

A Further Analysis of the Causal Link between Abortion and
Crime

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A FURTHER ANALYSIS OF THE CAUSAL LINK BETWEEN
ABORTION AND CRIME

Presented by Spencer Martin, a candidate for the degree of Master
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TABLE OF CONTENTS

ACKNOWLEDGMENTS	ii
LIST OF TABLES	iv
1. INTRODUCTION	1
2. DISCUSSION OF PREVIOUS LITERATURE	4
3. DISCUSSION OF DATA.....	12
4. DISCUSSION OF CRIME TRENDS AND THE ABORTION-CRIME MECHANISM.....	14
5. MODEL AND METHODOLOGY	20
6. RESULTS OF THE REGRESSION ANALYSIS	22
7. CONCLUSIONS.....	28
APPENDIX.....	29
BIBLIOGRAPHY.....	31

LIST OF TABLES

Table I.....	14
Table II.....	15
Table III.....	16
Table IV.....	18
Table V.....	23
Table VI.....	26
Table VII.....	27

1. Introduction

One of the most noted phenomenon of the 1990s was the precipitous drop in all types of crime, beginning around 1991 and continuing throughout the decade¹. This was an important trend for American society at the time, since the contemporary forecasts for the future of crime were grim; the entire country was gripped by fear of the infamous “super predators,” homicidal teen criminals from the inner cities, inured to violence and lacking any sort of moral or social mores. Even then President Bill Clinton predicted a rise in crime so drastic that the American public would cower in terror under their beds, afraid to conduct normal activities in the face of the ever-burgeoning crime wave. The noted, oft-quoted criminologist James Alan Fox made an “optimistic” prediction that teen homicides rates would rise only 15% in the coming years². In general, crime was bad, and everyone consulted could only see it getting worse in the future.

The explanations for the crime bust were many and varied; the only consensus was that multiple factors must have been involved, since the 30-40 percent drop that was observed during the decade could not have come from only one source. Those factors, however, ranged from improved policing strategies³ to the decline of crack-associated violence⁴ to the stabilization of the social institutions that can reduce street crimes⁵. The academic community seemed particularly enamored of the “Broken Windows⁶” theory of criminal behavior, postulating that the increased punishment of minor offenses reduced the amount of large crimes committed as well⁷. This theory was stressed in New York

¹ See Graph #1 in Appendix

² From Steven Levitt, in lecture, “Economics of Crime,” University of Chicago, Winter 2005

³ Ibid

⁴ Ibid

⁵ Lafree, pp. 1368

⁶ Popularized By George Kelling by way of William Bratton

⁷ Levitt, Winter 2005

City, where crime had one of the greatest recessions in the entire country. William Bratton, then New York Police Commissioner, co-authored a memoir proclaiming himself “America’s Top Cop,” who single-handedly reversed the decades-long crime trends⁸. The only hole in this theory is that crime dropped everywhere in the country, not just New York City; a more general and logical explanation was needed to decipher this epic crime bust.

In 2001, John Donohue and Steven Levitt offered another explanation. America’s fortuitous decrease in felonious acts was actually a product of a different controversial subject - the addition of legal abortion to the nation, which was a result of the *Roe v. Wade* decision in 1972. The original inference began by noting a significant overlap between two types of women - women who had legal abortions, and women whose children were prone to criminal behavior. Women in both groups shared similar characteristics; they were young, single, undereducated, and poor. The logic of this premise is that the same women who would previously have given birth to criminals were now terminating their pregnancy; this leads to a decrease in crime by two means. First, the total cohort size of that age group is reduced, and a smaller population leads to fewer committed crimes. Second, if the aborted fetuses are proportionally more likely to be criminal than the average fetus in the cohort, there may be a reduction in that generation’s high-risk members. Since approximately 6% of any given cohort will commit 50% of that set’s criminal behavior, removing even a slight quantity of the high-risk individuals will lead to a correspondingly larger drop in crime. The natural conclusion is that the

⁸ Bratton, William and Peter Knobler, “TURNAROUND: How America’s Top Cop Reversed the Crime Epidemic,” Random House, 1998

United States, having legalized, may have felt some impact on crime from abortion. The question now is magnitude - how much impact has there been?

The essential reasoning behind this paper is twofold. The primary purpose is to reassess Donohue and Levitt from a continuing perspective; does their conclusion of a large, significant impact on crime hold up after adding more years of observations? The original paper was written in 2001 and only considered the results through 1997; this paper seeks to add at least 7 extra years of panel data to further test their hypothesis. This is socially important for a number of reasons - most of all, to continue examination of exactly what shock abortion brought to the crime rate in the 1990s. Determining the cause of this shock is a popular and well-known academic exercise; learning the magnitude of *Roe v. Wade*'s responsibility will allow us to speculate into other areas of interest. How long will the 1972 ruling affect U.S. crime rates? Donohue and Levitt concluded that the effect would plateau and cease decreasing crime after a certain number of cohorts had been born post-1972. If they are correct, the effect should show a lesser magnitude after a certain point in time. The major criticisms of the theory have questioned the robustness of the results; with more data, the overall significance can come into a better focus by looking at the original model and a few alternate specifications. Crime and its proliferation in this country is always an important issue socially and politically; knowing the extent of the abortion shock could help determine which other crime deterrents that were put into place in the 1980s and 90s also had a significant effect. This in turn could lead to more efficient and effective crime-fighting

measures in the future; after all, the abortion shock cannot repeat itself with an unlikely re-criminalization⁹.

The second purpose of this work is to add a different type of analytical argument to the debate around this subject. The original article and argument simply assumed the link between the typical aborting mother and the typical mother of a potentially criminal child; no analytical results backed this claim. This paper, taking a novel approach, may have an interesting result in this area. If so, this could be another contention in the logic chain that leads to the conclusion that legalized abortion reduced crime in the 1990s.

2. Discussion of Previous Literature

When the article by Donohue and Levitt was published in 2001, the idea seemed revolutionary. The overarching topic of the work was that legalized abortion, which began in 1973 in the United States, had the side effect of lowering crime, and that the magnitude of this effect was a significantly large portion of the overall crime decrease. This not only contradicted the academic thinking of the time, which attributed the bust to other sources, but also the general public's notion that abortion was an isolated occurrence and had no larger effect. The paper made analyses of six different arguments, all generally pointing towards the conclusion that abortion reduced crime in the 1990s and possibly beyond.

