A Why did the US crime rate fall in the 1990s? Evaluation lessons from a cause celebre

When crime rates in New York city fell markedly in the 1990s, one early and popular conclusion was that Mayor Giuliani's 'zero tolerance' policing policy was having significant effect (Waley, 1999). If policing effort were the main cause, that could have had obvious policy relevance all over the world: police and courts should focus more on deterring even minor crime.

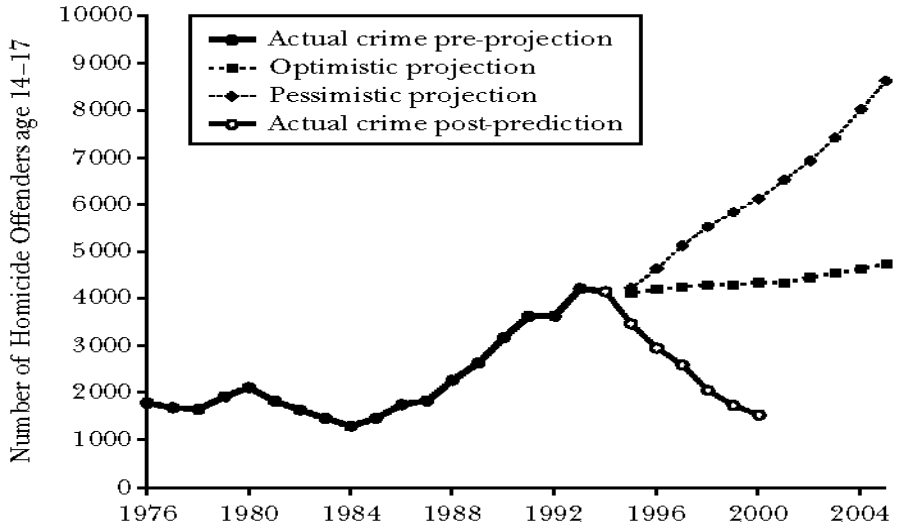
But it was soon noticed that crime rates fell remarkably all over the United States at much the same time: homicides fell by more than 40 per cent, and other violent crime and property crime by more than 30 per cent. Even the direction of change was unexpected — experts had been predicting a crime increase (figure A.1).[1] Instead, even cities such as Los Angeles that had not improved their policing, also experienced falling crime rates.

A.1 Exploring a conundrum

So the search for possible contributing causes widened: perhaps more criminals were being jailed for longer, or perhaps the peaking of the crack cocaine 'epidemic' reduced drug-related homicides and property crime. Table A.1 shows the most popular explanations in the major US newspapers over the period 1991-2001.

[1] Prominent criminologist Professor James Allen Fox was commissioned in 1995 by the US Attorney General to report on crime trends, and predicted 'the next crime wave will get so bad that it will make 1995 look like the good old days'. Instead, juvenile homicide rates fell by more than 50 per cent in the ensuing six years (cited in Levitt 2004, p. 169).

Figure A.1 1995 Teen Homicide Forecasts Compared to Actual Teen Homicides, 1995-2000



a Report on crime trends commissioned by US Attorney General from Professor James Alan Fox.

Source: reproduced from Levitt (2004, p. 169)

Table A.1 Common Media Explanations for the Decline in Crime in the 1990s, Ranked by Frequency of Mention

Explanation	*Number of mentions*
Innovative policing strategies	52
Increased reliance on prisons	47
Changes in crack/other drug markets	33
Aging of the population	32
Tougher gun control laws	32
Strong economy	28
Increased number of police	26
All other explanations	34

Notes: Based on a Lexis-Nexis search of articles written about the national decline in crime in leading newspapers over the period 1991-2001.

Source: Levitt (2004 p. 164)

In 2001, following wide circulation of a draft paper among the US economics and legal professions, Professors John Donohue and Steven Levitt published a striking hypothesis in a peer-reviewed journal. They suggested increased abortions in the early 1970s had largely contributed to lowering the crime rate a quarter-century later. They concluded the Roe v Wade supreme court ruling in 1973 had so suddenly and greatly liberalised legal access to abortion that the overall abortion rate greatly increased. (For a period after Roe v Wade, abortion in the US rose to the rate of one for every two live births.) Through channels explained below, they initially estimated liberalisation to have caused up to 50 per cent of the decline in criminal activity across the US twenty years later. In addition to this factor, increased incarceration was initially estimated to have accounted for perhaps another 20 per cent of the fall (Donahue and Levitt 2001).

