief history of abortion. Section III describes how the legalization of abortion can influence crime rates by changing the proportion of high-risk children entering the high-crime late adolescent years, and examines the likely magnitude of these effects based on past research findings. Section IV presents the basic empirical evidence that supports the proposed negative relationship between abortion and crime. Section V provides evidence that the reduction in crime comes predominantly from the lower crime rates of those born after the legalization of abortion. Section VI concludes. A data appendix with the sources of all variables used in the analysis is also provided.

II. Brief Overview of the History of Legalized Abortion

Under the governing principles of English common law, abortion prior to "quickening" (when the first movements of the fetus could be felt, usually around the 16th to 18th week of the pregnancy)

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[3] For example, Paulsen [1989: 49,76-77] considers legalized abortion to be worse than slavery (since it involves death) and the Holocaust (since the 34 million post-*Roe* abortions are numerically greater than the six million Jews killed in Europe). Despite these claims, the Supreme Court has ruled that women have a fundamental constitutional right of privacy to abort an early-term fetus and that the state cannot unduly burden this right.

was lawful. This common law rule was in force throughout America until the first law in the United States restricting abortions was adopted in New York in 1828 [David et al. 1988: 12-13]. Over the next 60 years, more and more states followed the lead of New York and by 1900, abortion was illegal throughout the country.

The first modest efforts at abortion liberalization began to emerge between 1967 and 1970 when a number of states began to allow abortion under limited circumstances.[4] Legal abortion became broadly available in five states in 1970 when New York, Washington, Alaska, and Hawaii repealed their antiabortion laws, and the Supreme Court of California (ruling in late 1969) held that the state's law banning abortion was unconstitutional. Legalized abortion was suddenly extended to the entire United States on January 22, 1973 with the landmark ruling of the United States Supreme Court in *Roe v. Wade*.

The Supreme Court in *Roe* explicitly considered the consequences of its decision in stating:

> The detriment that the State would impose upon the pregnant woman by denying this choice altogether is apparent. Specific and direct harm medically diagnosable even in early pregnancy may be involved. Maternity, or additional offspring, may force upon the woman a distressful life and future. Psychological harm may be imminent. Mental and physical health may be taxed by child care. There is also the distress, for all concerned, associated with the unwanted child, and there is the problem of bringing a child into a family already unable, psychologically and otherwise, to care for it.[5]

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[4] The 1962 amendments to the Model Penal Code provided for legal abortions to prevent the death or grave impairment of the physical and mental health of the woman, or if the fetus would be born with a grave physical or mental defect or in the case of rape or incest. These provisions were adopted in 1967 in Colorado, North Carolina, and California, in 1968 in Florida, Georgia, and Maryland, in 1969 in Arkansas, Kansas, New Mexico, and Oregon, and in 1970 in Delaware, South Carolina, and Virginia – a total of thirteen states. For an excellent review of state and federal abortions laws, see Merz, Jackson, and Klerman [1995].

[5] *Roe v. Wade*, 410 U.S. 110, 153 (1973).

The available data suggest that the number of abortions increased dramatically following legalization, although there is little direct evidence on the number of illegal abortions performed in the 1960s. As Figure I illustrates, the total number of documented abortions rose sharply in the wake of *Roe*, from under 750,000 in 1973 (when live births totaled 3.1 million) to over 1.6 million in 1980 (when live births totaled 3.6 million).[6] If illegal abortions were already being performed in equivalent numbers, one would not expect a seven-year lag in reaching a steady state. Moreover, the costs of an abortion – financial and otherwise– dropped considerably after legalization. Kaplan [1988, p. 164] notes that "an illegal abortion before *Roe v. Wade* cost $400 to $500, while today, thirteen years after the decision, the now legal procedure can be procured for as little as $80." [7] The costs of finding and traveling to an illegal abortionist and any attendant cost of engaging in illegal and therefore riskier and socially disapproved conduct were also reduced by legalization.

Perhaps the most convincing evidence that legalization increased abortion comes from Michael [1999], who finds abortion rates to be roughly an order of magnitude higher after legalization using self-

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[6] In our analysis we use Alan Guttmacher Institute (AGI) data on abortions. Although Michael [1999] argues that the AGI may substantially overstate true abortion rates, "it is generally acknowledged [that AGI data provide] the most accurate count of induced abortions in the United States." Apparently, "reporting is less complete for nonwhites than for whites, and overall reporting ... has declined over time." Joyce and Kaestner [1996: 185].

[7] The cost to the mother also depends on the availability of public funding, which was affected by the Hyde Amendment, which cut off federal funding of abortion for Medicaid recipients. The Hyde Amendment became law on September 30, 1976. The Hyde Amendment has been subject to a series of revisions and restraining orders since that time. No consensus exists as to the impact of the Hyde Amendment on the number of abortions or births, although most recent research suggests any impact is now small. [Joyce and Kaestner 1996, Kane and Staiger 1996].

reported data on pregnancy outcome histories. Thus, the first pre-requisite for legalization to have an impact on crime is met -- legalization increased the rate of abortion.

Consistent with this finding is a dramatic decline in the number of children put up for adoption after abortion became legal. According to Stolley [1993], almost 9 percent of premarital births were placed for adoption before 1973; that number fell to 4 percent for births occurring between 1973 and 1981. The total number of adoptions rose from 90,000 in 1957 to over 170,000 in 1970; by 1975 adoptions had fallen to 130,000.

III. The Mechanism By Which Abortion Legalization Lowers Crime Rates

In this section, we explore in detail the theoretical link between legalization of abortion in the early 1970s and subsequent drops in crime 15 to 20 years later. We identify a number of alternative pathways through which abortion can affect crime. We then generate "back of the envelope" calculations as to the likely magnitude of the various channels based on previous research findings.

The simplest way in which legalized abortion reduces crime is through smaller cohort sizes. When those smaller cohorts reach the high-crime late adolescent years, there are simply fewer people to commit crime. Levine et al. [1996] find that legalization is associated with roughly a 5 percent drop

in birth rates.[8] Assuming that the fall in births is a random sample of all births, total crime committed by this cohort would be expected to fall commensurately.

Far more interesting from our perspective is the possibility that abortion has a disproportionate effect on the births of those who are most at risk of engaging in criminal behavior.[9] To the extent that abortion is more frequent among those parents who are least willing or able to provide a nurturing home environment, as a large and growing body of evidence suggests, the impact of legalized abortion on crime might be far greater than its effect on fertility rates.[10] This is particularly true given that 6 percent of any birth cohort will commit roughly half the crime [Wolfgang et al. 1972; Tracy et al. 1990].[11]

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[8] This decline is broadly consistent with survey responses by mothers in 1973 who report that approximately 13 percent of lifetime births were unwanted [Statistical Abstract of the United States 1980, page 65, table 99]. Note, however, that the decline in births is far less than the number of abortions, suggesting that the number of conceptions increased substantially – an example of insurance leading to moral hazard. The insurance that abortion provides against unwanted pregnancy induces more sexual conduct or diminished protections against pregnancy in a way that substantially increases the number of pregnancies. Another possible explanation for the gap between abortion rates and fertility rate changes is that illegal abortion was already suppressing the birth rate by 15-20 percent and legalization reduced it another 5-10 percent, but this would imply a higher figure for the number of illegal abortions than we think is likely, as discussed above.

[9] As noted earlier, this effect can occur either because of lower lifetime fertility rates among high risk groups, or because women delay childbearing until conditions are more favorable for successfully raising children.

[10] In addition, with an estimated number of over 150,000 rapes in 1973 (often thought to be a conservative estimate), it is possible that 10,000 to 15,000 conceptions occurred that year as a result of rape, and one might expect a substantial proportion of these high-risk conceptions would end in abortion [Bureau of Justice Statistics 1985, p. 230, Table 3.2].

[11] The high concentration rates of crime among a relatively small number of offenders makes it more likely that legalized abortion would have larger effects on crime than on other social outcomes such as high school dropout rates or unemployment rates. A given child who has failed to complete school or secure a job counts as only one event in measuring school drop-out or unemployment rates. Conversely, a single child may commit hundreds of crimes and thereby contribute far more powerfully to a higher crime rate.

Prior to the legalization of abortion, there was a very strong link between the number of unwanted births and low maternal education over the period from 1965 through 1970 [Commission on Population Growth and the American Future 1972, p. 98]. Levine et al. [1996] found that the drop in births associated with abortion legalization was not uniform across all groups. They estimated that the drop in births was roughly twice as great for teenage and nonwhite mothers as it was for the non-teen, white population.[12] In the years immediately following *Roe v. Wade*, data from the Centers for Disease Control indicate that almost one-third of abortions were performed on teenagers [Centers for Disease Control 1994]. Angrist and Evans [1996)] found that while abortion reforms had relatively modest effects on the fertility of white women, "black women who were exposed to abortion reforms experienced large reductions in teen fertility and teen out-of-wedlock fertility."

A number of studies have shown that the availability of abortion improves infant outcomes by reducing the number of low birthweight babies and neonatal mortality [Grossman and Jacobowitz 1981; Corman and Grossman 1985; Joyce 1987; Grossman and Joyce 1990]. Moreover, Gruber et al. [1999, p. 265] conclude that "the average living circumstances of cohorts born immediately after abortion became legalized improved substantially relative to preceding cohorts." They go on to note that "the marginal children who were not born as a result of abortion legalization would have systematically been born into less favorable circumstances if the pregnancies had not been terminated: they would have been 60 percent more likely to live in a single-parent household, 50 percent more

[12] This is not surprising since in the late 1960s the "pill" and other birth control mechanisms were far more readily available to married, educated, and affluent women [Goldin and Katz 2000]

likely to live in poverty, 45 percent more likely to be in a household collecting welfare, and 40 percent more likely to die during the first year of life."

Previous research has found that an adverse family environment is strongly linked to future criminality. Both Loeber and Stouthamer-Loeber [1986] and Sampson and Laub [1993] present evidence that a variety of unfavorable parental behaviors (*e.g.*, maternal rejection, erratic/harsh behavior on the part of parents, lack of parental supervision) are among the best predictors of juvenile delinquency. Raine et al. [1994, 1996] argue that birth complications combined with early maternal rejection predispose boys to violent crime at age 18. Rasanen et al. [1999] find that the risk of violent crime for Finnish males born in 1966 is a function of (in descending order of impact): mother's low education, teenage mother, single-parent family, mother did not want pregnancy, and mother smoked during pregnancy. It is possible that abortion could reduce the number of children born under all these circumstances: teenagers who have abortions can get more education before they give birth and may delay childbearing until they are married and/or want a child. In addition, women who inadvertently become pregnant may have engaged in behavior such as smoking, drinking, or using drugs that elevate the prospect of future criminality of their offspring.