The first and most intuitive is the correlation between mothers seeking legal abortions and mothers bearing criminals. Prior to legalization, abortions were expensive

⁹ An interesting example occurs in Romania; on taking power in 1966, dictator Nicolae Ceausescu declared abortion and contraception illegal, and embarked on an attempt to boost Romania's population into contention with the top tier of economic powerhouses (or something to this effect.) As Levitt recounts in his book Freakonomics, a steep "abstinence tax" was instituted and women were routinely tested for pregnancy. Since abortion had been the leading form of birth control at the time, the birth rate soared. Two decades later, Ceausescu was forced from power, and a large number of the revolutionaries were the very children he had decreed would be born.

and difficult to procure, so the typical client tended to be more affluent. After the lifting of the ban, however, the rate of abortions soared, and the beneficiary tended to be the less affluent, unwed teenage mother¹⁰. The reduction in cohort size would lead to a drop in crime, but the authors argue that the decrease is far more than proportional. They propose that since there is a strong causal relationship between unstable home life - such as that provided by an unwed, teenage mother with little education - and criminal behavior, a significant portion of those abortions would have born into unpleasant circumstances, and thus prove prone to criminal activity. That is, legalized abortion was removing a larger share of prospective criminals from the age cohort as opposed to random sampling across the population. Thus, crime in the future would be reduced since the cohort is lacking a fraction of the normal criminal element¹¹.

The second contention provided by the authors is an analysis of the national time-series data. The peak of the crime wave in all categories of crime was in 1991; afterwards the trend is a decline across all states. They contend that this is consistent with the abortion theory, since the first cohort affected by the legalization would have been reaching the criminal peak at that time¹². The crime rate of this cohort thus does not match that of the previous generation's, and the overall crime rate falls. The next age group is similarly affected, and so year by year the rates decrease. They hypothesize that

¹⁰ Donohue and Levitt (2001) provide the following evidence for this claim: abortions more than doubled in the decade after *Roe v. Wade*; abortion had a marginal effect on the birthing rate of white women, but large effects on black, especially considering unwed teenage mothers from both groups; and the cost of an abortion fell from \$400-500 before the decision to around \$80 in the mid-Eighties - the cost today is around \$450, which is a substantial decrease in the real price compared to the early Seventies. This contention will be further examined later in this paper.

¹¹ Donohue and Levitt (2001) estimate that 6% of the cohort commits around 50% of that age group's crime

¹² The authors presented data from several studies showing that the most criminal demographic is males ages 18-24.

eventually, after all criminally active cohorts are affected by legalized abortion, the decrease in crime will level off at a lower plateau than before.

The third analysis is that of the staggered nature of the states' legalization; New York, California, Washington, Alaska, and Hawaii all lifted the abortion ban before the Supreme Court made it national, so theoretically they should have seen an earlier decrease in crime¹³. The results of the examination of these trends are mixed, but notable is that property crimes, the type of crime most likely to be committed by the young, are significantly reduced in the late Eighties in the early-legalizing states compared to the others that legalized with the *Roe v. Wade* decision in 1973.

The fourth argument is the difference between states with high post-legalization abortion rates and those with lower rates post-1973. The finding is that the higher-aborting states sustained a 30% advantage in the decrease in crime from 1985-1997 as opposed to their lower-aborting peers¹⁴. This directly leads to the fifth point, that the changes in the crime rates of high versus low aborting states were not following any particular pattern; the trends were generally increasing, with no clear difference between states. After 1985, though, the split is noticeable. The simple log regression model with crime rates as a dependent variable against abortion along with other variables as independent shows a significant effect of abortion on crime; the weighted least squares model estimates indicate that the states with higher abortion rates had an additional 16-25% decrease in crime following 1985¹⁵. These two arguments, taken together, provide analytical evidence of correlation between legalized abortion and the drop in the crime

¹³ The authors present a caveat that these states had higher abortion rates even after the decision and thus the effects made be difficult to separate.

¹⁴ This can be clearly seen in Table II of Donohue and Levitt (2001).

¹⁵ These regression results can be seen in Tables III and IV in the paper.

rate. The authors estimate that one additional abortion correlates to a decrease of .23 property crimes, .04 violent crimes, and .004 murders¹⁶ annually, for the peak crime years of the cohort¹⁷.

The sixth and final point that the original paper makes is about the impact of abortion on the ages of arrestees. Despite the obvious problems with using age of arrested as a proxy for age of criminals, the analysis shows a strong reduction in arrests for cohorts affected by legalized abortion, and no change in older age groups. This is far from conclusive, but is significant when taken with all the other evidence presented in the paper. The six arguments, together, present a story of legalized abortion and its effect on crime. The authors do not claim that abortion accounts for the entire crime drop of the 1990s, but they maintain that a significant portion is due to *Roe v. Wade*.

The primary criticism to the original Donohue and Levitt paper came in Joyce's 2004 paper, which questioned the findings on several levels. Joyce disagreed with the original authors' use of fixed effects to control for variation between states and years, especially since the earliest years of the decline corresponded with the end of the crack cocaine epidemic, which obviously affected states in different ways. He prefers to use a differences-in-differences-in-differences estimator for 1985-1990, and the evidence shows little evidence of a reduction in criminal behavior for cohorts born after the legalization of abortion. Thus, Joyce claimed that the results found in the original paper were due to an omitted variable problem - a failure to specify for the decline of the crack boom. Joyce's second contention is that the intuitive logic of demographic correlation of aborting mothers and criminal behavior is also short-sighted and misleading. He cites

¹⁶ Donohue and Levitt (2001), pp. 405

¹⁷ This leads to the estimation that the typical aborted fetus has four times as great a criminal propensity than the average cohort member. This directly relates back to contention one.

studies that within demographic groups, women who abort are likely to have more education than those who carry a baby to term. Since mother's education level is a primary factor, negatively correlated with future criminal behavior, this would seem to provide evidence against Donohue and Levitt's first argument that mothers bearing potential criminals are more likely to abort; Joyce claims that in fact the opposite is true, and that since most early legal abortions were simply replacing illegal abortions given to higher-education women, *Roe v. Wade* had little impact on cohort makeup at all. The author closes by stating that there is "little evidence to suggest, however, that the legalization of abortion had an appreciable effect on the criminality of subsequent cohorts"¹⁸.

