Did Legalized Abortion Reduce Crime? A Canadian Perspective

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Section I: Introduction

In the book *Freakonomics,* written in 2005 by Steven D. Levitt and Stephen J. Dubne, an interesting and somewhat controversial topic is raised. It is postulated that the recent and sudden decline of crime in the United States might be a consequence of the nationwide legalization of abortions some 18 years prior. Of course this topic was also documented in detail by Donohue and Levitt (2001) in the *Quarterly Journal of Economics*, but after being highlighted in such a mainstream book their argument has raised many issues and stimulated much debate.

What hasn't yet been studied in detail is the impact of legalized abortion on crime in Canada. Comparing the two nations we see many similarities and some dissimilarities which may influence the impact in Canada. In the great white north we also saw large a drop in reported crime of 26% between 1991 and 2000 (Baldé et al. 2005), 22 years after the introduction of legalized abortion nationwide in 1969, similar to what the US observed. While there was a comparable drop in crime during this period in the two countries, important differences affecting abortion rates and crime do exist. In particular, there are three main differences between Canada and the US that we believe could affect the relationship between abortion and crime: first, abortions have for many years been covered by Medicare in Canada; second, Canada did not experience the same cocaine problems as the US; and third, Canada has always had a lower crime rate than that of the US.

It is well-known that Canada's universal health care system is very distinct from the US health care system. One aspect of these differences that is particularly important to the present study is the fact that legalized abortions have always been covered by the provinces, with some minor exceptions. This distinction from the US may lead to some very interesting results since Canadian abortions are likely to be less influenced by income.

As for the use of crack cocaine in the US during the late 1980s and early 1990s, it has previously been described as an epidemic, whereas the corresponding period of increased crack cocaine use in Canada was both shorter and less intense. This fact may permit us to better tease out the abortion effect on crime rates during the cocaine periods that plagued many US studies.[1] The crack epidemic was likely to be a problem in the American studies primarily because it too was expected to have raised crime rates, and thus in the absence of variables that directly relate to cocaine use it was quite difficult to distinguish between the effects of abortion and the effects of the cocaine epidemic. In other words, the reason why the crack cocaine epidemic was such a concern in American studies is because of the link between crack cocaine use, crime, murder and the availability of guns during this period of time. The crack epidemic was also thought to be more prevalent in urban centers, leading to largely varied effects across American states. Since there are no actual statistics collected on this epidemic, many US studies therefore fail to control for it.

Finally, crime in Canada has followed a similar trend to that in the US but has always remained at a lower rate, which some may argue is due to more restrictive gun laws and other cultural factors.

Before any data were gathered or any analysis performed we took it upon ourselves to ask whether or not there were grounds for a Canadian study to be performed. First the literature was examined to reveal that few economists had ever tried to answer this question in the Canadian context with the methods put forth by Donohue and Levitt (2001).[2] This established that there was a knowledge gap. Second, we began to gather information on crime in Canada

[1] Cheung and Erickson (1997 p.186) point out that "there is little evidence that serious levels of crack use exist in the general Canadian population" during the late 80s and early 90s.

[2] One exception to this is the study presented by Sen (2007). However, his approach varies significantly from ours in that he uses older data and a weaker model for the effective abortion rate, as explained later in Section III,

over the past 40 years, as well as abortion rates. The similar patterns in the crime rates in the US, Shown in Figure 1a, and Canada, shown in Figures 1a, 1b and 1c, led to the question: can abortions explain the observed reduction in crime in Canada as well? If we look at the data (figures 1b, 1c, 1d) on crime rates in Canada over the past 30 years, we see an absolute peak around the year 1991 and then subsequent drops in crime per capita. Coincidently, the years 1988 to 1991 are when the first cohorts born after abortion was legalized would have been 18 to 21 years old, the ages of highest likelihood for crime.[3] Is it a coincidence that we see such a dramatic decrease in crime from 1991 onwards? Next, while examining the abortion laws and numbers, it became clear that there was a very sharp increase in abortions after the law was passed in 1969 (figure 2). As Donohue and Levitt (2001, p.385) put it "[t]hus, the first pre-requisite for legalization to have an impact on crime is met -- legalization increased the rate of abortion."

Now that we have an established ground for our study an important question must be answered: why might the legalization of abortion reduce crime in Canada? Well, there are many theories that hold true both in the US and in Canada. Studies have shown that growing up in unfavourable conditions is directly linked to juvenile delinquency and adult crime.[4] Along with other reasons explored later in this paper it seems that early childhood development may be the principle factor leading to criminal activity.

The aim of this paper is to investigate whether the findings and the theories presented by Donohue and Levitt (2001) hold true within the Canadian context. By examining the most up to date crime statistics from 1988 to 2007 and using pooled cross section data for the ten Canadian provinces, we will be able to analyze what, if any, the impact of legalized abortions from 1969

[3] Donohue and Levitt, 2001, p.393 find these ages to be the highest crime years.
[4] See for example papers by Lynch (2004) and Dearing (2008).

onward has had on crime in Canada. Our study extends the analysis of Sen (2007) by using the most up to date variables and provincial level data on arrests by age in the construction of our effective abortion rate.

The paper is organized in the following manner. First we present the history of abortion in the Canadian context, noting the differences in the routes taken by Canada and the US towards legalizing abortion. Next we examine and update the mechanisms postulated by Donohue and Levitt (2001), along with some new ideas relating to the Canadian context on how a higher abortion rate might lower crime rates in Canada. In section IV we review the literature from the US and around the world on this issue. In section V, we present the variables used in our study. In section VI, we identify key differences in the approaches used between our paper and those of Donohue and Levitt (2001), present our findings, and discuss what they mean and how they either differ from or resemble those for the US. Finally, in Section VII we form our conclusions. Please note that our stance on abortion is purely an academic interest in the policy decisions made by the government and its impact on the Canadian economy and people; we by no means suggest the use of abortion as means to control crime.