A number of studies have looked at cases of women, living in jurisdictions in which governmental approval to have an abortion was required, who sought to have an abortion, but were denied the right to do so [David et al. 1988; Posner 1992, p .283].[13] Dagg [1991] reports that these women overwhelmingly kept their babies, rather than giving them up for adoption, but that they often

[13] David et al [1988] reviews the findings of separate studies of the effects of denied abortion for cohorts born in Goteberg, Sweden in 1939-1942, Stockholm in 1948, all of Sweden in 1960, and Prague in 1961-63.

resented the unwanted children and were far less likely than other mothers to nurture, hold, and breastfeed these children. In an array of studies in Eastern Europe and Scandinavia, Dagg found that the children who were born because their mothers were denied an abortion were substantially more likely to be involved in crime and have poorer life prospects, even when controlling for the income, age, education, and health of the mother. This literature provides strong evidence that unwanted children are likely to be disproportionately involved in criminal activity, which may be the causal pathway from greater availability of abortion to lower rates of crime.

Evidence from prisoner surveys further reinforces the link between a difficult home environment as a child and later criminality [Beck et al. 1993]. In 1991, 14 percent of prisoners reported growing up with neither parent present and 43 percent reported having only one parent (compared to 3 percent and 24 percent respectively for the overall population). 38 percent of prisoners report that their parents or guardians abused alcohol or drugs; almost one-third of female inmates report being sexually abused before the age of 18.

A. The expected magnitude of the impact of abortion legalization on crime

Before presenting our empirical estimates in the next section, we present "back of the envelope" estimates of the plausible magnitude of the impact of legalized abortion on crime. Previous researchers have studied (1) how legalized abortion affects birth rates across different groups, and (2) crime rates across groups. By combining these two sets of estimates, we can obtain a crude prediction of the impact of legalized abortion on crime.

This analysis considers four factors: race, teenage motherhood, unmarried motherhood, and unwantedness. Beginning with the first three of these factors, we use the 1990 Census to determine

the proportion of children in each of the 8 possible demographic categories (e.g. white children born to teenage mothers growing up in a single-parent household, or black children born to non-teenage mothers growing up in two-parent households). We then use the estimates of Levine et al. [1996] to determine what those proportions might have been in the absence of legalized abortion. Using Rasanen et al. [1999] and observed frequencies of crime by race in the United States, we generate category-specific crime rates corresponding to each of the eight cells. Combining these crime rates with the change in the number of births in each category due to abortion provides an estimate of the hypothetical reduction in crime. Finally, under the assumption that 75 percent of unwanted births are aborted (this number appears consistent with data from self-reported pregnancy histories), we estimate the contribution to lower crime from fewer unwanted births.[14] It is important to note that our calculations below isolate the *marginal* contribution of race, teenage motherhood, unmarried motherhood, and unwantedness. Thus, when computing the impact of race, we net out any racial differences in those other characteristics in order to avoid double counting.

The results of this exercise for homicide are as follows. All values reported are the hypothetical reduction in total homicides committed by members of a given cohort. Through a purely mechanical relationship, the 5.4 percent overall decline in cohort size post-legalization obtained by Levine et al. [1996] translates into a 5.4 percent reduction in homicide.

Fertility declines for black women are three times greater than for whites (12 percent compared to 4 percent). Given that homicide rates of black youths are roughly nine times higher than those of

[14] A full description of the assumptions and calculations is available from the authors on request.

white youths, racial differences in the fertility effects of abortion are likely to translate into greater homicide reductions. Under the assumption that those black and white births eliminated by legalized abortion would have experienced the average criminal propensities of their respective races, then the predicted reduction in homicide is 8.9 percent. In other words, taking into account differential abortion rates by race raises the predicted impact of abortion legalization on homicide from 5.4 percent to 8.9 percent.[15]

Teenagers and unwed women experience reductions in fertility of 13 and 7 percent respectively, well above that for non-teenage, married women. Rasanen et al. [1999] finds, after controlling for other characteristics, that having a teenage mother roughly doubles a child's propensity to commit crime, as does growing up with a single parent.[16] Accounting for these two factors raises the estimated impact of abortion on homicide from 8.9 percent to 12.5 percent.

Adjusting for unwantedness, which more than doubles an individual's likelihood of crime based on the estimates of Rasanen et al. [1999], raises the estimates from 12.5 percent to 18.5 percent. The impact of unwantedness is large because abortion rates of unwanted pregnancies are very high, whereas wanted pregnancies are by definition not aborted.

Thus, using past estimates in the literature, we crudely estimate that crime should fall by 18.5 percent in cohorts that have access to legalized abortion. As of 1997, roughly 60 percent of crimes

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[15] For other crimes, the impact of race is much lower because rates of offending and victimization are much more similar across races.

[16] Comaner and Phillips [1999], using National Longitudinal Survey of Youth, find that adolescents in households with absent fathers are 2.2 times more likely to be charged with a crime as a juvenile, controlling for other observable factors. That estimate is very close to the Rasanen et al. [1999] finding for Finnish males that we use in our calculations.

were committed by individuals born after legalized abortion, implying that (thus far) the hypothetical impact of abortion on crime is only 60 percent of the impact on affected cohorts, or about an 11 percent reduction. To the extent that other factors are correlated with both criminal propensities and abortion likelihoods (e.g. poverty, maternal education, religiosity), this rough estimate is likely to understate the true impact.[17] Given that the observed declines in crime in the 1990s are 30-40 percent, abortion may be an important factor in explaining the crime drop. In the next section, we present empirical estimates of the impact of abortion on crime that are roughly consistent with these hypothetical calculations.

IV. Empirical Evidence on Legalized Abortion Affecting Crime Rates

We begin our empirical analysis by establishing a relationship between crime changes in the 1990's and legalized abortion in the early 1970's. We consider three different sources of variation: the national time series of crime and abortion, differential crime patterns across early legalizers and other states, and the impact of state abortion rates (properly lagged) on state crime rates. In Section V we focus on arrest rates, which allows us to decompose the effect of abortion by the age of offenders.

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[17] These estimates will understate the true impact of abortion on crime if there are other factors beyond the four we explicitly considered that positively covary with abortion and crime, such as religiosity, poverty, or low maternal education. Indeed, this last factor was found by Rasanen et al. [1999] to be the single most powerful factor leading to criminality by the children. Moreover, to the extent that abortion reduces crime committed by other family members as a result of the beneficial effects of a reduction in family size (since larger family size increases the likelihood of criminality), this effect would also be missed. On the other hand, a countervailing force is that a reduction in the supply of criminals will induce higher returns to entry into the criminal occupations thereby offsetting through recruitment the initial dampening affect on crime. One would suspect this effect to be limited to crimes involving active markets for illegal substances (drugs) or services (prostitution).

A. National Time Series

Figure II presents per capita crime rates for the United States for violent crime, property crime, and murder for the period 1973-1999, as measured in the Uniform Crime Reports compiled by the Federal Bureau of Investigation.[18] Between 1973 and 1991, violent crime nearly doubled, property crime increased almost 40 percent, and murder was roughly unchanged (despite substantial fluctuations in the intervening years). The year 1991 represents a local maximum for all three of the crime measures. Since that time, each of these crime categories has steadily fallen. Murder has fallen by 40 percent and the other two categories are down more than 30 percent.

The National Crime Victimization Survey (NCVS), which gathers information on self-reported crime victimizations, offers another perspective on national crime patterns in Figure III. According to victimization surveys, violent crime fell through the early 1980s, increased from that point until 1993, and fell sharply thereafter. Property crime fell throughout the period 1973 to 1991, and began to fall even more quickly thereafter. The crime declines in the 1990s are even greater using victimization data than the reported crime statistics. It is notable that the longer time-series patterns of UCR and victimization data do not match closely, yet both demonstrate a distinct break from trend in the 1990s.

The timing of the break in the national crime rate is consistent with a legalized abortion story. In 1991, the first cohort affected by *Roe v. Wade* would have been roughly 17 years old, just beginning to

[18] Uniform Crime Reports compile the number of crimes reported to the police in various crime categories each year. While the potential shortcomings of these data are well recognized [e.g., O'Brien 1985], they remain the only source of geographically disaggregated crime data available in the United States.

enter the highest crime adolescent years.[19] In the early-legalizing states (in which slightly more than 20 percent of all Americans reside), the first cohort affected by legalized abortion would have been 20 years of age, roughly the peak of the age-crime profile [Blumstein et al. 1986, Cook and Laub 1998].

The continual decrease in crime between 1991 and 1999 is also consistent with the hypothesized effects of abortion. With each passing year, the fraction of the criminal population that was born post-legalization increases. Thus, the impact of abortion will be felt only gradually. To formalize this idea, we define an index that is designed to reflect the effect of all previous abortions on crime in a particular year *t*. Obviously, recent abortions will not have any direct impact on crime today since infants commit little crime. As the post-legalization cohorts age, however, we can estimate the effect of abortion by seeing how much crime (proxied by the percentage of arrests committed by those of that age) is committed by the particular cohort. Thus, we define the "effective legalized abortion rate" relevant to crime in year t as the weighted average legalized abortion rate across all cohorts of arrestees, i.e.,

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[19] The Supreme Court handed down the decision in *Roe v Wade* on January 22, 1973. Typically, there is a six to seven month lag between the typical time that an abortion would be performed and the time that the birth would have occurred. Thus the first births affected would be those born in late 1973.