Donohue and Levitt responded to each of Joyce's contentions in their 2004 paper¹⁹. First, Joyce claimed that due to legal abortions replacing illegal procedures, there is no cohort change and the original authors had severe measurement error in their proxy for abortions. The authors claim that not only is this not accurate econometrics, but since they begin with the assumption of zero abortions before 1973, the impact of each abortion is understated, and the magnitude of the effect of legalized abortion on crime was in fact greater than estimated in the original analysis. Further, they assert that although educated women are more likely to abort, less educated women are more likely to get pregnant, and thus account for a higher overall percentage of abortion²⁰. Second, Joyce finds little impact of abortion on crime during the years 1985-1990. Donohue and Levitt reply by arguing that the magnitude of the crack epidemic is such that it is difficult

¹⁸ Joyce (2004), pp. 26

¹⁹ The reply was in the same issue of the *Journal of Human Resources* as Joyce (2004).

²⁰ The authors also point out the Joyce is contradicting himself on this issue, and refer to his 1987 paper where he determines that repealing abortion would have a negative effect on birth outcomes, the reverse of what he claims in 2004.

to produce any solid results from these years; they also note that abortion did seem to have a strong effect on property crimes during these years²¹. The authors generally dismiss this claim due to omitted variables and the strength of the results in the 1990s. Third, Joyce finds no evidence of abortion impacting crime when taking a differences-in-differences estimator of early-legalizing states versus those that waited until 1973. Donohue and Levitt argue that this may be a function of Joyce's choice of sample size; when the authors ran this experiment again for a multitude of age groups, their findings were much more supportive of the original results. Fourth, in the states that did not legalize early, cohorts born after legalization did not show a decrease in criminal activity compared to those born before; Joyce chooses to look at only national time-series data, and limits his analysis to only a section of the available periods. The authors retort this claim by using the counterargument that such factors as crack that Joyce failed to control for will damage the results, and run their own regression showing an impact of abortion after controls are implemented. Fifth, Joyce finally argues against the causality of the proposed relationship, mentioning that the states legalizing before 1973 enjoyed far greater reductions in crime, even after the national legalization. This is argument by Joyce is less powerful than the others, since the original paper showed the gap in abortion rates between these two groups actually growing over time. Since the five states in the early group continued to have an increased number of abortions, the authors take this argument as further evidence of their theory. In summary, the authors generally suggest that since Joyce limits his data analysis to the six-year window in which crack is most prominent, his contentions should not be taken as a counterfactual to their argument.

²¹ Donohue and Levitt consider property crimes to be the crime index least likely to be influenced by the crack wars taking place in urban areas at this time.

Joyce responds to this rebuttal by arguing from a new angle. In his 2004 working paper, he first attempts to demonstrate the frailty of Donohue and Levitt's results. He argues that since the number of necessary controls is vast²², the coefficients are very sensitive to the inclusion or removal of the various interactions, and can in fact be shown to switch signs while remaining significant. Joyce contends that this leads to data instability, with the excessive controls needed to produce the results allowing too little fluctuation in the observed variables, and that the results that support the original theory are not robust enough to gain significance. He counters with his own analysis, using fertility rates, not abortion rates, and finds little impact for the original argument²³. He contends that since fertility was little changed, it would be difficult for abortion to have an effect on crime²⁴.

The only other direct response to the original paper comes from Foote and Goetz (2005). These authors counter on two purely econometric grounds; first, they show that in the original regressions run by Donohue and Levitt, they failed to include a state-year interaction term that was listed in the model when they performed the analysis. Secondly, Foote and Goetz argue that in the sixth point in the original paper, population data should be added to the regression when discussing arrest data, since total population is likely to be very significant when discussing arrest rates. The authors address the interaction term problem, and revise both sets of regression results with the included variable. They find not only that population size is very relevant, but also that the

²² The model Donohue and Levitt use has, most recently, almost 1300 parameters, compared to 7000 observations.

²³ The caveat is that Joyce uses only the 45 states that failed to legalize early, which certainly has an impact on his results.

²⁴ Joyce addressed his seeming contradiction of his earlier work, by arguing that the negative impact of banning abortion on birth outcomes would not be significant enough to cause a wholesale drop in the crime rate.

coefficients become insignificant. Thus, Foote and Goetz conclude that the original argument is flawed due to these exclusions, and there is little or no evidence that legalized abortion reduces crime outside of the proportionality expected when cohort size is reduced.

Donohue and Levitt respond in 2006 to the above paper. While they concede that the first programming flaw is an “embarrassing” mistake, they argue that it shrinks the magnitude of the effects of abortion without altering the overall result. As to the second argument, they answer that the method as used in Foote and Goetz is flawed in removing too much variation from the data, leading to a lack of results. Donohue and Levitt then construct a similar model with abortion proxies and cross-state variation. With this, they intend to lessen measurement error and produce more robust results. Using an instrumental variable²⁵, the authors provide a different estimator and receive similar results to those in the original paper. Thus, they argue the link between legalized abortion and crime reduction is still statistically strong. In conclusion, the authors repeat their theory, and contend that no analysis has yet disproved their results²⁶.

It is not the intent of this paper to recreate the entirety of the original argument, but merely the most critical segment of it using the new data set discussed in Section III, and an analytical expansion on the first contention made in Donohue and Levitt (2001). While the other approaches have merit, the crucial story in the original paper is the regression analysis of the impact of effective abortions rates on crime; while a full recreation of the progressing works would be useful, such a task falls outside the scope of this paper, and will have to be left for further research.

²⁵ Abortion data collected by the Center for Disease Control.

²⁶ The authors also point out that Foote and Goetz argue on only one of their six contentions, and were somewhat optimistic when they purported to have refuted the entire hypothesis.