Section II: A Brief History of Abortion Law in Canada

Canada and the US share many ideals and policies, though the story of abortion laws in the two countries is not one of them. In the US prior to 1973, with only a few states exempt, abortion was banned and illegal. Following the 1973 case of Roe v. Wade abortion was legalized nationwide.

When studying abortion law in Canada one thing becomes clear: the US made sharp rigid changes in abortion law whereas in Canada the evolution of abortion laws was a more drawn out process. This makes our paper all the more difficult since there are many caveats to consider when setting up a model. Laws governing abortion in Canada were first passed in 1892 (Arthur 2009, p.2). This law "prohibit[ed] abortion as well as the sale, distribution and advertising of contraceptives." Following that law in 1892 no significant changes were made until 1969. In this year, the CBC states, "Prime Minister Pierre Trudeau's Liberal government decriminalizes contraception and allows abortion under certain circumstances. Abortions may be performed in a hospital if a committee of doctors decides that continuing the pregnancy may endanger the mother's life or health. Access to abortions varies across the country." (CBC 2009) The big issue here is that there was no set definition of the mother's health. In practice this was largely up left to the therapeutic abortion committee of doctors to decide upon; sometimes a mother's health could be her financial, psychological or anything else the doctor deemed a risk to her "health."[5]

From 1969 to 1987 access to legal abortions was limited to hospitals in the provinces and territories, but this access varied by province. Dr. Henry Morgentaler, a medical practitioner from Montreal, had several bouts with the law regarding his own practice of providing illegal abortions in clinics. He was jailed and acquitted several times in Quebec and even opened up other illegal clinics in Ontario.

By 1988 the Supreme Court of Canada had declared the 1969 abortion law to be unconstitutional. According to CBC News (2009), in this year "Canada becomes one of a small

[5] While no papers explicitly note valid reasons for an abortion during this time, studies published by Wadhera and Millar (1997a and 1997b) note that although there were handfuls of unspecified abortions, most doctors and hospitals had few restrictions on what qualified as a risk to the health of the mother. Also note that Sen (2007 p.7) commented that "abortion applications in hospitals in most major cities were rarely denied."

number of countries without a law restricting abortion. Abortion is now treated like any other medical procedure and is governed by provincial and medical regulations." This also meant that abortions performed in a hospital were covered by the provincial government. Following this decision, Nova Scotia, in 1989, and New Brunswick, in 1994, banned abortions in clinics outside of hospitals. This restriction was later overruled in 1995 and both provinces were forced to allow private abortion clinics. However, some provinces still refuse to cover the cost of abortions in these private clinics. Some struggles with abortion laws still ensue within Canada such as in New Brunswick, where the provincial government even now refuses to pay for abortions at private clinics.

In summary, all Canadians today have access to free abortions in hospital, but some women in rural areas still may find it difficult to obtain an abortion.

Section III: The Impact of Abortion on Crime

The most prevalent mechanism through which the impact of abortion on crime is thought to work is through the unbalanced effect of lowering the number of children born who are most at risk of criminal behaviour in their later years. Studies and anecdotal evidence show that the majority of abortions are performed when the timing of a child is not optimal for the mother.[6] In the absence of abortion this may lead to a sort of maternal rejection when the baby is born may drive the child towards crime. We can also clearly see in figure 3 that abortions are far more common among women under age 20 (these young ages may suggest non optimal timing for mothers) than in any other age group. In fact the rate of induced abortions for every 100 live

[6] Optimal timing may mean with respect to a combination of factors from financial stability, maturity level, marital status etc.

births in Canada from the period 1987 to 2002 reaches as high as 350 for women under 15. Comparing this rate to the overall Canadian rate which peaked at 32.2 in 2002, we clearly see a highly disproportionate share of young women who chose abortion.

We can also see that this issue with young women being the most inclined to abortions ties into the income situation of the mother and unborn child. The data show that the most lucrative years of income for Canadians are from age 45 to 55 (both men and women), as shown in figure 4, while the under 20 years old group shows the lowest average income. So not only are the women young but they are also in the lowest income years of their lives. This is not just a Canadian phenomenon but has been documented in the US as well by the GuttMacher Institute:

> Poor women were overrepresented among abortion patients. Their relative abortion rate was more than twice that of all women in 2008 ... and more than five times that of women at 200% or more of the poverty level. The abortion rate for low-income women was three times that of better-off women. Not only do poor women have above-average relative abortion rates, the abortion indices suggest that the difference increased between 2000 and 2008 ... In contrast, the abortion indices for both low-income and better-off women decreased. (Jones et al, 2010, p.9)

Thus because the young are more likely to be poor, the fact that proportionally more abortions tend to be carried out by the poor is likely to compound the effect of youth on the abortion rate, especially in Canada where all abortions undertaken in hospitals, and most clinics, are paid for by the provincial health care system, as opposed to out of pocket in the US.

What does all of this mean for crime in Canada? The fact that these children are unwanted or would have been born to such young and mostly poor mothers lends significant support to the idea that the likelihood of these children growing up to be criminals had they been born is high.[7] Studies show that the psychological costs of growing up poor lead to a larger likelihood of criminal activity "primarily because poverty limits children's access to developmental stimulation and heightens their exposure to stress in both their physical and

[7] Dearing (2008) paper investigates the psychological impacts of growing up poor. Among the costs of growing up poor are the social emotional functions that may suffer, which can lead to violence and therefore crime.

psychosocial environments" (Dearing 2008, p.329). Gruber et al. (1999, p. 269) summarized it best:

> the average living circumstances of cohorts born immediately after abortion became legalized improved substantially relative to preceding cohorts...the marginal children who were not born as a result of abortion legalization would have systematically been born into less favourable 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 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.