If women who already had children in 1973 used abortion to prevent increases in family size, then abortion may indirectly lower criminality for the remaining children who will receive greater per child contributions of parental resources [Becker 1981, Barber et al. 1999]. Sampson and Laub [1993: 81] and Rasanen et al. [1999] find that family size significantly increases delinquency. Note that this family size effect suggests that criminality could be reduced for children who were born a number of years in advance of any abortion that prevents further increases in family size, and thus would allow the effect of abortion on crime to be observed prior to the time that the direct effect of abortion would be observed.

$$(1) \qquad \text{Effective_Abortion}_t = \sum_a \text{Abortion}_{t-a} * (\text{Arrests}_a / \text{Arrests}_{total})$$

where *t* indexes years and *a* indexes the age of a cohort. *Abortion* is the number of abortions per live birth, and the ratio of arrests inside the parentheses is the fraction of arrests for a given crime involving members of cohort *a*. In a steady state with all cohorts subjected to the same abortion rate, the effective abortion rate is equal to the actual abortion rate. For many years following the introduction of legalized abortion, the effective abortion rate will be below the actual abortion rate since many active criminal cohorts are too old to have been affected by legalized abortion. For instance, following *Roe v. Wade*, the actual abortion rate (per 1,000 live births) rose to a steady state of about 400. Yet we estimate that the effective abortion rate in 1991 was only about 33 for homicide, 63 for violent crime, and 126 for property crime. Because property crime is disproportionately done by the young, the effect of abortion legalization is felt earlier.[20] The effective rates grew steadily, rising to 142, 180, and 252 respectively by 1997. If legalized abortion reduces crime, then crime should continue to fall (all else equal) as long as the effective abortion rate is rising, precisely the pattern observed in actual crime data in Figures II and III.[21]

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[20] Details of this calculation are available from the authors. This effective abortion rate includes legal abortion exposure prior to 1973 in the five states that legalized in 1970.

[21] It is worth noting one ostensible inconsistency between our predictions and the disaggregated time-series data. As noted by Cook and Laub [1998] and Blumstein and Rosenfeld [1998], there was a sharp spike in youth homicide rates in the late 1980s and early 1990's, especially among African-Americans. These cohorts were born after legalized abortion. Importantly, this finding is not inconsistent with the central claim that abortion legalization contributed to lower crime rates, but merely shows that this dampening effect on crime can be outweighed in the short-term by factors that stimulate crime. Elevated youth homicide rates in this period appear to be clearly linked to the rise of crack and the easy availability of guns. That abortion is only one factor influencing crime in the late 1980s points out the caution required in drawing any conclusions regarding an abortion-crime link based on time-series evidence alone.

B. Comparing Crime Trends in Early-Legalizing States versus the Rest of the United States

As noted earlier in the paper, five states (Alaska, California, Hawaii, New York, and Washington) legalized or quasi-legalized abortion around 1970; in the remaining states, abortion did not become legal until 1973. The staggered timing of the introduction of legalized abortion provides a potential avenue for assessing its impact.[22] Using this source of variation to explore the consequences of abortion legalization, Levine et al. [1996] analyze the fertility effects, Angrist and Evans [1996] study the impact on female labor supply, and Gruber et al. [1999] examine the effect on a variety of measures of child welfare.

For the purposes of analyzing crime, the comparison of early legalizers to all other states is less than ideal. First, criminal involvement does not jump or fall abruptly with age, but rather steadily increases through the teenage years before eventually declining. Early-legalizing states only have a three-year head start. Thus, it may be difficult to identify an impact on overall crime rates since even in the peak crime ages three cohorts account for less than twenty percent of overall arrests. Second, states that legalized abortion in 1970 continued to have higher abortion rates even after *Roe v. Wade*. For instance, in 1976, three years after *Roe v. Wade* was handed down, the early-legalizing states had a 1985 population-weighted average rate of 593 abortions per live birth, compared to 308 for all other

[22] Evidence in Levine, et al. [1996] suggests there was a substantial amount of border crossing in order to obtain legal abortions prior to 1973. To the extent that is true, the observed differences in crime between early-legalizing states and all others will be muted. It appears, however, that the more affluent tended to travel for abortions, which probably diminishes the importance of such activity for assessments about crime. Some evidence of this is seen in the fact that abortions performed in New York on white women were cut in half in the wake of the decision in *Roe v. Wade*, but there was a far smaller drop in the number of abortions performed in New York on black women.

states. Given that the impact of abortion on crime happens only gradually, it is difficult to disentangle the separate impacts of early legalization and higher steady state abortion rates.[23]

Bearing in mind these important caveats, a comparison of crime trends in early-legalizing and all other states is displayed in Table I, as well as the difference between those two values. For each of three crime categories (violent, property, murder), we present percent changes in crime by six-year periods for the years 1976-1994, and for the period 1994-1997. The bottom panel of the table also presents the effective abortion rate for violent crime for the two sets of states at the end of each time period, computed using equation (1).[24]

Prior to 1982, legalized abortion should have no impact on crime since the first cohort affected by abortion is no more than twelve years old. These years are included as a check on any pre-existing trends in crime rates across the two sets of states. As Table I shows, these pre-existing trends are not statistically different across early legalizing and all other states, nor is the relative pattern constant across the three crime categories. Both property and violent crime were increasing at a slower rate in early legalizing states between 1976 and 1982, whereas murder was rising faster in early legalizing states.

As shown in the bottom panel of Table I, by 1988 the effective abortion rate for violent crime in early legalizing states was 64.0 compared to 10.4 in the rest of the United States. To explore whether crime rates began to respond to early abortion legalization between 1982 and 1988 look at the rows

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[23] From the broader perspective of determining whether crime rates respond to abortion, this distinction may be irrelevant. However, the inability to distinguish the two channels of impact lessens the extent to which a comparison of early legalizers to other states represents a distinct source of variation from the regression analysis using abortion rates across states after 1973.

[24] The effective abortion rate for violent crime falls between the corresponding measures for property crime and homicide. The pattern of differences is similar for the other crime categories, except that the gap rises more (less) quickly for property crime (homicide).

labeled "Difference" in the 1982-88 column. A negative sign for this difference suggests that crime fell faster in the states that legalized abortion earlier (consistent with the theory of this paper), while a positive sign suggests the opposite. Here we see the evidence of the impact of early legalization for the 1982-88 period is mixed. Property crime fell significantly in early legalizing states relative to the rest of the United States (-9.8 percentage points), and the difference is more than twice as large as the pre-existing trend in the first column. There is no apparent impact on violent crime or murder by 1988. Nonetheless, the earlier impact on property crime is consistent with the fact that offenses committed by the very young are disproportionately concentrated in property crime. For instance, in 1995 those under age 18 accounted for over one-third of all property crime arrests, but less than 20 percent of violent crime and murder arrests.

By 1994, the gap in the "effective abortion rate" between early legalizing states and all others had grown to 150.9. The early legalizing states experienced declines in crime relative to the rest of the United States in all three crime categories. The trend accelerates between 1994 and 1997, with double-digit (and highly statistically significant) differences for each of the crimes. The last column of Table I shows that the cumulative decrease in crime between 1982-1997 for early legalizing states compared to the rest of the nation is 16.2 percent greater for murder, 30.4 percent greater for violent crime, and 35.3 percent greater for property crime. Realistically, these crime decreases are too large to be attributed to the three-year head start in the early-legalizing states. Put another way, the observed differences in the "effective abortion rate" documented in the bottom of Table I reflect not only the head start on abortion, but also higher steady state rates. Thus, the source of variation exploited in Table I is not entirely distinct from that used in the state-level panel regressions below.

C. State-level changes in crime as a function of post-legalization abortion rates

The preceding discussion provides suggestive evidence of an impact of abortion on crime. In what follows, we explore this relationship more systematically by using a panel data analysis to relate state abortion rates after *Roe v. Wade* to state-level changes in crime over the period from 1985 through 1997.

Before presenting regression results, Figures IVa-IVc show simple plots of log-changes in crime rates between 1985 and 1997 against the change in the state-level effective abortion rate over that same time period.[25] The three figures correspond to violent crime, property crime, and murder respectively. In each case, there is a clear negative relationship between crime changes over the period 1985-1997 and abortion rates in the years immediately following *Roe v. Wade*. The fitted population-weighted regression lines are also included in the figures. The R^2 from these simple regressions range from .12 (murder) to .45 (property crime), as reflected in the relatively tighter fit of the regression line for the latter crime category.

The raw relationship between abortion rates in the 1970's and falling crime in the 1990's emerges even more clearly in Table II. States are ranked based on effective abortion rates in 1997 and divided into three categories: low, medium, and high. Mean effective abortion rates, and percent changes in murder, violent crime, and property crime for the periods 1973-1985 and 1985-1997 are

[25] The figures plot the scatter diagrams for all 50 states. The District of Columbia is dropped from the graph, as it is an extreme outlier that doesn't accurately reflect the abortion rates of D.C. residents, as indicated in footnote 27, below. All states had effective abortion rates close to zero in 1985, so the change in the effective abortion rate between 1985 and 1997 is almost identical to the effective abortion rate in 1997.

shown in the table for the three sets of states. Crime data for the period 1973-1985 is included as a check on the validity of the results. There should be no effect of abortion on crime between 1973-1985. To the extent that high and low abortion states systematically differ in the earlier period, questions about the exogeneity of the abortion rate are raised. It is reassuring that the data reveal no clear differences in crime rates across states between 1973 and 1985 as a function of the abortion rate. In some instances crime was rising more quickly in high abortion states; in other cases the opposite is true. For the period 1985-1997, however, the results change dramatically. For each crime category, the high abortion states fell relative to the low abortion states by at least 30 percentage points. In every instance, the medium abortion states had intermediate outcomes with respect to crime.

The panel data regressions that we report are similar in spirit to Figure IV and Table II, but utilize not only the endpoints of the sample, but also information from the intervening years, as well as including a range of controls:

$$(2) \qquad ln(CRIME_{st}) = \beta_1 ABORT_{st} + X_{st}\grave{E} + \tilde{a}_s + \ddot{e}_t + \mathring{a}_{st}$$

where s indexes states and *t* reflects time. The left-hand side variable is the relevant logged crime rate per capita. Our measure of abortion is the effective abortion rate (defined earlier) for a given state, year, and crime category.[26] *X* is a vector of state-level controls that includes prisoners and police per capita, a range of variables capturing state economic conditions, lagged state welfare generosity, the presence of

[26] The weights used in computing the effective abortion rates are the percentage of arrests by age for a given crime category in the United States in 1985. In other words, abortion rates are state-specific, but the same weighting function is used for all states.

concealed handgun laws, and per capita beer consumption. $\tilde{a}_s$ and $\ddot{e}_t$ represent state and year fixed effects. All regressions are weighted least squares with weights based on state populations. All of the estimates we present are adjusted for serial correlation in panel data using the method of Bhargava et al. [1982].[27]

Summary statistics for the sample are provided in Table III. The summary statistics on abortion correspond to the effective abortion rate, which is well below the actual abortion rate throughout the sample because much of the criminal population was born prior to legalized abortion. Actual national abortion rates in the years immediately after *Roe v. Wade* were roughly 300 abortions per 1,000 live births, but with considerable variation across states. For example, over the period from 1973-76, West Virginia had the lowest abortion rate (10 per 1,000 live births), while New York (763) and Washington, D.C. (1,793) had the highest rates. There is a great deal of variation in crimes per 1,000 residents, both across states and within states over time. The same is true for arrest rates.