They offered a mixture of natural experimental, quasi-experimental and other econometric evidence using data for all the US states, that also controlled for some other possible influences on crime such as differences across states and over time in policing, incarceration policies, handgun laws and economic conditions. (They could not econometrically control for crack cocaine trends, which had not at that time been quantified at the necessary level of state detail and over time.) [2]

A later work by Levitt, using new estimates of the likely effect of crack cocaine trends, lowered the estimated contribution of abortion law liberalisation, but suggested that just four factors could explain virtually all of the fall in violent crime (table A.2). In order of declining significance, the factors were: increased incarceration, legalised abortion, the decline of crack cocaine and more police (Levitt 2004, pp. 176-184).[3]

2 The natural experiment aspect of the study examined the differential changes in abortion and crime in the five states that had individually liberalised their abortion laws in 1970, compared to those whose abortion rates only increased after Roe v Wade in 1973. Econometric analysis also benefitted from the remarkable diversity of abortion rates across the US States, both before and after Roe v Wade. For example, in the years after Roe v Wade, the average US abortion rate was about 300 per 1000 live births, but ranged from 10 per thousand in West Virginia to 1793 per thousand in Washington DC.

3 The estimated relative significance of police numbers and the decline of crack varies by type of crime, with the crack decline having no impact on property crime, and most impact on homicide.

Table A.2 **Estimated Contributions to the US Decline in Crime in the 1990s**

Factor	*Percentage change in crime that this factor accounts for over the period 1991-2001:* Homicide	Violent Crime	Property crime	*Certainty level of estimated impact*
Strong economy	0	0	-2	High
Changing demographics	0	-2	-5	High
Better policing strategies	-1	-1	-1	Low
Gun control laws	0	0	0	Medium
Concealed weapons laws	0	0	0	High
Increased usage of capital punishment	-1.5	0	0	Medium
Increases in the number of police	-5.5	-5.5	-5.5	Medium
Increases in the prison population	-12	-12	-8	High
The decline of crack	-6	-3	0	Low
Legalized abortion	-10	-10	-10	Medium
Total of all factors considered	-36	-33.5	-31.5	
Actual change in FBI crime reports	-43	-34	-29	
Actual change in crime according to survey of victims	-	-50	-53	

Notes: The estimated impacts in the table are based on the discussion presented throughout the text of Levitt 2004. The last column of the table is Levitt's appraisal of how speculative the estimates are for each of the factors considered

Source: Levitt (2004, p. 184)

Abortion was argued to contribute to the crime decrease through two channels:

- First, the liberalisation of abortion policy caused a drop in unwanted births, so that some 20-25 years later, there was dip in the proportion of 18-24 year old males in the population. This age bracket is the period of highest crime by males. (Donahue and Levitt (2001) called this 'Shrinking the size of the cohort', and it can be considered a 'pure' demographic factor.)
- Second, as a result of women gaining another legal tool in 1973 to manage their fertility, some probably chose to bear children later in life at times of their preference, perhaps when children could be raised with more support (for example, because the mother was older, in a permanent relationship, or had a better job or higher education). So even when mothers who had had abortions subsequently chose to have children (and even if their lifetime fertility remained constant), their sons might grow to be young men with a lower statistical propensity to commit crime. (Donahue and Levitt (2001) called this 'Lowering the average crime propensity of those who are born through positive selection.') They initially estimated this selection effect contributed to about half the overall

impact on crime of the abortion changes, that is, about one-quarter of the total reduction in crime.