So since we have fewer children exposed to these unfavourable conditions which are linked to juvenile delinquency and crime, we should see less crime as abortion rates increase, ceteris paribus. As Lott and Whitley (2001, p.5) suggest, most theories "relate abortion to crime rates through the level of investment in a child's human capital."

Section IV: Literature Review

While trying to explain the sudden drop in crime there have been many reasons cited, proven and disproven only to be proven again. Levitt (2004) is a paper examining the most widely identified reasons for the drop in crime. He breaks these reasons down into two categories: factors that played little to no role and factors that did play a role.

The six factors that Levitt (2004) describes as playing little to no role in the crime drop are the strong economy, demographics, policing methods, gun control laws, concealed weapon laws and capital punishment.[8] While looking at the unemployment rate Levitt finds that "almost all of these studies report a statistically significant but *substantively small* relationship between unemployment rates and property crime" (Levitt 2004, p.170) while violent crime does not

[8]Levitt (2004) examines US crime data from the 1950s to 2001 obtained from the FBI's Uniform Crime Reports.

systematically move with unemployment. Even using the average estimate of a one percent drop in unemployment leading to a one percent drop in property crime, the time period in question only experienced a two percent drop in unemployment while property crime fell 30%. Regarding the demographics explanation, Levitt acknowledges that the "share of the elderly population increased during the 1990s, [thus] a purely demographically driven decline in crime might be expected." (Levitt 2004, p.171) He argues, however, that this decline is off-set by an increase in minorities who are more at risk of committing a crime and an increase in the number of teenage to mid twenties year olds within the population.[9] This younger cohort is also disproportionately more likely to be involved in crime.[10][11]

The four factors that Levitt (2004) describes as playing a role in the crime drop are the number of police per capita, the incarceration rate, the decline of the crack epidemic and the legalization of abortion. Levitt argues that the number of police officers increased nationwide by around 14% during the 1990s, and using a cautious estimate of elasticity, found in most studies, of -0.40 he finds that the increase in police per capita accounted for about 5-6 percent of the decline in crime during the 1990s.

While these four factors play an important role in the US data, the crack epidemic would arguably not play a significant role in Canada as previously discussed.[12] However in our study

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[9] Levitt (2004) identify Hispanics and African Americans as those with higher offending and victimization rates than whites.

[10] In Canada especially the weights in our study show that the age group 18-24 consistently counts for approximately 30% of all crime types.

[11] While gun laws, carrying concealed weapons and capital punishment are systematically rejected by Levitt, these are non issues with Canadian data since capital punishment was abolished in 1976, with the last person sentenced to death in 1962,[11] and gun homicides in Canada are far less likely than in the US. Sources:
CBC News In Depth: Death Penalty. (2010, June 7) "Capital Punishment in Canada " Retrieved June 6, 2010, from http://www.cbc.ca/canada/story/2009/03/16/f-death-penalty.html.
SAGE Publications UK (2009, July 29). "US Guns Fuel Canada And Mexico Crimes, UK Gun Crime Remains Rare." ScienceDaily. Retrieved June 6, 2010, from http://www.sciencedaily.com /releases/2009/07/090729074158.htm .

[12] See Cheung and Erickson (1997).

we include police per capita, prisoners per capita (only in the national regression) and of course our effective abortion rate variable.[13]

Ouimet (2002) carries out a literature review examining the similarities and dissimilarities between Canada and the US in the explanations for the drop in crime during the 1990s. Ouimet's theory is that since Canada and the US share a similar history and remarkably indistinguishable popular culture, in order to explain the drop in crime these two countries shared over the same period of time one has to examine explanations that envelop both countries. Ouimet notes that the US explanations mainly attribute the decline in the crime rate during the 1990s to demographics, incarceration rates, policing methods, legalization of abortion and even the decline in the use of paper money. However, when referencing abortion, Ouimet argues that, using the same logic as Donohue and Levitt (2004), during the same period of increased abortions there had been an increase in the number of single parents in the US which should be associated with more "juvenile delinquents during the 90's," thus countering the abortion impact (Ouimet 2001, p.39).

Looking at Canada independently Ouimet argues that the only plausible explanations for the sudden drop in crime may be less public consumption of alcohol, higher education levels, demographic shifts of the high crime age groups, and increased employment opportunities. While examining the explanations in both countries Ouimet acknowledges that although budgets of crime-preventing organizations (such as the police) expanded in the US and have been seen as a possible explanation, the same can't be said for Canada. In fact Ouimet (2001) points out that "the growth in the budget of justice related organizations was below the level of inflation" during the 1990s in Canada (Ouimet 2001, p.42). Ouimet (2001) also finds a similar argument for the

[13] The reason prisoners is not included in the provincial level regressions is because it is only available at the national level thus including it would create a time trend variable which would not identify the true impact of the prisoner population on crime rates.

number of police and incarcerations in Canada. He notes that in Canada during the 1990s when crime was falling, so too were the number of police per capita and the incarceration rate, whereas in the US crime was also falling but the number of police per capita was rising along with the incarceration rate. This led him to reject these explanations as viable reasons for the simultaneous fall in crime in both countries. Ouimet concludes that the most feasible explanations for the joint fall in crime are the demographic shifts of the high crime age groups and rising employment opportunities that both countries shared during the same period. Ouimet also identifies some other hard to measure factors such as refined social behaviours and values as well as advances in the technology of policing which may have contributed to the large decline in both countries.

Now, in order to link the idea that those not born due to abortion are more inclined to a life of crime, we examine the two additional papers. In the paper presented by Gruber et al. (1999), the social circumstances of the marginal child not born due to the legalization of abortion are examined. By first looking at this paper we can identify any special characteristics these marginal children might present which may be of interest to our study. Gruber et al. (1999) use a "difference in difference" model to compare the living circumstances of the children born during legalized abortion in the repeal states as compared to the rest of the US.[14] They break down the analysis by looking at circumstances in the repeal states versus non-repeal states from 1970-1973 and hypothesize that the repeal states' cohorts should have relatively improved living circumstances. They also examine repeal versus non-repeal states post the 1973 Roe v. Wade decision and hypothesize that there should be a convergence of living circumstances.