An important limitation of the data is that state abortion rates are very highly serially correlated. The correlation between state abortion rates in years t and $t+1$ is .98. The five-year and ten-year correlations are .95 and .91 respectively. One implication of these high correlations is that it is very difficult using the data alone to distinguish the impact of 1970's abortions on current crime rates from the impact of 1990's abortions on current crime rates; if one includes both lagged and current abortion rates in the same specification, standard errors explode due to multicollinearity. Consequently, it must be

[27] Blank et al. [1996] suggest that the official abortion rate in Washington, D.C. is artificially elevated because women from Maryland and Virginia frequently travel there to receive abortions. The CDC estimates that about half of all abortions performed in District of Columbia are on nonresidents (which is the highest percentage for any state); the comparable percentage in New Jersey is 2 percent. Dye and Presser [1999: 143].

recognized that our interpretation of the results relies on the assumption that there will be a 15-20 year lag before abortion materially affects crime. This lag between the act of abortion and its impact on crime differentiates it from many other social phenomena like divorce and poverty which may have both lagged and contemporaneous effects, making it very difficult to separately identify any lagged effects.

Regression results are shown in Table IV. For each of the three crime categories, two different specifications are reported. The odd-numbered columns present results without control variables; the even columns add the full set of controls.

The top row of the table presents the coefficients on the abortion variable across specifications. In all six cases, the coefficient is negative, implying that higher abortion rates are associated with declining crime. These estimated effects of abortion are highly statistically significant -- more so than any other variable included in the analysis. The real-world magnitude implied by the coefficients on abortion is substantial. An increase in the effective abortion rate of 100 per 1000 live births (the mean effective abortion rate in 1997 for violent crime is 180 with a standard deviation of 96 across states) is associated with a reduction of 12 percent in murder, 13 percent in violent crime, and 9 percent in property crime. In Table II, comparing the states in the top-third with respect to abortions to the states in the bottom third, our parameter estimates imply that crime fell an additional 16-25 percent in the former states by 1997 due to greater usage of abortion. One additional abortion is associated with a reduction of 0.23 property crimes, 0.04 violent crimes, and 0.004 murders annually when a cohort is at its peak crime age. Comparing these estimates to average criminal propensities among 18-24 year olds, those on the margin for being aborted are roughly four times more criminal. These estimates are roughly consistent with, but somewhat larger than, the back-of-the envelope predictions in Section III.

The other coefficients in the model appear plausibly estimated. The elasticities of incarceration and police with respect to crime all carry the expected sign, with prison associated with significant reductions in property crime and murder, and police associated with significant reductions in murder.[28] A higher state unemployment rate is associated with significant increases in property crime, but not violent crime, consistent with previous research [Freeman 1995]. The three other measures of state economic conditions -- per capita income, the poverty rate and AFDC generosity (lagged 15 years to roughly correspond with the early years of life of the current teenagers) do not systematically affect crime. Shall-issue concealed carry laws appear to significantly increase the amount of property crime, but have no effect on violent crime or murder. Finally, beer consumption is weakly linked with higher crime rates, but never significantly so.

Table V investigates the sensitivity of the abortion coefficients to a range of alternative specifications. We take the specifications with the full set of controls in Table IV as a baseline. The abortion coefficient from those regressions are reported in the top row of Table V. Each row of the table represents a different specification. The sensitivity of the results to large states (since the regressions are population weighted) and states with very high or low abortion rates are examined first. Removing New York reduces the estimates for violent crime and murder, while eliminating California increases the abortion coefficient for those two crime categories. Dropping Washington, D.C., which is an extreme outlier (with an abortion rate over four times the national average) increases the estimated

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[28] The estimated effects of incarceration are consistent with previous correlational panel-data studies [e.g., Marvell and Moody 1994]. The prison coefficients obtained here are approximately the same magnitude as Levitt [1996] finds when correcting for the endogeneity of the prison population using prison overcrowding litigation as an instrument. Levitt [1997] finds a negative impact of police on crime using electoral cycles in large cities as an instrument for the size of the police force.

impact of abortion. Dropping all three of those high abortion states leads to higher estimates across the board, suggesting that the crime-reducing impact of abortion may have decreasing returns.

Omitted variables may also be a concern in the regressions given the relatively limited set of covariates available. One crude way of addressing this question is to include region-year interaction terms in an attempt to absorb geographically correlated shocks. The abortion coefficients are not substantially affected by this approach.

Since we are measuring the effect of abortions in a state on crime in that state up to a quarter century later, the issue of cross-state mobility should be considered. Theoretically, the presence of such cross-state movements will tend to systematically bias the abortion coefficient towards zero since the true effective abortion rate is measured with error by our proxy that ignores mobility. In order to adjust for migration, we determined the state of birth and state of residence for all 15 year-olds in the 1990 PUMS 5 percent sample. Using this information, we re-calculated effective abortion rates as weighted average abortion rates by the actual state of birth of 15 year-olds residing in a state. For all three crime categories, the estimated impact of abortion increases with the migration correction, although the changes are not large.

We perform a range of other sensitivity checks. Controlling for the flow of immigrants to a state somewhat reduces the estimated effect of abortion on crime (particularly for property crime), but it does not change their significance. When we include state-specific time trends, the estimates change somewhat erratically, and the standard errors double for murder and property crime and triple for violent crime. Unweighted panel data regressions (as opposed to population weighted) yield sharply smaller coefficients, but this is exclusively due to Washington, DC as an outlier (owing in all likelihood to

mismeasurement in the DC abortion rate). Excluding District of Columbia alone, or District of Columbia in combination with California and New York, leads to coefficients from the unweighted regressions that are greater than the baseline estimates.

Including controls for lagged changes in overall fertility rates for the same era as our abortion measures has almost no impact on our estimated coefficients. Regressions using only the 1985 and 1997 endpoints of our sample ("long-differences") yield coefficients similar to, although somewhat smaller than, the baseline coefficients for the overall panel.

V. The Impact of Abortion on Arrests by Age of Offender

The preceding section highlighted a strong empirical correlation between abortion rates after *Roe v. Wade* and crime changes in recent years. In this section, we explore the extent to which arrest patterns substantiate a possible causal interpretation of these results. In particular, if legalized abortion is the reason for the decline in crime, than one would expect that decreases in crime should be concentrated among those cohorts born after abortion is legalized.[29]

[29] It is possible that crime by older cohorts may be affected indirectly by abortion. For instance, if there are fewer criminals in younger cohorts, this may increase additional criminal opportunities for older individuals (particularly in activities such as drug distribution where there may be easy substitutability). On the other hand, to the extent that lower crime by the young increases the criminal justice resources available per older criminal [Sah 1991], crime among older cohorts may also fall. Moreover, as noted above, if abortion results in smaller family sizes and a concomitant increase in parental resources per child, the effect of legalization could be observed in crime reductions for older siblings. All of these effects are likely to be of second-order magnitude, however.

Testing that hypothesis is complicated by the fact that the age of criminals is not directly observable. The age of arrestees, however, is reported.[30] Thus, we can analyze whether arrests by cohort are a function of the abortion rate.

The basic specification used to explain state arrest rates by age category are identical to the crime regressions in the preceding section, except that the dependent variable is the (natural log of the) arrest rate per capita for those under age 25 rather than the overall crime rate for all ages, and 1997 is excluded from the sample because the necessary arrest data is not yet available.[31] Results from the estimation are reported in columns 1-3 of Table VI. Two specifications per crime category are presented: the top row of results just includes the effective abortion variable and year and state fixed effects, while the bottom row adds to these the remaining covariates that were used in Table IV above. Because the dependent variable is denominated by the population under age 25, the abortion coefficients only reflect changes in arrest rates per person. If the impact of abortion was solely through changes in cohort size, then the per capita specifications we run would yield zero coefficients on the abortion variable. In all six cases, lagged abortion rates are associated with decreases in arrests per capita by those under the age of 25, with estimates ranging between -.044 and -.214. The abortion coefficient is statistically significant in five out of six specifications.

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[30] Arrest data may not accurately reflect criminal activity for a number of reasons. Greenwood [1995] argues that juvenile crime is more likely to be committed in groups so that the arrest frequency of juveniles overstates the true fraction of crime they commit. Also, if there are differences across criminals in avoiding detection, arrests will be skewed towards the less proficient criminals.

[31] We use an age cutoff of 25 because it is approximately the age of the oldest cohorts affected by legalized abortion. Arrest data is available by single year of age up to age 24, but only in five year groupings thereafter. The results presented are not sensitive to small perturbations of the age groupings.

If the arrest data is measured without error and there are no spillovers between the crime of the young and the old, then we would not expect legalized abortion to affect the crime of those born prior to the law change. Columns 4-6, which relate arrest rates of older cohorts to abortion rates, thus provide a natural specification test for our hypothesis. In none of the crime categories does the abortion rate variable have a statistically significant impact on arrests of older cohorts. In three instances the coefficient is positive; in the other three cases the coefficient is negative. All of the estimates are much smaller in magnitude than was the case for arrests of those under the age of 25. The last three columns of the table show "difference in differences" estimates of the impact of abortion on cohorts born after legalization relative to those born before. In all cases, the coefficients are similar to those in the first three columns of the table. This result strengthens the causal interpretation of the abortion coefficients on the arrest patterns of the young.