3. Discussion of Data

In order to measure the impact of abortion on crime, a combination of data is needed - both across different states, to account for state fixed effects and the differences in the five early-legalizing states, and across time, since the theory implies there is a time lag between the abortion decision and the crime impact. For this reason, every author investigating this hypothesis has chosen to use panel data. The data for this paper comes from two sources. The original data Donohue and Levitt used in their paper is available online; it may be updated. The second data component is compiled from various government and independent sources. The data originates from, by type: abortion data²⁷ is taken from the Johnston Archives, which tracks abortions for the United States, using data from both the Center for Disease Control and the Alan Guttmacher Institute, and various other reporting countries; crime, police, and arrest data come from the Uniform Crime Reports, compiled by the FBI; data on prison populations comes from the *Correctional Populations in the United States* report, published by the Bureau of Justice Statistics; data on unemployment levels, poverty thresholds, fertility, welfare distribution, and per capita income all comes from the *United States Statistical Abstract*, published by the Census Bureau; the timing and extent of shall-issue gun laws was derived from a gun advocacy website; and beer consumption data is taken from the *Brewer's Almanac*, published by the Beer Institute. The data is paneled by state, and the potential fixed effects may be large, with states such as New York and California accounting for a much

²⁷ A major caveat for abortion data is that several US states ceased requiring abortions to be reported to the Center for Disease Control as of 1997; this has greatly skewed post-97 totals, and leads to a rather unorthodox trend line. However, this should have little bearing on this paper, since the 1997 cohort is 8 years of age at the endpoint of this study, and unlikely to be criminally active; their abortion totals are not necessary.

greater proportion of abortions per capita than a state such as Utah or North Dakota²⁸.

Thus, the observations are abortions, crime rates, and various controls that shall be discussed in the model section over time. All values are relatively variable, both within the entire sample, and within states over time. The effective abortion rate, discussed in a following section, also widely varies, due to it being near zero at the beginning of the measured period for most states. Property crime has the highest effective abortion rate, which is consistent with the observation that those crimes are committed mostly by the young. The summation of the data is as follows:

²⁸ Logically, urban centers tend to abort more, and also experienced a greater crime reduction almost across the board. The extreme outlier is the District of Columbia, which has high levels of both abortion and crime - most authors have either excluded it or treated the results skeptically.

Table I
Summary Values

Variable	Mean	Overall SD	Within State SD
Violent Crime per 1000	6.02	2.56	1.34
Property Crime per 1000	43.3	12.0	7.9
Murder per 1000	.07	.04	.02
EAR per 1000 live births by crime			
-Violent Crime	149.4	132.6	108.4
-Property Crime	199.5	145.6	109.2
-Murder	120.9	121.5	103.4
Prisoners per 1000 (t-1)	3.5	1.59	1.14
Police per 1000 (t-1)	3.0	.71	.34
State personal income per capita (1997 \$)	25006.83	4103.88	2492.56
AFDC per family (t-15)	6683.08	2789.10	1420.34
Beer Consumption per capita	22.46	3.4	1.45
Percent below Poverty line	13.2	3.3	1.6
Percent Unemployed	5.7	1.5	1.2

4. Discussion of Crime Trends and the Abortion-Crime Mechanism

The motivation for this paper is derived from a few simple observations about the trends of criminal behavior in the United States. When the original Donohue and Levitt paper was published in 2001, they marked an endpoint to the study at 1997; a summary review at crime rates²⁹ since 1997 reveals that this was hardly the end of the decline - in fact, crime declines for practically every year in the decade of the 1990s. The impetus behind this further examination of abortion and crime is the trend immediately following

²⁹ See graphs

those years; in the 21st century, crime seems to have reached a lower plateau. This is almost exactly 20 years after abortion rates themselves reached a sort of steady state³⁰, and 20 years was Donohue and Levitt's estimated lag for abortion to obtain maximum effect on crime rates. Thus, this paper seeks to measure the continuing effect of abortion on crime, and whether the decline has continued or reached a steady state.

Table II
Crime Trends - Early Legalizing States and *Roe v. Wade* States

Type of Crime	Percent Change in Crime Rate Over Period:					
	1976-1982	1982-1988	1988-1994	1994-1997	1997-2005	1982-2005
Violent Crime						
-Early	16.6	11.1	1.9	-25.8	-39.8	-52.5
-Non	20.9	13.2	15.4	-10.8	-20.9	-3.1
-Spread	-4.3 (5.5)	-2.1 (5.4)	-13.5 (4.4)	-15.0 (3.3)	-18.8 (5.2)	-49.4 (8.5)
Property Crime						
-Early	1.7	-8.3	-14.3	-21.5	-27.3	-71.4
-Non	6.1	1.5	-6.0	-7.5	-23.4	-35.4
-Spread	-4.4 (2.9)	-9.8 (4.0)	-8.4 (4.2)	-14.0 (10.7)	-3.9 (4.3)	-36.0 (11.7)
Murder						
-Early	6.3	0.5	2.7	-43.9	-22.3	-63.0
-Non	1.7	-8.8	5.2	-21.1	-15.7	-40.4
-Spread	4.6 (7.3)	9.3 (6.8)	-2.5 (8.6)	-22.8 (6.8)	-6.6 (6.5)	-22.6 (10.9)
Effective Abortion Rate at End of Period						
-Early	0	64.0	238.6	326.7	486.5	486.5
-Non	0	10.4	87.7	140.7	243.3	243.3
-Spread	0	53.7	150.9	186.0	243.3	243.3

³⁰ See graphs

There are two methods that can examine the continuing effect of abortion on crime; we can divide the states into groups based on their legalization decision, and we can separate them by abortion rate. The five states that legalized abortion prior to 1972 were found by Donohue and Levitt to have experienced markedly more rapid decline in the crime rate compared to the *Roe v. Wade* states. This can be easily amended to include post-1997 data. As seen in the table above, the results seem consistent with the theory. While early-legalizing states have experienced a significantly greater decrease in crime, the gap has closed in the most recent period for both murder and property crime; violent crime seems to be a tad anomalous. However, the link between abortion and crime seems reasonable with the data, as there was little separation in crime rates for the period preceding the mid 1980s, when the first effects are projected to be felt, but a significant difference in the decline taking place in the 1990s and to a lesser extent in the 2000s.