[14] The use of "repeal" means the states that independently removed abortion laws before the Roe v. Wade case. These states are New York, California, Washington, Alaska, and Hawaii. These actions affectively took place in 1970. The "non-repeal" states are all other states.

One shortcoming of this study is that they use cross-section data from the 1980 census for the United States.[15] By only using cross section data the authors may be overlooking some important time trends, whereas period specific effects from that year may not be fully incorporated into the model. Nevertheless, their analysis "focus[es] on three measures of living circumstances: living in poverty; living in a single parent household; and living in a household receiving welfare" (Gruber et al. 1999, p.276). The results from Gruber et al. (1999, p.283) suggest that "the legalization of abortion lowers the share of children living in single parent households." They also find significant evidence that following the years of nationwide legalization there is convergence of the repeal and non-repeal states in terms of cohorts' living standards. As a result Gruber et al. (1999, p.293) conclude: "we find that for the marginal child not born due to increased abortion access, the odds of living in a single parent family would have been roughly 60% higher, the odds of living in poverty nearly 50% higher, the odds of welfare receipt 45% higher, and the odds of dying as an infant 40% higher."

In order to link the finding that the marginal child not born due to legalized abortion would have grown up poorer than the average child and thus possibly be more likely to turn to crime we next examine the paper presented by Dearing (2008), which directly ties these two ideas together. This study finds "evidence on the association between family income and adolescent criminality [that] suggests that the rate of serious crimes committed by youth living in low income families may be more than 10% greater than this rate for youth in middle-class families"(Dearing 2008, p.325-326). He also examines the communities associated with poor families and find that "through peer relationships in their neighbourhoods, poor children and adolescents are also more likely than youth who are not poor to be exposed to antisocial and

[15] However, their data does have a large number of observations with around 2.4 million children below the age of 15 in the census.

deviant behaviour, as well as violence" (Dearing 2008, p.327). This would be seen most often as a gateway to crime. Thus the link between those not born due to abortion and crime is clear: they would have been more susceptible to growing up poor and/or in a single parent household which would result in a higher likelihood of criminal activity.

Donohue and Levitt (2001) were the first to effectively bridge the link between abortion and crime, and explicitly model it using an econometric framework. This paper theorized that, aside from the presumed "normal" factors deemed to influence crime rates, the recent and sudden decrease in US crime since 1991 can partly be attributed to the legalization of abortion nationwide in 1973 following Roe v. Wade. Donohue and Levitt argue, using panel data from the years 1985-1997, that there is strong evidence that a higher abortion rate does in fact lead to lower levels of crime, ceteris paribus.[16] In their study Donohue and Levitt broke crime down into three categories: property crime, violent crime and murder. The whole paper centered around the creation of their effective abortion variable as defined by

$$\text{Effective\_Abortion}_t = \sum \text{Abortion}_{t-a} * (\text{Arrests}_a / \text{Arrests}_{total}),$$

"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*" (Donohue and Levitt, 2001, p.394). Looking at this created variable more closely we see it is built around lagged abortion rates. This is due to the fact that the current abortion rate affects only cohorts born this year. So in order to construct the variable the abortion rate is lagged by a number of years equal to the age of the cohort; for example, the abortion rate for an 18 year old in 1991 would have been the rate from his year of birth in 1973. The second half of the equation on the right hand side is the weight of that cohort's share of

[16] "Normal factors" include the unemployment rate, alcohol consumption, proportion of individuals below the poverty line, average income, etc.

crime; for example, 18 year olds account for 7% of crime so that would be their weight. By using weighted variables we can explicitly account for the disproportions inherent among age groups who commit crime, by ensuring that the abortion rates for cohorts that are more likely to commit crime receive a higher weight in the EAR. Donohue and Levitt created this variable to capture the impact that a higher abortion rate might have on crime. The advantage of using this sort of weighted average of past abortion rates is that it avoids the multicollinearity problem that would likely arise if many lagged abortion rates were simply added individually to the estimating equation. It also increases degrees of freedom by collapsing many lagged abortion rates into a single explanatory variable.

The model used by Donohue and Levitt analyzed panel data utilizing weighted least squares, with population shares for the weights, for the American states over the years 1985-1997 correcting for serial correlation while including state and year fixed effects. The other independent variables included in their model were prisoners per capita, police per capita, state unemployment rate, state income per capita, poverty rate, AFDC generosity,[17] shall issue concealed weapons law (dummy variable) and beer consumption per capita. Through econometric analysis Donohue and Levitt find 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. (Donohue and Levitt 2001, p.414)

Donohue and Levitt also go on further using age specific break-downs of crime and a difference in difference model to demonstrate robustness. The difference in difference model they presented uses the unique nature of the history of abortion in the US to examine the impacts on crime in the repeal states versus the non-repeal states.

[17] AFDC consists of public assistance payments to families with dependent children.

In one of many papers inspired by Donohue and Levitt (2001), Lott and Whitely (2001) focus on the opposite impact that legalizing abortion might have on crime. Citing a paper by Akerlof, Yellen, and Katz (1996) analyzing out-of-wedlock births in the US, they argue that the number of out-of-wedlock children has increased since the legalization of abortion and as such the human capital investment in children has decreased leading to an opposite effect on crime to that proposed by Donohue and Levitt (2001).[18] Lott and Whitely exclusively analyze this theory with regards to the murder rate. The reasoning Lott and Whitely argue that out of wedlock children means less investment in human capital is simple: since the parent is single they have less time to raise the child because they are the sole income provider as compared to two parents and have less income for investment in the human capital of the child.