The implied magnitude of the abortion effects on arrests are smaller than the parallel estimates presented in the preceding section analyzing crime rates, but are of the same order of magnitude. On average, about half of those arrested are under the age of 25.[32] Thus, to generate the crime reduction in Table IV requires coefficients on young arrests that are twice as large as the coefficients on overall crime. With the exception of murder, the arrest coefficients are actually smaller than the crime coefficients. Part of this discrepancy may be attributable to the fact that the arrest regressions reflect only reductions in per capita crime by the young, not smaller youthful cohorts, but this can explain only a portion of the gap. It remains an open question as to whether this discrepancy represents a partially

[32] Over the sample period, those under the age of 25 accounted for an average of 49 percent of violent arrests, 62 percent of property arrests, and 48 percent of murder arrests.

spurious relationship in the crime regressions, measurement error in the arrest data, or a relationship between crime and arrests that is not proportional. It is important to stress, however, that while the magnitude of the effects differs between the crime and arrest regressions, the basic story with respect to abortion is present in both cases.[33]

As a further test of our hypothesis, we analyze arrest rates by state by single year of age. These data are available for the ages 15 and 24 covering the period 1985 through 1996. If abortion legalization reduces crime, then we should see the reduction begin with, say, 15 year olds about 16 years after legalization, then extend to 16 year olds a year later, and so on. Because we observe many cohorts in a given state and year, we are able to include controls for state-year variation. Thus, unlike the preceding table, where state-year variation was our source of identification, in the analysis that follows our estimates are based on differences in abortion rates and crime rates across cohorts within a given state and year. The regression we run takes the following form

(3) $$ln(ARRESTS_{stb}) = \beta_1 ABORT_{sb} + \tilde{a}_s + \ddot{e}_{tb} + \grave{e}_{st} + \mathring{a}_{stb}$$

where *s*, *t*, and *b* index state, year, and birth cohort respectively. The variable *ARRESTS* is the raw number of arrests for a given crime. Unlike previous tables, we do not divide arrests by population to create per capita rates because of the absence of reliable measures of state population by single year of age. As our measure of the abortion rate for a particular cohort, we use the abortion rate in the current

[33] We replicated the sensitivity tests that were presented in Table V for the baseline Table IV regressions using Table VI as the baseline estimates. These regressions again revealed the robustness of the coefficient estimates, exhibiting patterns similar to the sensitivity analysis for the full sample. These results are available from the authors on request.

state of residence in the calendar year most likely to have preceded the arrestees birth.[34] Cross-state migration will not be captured by this measure, but the results in earlier sections suggests that the impact of migration on the estimates is small (and that any migration correction would, if anything, strengthen our results). Because the unit of observation in the analysis is a state-birth cohort and cohorts are observed repeatedly over time, we will include controls for age, national year-cohort interactions, state-year interactions, and (in some cases) state-age interactions. We cannot, however, include state-birth cohort interactions without absorbing all of the variation in the abortion exposure of a state-birth cohort.

Table VII presents the results of this analysis for violent crime and property crime. There are too few murder arrests per single age category per state to enable us to provide similar estimates for murder. We present estimates restricting the impact of abortion to be constant over the entire age range (odd columns) and allowing the impact of abortion to vary by age (even columns). Some of the regressions include state-age interactions, others just have state-fixed effects. All of the specifications include year-age interactions to control for national-level fluctuations in the age-crime profile.[35] In all cases, standard errors have been corrected to reflect correlation over time in a given birth cohort's observations.

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[34] For example, we use the abortion rate in 1980 to reflect the abortion exposure of 15 year olds arrested in 1996. Because the arrest data cover a calendar year, there is a possible 730 day window into which an arrestee's date of birth may fall (i.e. an arrest is made on January 1st of someone who is 16 years and 364 days old versus an arrest is made on December 31st of someone who is 16 years and 1 day old). With a six to seven month lag from likely time of abortion to time of birth, this 730 day window is centered on the calendar year that we use to capture abortion exposure. More complicated attempts to measure abortion exposure yields similar estimates to the ones we present.

[35] For instance, the arrival of crack appears to have temporarily raised the violent crime propensities, particularly among youths.

The top row of Table VII presents estimates restricting the abortion coefficient to be constant across the ages 15-24. In all instances, the coefficient is strongly significantly negative, implying that higher abortion rates around the time a cohort is born are associated with lower arrest rates in their teens and twenties. When the abortion coefficient is allowed to vary by age, 38 of the 40 parameter estimates are negative; more than two-thirds of these estimates are statistically significant at the .05 level. The greatest impact of abortion appears to occur in the age range 18-22. The effects are generally weakest for the youngest ages in the sample.

The coefficients in this table are not directly comparable to those in the preceding tables. Because we are analyzing arrests by single year of age in this table, we are able to use actual abortion rates as opposed to the effective abortion rates that average over many cohorts. Comparing states in the top-third and bottom-third with respect to abortion frequency, the gap between those sets of states in actual abortion rates was about 350 per 1,000 births. Given the estimates in the top row of Table VII, this implies that arrest rates of 15-24 year olds in the high abortion states are estimated to have fallen between 5 and 14 percent relative to the low abortion states.

VI. Conclusion

We know that teenagers, unmarried women, and poor women are most likely to deem a pregnancy to be either mistimed or unwanted, and that a large proportion of these unintended pregnancies will be terminated through abortion.[36] According to a recent National Academy report

[36] Roughly 75 percent of never-married women who unintentionally become pregnant will opt for abortion. Overall, almost exactly half of all unintended pregnancies – whether mistimed or unwanted – will be terminated by abortion. Institute of Medicine [1995, p. 41-47].

there appears to be "a causal and adverse effect of early childbearing on the health and social and economic well-being of children; this effect is over and above the important effects of background disadvantages." [Institute of Medicine 1995, p. 58]. Moreover, unintended pregnancies are associated with poorer prenatal care, greater smoking and drinking during pregnancy, and lower birthweights. Consequently, the life chances of children that are born only because their mothers could not have an abortion are considerably dampened relative to babies that were wanted at the time of conception. The drops in the proportion of unwanted births during the 1970s and early 1980s appears to be the result of the increasing availability and resort to abortion.

The evidence we present is consistent with legalized abortion reducing crime rates with a twenty year lag. Our results suggest that an increase of 100 abortions per 1,000 live births reduces a cohort's crime by roughly ten percent. Extrapolating our results out of sample to a counterfactual in which abortion remained illegal and the number of illegal abortions performed remained steady at the 1960s level, we estimate that (with average national effective abortion rates in 1997 for all three crimes ranging from between 142 and 252) crime was almost 15-25 percent lower in 1997 than it would have been absent legalized abortion.

These estimates suggest that legalized abortion is a primary explanation of the large drops in murder, property crime and violent crime that our nation has experienced over the last decade. Indeed, legalized abortion may account for as much as one-half of the overall crime reduction. Assuming that this claim is correct, existing estimates of the costs of crime [e.g., Miller et al. 1993] suggest that the social benefit to reduced crime as a result of abortion may be on the order of $30 billion dollars annually. Increased imprisonment between 1991 and 1997 (the prison population rose about 50 percent over this

period) lowered crime 10 percent based on an elasticity of -.20. Thus, together abortion and prison growth explain much, if not all, of the decrease in crime.[37]

Roughly half of the crimes committed in the United States are done by individuals born prior to the legalization of abortion. As these older cohorts age out of criminality and are replaced by younger offenders born after abortion became legal, we would predict that crime rates will continue to fall. When a steady state is reached roughly twenty years from now, the impact of abortion will be roughly twice as great as the impact felt so far. Our results suggest that all else equal, legalized abortion will account for persistent declines of 1 percent a year in crime over the next two decades. To the extent that the Hyde amendment effectively restricted access to abortion, however, this prediction might be overly optimistic.

While falling crime rates are no doubt a positive development, our drawing a link between falling crime and legalized abortion should not be misinterpreted as either an endorsement of abortion or a call for intervention by the state in the fertility decisions of women. Furthermore, equivalent reductions in crime could in principle be obtained through alternatives for abortion, such as more effective birth control, or providing better environments for those children at greatest risk for future crime.

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[37] This is not to say that other factors did not also contribute to the decline in crime. To the extent that there were other forces pushing crime higher, such as crack, then the set of factors leading to reduced crime will explain more than 100 percent of the observed decrease in crime.

Data Appendix

Crime and Police

All crime and police data used in the analysis are from Federal Bureau of Investigation Crime in the United States [annual], except the victimization data in Figure II, which are summarized annually in Bureau of Justice Statistics Sourcebook of Criminal Justice Statistics [annual].

Abortion

All abortion data is from Bureau of the Census United States Statistical Abstract [annual]. The primary source for the abortion data is an annual survey conducted by the Alan Guttmacher Institute.

Prisoners

Data on number of prisoners is from Correctional Populations in the United States, published annually by the Bureau of Justice Statistics.

Population by Age

These data are 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

Persons Below Poverty Level, by State, taken from Bureau of the Census United States Statistical Abstract [annual].

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].

Fertility

The number of live births per 1000 population, taken from Bureau of the Census, United States Statistical Abstract [annual].

Income

Per capita state personal income, converted to 1997 dollars using the Consumer Price Index, from Bureau of the Census, United States Statistical Abstract [annual].

AFDC Generosity

Public Assistance Payments to Families with Dependent Children, from Bureau of the Census, United States Statistical Abstract [annual]. The data reported in the Statistical Abstract are the average monthly payment per family receiving aid. That number is multiplied by 12 to obtain a yearly average, and then converted into 1997 dollars using the Consumer Price Index.

Non-discretionary concealed handgun law

Indicates the year in which the state 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].

Beer Consumption

Consumption of Malt Beverages from the Beer Institute's Brewer's Almanac [1995, 1998]. In gallons consumed per capita.

Cross-State Migration

The corrections for cross-state migration are based on a comparison of the state of birth and current state of residence of 15 year-olds in the 1990 Census Public Use Microdata 5 percent sample.

Foreign Born Population

Prior to 1994, the decennial census was the only source of data on the number of foreign-born individuals living in the U.S. Data from the three Census years and 1997 were used to interpolate intervening years. All data from Bureau of the Census United States Statistical Abstract [annual].

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TABLE I

Crime Trends for States Legalizing Abortion Early vs. the Rest of the United States

Crime category	Percent change in crime rate over the period				
	1976-82	1982-88	1988-94	1994-97	Cumulative, 1982-97
Violent crime					
Early legalizers	16.6	11.1	1.9	-25.8	-12.8
Rest of U.S.	20.9	13.2	15.4	-11.0	17.6
Difference	-4.3	-2.1	-13.4	-14.8	-30.4
	(5.5)	(5.4)	(4.4)	(3.3)	(8.1)
Property crime					
Early legalizers	1.7	-8.3	-14.3	-21.5	-44.1
Rest of U.S.	6.0	1.5	-5.9	-4.3	-8.8
Difference	-4.3	-9.8	-8.4	-17.2	-35.3
	(2.9)	(4.0)	(4.2)	(2.4)	(5.8)
Murder					
Early legalizers	6.3	0.5	2.7	-44.0	-40.8
Rest of U.S.	1.7	-8.8	5.2	-21.1	-24.6
Difference	4.6	9.3	-2.5	-22.9	-16.2
	(7.4)	(6.8)	(8.6)	(6.8)	(10.7)
Effective abortion rate at end of period					
Early legalizers	0.0	64.0	238.6	327.0	327.0
Rest of U.S.	0.0	10.4	87.7	141.0	141.0
Difference	0.0	53.6	150.9	186.0	186.0

Notes: Early legalizing states are Alaska, California, Hawaii, New York, and Washington. These five states legalized abortion in late 1969 or 1970. In the remaining states, abortion became legal in 1973 after *Roe v. Wade*. Percent change in crime rate is calculated by subtracting the fixed 1985 population-weighted average of the natural log of the crime rate at the beginning of the period from the fixed 1985 population-weighted average of the natural log of the crime rate at the end of the period. The rows labeled "Difference" are the difference between early legalizers and the rest of the United States (standard errors are reported in parentheses). The bottom panel of the table presents the effective abortion rate for violent crime, as calculated using equation (1) in the text, based on the observed age distribution of national arrests for violent crime in 1985. Entries in the table are fixed 1985 population-weighted averages of the states. Abortion data is from the Alan Guttmacher Institute; crime data is from Uniform Crime Reports. Because of missing crime data for 1976, the 1976-82 calculations omit the District of Columbia. Precise data sources are provided in the data appendix.