Table III

Crime Changes as Function of Effective Abortion Rate

Abortion Incidence, ranked by 2005 EAR	EAR per 1000 live births, 2005	Percent Change in Crime Rates, 1973-1985			Percent Change in Crime Rate, 1985-1997			Percent Change in Crime Rate, 1997-2005		
		Violent Crime	Property Crime	Murder	Violent Crime	Property Crime	Murder	Violent Crime	Property Crime	Murder
Low	132.3	32.0	29.6	-21.3	30.6	-6.1	4.4	-21.9	-17.8	-24.5
Mid	235.6	30.3	30.6	-20.3	17.7	1.3	-9.4	-18.8	-20.1	-15.6
High	412.2	30.9	14.5	-8.3	-3.7	-23.8	-29.7	-31.7	-30.1	-15.9

The second and more equitable method is to separate states by abortion level. Specifically, they are divided into three groups based upon the 2005 effective abortion

rate for violent crimes - each grouping contains 17 states, counting the District of Columbia; here again the data shows a trend consistent with theory. The high-aborting states quickly reduced crime, but the mid and low states eventually caught up; the low-aborting states especially seem to have felt the lagged effects after their peers. The crime rates, at least, trend in the direction that seems to be consistent with a link between an approximately 20-year lag between abortion rates and crime reduction.

The mechanism for high abortion rates was originally conceived by Donohue and Levitt as a thought exercise, but was lacking in any analytical backing. This paper will attempt to rectify this to some degree with a novel look at how the legalization of abortion may have affected certain demographics. Specifically, the topic will be the Aid to Families with Dependent Children program and its effect on the abortion rate during the period in question. While this argument may not explain a large portion of abortion and crime link, it is interesting as an analytical backing for the original logic concerning the causality of the connection.

The Aid to Families with Dependent Children program was started in 1935 as a way to help needy families who were unable to financially support their children. The typical AFDC family³¹ consists of a single, unemployed, uneducated mother who had approximately two children, lived in an urban setting, and received, in 1997 dollars, around \$7,000 per year in aid from the government. It is easy to see that this fits the profile of not only the typical woman who seeks abortion, but the typical environment that leads to criminal behavior. It is possible to think that the ability of women to receive

³¹ Around 10% of all mothers with children received AFDC; this figure rose to 25% for black mothers.

Federal assistance may factor into the birth decision; therefore, the examination looks for a correlation between AFDC generosity and abortion rates³².

The model in which these trends are examined in is a fairly simple one; the equation is:

$$ABORT_{st} = \beta_0 AFDCper_{st} + \beta_1 Incomeper_{st} + \beta_2 Unemp_{st} + \delta_s + \gamma_t + \varepsilon_{st} \quad (1)$$

The left hand side is the rate of abortions per 1000 live births, indexed by state and year; this variable is lagged one year. The AFDCper variable is the amount each receiving family was granted in December of each year, multiplied by 12 to get a full year's value, and converted to 1997 dollars. Since the value is measured in the month of December, the abortion variable was lagged to avoid fluctuations within the calendar year; thus, the 1975 AFDC benefits affect the 1976 abortion rate. The Unemp and Incomeper variables are unemployment rate and state per capita indexed by state and year. The other terms are state and year fixed effects, and the error term. The model is estimated with data from the sources listed in the previous section using weighted least squares, with state populations as weights. The results are in the table below.

Table IV
Effects of Economic Indicators on Abortion

Variable	During the Period:	
	1971-1980	1981-1989
AFDC per family	-.023 (.005)	.002 (.003)
Unemployment rate	10.7 (4.3)	2.14 (2.42)
State per capita income	.026 (.009)	.001 (.004)
R ²	.913	.885

³² Before it was discontinued in 1997 and replaced by a more efficient system, critics saw AFDC as a means for single women to avoid working; by continuously bearing children, they could receive government funding with little restraint. However, as attitudes changed in the 1960s and 70s, there was public pressure to reduce AFDC payments. This coincided with the *Roe v. Wade* decision, and provides a natural experiment unlikely to be equaled.

Abortion rates reached a plateau in the early 1980s; at approximately the same time, total AFDC aid reached a low in real spending³³, and maintained a lower rate for several years. This is not to suggest that the rapid increase in abortion rates were totally due to decrease in AFDC aid, but a correlation seems to exist. The analytical results suggest that for every 1997 dollar less in AFDC aid during the period from 1971 to 1980, the abortion rate per 1000 live births increased by .02. This would imply that for every 50 1997 dollars less in aid, the abortion rate rose by 1. On the face of it, this is not a stunning result. However, it becomes more so when the change in AFDC aid from 1971 to 1980 is considered. In 1971, average AFDC aid was \$8940.44; in 1980, it had dropped to \$6544.66, a change of \$2395.78. If every \$50 decrease over this period led to one extra abortion per 1000 live birth, this would imply an abortion increase of approximately 47. Since the actual abortion rate increase from 1971 to 1980 was approximately 293 per 1000 live births, this decrease in AFDC aid potentially counts for up to 16 percent of the total change.

This is an interesting result. It is difficult to explain as a matter of scale since only 10 percent of all mothers receive AFDC at any given time³⁴. This analysis would seem to indicate that these mothers were aborting with a much higher frequency than their peers, not just at a “normal” abortion rate, but due to decreased levels of government aid. This is consistent with the theory of abortion and crime, and provides the first tenet for Donohue and Levitt (2001); however, this is the first data-based analysis this paper is aware of in this area.

³³ This is likely for political reasons unrelated to abortion; the decline in AFDC benefits began before 1972 and was not correlated with abortion on a state level.

³⁴ US Census Bureau

5. Model and Methodology

The model used in the analysis of this data is relatively simple - it was originally proposed in Donohue and Levitt, and each related article has used a similar model. The regression equation is:

$$\ln(\text{Crime}_{st}) = \beta_0 + \beta_1 \text{ABORT}_{st} + X_{st} \beta_2 + \gamma_s + \delta_t + \varepsilon_{st} \quad (2)$$

The model is a standard two-way fixed effects panel data model, using not only the two keys elements of abortion and crime, but also a range of other control variables. The indexes are s and t , in which s marks state and t marks time. The coefficients of interest are β_1 and β_2 , where the former is the effect abortion has on the crime rate in question and the latter a vector of the control coefficients, which represents the effects of other potential crime determinants. The fixed effects as stated capture the unobserved state- or time-specific components of crime that are separate from the abortion effect.