Lott and Whitely also examine the effective abortion rate variable created by Donohue and Levitt (2001) pointing out the weaknesses in its creation. They argue that by using a static weighting system that does not vary by state or by year, Donohue and Levitt make a grave mistake.[19] They show that over the years, murders by "16 to 20 year olds made up (only) 12 percent of total identified murders in 1984, (whereas) they made up 21 percent in 1994." (Lott and Whitely 2001, p.9) Although they are unclear about the types of errors or biases these over simplifications can create, we agree they should not be overlooked. Lott and Whitely also note another shortcoming of Donohue and Levitt (2001) to be the source of their data[20] for murder from the Uniform Crime Reports, Lott and Whitely write: "As we noted earlier, the major benefit

[18] Our personal opinion is that this may be a weak argument since out-of-wedlock sex and common law partners are now more acceptable social practices and may even be preferred to marriage by some women.
[19] Note that in the creation of our own EAR we use weights that change from province to province and year to year, when available. This difference between our EAR and that presented by Donohue and Levitt (2001) should lend more credibility to our take on their created variable.
[20] Donohue and Levitt (2001) use the Uniform Crime Reports compiled by the Federal Bureau of Investigation, citing that "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." p.392

of the Supplemental Homicide Report is to move beyond these aggregate crime and abortion numbers and directly link the age of the murderer with the year in which the crime occurs." By reproducing the regressions presented by Donohue and Levitt (2001) and adding additional "fixes" to the data, such as using state and year specific weights, or using their more accurate data, Lott and Whitely obtain some interesting results. They show that after switching to the data from the *Supplemental Homicide Report*, the coefficient of the effective abortion rate falls by 50% and is no longer statistically significant.

To further support their argument, Lott and Whitely redefine the effective abortion variable by "using state and year specific weights instead of a national average (which is constant across all states for all years)" (Lott and Whitely 2001, p.10). Using this new variable then "reverses the sign of the coefficients and implies that more abortions increase murder rates, though neither coefficient was found to be statistically significant at the 10 percent level." (Lott and Whitely 2001, p.10) They go on to test six thousand different estimates and find "only one regression implied even a small reduction in murder rate. All the other estimates implied significant if very small to modest increases in murder rates." (Lott and Whitely 2001, p.19) In the end Lott and Whitely agree that abortion actually had a net positive effect on the murder rate.

Joyce (2003) is another paper inspired by Donohue and Levitt (2001). Initially Joyce begins with a reproduction of the model presented by Donohue and Levitt (2001). Like Donohue and Levitt (2001), he finds that the model is quite robust to changes in the variables used; however, once the time period is changed to the height of the crack cocaine epidemic, 1985-1990, Joyce begins to see some startling effects. The coefficients of the effective abortion rates for all three types of crime fall, with some becoming significant with a positive value. He argues

that "[t]he lack of temporal homogeneity in the abortion-crime association points to problems of omitted variables." (Joyce 2003, p.8)

Joyce also presents some estimates of a different model, namely the difference in differences model, to analyze the impact of abortion on crime, by focusing on the differences between those states legalizing adoption before Roe v. Wade (repeal states) and those after (non-repeal states). In addition this model helps tease out the effects of the crack cocaine epidemic on major metropolitan centers. Joyce uses the same approach as Lott and Whitely (2001) in that he uses the *Supplemental Homicide Report* for data regarding murder. For his difference in differences model Joyce uses two variations; one examines cohorts before and after legalization, closely following that of Donohue and Levitt (2001), while the second measures cohorts before and after legalization who are very close in age and within the same state and compares the early adopting states with the late adopting states. Using the first approach Joyce obtains the same results as Donohue and Levitt (2001) but once he begins removing states who he believed had different crack markets, and analyzing different time periods the strength of the Donohue and Levitt (2001) result falls. Joyce concludes, however, that this approach is not optimal, since comparisons between repeal and non-repeal states may counterfactual. Using the second approach Joyce develops a "difference-in-difference-in-difference" model for which he "subtract[s] the DD in non-repeal states from the DD in repeal states." (Joyce 2003, p.16) This method, he argues, eliminates cohort and period effects from the data. In doing so Joyce finds that especially for murder, the sign of the coefficient of effective abortion rate is reversed and statistically significant.

In the end Joyce finds no evidence to support either the magnitude or direction of effective abortion rate coefficients found in Donohue and Levitt (2001). The reasoning Joyce

uses to back his results is that women who chose to abort "are at lower risk of having children with criminal propensities than women of similar age, race and marital status who instead carried to term." (Joyce 2003, p.26)

In a response to Joyce (2003), Donohue and Levitt (2004) argue that Joyce's failure to expand his analysis beyond 1985-1990, the peak of the crack epidemic, causes him to fall short in his conclusion. By pointing out five critical flaws in Joyce (2003), Donohue and Levitt (2004) systematically prove the robustness of their model from 2001. Donohue and Levitt argue that

> In order to make reasonable inferences about the link between abortion and crime, one needs to look at the entire period: before, during, and after the peak of the crack epidemic. To the extent that early legalizing states were affected more severely by crack, using data for the whole period will still be biased against finding an impact of legalized abortion on crime, but to a lesser degree than if one looks only at the peak crime years. (Donohue and Levitt, 2004, p.40)

Donohue and Levitt even go so far as to reproduce and update the triple difference model proposed by Joyce. In building their model Donohue and Levitt expand the period of analysis beyond 1985-1990 to the lifetime of the cohorts, based on the above argument. In doing so they find that 12 of the 15 estimates carry a negative coefficient implying that abortion has a negative effect on crime. In conclusion Donohue and Levitt "find nothing in Joyce's paper that offers a serious challenge to the original hypothesis proposed in Donohue and Levitt (2001)." (Donohue and Levitt, 2004, p.48)