TABLE II
Crime Changes 1985-97 as a Function of Abortion Rates 1973-76

Abortion frequency (Ranked by effective abortions rate in 1997)	Effective abortions per 1,000 live births, 1997	% Change in crime rate, 1973-1985			% Change in crime rate, 1985-1997		
		Violent crime	Property crime	Murder	Violent crime	Property crime	Murder
Lowest	67.5	+31.8	+29.8	-21.1	+29.2	+9.3	+4.1
Medium	135.0	+28.8	+31.1	-19.7	+18.0	+2.2	-12.6
Highest	257.1	+32.2	+15.2	-9.7	-2.4	-23.1	-25.9

Notes: States are ranked by effective abortion rates for violent crime in 1997, with the 17 states with lowest abortion rates classified as "lowest," the next 17 states classified as "medium," and the highest 17 states (including District of Columbia) classified as "highest." The effective abortion rate is the estimated average abortion rate per 1,000 live births for criminals in the state, as calculated using equation (1) in the text, based on the observed age distribution of national arrests for violent crime in 1985. All values in the table are weighted averages using 1985 state populations as weights. Percent change in crime per capita is calculated by subtracting the fixed 1985 population-weighted average of the natural log of the crime rate at the beginning of the period from the fixed 1985 population-weighted average of the natural log of the crime rate at the end of the period. Because crime rates are extremely low until the mid-teenage years, legalized abortion is not predicted to have had a substantial impact on crime over the period 1973-1985, but would be predicted to affect crime in the period 1985-1997. Abortion data is from the Alan Guttmacher Institute; crime data is from Uniform Crime Reports. Precise data sources are provided in the data appendix.

TABLE III
Summary Statistics

Variable	Mean	Standard deviation (overall)	Standard deviation (within state)
Violent crime per 1,000 residents	6.73	2.81	.88
Property crime per 1,000 residents	48.04	11.46	4.60
Murder per 1,000 residents	0.09	0.04	0.02
"Effective" abortion rate per 1,000 live births by crime:			
Violent crime	77.11	83.18	66.13
Property crime	132.26	116.46	86.89
Murder	51.00	66.57	55.39
Prisoners per 1,000 residents	2.83	1.26	0.86
Police per 1,000 residents	2.85	0.64	0.27
State personal income per capita ($1997)	23207	3408	1361
AFDC generosity per recipient family (t-15)	7242	2905	1364
State unemployment rate (percent unemployed)	6.15	1.55	1.21
Beer consumption per capita (gallons)	23.03	3.32	1.24
Poverty rate (percent below poverty level)	13.80	3.51	1.64
Violent crime arrests per 1,000, under age 25	3.18	1.46	0.49
Property crime arrests per 1,000, under age 25	12.36	3.76	1.44
Murder arrests per 1,000, under age 25	0.11	0.06	0.03
Violent crime arrests per 1,000, age 25 and over	2.04	1.06	0.34
Property crime arrests per 1,000, age 25 and over	4.82	1.58	0.65
Murder arrests per 1,000, age 25 and over	0.06	0.03	0.01

Notes: All values reported are means of annual, state-level observations for the period 1985-1997 with the following exceptions. Arrest data cover the years 1985-1996, and AFDC generosity data is for the years 1985-1998. The police and prisons data are once-lagged, and thus correspond to the years 1984-1996. The values reported in the table are population weighted averages. The effective abortion rate is a weighted average of the abortion rates for each cohort born in a state, with weights determined by the percentage of arrests by age for a given crime category in the United States in 1985 as shown in equation (1). All summary statistics are based on 663 observations, except where

otherwise noted. Because of missing data, arrest statistics are based on 574 observations, compared to a theoretical maximum of 612. AFDC statistics are based on 714 observations. See data appendix for further details.

TABLE IV

Panel-data Estimates of the Relationship between Abortion Rates and Crime

	ln(Violent crime per capita)		ln(Property crime per capita)		ln(Murder per capita)	
Variable	(1)	(2)	(3)	(4)	(5)	(6)
"Effective" abortion rate (x100)	-.137 (.023)	-.129 (.024)	-.095 (.018)	-.091 (.018)	-.108 (.036)	-.121 (.047)
ln(prisoners per capita) (t-1)	-----	-.027 (.044)	-----	-.159 (.036)	-----	-.231 (.080)
ln(police per capita) (t-1)	-----	-.028 (.045)	-----	-.049 (.045)	-----	-.300 (.109)
State unemployment rate (percent unemployed)	-----	.069 (.505)	-----	1.310 (.389)	-----	.968 (.794)
ln (state income per capita)	-----	.049 (.213)	-----	.084 (.162)	-----	-.098 (.465)
poverty rate (percent below poverty line)	-----	-.000 (.002)	-----	-.001 (.001)	-----	-.005 (.004)
AFDC generosity (t-15) (x1,000)	-----	.008 (.005)	-----	.002 (.004)	-----	-.000 (.000)
Shall-issue concealed weapons law	-----	-.004 (.012)	-----	.039 (.011)	-----	-.015 (.032)
Beer consumption per capita (gallons)	-----	.004 (.003)	-----	.004 (.003)	-----	.006 (.008)
R-squared	.938	.942	.990	.992	.914	.918

Notes: The dependent variable is the log in the per capita crime rate named at the top of each pair of columns. The first column in each pair presents results from specifications in which the only additional covariates are state- and year- fixed effects. The second column presents results using the full specification. The data set is comprised of annual state-level observations (including the District of Columbia) for the period 1985-1997. The number of observations is equal to 663 in all columns. State- and year- fixed effects are included in all specifications. The prison and police variables are once-lagged to minimize endogeneity. Estimation is performed using a two-step procedure. In the first step, weighted least squares estimates are obtained, with weights determined by state population. In the second step, a panel data generalization of the Prais-Winsten correction for serial correlation developed by Bhargava et al. [1982] is implemented. Standard errors are in parentheses. Data sources for all variables are described in the data appendix.

TABLE V
Sensitivity of Abortion Coefficients to Alternative Specifications

Specification	Coefficient on the "effective" abortion rate variable when the dependent variable is: ln(Violent crime per capita)	ln(Property crime per capita)	ln(murder per capita)
Baseline	-.129 (.024)	-.091 (.018)	-.121 (.047)
Exclude New York	-.097 (.030)	-.097 (.021)	-.063 (.045)
Exclude California	-.145 (.025)	-.080 (.018)	-.151 (.054)
Exclude District of Columbia	-.149 (.025)	-.112 (.019)	-.159 (.053)
Exclude New York, California, and District of Columbia	-.175 (.035)	-.125 (.017)	-.273 (.052)
Adjust "effective" abortion rate for cross-state mobility	-.148 (.027)	-.099 (.020)	-.140 (.055)
Include control for flow of immigrants	-.115 (.024)	-.063 (.018)	-.103 (.047)
Include state-specific trends	-.078 (.080)	.143 (.033)	-.379 (.105)
Include region-year interactions	-.142 (.033)	-.084 (.023)	-.123 (.053)
Unweighted	-.046 (.029)	-.022 (.023)	.040 (.054)
Unweighted, exclude District of Columbia	-.149 (.029)	-.107 (.015)	-.140 (.055)
Unweighted, exclude District of Columbia, California and New York	-.157 (.037)	-.110 (.017)	-.166 (.075)
Include control for overall fertility rate (t-20)	-.127 (.025)	-.093 (.019)	-.123 (.047)
Long difference estimates using only data from 1985 and 1997	-.109 (.054)	-.077 (.034)	-.089 (.077)

Notes: Results in this table are variations on the specifications reported in columns 2, 4, and 6 of Table IV. The top row of the current table is the baseline specification that is presented in Table IV. Except where noted, all specifications are estimated using an annual, state-level panel of data for the years 1985-1997. Standard errors (in parentheses) are corrected for serial correlation using the Bhargava et al. (1982) two-step procedure for panel data. The specification that corrects for cross-state mobility does so by using an effective abortion rate that is a weighted average of the abortion rates in the state of birth for 15 year-olds residing in a state in the PUMS 5 percent sample of the 1990 census. Controls for the flow of immigrants are derived from changes in

the foreign born population, based on the decennial censuses and 1997 estimates, linearly interpolated. Region-year interactions are for the nine census regions.