The left-hand side of the equation is the log of the different crime rates per capita, indexed over the states and years contained within the data. The analysis looks at violent crimes, property crimes, and murder and non-negligible manslaughter. The log operator is used for expediency; the results will be returned in semi-log form, which will be expressed as percentages, an approach borrowed from the original paper.

The right-hand side includes the abortion variable that is of main interest in the model. The indexed data here is not abortions per capita, nor total numbers; Donohue and Levitt refer to it instead as an “effective abortion rate.” The calculation method is:

$$\text{Effective_Abort}_t = \sum_a \text{Abortion}_{t-a} (\text{Arrests}_a / \text{Arrests}_{\text{total}}) \quad (3)$$

The indexes are again t for time and a for age of the cohort in question. The Abortion variable is now the number of abortions per 1000 live births; this is a far more accurate

indicator of fertility decisions than abortions per capita or a total number. The Arrests ratio is the percentage of arrests accounted for by the members of the particular age cohort a in the year 1985 - this total is for the United States, so all states and years are weighted equally. However, since the abortion rates vary over state and year, this process assigns a unique value to each year, state, and type of crime: violent, property, or murder. The end result is three Effective Abortion variables, increasing with time³⁵, as more and more criminally active generations are born³⁶. The idea behind using this rate as opposed to a raw number is that the true effect of abortions can only be felt over time; an alternative would be to regress the current crime rate against all previous abortion rates, but that would provide for an unwieldy model, as well as the difficulty of determining the overall results. This method allows for all previous rates to be combined at the approximate ratio of their consequence on current-day crime; in a steady-state of abortion rates, when every active cohort had been exposed to legalized abortion at the same rate, the effective abortion rate would equal the actual abortion rate. In summary, the effective abortion rate reports the entire effect of all abortions performed on a particular year t - as more potentially criminal cohorts are born post-legalization, the more crime rates are impacted.

³⁵ The Effective Abortion rate for violent crimes in 1985 was 10.4 for the *Roe v. Wade* states; by 2005, it was 243.3

³⁶ For example, the abortion rate per 1000 live births in Alabama in 1973 was 78. The earliest the impact of this could be felt was 1982, when the cohort exposed to this rate reached the age of 9; 9 is the youngest year arrest data is available for. However, since the 9-year-old arrest rate is very close to zero, it is unlikely to have had much effect. The youngest age at which arrests become significant is 15; thus, this study begins calculating Effective Abortion Rates beginning in 1985, the year at which the early-legalizing states had 15-year-olds born under abortion.

The remaining portions of the explanatory side of the model are straightforward. The state- and year-specific fixed effects are represented by γ and δ ³⁷. The X is a vector of control variables, such as police and prisoners per capita, as well as other economic and social factors, such as per capita income and per capita beer consumption³⁸. The estimation method used is weighted least squares, with the weights corresponding to state population.

The problem of serial correlation among the model errors may present itself; correlation is high for all the variables, and may lead the analysis to overstate the significance of the regression results. Following Donohue and Levitt, the Prais-Winston method as described in Bhargava et al. (1982) is used to account for serial correlation in the panel data model³⁹.

The key results will appear in the β operator; the results in the following sections are the coefficients of some variable in the model. The most significant, in terms of this research, is the operator for the ABORT variable; this is the impact of legalized abortion on crime. The next sections will deal with this impact and its estimated magnitude.

VI. Results of Regression Analysis

The results of the regression in (2) are as follows, with standard errors in parentheses. The dependent variable is the natural log of crime rate per capita of all three types of crime indices: violent crime, property crime, and murder. The first, third, and fifth columns contain the results from regressions run with only the ABORT term as an

³⁷ Ted Joyce objects to using the fixed effects approach, but his differences-in-differences methodology is flawed, as described in Donohue and Levitt (2004).

³⁸ The number of crimes committed under the influence of alcohol has been estimated to be as high as 50%.

³⁹ This method is as follows; after the residuals are calculated in the original regression, they are transformed by equation (23) in Bhargava et al. to find estimates of the residuals, and the model is re-run with the new data. It provides estimates of lower magnitude, but by removing the correlation that is inherent in the first regression.

independent variable. The second, fourth, and sixth columns contain the listed controls in addition to the ABORT term. All regressions contain fixed effects of state and year, are weighted by state population, and are corrected for serial correlation in the manner described in Bhargava et al. (1982). The R^2 term is reported in the final row for each column.

Table V
Regression Analysis Data

Variable	ln(Violent Crime per capita)		ln(Property Crime per capita)		ln(Murder per capita)	
	(1)	(2)	(1)	(2)	(1)	(2)
-EAR (x100)	-.158 (.017)	-.154 (.018)	-.082 (.025)	-.086 (.024)	-.119 (.017)	-.149 (.023)
-ln(prisoners per capita) (t-1)	--	-.003 (.03)	--	-.068 (.027)	--	-.202 (.049)
-ln(police per capita) (t-1)	--	-.024 (.031)	--	-.033 (.029)	--	-.266 (.090)
-Percent unemployed	--	.001 (.001)	--	.002 (.002)	--	-.003 (.003)
-ln(income per capita)	--	.162 (.390)	--	1.26 (.340)	--	.983 (.77)
-Percent below poverty line	--	.130 (.151)	--	.094 (.192)	--	.299 (.303)
AFDC per family (t-15)	--	.000 (.000)	--	.000 (.000)	--	-.000 (.000)
Shall-issue gun law	--	.003 (.003)	--	.003 (.003)	--	-.001 (.007)
Beer consumption per capita	--	.003 (.01)	--	.024 (.009)	--	-.021 (.024)
R^2	.891	.898	.943	.948	.892	.895