The final paper examined, Sen (2007), is yet another paper inspired by Donohue and Levitt (2001). Sen (2007) analyzes the years 1983-1998 for all Canadian provinces, and focuses on the impact of legalized abortion on Canadian crimes of violence and property crime. He notes the same advantages of using Canadian data as we found, such as a less pronounced crack epidemic, and less hand gun use. One drawback of Sen (2007) is that he could not find data breaking down arrests by age for Canada. He instead uses

population weights "based on the proportion of young males" to construct his effective abortion rate variable (Sen 2007, p.20).[21] The reason he uses this as a weight is because he assumes it is disproportionately young males who commit crimes of violence and property crime. This reasoning is not without flaws since the composition of age groups who are committing crimes is more complex and highly skewed with young adults disproportionately committing the most crimes. In contrast, with our paper we have corrected this issue and even gone so far as to include provincial level data on arrests by age by utilizing the correct weights for our calculation of the effective abortion rate. When analyzing his data Sen (2007) employs OLS estimation, with standard errors that are corrected for both heteroskedasticity and second-order autocorrelation using the Newey-West method.[22] While we correct for the same types of problems, our paper does so using panel specific corrections, for GLS estimation which proves more useful for our panel data used

Sen (2007) obtains early results similar to those of Donohue and Levitt (2001) when looking at Violent Crime, but when he analyzes similar regressions with Property Crime as the dependent variable he finds statistically significant estimates with positive signs. He also finds that none of his other control variables have coefficients which are statistically significant in the violent crime model, which leads one to worry that there may be some problems with the model specification. The paper also goes one step further than Donohue and Levitt (2001), in the sense that he is "evaluating the impacts of fertility on crime [as] a very useful counterfactual exercise" in order to further strengthen their findings. Utilizing a separate regression model in which 1960s

[21] Instead of using the cohort's share of crime as the weight in the calculation of the effective abortion rate Sen uses the percentage of population in that cohort from Statistics Canada as a substitute.
[22] More specifically, he states that he uses "Standard errors of coefficient estimates [which] are White corrected for heteroskedasticity and Newey-West corrected for second-order autocorrelation." (Sen 2007, p.14)

and 1970s fertility rates are analyzed, and *not* abortion rates, against changes in the crime rates, Sen finds results from this exercise that show a 1% increase in teen fertility is associated with a 0.296% increase in violent crime about 18 years later. The paper concludes that "The drop in teenage abortion rates accounts for roughly more than a quarter of the decline in violent crime during the nineteen-nineties" and "the corresponding decline in teenage fertility was responsible for more than half the decline in violent crime over the specific time period" (Sen 2007, p.31 and p.32)

Section V: Variables

The focus of our study is to further the study presented by Donohue and Levitt (2001) holding true to their methods while exploring the Canadian data.

First of all we planned to include in our study regression models for property crime, total crime, violent crime and homicide. Unfortunately data breaking down violent crime by age groups was not available, so violent crime had to be dropped from our analysis. We also tried our best to use the explanatory variables highlighted in Donohue and Levitt (2001) so comparisons can be easily made between the two papers. Furthermore, due to the scope of the time series data needed the Northwest Territories, Nunavut and Yukon were dropped from the analysis due to data availability constraints.[23] The study's aim is to test the effect of the legalization of abortion in Canada in 1969 and its impact on different crime rates thereafter. All data collected uses

[23] The territories are notorious for the lack of data available and we found unemployment figures, percentage of people in low income and abortion numbers to be either missing or lacking data for points in our study period.

aggregate panel data for each Canadian province during the years 1988 to 2007, as collected by Statistics Canada. We collect data at the provincial level so that we can produce panel data which separates out province-specific effects.

Crime

To begin with, we need data on three dependent variables: property crime, homicides and total offences. Crime statistics in Canada are collected by the Uniform Crime Reporting Survey, and then compiled by Statistics Canada. Although there are many types of criminal offences reported on and collected, we found these three groups suited our study best. Property crime was included due to the relative youth of the persons committing this type of offence; homicide is included because it serves as a suitable benchmark for violent crime and can easily be compared against other studies on our topic; and finally, total offences are included because it may allow us to identify the overall general impact on crime abortion may play. One may expect the impact of legalization of abortion to be most heavily felt by property crime. All crimes are reported on in terms of total incidents for each year by province. These figures are then converted to rates per 1,000 residents using the first quarter population estimates for that year and province. The final step involves taking the natural logarithm of the crime rates per 1,000 residents.

Abortion Rate

Data on abortion rates in Canada began to be collected only in 1970, one year after the legalization of abortion in Canada. These figures are the reported numbers of induced abortions by hospitals and clinics for each province. The only possible drawback of these numbers is that

they are reported based on where the procedure was done, not the person's area of residence. While this may have been a large problem in the American studies we do not believe it is of much issue in Canada. There are two reasons for this: one, Canada did not have any provinces where abortion was illegal,[24] whereas in the US in some states abortion was legal and in others it was not prior to nationwide legalization; and two, because the cost of the procedure was covered by provincial health care,[25] there should theoretically be no cost savings to the individual as a result of going to different clinics or to hospitals in different provinces. The Canadian data also have a large advantage over the US data since most abortions were covered by the provincial health care system and records needed to be kept for recovering expenses. These total abortion values are combined with birth figures over the same period to give an estimate of abortions per 1,000 births. Although we do not explicitly use this variable as an independent variable in any of our regressions, it is central to our calculation of the Effective abortion rate explained later.

Age Group Share of Crime

These percentage values are critical to our calculation of the effective abortion rate (see below) and are once again not explicitly used as an independent variable in any of our regressions. Ideally the breakdown of crime would be reported with the specific age of the offender but this information was not available at the provincial level in Canada. Instead we look to the Adult Criminal Court Survey to find our data. The data were broken down into five age groups: 18-24 years old, 25-34 years old, 35-44 years old, 45-54 years old and 55 years old and over. These figures are very accurate and collected for each province from 1994 to 2003. Since

[24] Although not illegal in PEI as of the year 1983 there were no hospitals capable or willing to do the procedure. This outlier is accounted for in our sensitivity analysis, by exclusion, and is shown to not impact our original findings.