– Subsequent research suggested that in the US (but perhaps not in Canada - see Sen (2007)), the demographic effect dominated the selection effect. Most US women who had an abortion in the years after Roe v Wade had lower lifetime fertility, rather than just postponing the timing of their children (Ananat et al., 2006). In support of the view that selection effects may not be large, the only direct attempt to study whether unwanted pregnancies in the US, before Roe v Wade, predicted greater criminality of the offspring, produced only qualified support for the idea of 'positive selection'.[4]

A useful hypothesis explaining the 1990s' crime trends should offer or imply tests that could verify the hypothesis' application in other periods of time. Donahue and Levitt predicted the effects of Roe v Wade on crime would continue to subtract about 1 percent a year from the US crime rate for this decade and the next (other influences remaining the same) before reaching a stationary state (2001, p. 415). Essentially, criminals born pre-Roe v Wade would by 2020 have 'retired', the 'cohort effect' would have largely passed through the demographic structure, and the entire economically active population (including criminals) would have been born since the 'positive selection' effect of Roe v Wade.

This estimated contribution of liberalised abortion to reducing crime was popularised as a chapter of the best-selling *Freakonomics* (Levitt and Dubner 2005).

Donohue and Levitt stressed they were trying to establish the facts about the relative importance of many contributing factors to the crime rate reduction, not to offer any normative comment on abortion. But nevertheless their ideas seemed explosive in the US context. One magazine branded the work 'racist, genocidal stupidity' (cited in Abramsky 2001, p. 25). They were suspected 'from the right' of implied support

4 A few Scandinavian studies suggest the children of unwanted pregnancies have a higher crime rate in later life. But a study found a sample group of US children born between 1964 and 1969 (i.e. before Roe v Wade) from pregnancies which their mothers recalled to be unwanted or mistimed, exhibited greater delinquency over ages 11 to 17 (especially if male), but no significantly greater disposition to more serious crime over ages 17 to 23 (Hay and Evans, 2006, pp 57-61). The study could not test Donohue's and Levitt's exact hypotheses about positive selection. This was because data limitations forced it to examine the self-reported misbehaviour of all children from 'unwanted' or 'mistimed' pregnancies in its sample, not just the subset whose mothers might have chosen legal abortions if they had then been available. (Such information could not have been reliably gathered in sampling of voluntary respondents, even if the interest in abortion intentions had been foreseen at the time the data was gathered.)

for easier abortion to reduce crime (the demographic effect), and 'from the left', of tacitly supporting eugenics (the selection effect).[5]

A.2 Contested explanations: improving the evidence base and removing errors

The ensuing lively debate over Donahue's and Levitt's hypothesis illustrated many of the measurement issues, evaluation complexities and policy ambiguities that afflict most analysis of complex social phenomena with multiple influences. For example:

- Even though the study statistically examined and econometrically 'controlled for' many possible influences, perhaps other, unobserved variables were in play? Perhaps, for example, politically liberal and more urbanised states had higher pre-abortion crime rates and then had more abortions, both caused by other factors?[6]
- There was, of course, no direct measure of illegal abortions, and perhaps legal abortions mostly took the place of what would otherwise have been illegal abortions (Joyce 2003)? However the evidence confirms a large increase in the overall rate of abortions, and a significant fall in their price (Donahue and Levitt 2001, pp. 383-385; Donahue and Levitt 2003, pp. 32-33).
- Perhaps liberalising abortion also has the indirect effect of increasing out-of-wedlock births and creating more single-parent families, thus indirectly inducing more births from 'unwanted pregnancies' than abortion prevents? Some initially estimated that the net effect might actually have slightly increased crime, rather than reduced it. But subsequent study confirmed the net effect had been to reduce the size of the cohort born immediately after Roe v Wade (Ananat, Gruber, Levine and Staiger, 2006; Ananat, Gruber and Levine, 2007).

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5 The reason for racial sensitivity in this debate is the estimate by Donahue and Levitt that fertility decline for black women following abortion liberalisation were about 3 times greater than for whites (2001 p. 390). A Minneapolis official who had suggested independently and earlier (in 1990) that abortion had reduced crime was heavily criticised, and subsequently defeated at the polls (Levitt and Dubner 2005, p. 142).