TABLE VI
The Impact of Abortion Rates on Arrests by Age
(All Values in the Table are Coefficients on the Effective
Abortion Rate (x100), Other Coefficients are Not Reported)

Specification	ln(arrest per person, under age 25)			ln(arrests per person, age 25+)			ln(arrests per person, under age 25) minus ln(arrests per person, age 25+)		
	Violent crime	Property crime	Murder	Violent crime	Property crime	Murder	Violent crime	Property crime	Murder
Effective abortion rate (x100) only, no covariates included	-.095 (.029)	-.085 (.023)	-.214 (.051)	.022 (.054)	-.019 (.037)	-.034 (.037)	-.116 (.042)	-.066 (.023)	-.180 (.034)
Effective abortion rate (x100), including full set of covariates	-.044 (.030)	-.054 (.023)	-.180 (.062)	.033 (.046)	.008 (.031)	-.036 (.050)	-.062 (.034)	-.063 (.019)	-.137 (.046)

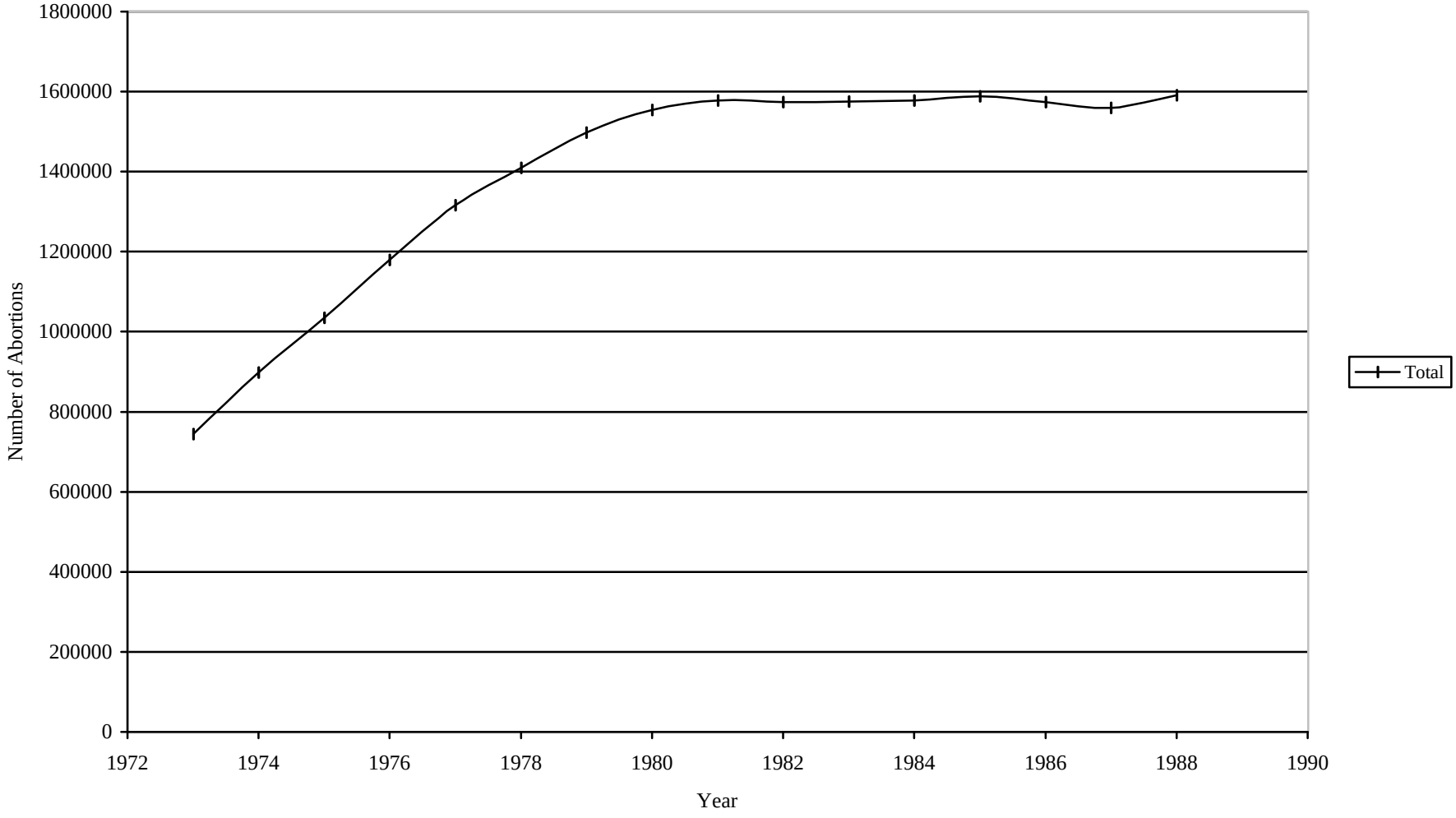
Notes: Regressions are identical to those in Table IV, except that the dependent variables are arrest rates broken down by age category instead of overall crime rates. The top row of the table presents results from specifications in which the only additional covariates are state- and year- fixed effects. The bottom row of the paper presents results using the full specification. Covariates included in the bottom row are once-lagged police and prisoners per capita in logs, state unemployment rate, logged state income per capita, the poverty rate, lagged AFDC generosity, shall-issue concealed weapons law, and beer consumption per capita. The regressions use annual state-level data for the period 1985-1996 (1997 arrest data by age are not yet available). Because of missing data, the number of observations varies across columns between 555 and 557, compared to a theoretical maximum of 612. State- and year- fixed effects are included in all specifications. The prison and police variables are once-lagged to minimize endogeneity. Estimation is performed using a two-step procedure. In the first step, weighted least squares estimates are obtained, with weights determined by state population. In the second step, a panel data generalization of the Prais-Winsten correction for serial correlation developed by Bhargava et al. [1982] is implemented. Standard errors are in parentheses.

TABLE VII
The Relationship between Abortion Rates and Arrest Rates, by Single Year of Age

	ln(Violent arrests)				ln (Property arrests)			
Abortion rate (x100)	-.015 (.003)	----	-.028 (.004)	----	-.040 (.004)	----	-.025 (.003)	----
Abortion rate (x100) interacted with:								
Age=15	----	.018 (.008)	----	-.008 (.010)	----	-.037 (.007)	----	-.005 (.008)
Age=16	----	.008 (.007)	----	-.007 (.008)	----	-.043 (.006)	----	-.011 (.006)
Age=17	----	-.010 (.006)	----	-.021 (.007)	----	-.042 (.006)	----	-.013 (.005)
Age=18	----	-.035 (.004)	----	-.039 (.007)	----	-.053 (.005)	----	-.023 (.005)
Age=19	----	-.040 (.005)	----	-.043 (.007)	----	-.050 (.005)	----	-.036 (.006)
Age=20	----	-.043 (.006)	----	-.043 (.007)	----	-.038 (.006)	----	-.035 (.006)
Age=21	----	-.039 (.009)	----	-.039 (.008)	----	-.028 (.006)	----	-.037 (.006)
Age=22	----	-.028 (.013)	----	-.024 (.009)	----	-.020 (.008)	----	-.032 (.009)
Age=23	----	-.031 (.023)	----	-.026 (.013)	----	-.015 (.011)	----	-.030 (.013)
Age=24	----	-.027 (.040)	----	-.016 (.020)	----	-.024 (.019)	----	-.047 (.018)
R-squared	.972	.972	.985	.985	.967	.968	.984	.984
Number of observations	5,737	5,737	5,737	5,737	5,740	5,740	5,740	5,740
State-fixed effects or State-age interactions?	State-fixed	State-fixed	State*Age interactions	State*Age interactions	State-fixed	State-fixed	State*Age interactions	State*Age interactions

Notes: Results in the table are coefficients from estimation of equation (3). The unit of observation in the regression is annual arrests by state by single year of age. The sample covers the period 1985-96 for ages 15-24. The abortion rate for a cohort of age *a* in state *s* in year *y* is the number of abortions per 1,000 live births in state *s* in year *y-a-1*. Note that this is the actual abortion rate, rather than the "effective" abortion rate used in preceding tables. Therefore, the coefficients in this table are not directly comparable to those of earlier tables. If data were available for all states, years, and ages, the total number of observations would be 6,120. Due to missing arrest data and occasional zero values for arrests, the actual number of observations is somewhat smaller. A complete set of year-birth cohort interactions are included in all specifications to capture national changes in the shape of the age-crime profile over time. State-year interactions are also included. Some specifications include state-fixed effects; in other specifications, a complete set of state-age interactions are included. Estimation is weighted least squares, with weights determined by total state population. Standard errors have been corrected to account for correlation over time within a given birth cohort in a particular state. Such a correction is necessary because the abortion rate for any given cohort is fixed over time, but multiple observations corresponding to different years of age are included in the regression. Results for murder are not included in the table because murder is infrequent, leading to many zeros when analyzed at the level of state and single year of age.

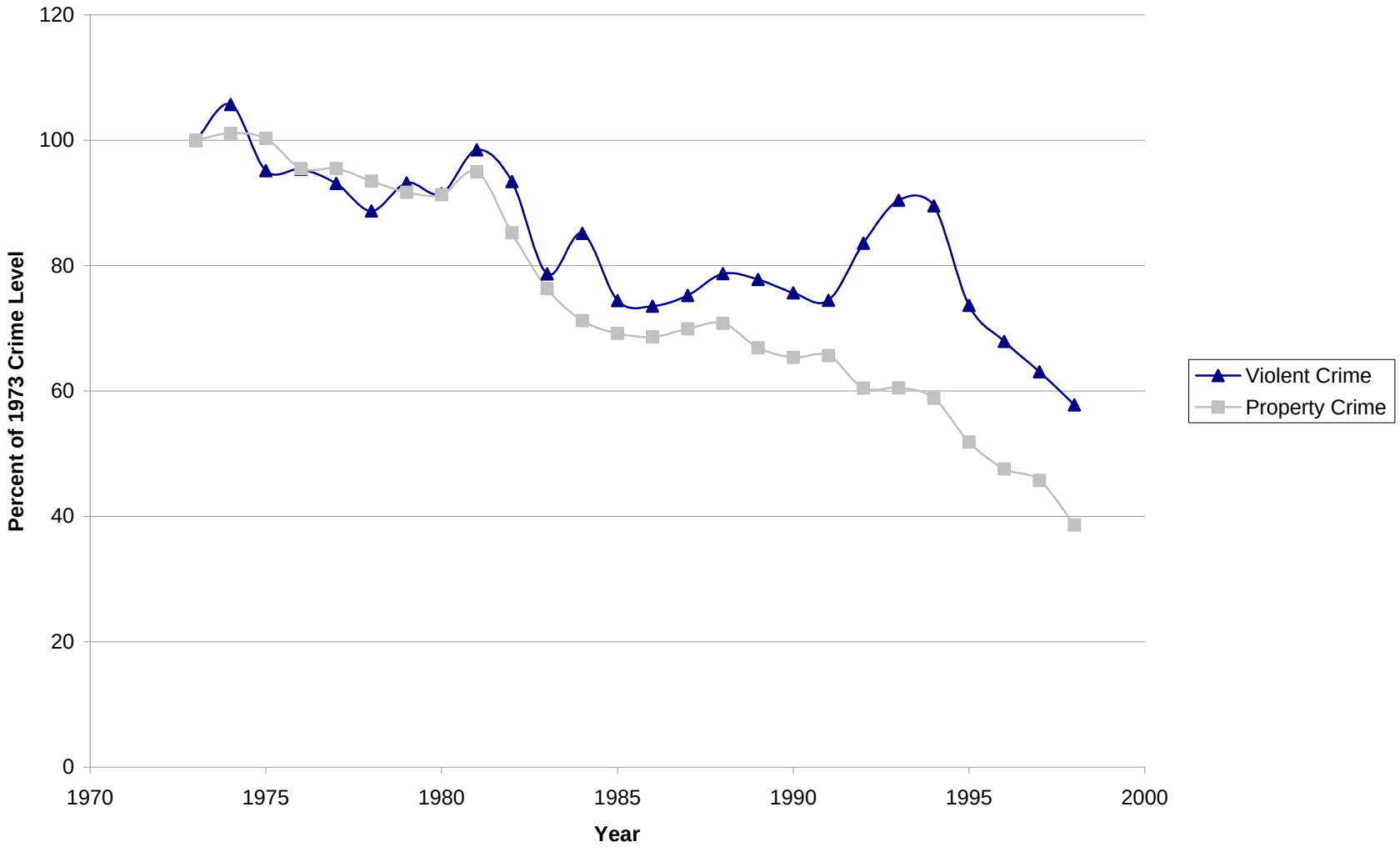
Figure 1
Total Abortions by Year



Source: Henshaw, Stanley K. and Jennifer Van Vort eds., Abortion Factbook 1992 Edition, The Alan Guttmacher Institute, New York, 1992.