[25] Depending on province of residence, women who travelled out of province would have to pay up front for the abortion and be either partially or fully reimbursed by their home province medical insurer.

the data do not cover the entire period of interest for our study we have used the average weights for any missing periods for each province.[26] Please note that data for Manitoba on this variable were not available and homicide weights for PEI were inconsistent therefore these provinces were not included in the homicide regressions.

The Effective Abortion Rate (EAR)

The main variable of interest is the effective abortion rate (EAR).. This variable is calculated so as to resemble as closely as possible the variable used by Donohue and Levitt (2001) in their paper, with some minor changes. Since we are studying three types of crime, a separate EAR will be calculated for each, for every year. The reason why we need to calculate three separate EARs is because the age group share of crime is different for each of the types of crime examined; for example property crime is disproportionately committed by those under 25 as compared to homicide. Another example would be an 18 year old male is more likely to commit a property crime then a murder, so their weight must be different for the calculation of EAR for each type of crime. The EAR is derived from the two basic variables listed earlier: the abortion rate from the year that group/cohort was born, and the weights of the group/cohorts' **share** of that type of crime committed during that year:

$$EAR_t = \sum Abortion_{t-g} * (Arrests_g / Arrests_{total}),$$

where t is our time index and g is our group index.[27,28] Remember that this calculation will be done for each type of crime as well. For example, if we wanted to calculate the EAR in 2007, a

[26] All provinces had age breakdowns from 1994 to 2003 except New Brunswick (NB) and British Columbia (BC), which had age breakdowns only for the years 2001-2003, and Manitoba, which had no age breakdowns for any years. In the case of NB and BC we used the provincial averages for 2001-2003 for the missing data and for Manitoba we used the national average for all data.

[27] We are going to assume that for the age groups 18-24, 25-34, and 35-44, crime is distributed evenly within the group so that the weight for one specific age within the group is $1/10^{th}$ of the actual weight, except in the case of

20 year old in Alberta would be linked to an abortion rate of 130.73 abortions per 1,000 live births in 1987, with a weight representing a 20 year olds share of crime in Alberta in 2007. To get the final EAR figure for Alberta in 2007, this value would be added to similar terms for the remaining age groups from 18 to 44.

Had we used just the abortion rate lagged each year without the weights we would have significantly reduced the effectiveness of our model because crime rates vary with age. Since a larger share of crime is committed by the young, this weighting effectively internalizes these differences by placing a higher weight on the abortion rates in years when the younger cohorts were born.

Beer

This is another explanatory variable which is present in many studies trying to analyze the statistical relationship between various crime trends and other socio-economic variables.[29] It is theorized that higher per capita alcohol/beer consumption leads to higher crime. Although links between crime and alcohol are frequently established, the causality of the link is still a matter of debate -- does drinking lead to crime due to alcohol abuse, or is alcohol abuse due to the criminal culture and community? Donohue and Levitt (2001 p.405) find that "beer consumption is weakly linked with higher crime rates, but never significantly so." Nevertheless, we shall include this variable as other studies have shown it to be significant in the Canadian context.[30] Since there is a deficiency of data on alcohol or beer consumption for Canadians we

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the 18-24 age group where the weight is $1/7^{th}$ of the age group weight. The lag for the effective abortion rate; 1982 would be time lagged (18-24) years and would be 1958-1964.

[28] First year available is 1988 for one year of abortion data from 1970, since abortions before 1969 were illegal and not tracked. Therefore the only years which are calculable with our data are from 1988 to 2009.

[29] For example, see Donohue and Levitt (2001) and Baldé et al. (2005).

[30] For example Baldé et al. (2005) find that alcohol consumption varies positively with homicide rates.

will use the total volume, in litres, of sales of beer per capita. According to Baldé et al. (2005), who use a similar approach, but with alcohol instead of beer included in their models, sales constitute a good proxy for consumption since alcohol/beer waste is only 3.5%.

Income

Income has long been linked with higher criminal activity. As income is the leading motivation for crime one would expect crime to decrease as the average income of individuals increases. Why steal when you make thousands of dollars a week? Also looking at it another way, behavioural factors might have led to the individual having a low income, contributing to lower levels of education and poor employability, and thus to criminal activity. Poverty can also cause higher levels of stress for the individual and consequently lead to committing theft or other violence. However, some other types of crime may be less influenced by income, for example murder or assault. The income variable is defined as the average after tax income of all family unit types using 2007 constant dollars for each year and province combination. We then transform the income variables into a natural log in order to convert the time series aspect of the variable into a linear trend.

Unemployment Rate[31]

The unemployment rate is another variable of interest when studying crime rate trends across Canada. It is theorized that higher unemployment rates may lead some to criminal activity, especially theft, as a means of providing money for oneself and others in one's care. Employment may also be a critical factor in the development of young adults: "Employment may

[31] This variable is also present in Donohue and Levitt (2001) except that in Canada we calculate the unemployment rate slightly differently so that no direct comparisons can be made between the two values.

reduce the risk of engaging in criminal behaviour by offering teenagers and young adults a steady income and some purchasing power, increasing time under adult supervision, expanding social bonds thereby raising informal social control, and by enhancing the ability of young people to integrate successfully into society and the economy." (Baldé et al.2005, p.20). The unemployment rate is calculated for each year and province combination for all people aged 15 and over.[32]

Policing Variables

Donohue and Levitt (2001) use as a variable representing policing effort the natural log of the number policemen per 100,000 residents lagged by one year. We also introduce this variable, along with the overall expenditure on police by each province. The reason for including a police per capita variable is straight forward: as more police per capita are added to the streets one would expect crime to decline, since the likelihood of getting caught is now higher, ceteris paribus. However, some complications do arise with this idea; for instance, more police could have been added due to increased crime, or if there are more police on patrol then we may see an increase in the proportion of crimes that are solved without any change in the number of crimes committed, leading to the impression that police per capita have a positive impact on crime rates.