6 An example of an unobserved variable in the Donohue and Levitt analysis was the progressive impact on fertility of the widening availability of the birth control pill, first released in 1957 but still restricted in some states until the early 1970s. Initial marketing and distribution had been hindered in 45 states by the effect of the 1873 'Comstock Act', which prohibited 'obscenities' and anything used 'for the prevention of conception'. Paradoxically, California and Washington state, which both liberalised abortion before Roe v Wade, still restricted the availability of the pill. (Untangling the impact of these restrictions on the use of the pill is itself a fascinating example of evaluation using the variability of practices across the US states.)

- Perhaps inadequate treatment of how much 1980s crime was driven by the crack cocaine-driven 'epidemic' distorted estimates of the effects of other factors, including abortion (Joyce 2003)?[7] A recent study (Fryer, Heaton, Levitt and Murphy, 2005) improved knowledge of the extent of the crack epidemic and its costs, and has provided evidence for the view that the likely effect of crack was to contribute to underestimation of the effect of abortion in reducing crime in the late 1980s, and to only modestly overestimate its effect in latter years. Estimates derived over the period as a whole should not be biased (Donahue and Levitt 2003, pp. 39-40).
- To add confusion to the debate, other academics attempting to replicate Donahue's and Levitt's results (with the authors' encouragement, and with free access to the authors' database), discovered a coding error that meant some of the originally reported estimates had not been subjected to some of the statistical tests that the authors' text claimed they had (Ananat et al. 2006 p 34; Foote and Goetz 2008). However, correction of this error made little difference to the original results. Data improvements to address cross-state mobility better[8], and some econometric improvements, showed the original estimates still stood (Donahue and Levitt, 2008).
  - The identification and correction of error in this complex body of work carries an important lesson, drawn by Donohue himself in an earlier, different context:

    > increased complexity means that it will be harder for researchers and readers to have a feel for the data, and it will be more difficult to critique an ostensibly well-crafted empirical study that isn't marred by one of the obvious pitfalls. As econometrics becomes increasingly technical, the rewards from the academy will more often go to those who have mastered complex mathematical techniques, rather than those who are alert to the relatively low-grade (but often pivotal) issues of data quality. Studies now pour out with conclusions based on increasingly fancy statistics, which their authors accept uncritically and which reviewers are at a loss to

7 Crack cocaine effects were potentially large – crack was a technological innovation virtually unknown prior to the mid 1980s, and its distinctive characteristics changed the nature of the drug trade. Its distribution through street gangs, and ensuing gang battles over 'turf', caused US youth homicide rates to briefly more than double in the late 1980s, overwhelmingly because of a surge in homicides among young blacks.

8 Donahue's and Levitt's methodology maps data recording the changing rates of abortion by state with changing recorded crime by people in the high-crime age bracket decades later. But women residing in one state sometimes have abortions in another, and children born in one state may migrate to another state in which they may commit crimes as young adults. The original 2001 study dealt with this issue only roughly, whereas a different data source allowed better treatment in the 2008 study.

appraise effectively absent an enormous amount of work through attempted replication. (Donohue 2001, p. 4)

– Even after almost a decade of testing, some researchers remain unconvinced that the statistical sources and Donohue's and Levitt's methodology are sufficiently robust to support the current (reduced) estimates of the impact on 1990s crime of abortion liberalisation. They observe that the original Donohue and Levitt estimates of the impact of abortion on crime were so large that its effect should also be apparent in the pattern of age-specific crime rates, but it is not. Donohue and Levitt respond that the reason such pair-wise correlations are not apparent is that other factors such as the crack cocaine epidemic are simultaneously at work. The statistical and econometric arguments on these issues are beyond the scope of the present appendix, but interested readers are referred to the work of Joyce (2006, 2009 (a) and 2009 (b)).

A.3 Similar international experience?

Once the Donohue and Levitt hypothesis gained attention in the US, others wondered whether it had application in other countries. Looking to other countries might help clarify causalities, because for example crack cocaine and handgun availability were not such important disturbances to crime rates elsewhere as in the US.

Both Canada and the UK enjoyed falling crime rates in the mid 1990s, following liberalisation to their abortion laws that took effect in the late 1960s.