There are some notable items in this table. First, we can see that the estimated effect of abortion on crime is strong for all three types of crime. The estimates for 1985-2005, the years covered in the sample, indicate that an increase in the effective abortion

rate of 100 per 1000 live births is associated with a 15 percent reduction in the murder rate, a 15.4 percent reduction in the violent crime rate, and an 8.6 percent reduction in the property crime rate. Since the average effective abortion rate in 2005 was 252 for violent crime, this represents a potentially large impact that approximately correlates with the decline observed in the United States crime trends. These are also substantially higher estimates than originally reported by Donohue and Levitt (2001) - they associated a similar increase in effective abortions with a 12 percent reduction in murder, 13 percent in violent crime, and 9 percent in property crime. The estimates obtained by this paper, however, are consistent with the hypothesis that property crimes, being largely committed by the young, are likely to be the first impacted by abortion, and the first to feel the declining effects as the cohorts have progressed - after a steady-state rate of abortion is reached, the impact on crime will no longer be a factor. Thus, the declining impact on property crimes that is observed in 1997-2005 may be attributed to reaching some sort of abortion steady-state, as abortion trends leveled off in the early 1980s⁴⁰.

The coefficients for the other variables are generally reasonable. Increased numbers of police and prisoners reduce crime, especially murder - murder being the most likely crime to draw a prison sentence, as well as the most likely crime for the police to solve. Unemployment, Aid to Families with Dependent Children, and Shall-Issue weapon laws have little or no effect on any type of crime. Beer consumption increases property crimes, but has little significant effect otherwise. An increased level of poverty appears to affect crime, but not significantly. The only result that differs greatly from the original estimates is that of state per capita income; this regression finds it to have a

⁴⁰ See Graph

significant effect on property crime, and to a lesser extent murder; this is possibly a compensating effect for the decline discussed in the following sections.

Since the model is all-inclusive of states and years, there could be a question of sensitivity to sample composition. Table V presents alternative specifications of the model and their impact on the results. The coefficients listed as “Baseline” are the same as were discussed above in Table IV. The next few rows exclude the various outliers in the relationship between crime and abortion rates - the states of New York, California, and the area of the District of Columbia all experienced higher than normal abortion and crime rates, and corresponding crime loss. The D.C. area has specifically been targeted, since it is believed that abortion rates are skewed by women from other areas traveling to D.C to receive an abortion - in fact, the abortion rate there is four times the national average⁴¹. Removing New York, California, and D.C. from the data, first individually and then together, somewhat weakens the results, but does not alter the significance or sign of the impact.

⁴¹ Donohue and Levitt (2001)

Table VI**A Few Alternate Specifications**

Specification	Coefficient on EAR when Dependent Variable is:		
	ln(Violent Crime per capita)	ln(Property Crime per capita)	ln(Murder per capita)
Baseline	-.153 (.018)	-.086 (.024)	-.149 (.023)
Excluding New York	-.128 (.020)	-.078 (.028)	-.071 (.024)
Excluding California	-.154 (.018)	-.081 (.028)	-.170 (.025)
Excluding D.C.	-.167 (.018)	-.098 (.025)	-.172 (.024)
Excluding NY, CA, D.C.	-.140 (.023)	-.078 (.039)	-.127 (.028)
Including State-specific trends	-.010 (.035)	.023 (.025)	-.002 (.058)
Unweighted	-.065 (.022)	-.005 (.022)	-.016 (.032)
Unweighted, excluding D.C.	-.118 (.024)	-.031 (.032)	-.094 (.027)
Unweighted, excluding NY, CA, D.C.	-.097 (.028)	-.019 (.035)	-.058 (.033)
Control for (t-20) fertility rate	-.154 (.018)	-.086 (.025)	-.149 (.023)
Long differences, 1985-2005	-.139 (.045)	-.135 (.043)	-.137 (.054)

Adjusting for state-specific time trends changes the sign of property crimes, a result Donohue and Levitt also observed, and generally increases the standard errors. Running the regression analysis without weighting by state population sharply reduces the estimates, but removing outlier D.C. brings the coefficients back in line with the weighted values. Controlling for the rate of fertility, the number of births per 1000 in state population, has little or no impact on the estimation. Finally, using only the two endpoint years, 1985 and 2005, we receive slightly smaller but still negative and significant results.

Since the original paper relating this methodology was published in 2001, eight more years of data have been collected and analyzed; we can look at the change that have taken place in this model since it was first described. Table VI looks at the coefficients over time since 1997. The 2005 results are simply reproductions of the above Table IV; the rest have been produced by incrementally adding one year of data from the end of 1997 until 2005.

Table VII

The EAR Coefficients 1997-2005

Using data from 1985-Year	Coefficient on EAR-Violent Crime	Coefficient on EAR-Property Crime	Coefficient on EAR-Murder
1997	-.137 (.024)	-.071 (.032)	-.110 (.037)
1998	-.143 (.022)	-.078 (.031)	-.145 (.035)
1999	-.147 (.020)	-.088 (.030)	-.150 (.030)
2000	-.147 (.019)	-.092 (.028)	-.143 (.025)
2001	-.147 (.019)	-.092 (.027)	-.141 (.022)
2002	-.149 (.018)	-.090 (.027)	-.131 (.020)
2003	-.148 (.018)	-.086 (.026)	-.128 (.019)
2004	-.157 (.018)	-.083 (.026)	-.122 (.017)
2005	-.158 (.017)	-.082 (.025)	-.119 (.017)

The estimates are consistent with a story that the impact of legalized abortion peaked around the turn of the century, and have declined since then. This holds true for both murder and property crime; the exception is violent crime. While the effective abortion rate for violent crime's estimated operator seemed to have peaked, it began ascending again, while the other estimations seem to be in decline. However, since the demographic for violent crime offenders is older than that of property crime, it is feasible that while the impact of abortion may have peaked for property crimes, the effect on violent crime may still be increasing. The explanation for murder's decline would be the

effective tendencies of prison and police to prevent murder as opposed to other crimes. It is also notable that the standard errors for all three variables are declining, which should be expected as more observations are added to the sample period.