Figure 2: Crime Rates from the Uniform Crime Reports, 1973-1999

Figure 3: National Crime Victimization Survey, 1973-1998



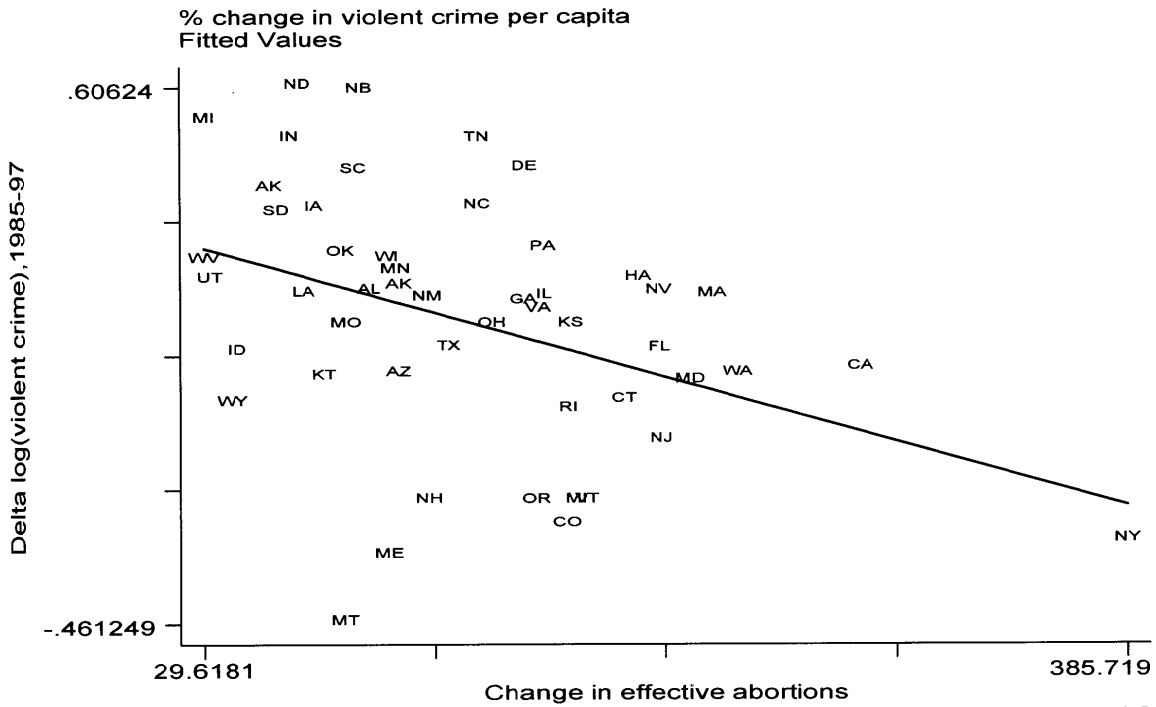


Figure 4a: Changes in Violent Crime and Abortion Rates, 1985-1997

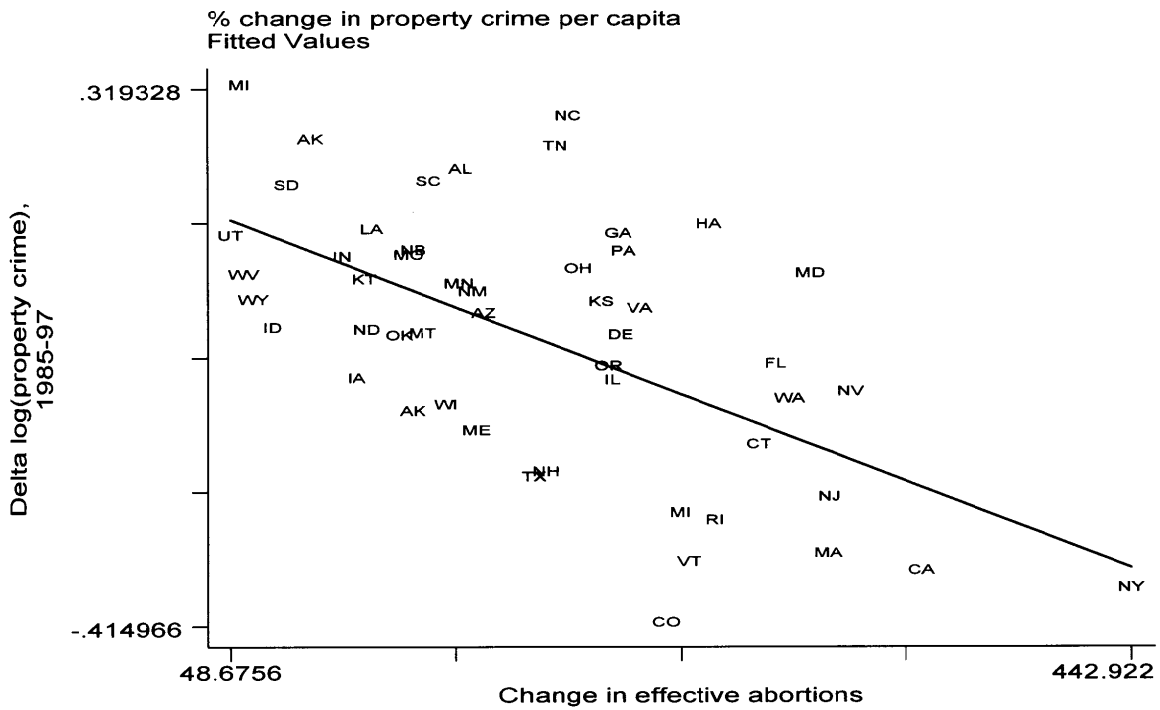


Figure 4b: Changes in Property Crime and Abortion Rates, 1985-1997

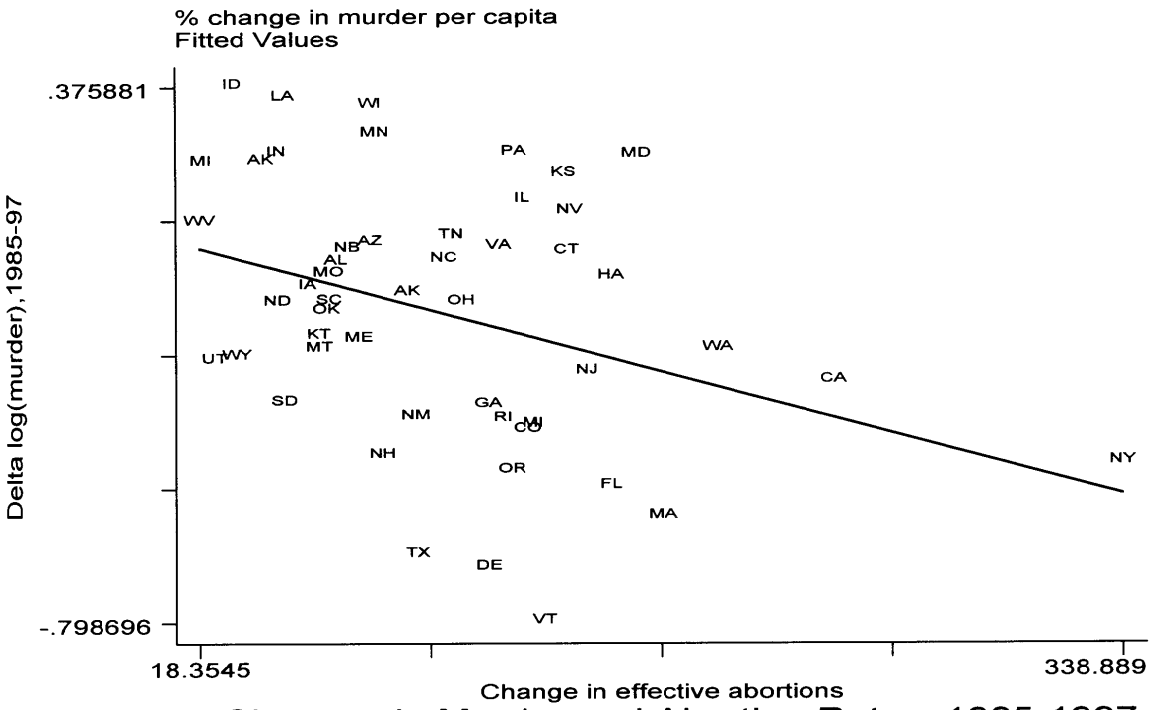


Figure 4c: Changes in Murder and Abortion Rates, 1985-1997

Notes to Figure II: Data are national aggregate per capita reported violent crime, property crime, and murder, indexed to equal 100 in the year 1973. All data are from the FBI's Uniform Crime Reports, published annually.

Notes to Figure III: Data are national aggregate per capita violent crime and property crime victimizations, indexed to equal 100 in the year 1973. All data are based on the National Crime Survey, conducted annually. Data have been adjusted to correct for a one-time shift associated with the re-design of the survey in the early 1990s.

Notes to Figures IVa-IVc: The vertical axis in the figures corresponds to the log change in the named crime category between 1985 and 1997. The horizontal axis is the change in the effective abortion rate corresponding to the crime category between 1985 and 1997. The effective abortion rate is the estimated average abortion rate per 1,000 live births for criminals in the state, as calculated using equation (1) in the text. Washington, D.C., which is an extreme outlier with respect to abortion rates, is omitted from the figures, but is included in all other statistical analyses.