Canadian research suggests that abortion liberalisation that took effect in 1969 did contribute to a reduction in violent crime some 20 years later, but no impact on property crime. The Canadian data and methodology also suggested the effect was through selection effects (in particular, the decline in children born to teenage mothers) more than cohort effects (Sen, 2007).

In contrast, UK research found no evidence that liberalised abortion in England and Wales led to decreased crime with a plausible lag: property crime and overall crime did fall in the 1990s, but about 23 years after abortion liberalisation, not the 18-19 years observed in the US (and corresponding there with the peak years of male criminality). Moreover, violent crime rose steadily in England and Wales, and total crime rates did not fall in England and Wales relative to Northern Ireland and the Republic of Ireland, which did not liberalise abortion laws (Kahane, Paton and Simmons, 2008).

Another potential international test of the hypotheses arose in Romania, where abortion had been freely allowed until a pro-natalist policy in 1966 criminalized abortion and taxed childless couples. In the context of restricted access to birth control measures, the birth rate rose sharply, and the subsequent demographic bulge of young people did indeed corresponded to higher crime rates in the late 1980s and 1990s. However, the case is judged to shed little light on the effect of abortion law changes alone, because of interactions with the significant economic disruptions that attended the last years of Ceausescu and the fall of communism (Kahane, Paton and Simmons, 2008, p. 1).

A brief Australian study using more limited data than available in the US pointed to some of the tell-tale signs that abortion law liberalisation in the most populous Australian states over the period 1969 to 1974 might have caused some of the declines in homicide rates 20 years later (Leigh and Wolfers 2000). For example, homicides fell most in states that had liberalised abortion, and fell at times that lagged the individual state's liberalisation with the expected delay. Moreover the Australian homicide declines preceded the US reductions by about the times that Australian abortion liberalisations preceded Roe v Wade. Nevertheless, it is impossible to be confident of the linkages, because of Australian data limitations (such as the lack of extended data recording the age at which criminals offended, and of comprehensive abortion statistics), and perhaps also because the liberalisations of Australian states' laws were not as dramatic or compressed in time as the impact of Roe v Wade in the US. One recent overview concludes the linkage in the Australian case is unproven (Zimring 2007, pp. 218-221).

An interpretation of these diverse studies is that while there is some suggestive evidence of possible international equivalents to the US experience with abortion and crime, there has been no robust confirmation of similar links.

It seems now reasonably settled that the US experience of sudden, major liberalisation of legal abortion in 1973 had a significant contributing impact on the fall in the crime rate a quarter century later. Corresponding effects have not been robustly demonstrated in other countries that liberalised abortion laws, perhaps because the legal restrictions on abortions (and other forms of birth control) in other countries studied were never as strict as in the US, and the liberalisations of those restrictions were not so sweeping.

A.4 Some policy evaluation lessons illustrated in the US crime debate

Attribution of changes to underlying causes

1. Untangling causes of a complex social problem will usually require formal and sophisticated evaluation. Both expert predictions (e.g. of a crime explosion) and common sense explanations (e.g. increased policing was the dominant cause of falling crime rates) can be wrong.
   - As one of the prominent contributors to the abortion-crime debate has reflected in a broader context:

     > The single most important advance in the social sciences in the last 25 years has been the enormous improvements in the ability to analyze microdata in order to identify and quantify causal relationships. Some of these gains have come from technological progress, as the vast increases in computing power have enabled the analysis of larger data sets using more sophisticated statistical techniques. Some of these gains have been organizational, as government and private entities have funded the collection of an extensive array of data sets that provide fertile grounds for academic researchers. But the most intellectually intriguing developments have been scientific, as the tools and methods of statistical analysis have been developed and sharpened. (Donohue 2001, p. 2)

2. Distrust mono-causal explanations and simple correlations; seek evaluative processes that explicitly estimate the separate contributions of all major influences.
   - Work before 2001 that sought to explain the fall in crime without including the impact of abortion law changes were subject to 'omitted variable bias', and the estimates of the impact of other factors were overstated.
3. Beware of overemphasis on factors that can be measured, at the cost of study of factors that may be important but are not quantified.
   - It was expected from the early 1990s that the crack cocaine epidemic must have had something to do with the surge and then decline in crime rates, but because there was no good quantitative estimate of those effects until the work of Freyer, Heaton, Levitt and Murphy in 2005, initial quantitative work by Donohue and Levitt in 2001 and 2003 overestimated the impact of other factors (such as imprisonment, policing and abortion policies) – another example of omitted variable bias.
4. Look for unintended linkages and indirect effects.
   - It took a leap of imagination to hypothesise the radical change in US abortion policy in 1973 had an unintended consequence for crime rates in the 1990s.