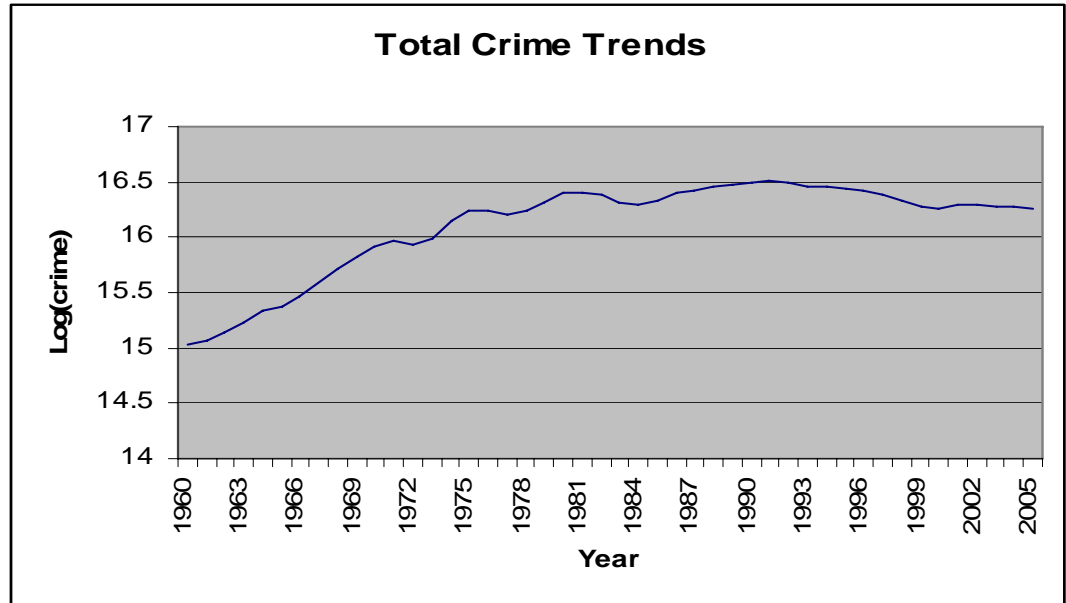
7. Conclusions

The regression analysis performed in this paper has found a significant impact of legalized abortion on crime through the mechanism of altering birth decisions. Further, this paper has shown results consistent with the theory that this impact may have grown since the publication of the original Donohue and Levitt article in 2001; specifically, the impact is 3 percent greater for murder, 2 percent greater for violent crime, and 1 percent greater for property crimes. Since property crimes are disproportionately crimes of the young, it is logical that the decline of abortion's impact be felt in that category first. Since the effect of legalized abortion on crime in an abortion steady-state is zero, and since a plateau of abortion rates was reached in the 1980s, we may be observing an end of the crime-reducing effects of the *Roe v. Wade* decision. While the reduction of crime is a social positive, this paper in no way suggests that increased abortion is a net societal benefit; since the negative effects of abortion are difficult to competently measure, this paper draws no conclusion in that area. Rather, that, *ceteris paribus*, a world with legalized abortion appears to have significantly less crime than one without.

There are still several extensions that could be made to this theory; for example, modeling the effects of abortion on other birth-outcome measures, such as birth weight, test scores, or school drop-out rates could provide information on the birth decisions of at-risk mothers. However, the magnitude of the effect in those areas is likely to be significantly less than that of crime; population means will be less impacted, since crimes

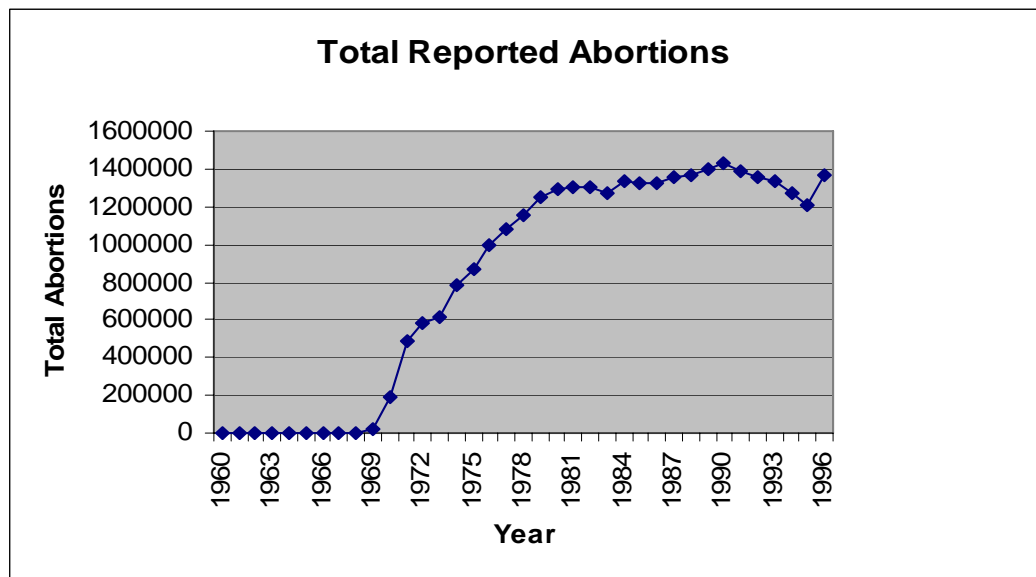
are generally committed by a select grouping of an age-cohort. Research could also be done in the area of timeline impact, examining how far into the future the effects of abortion will be felt before they cease by using a lagged variable mechanism to better estimate the effect over time.

Appendix



Donohue and Levitt's Original Regression Table

Variable	ln(Violent Crime per capita)		ln(Property Crime per capita)		ln(Murder per capita)	
	(1)	(2)	(1)	(2)	(1)	(2)
-EAR (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)
-Percent unemployed	--	.069 (.505)	--	1.310 (.389)	--	.968 (.794)
-ln(income per capita)	--	.049 (.213)	--	.084 (.162)	--	-.098 (.465)
-Percent below poverty line	--	-.000 (.002)	--	-.001 (.001)	--	-.005 (.004)
AFDC per family (t-15)	--	.008 (.005)	--	.002 (.004)	--	-.000 (.000)
Shall-issue gun law	--	-.004 (.012)	--	.039 (.011)	--	-.015 (.032)
Beer consumption per capita	--	.004 (.003)	--	.004 (.003)	--	.006 (.008)
R ²	.938	.942	.990	.992	.914	.918



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