Data issues

5. Data quality matters: most social phenomena are imperfectly measured, and small differences in measurement quality may prove material to estimating the relative contribution of different causes.
   - The attention attracted by the 2001 Donahue and Levitt article led to more relevant data being estimated (e.g. abortion by state of woman's residence, rather than by state in which the abortion was performed). This data strengthened the original results (Donahue and Levitt 2003).[9]
   - The absence of good proxies for crack cocaine usage and its impacts made it impossible to initially factor that cause into an explanation of declining crime rates. The creation in 2005 of an index of the usage of crack cocaine by state and large city, and a study of its impacts (not only on crime but on low birth weights, foetal death rates, etc) allowed a significant advance in analysing the fall of crime.[10] This index and associated data has been made freely available to all researchers (Freyer et al., 2005, p. 6).

Transparency

6. Publish policy evaluation and underlying data freely, to facilitate checking and replication of results, and trigger improvements and corrections.
   - Notwithstanding peer review for publication in a prestigious journal, a potentially significant but arcane coding mistake affected part of Donahue's and Levitt's original 2001 results. It is unlikely that mistake would have been discovered and corrected without the transparency of the research and publication process, and the freedom with which Donahue and Levitt made their data available and engaged in dialogue with their critics.[11]
7. Be cautious not to over-interpret new results. Even peer review and transparency are no guarantee of instant accuracy or immediate success in evaluating complex phenomena.
   - Notwithstanding intense interest in this subject, it has taken the best part of a decade to resolve disputes about the estimation of the abortion impact.

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9 Measurement error usually leads to 'attenuation bias' and understatement of the estimated causal relationships under study (Donahue and Levitt 2003, pp. 36-37).

10 The study of why crack usage exploded so quickly and was so devastating for a period to young blacks is itself a fascinating analysis of the economics of illicit drugs, though beyond the scope of this paper. Freyer et al (2005) provides an excellent account.

11 Foote and Goetz explicitly acknowledged the openness with which data and analysis was shared by Donahue and Levitt (2008, p 407).

8. Vibrant academic engagement greatly strengthens evaluation.
   - With the exception of one important contribution by two economists employed in the Federal Reserve system (Foote and Goetz 2008), all the improvements in understanding cited above arose from academic contributions.

Policy

9. Good evaluation requires independence and sometimes, courage.
   - In the ethically and politically fraught environment of debate over abortion policy in the US, it is perhaps surprising that the abortion/crime hypothesis emerged at all, and that it steadily progressed through careful, high quality and freely contested evaluation of the evidence.

10. National policy analysis requires national evaluations because of country-specific factors, but evidence-based policy can learn also from international comparisons and contrasts.
    - Widening study beyond the US to other countries that had experienced liberalisation of abortion laws allowed further testing of the hypothesis in circumstances where national data strengths and weaknesses were different, and other potential influences were of lesser importance.

11. Ethically charged policy topics will inevitably generate passion, but transparent evaluation can help clarify policy improvements that all would support.
    - The US and Canadian abortion experiences can be interpreted as showing that any effective method of improving a woman's control of her fertility, or any effective means of improving assistance to the carers of children born into difficult circumstances, can pay surprising dividends not only in better realisation of those children's potential, but also in less crime.[12]
    - As Leigh and Wolfers note:

      > When the political dust settles, we might – surprisingly - learn something far more interesting about child rearing than about abortion. (2000, p. 28)

12 Voluminous evidence that 'being unwanted' leads, on average, to much poorer life outcomes for children is beyond the scope of this paper, but see Gruber, Levine and Staiger (1999) for a summary.