The other policing variable we decided to enter into the model was provincial police expenditures per capita. This other measure of policing effort was included due to the unique nature of policing found in some rural areas in Canada. In these areas police expenditures will include RCMP costs, which may not be included in the provincial totals for policemen per capita, since RCMP numbers are only kept at the national level in that data.[33]

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[32] As calculated by Statistics Canada, see data appendix for more details.
[33] See CANSIM table 254-0002 with Statistics Canada for more details on this issue.

Low Income

This variable is a proxy for the poverty variable used in the Donohue and Levitt (2001) study. We use the percentage of all persons with income below the after-tax low income cut-offs, in 1992 base dollars, as an indicator of the proportion of the population living in poverty. For the purpose of this study the low income cut-offs are defined by Statistics Canada as follows:

> Low income cut-offs are used to delineate family units into "low income" and "other" groups. A family unit with income below the cut-off for its family size and urbanization classification is considered a "low income" family. Any family with income equal to or above the cut-off is considered in the "other" category. (Statistics Canada 1999, p.7)

Descriptive statistics for all the variables of the model can be found in the appendix.

Section VI: Analysis

National Data

Let us begin by exploring the national data for Canada as a whole. The reason for starting with the national data is that since the abortion law came into effect across Canada at one specific time, we might find some evidence of its effect on national crime rates. We can also include national variables like prisoners per capita that are not available by province in our regression here, and we do not have to worry as much about inconsistent provincial level variables. Using a simple ordinary least squares technique on the national data we get the results presented in Table 1. Our OLS regression for all three types of crime can be summarized by this equation:

$$\ln(Crime)_t = \beta_0 + \beta_1(EAR) + \sum(\beta_{k-1}X_{k-1}) + \varepsilon_t \quad (1)$$

where β_0 is the constant, k identifies the independent variable, t is time, and ε is our error term. Looking at the results, specifically the total number of offences committed yearly regression (Table 1, column b) we can see that the EAR measure has the only significant coefficient at the 5% level, with prisoners per capita and police expenditures coefficients significant at the 10% level. With an average value of 54.8 over the 20 years analyzed and a standard deviation of 35.08 for the EAR for total offences (Table 1, column b), we can see that the estimates imply that an increase of 30 abortions per 1,000 live births results in a 19.31% reduction in overall crime.[34] This seems to be a very high figure since Donohue and Levitt (2001) report a high of 13% (for violent crime) resulting from an increase in 100 abortions per 1,000 live births. However, the US abortion figures do have a higher mean of 180 and a standard deviation of 96 for violent crimes.

This is only a simple exploratory analysis since the coefficients of all the other EARs are not significant, perhaps due to the relatively small number of degrees of freedom, and we see issues with the sign of other explanatory variables across all regressions. These particular regressions do not take into consideration provincial effects, time effects or differences in independent variables at the provincial level. All these inconsistencies demand a more concise regression which can better analyze and account for these details. This leads us to provincial data and panel regressions.

Provincial Data

All subsequent regressions, unless otherwise stated, are now analyzed using this general time series cross-sectional regression form:

$$y_{pt} = \sum_{k=1}^{K} X_{ptk}\beta_k + \mu_{pt} \quad p = 1, \dots, P; \quad t = 1, \dots, T \qquad (2)$$

[34] Since the dependent variable is in logs, the exact calculation is exp(-0.007154 x 30)= 19.31% .

where T is the number of years in years in our analysis, K is the number of independent variables, μ is the error term and P is the number of cross sectional units (provinces). Although this is the basic model for our panel data, the error structure will change depending on our analysis. We have used two common panel data models within this paper -- one way fixed effects (provincial effects only) and two way fixed effects (provincial and year effects). The reason for using fixed affects models as opposed to random effects models is that according to Gujarati (2004), the random effects model is not valid if we assume the province specific effects and the Xs to be correlated. We do believe this to be true in our model since some explanatory factors which may impact crime systematically differ across provinces as shown in the descriptive statistics section of the appendix. Also, as Gujarati 2004 (p.650) also goes on to explain,

> "The assumptions underlying ECM [random effects] is that the ε_i are a random drawing from a much larger population. But sometimes this may not be so. For example, suppose we want to study the crime rate across the 50 states in the United States. Obviously, in this case, the assumption that the 50 states are a random sample is not tenable."

Since our study is dealing with exactly that situation, except within Canada, we can strongly argue that fixed effects modeling does indeed best fit our model. Just to further support the use of fixed effects over random effects we also conducted a test for model specification using the Hausman m-statistic which also led to the conclusion that a fixed effect model was more effective.[35] All regressions also use panel corrected standard errors as proposed by Beck and Katz (1995) to correct for cross section heteroskedasticity.

The first model used in this paper is one way fixed effects. This model is written as

[35] "...based on the idea that, under the null hypothesis of no correlation between the effects variables and the regressors, OLS and GLS are consistent, but OLS is inefficient. Hence, a test can be based on the result that the covariance of an efficient estimator with its difference from an inefficient estimator is zero. Rejection of the null hypothesis might suggest that the fixed effects model is more appropriate." (SAS 1999 p.1116) Also see Hausman (1978) since it is referenced from this text book.

$$\ln(crime)_{pt} = \beta_0 + \beta_1(EAR)_{pt} + \beta_K\theta_{ptk} + \gamma_p + \varepsilon_{pt} \quad (3)$$

where the right hand side reflects our independent variables with β_1 representing the effect our EAR has on crime, θ represents the vector of provincial control variables which impact crime, β_K is the vector of coefficients of the control variables, and the new term γ represents the cross-sectional (provincial) fixed effects. We can see here that the error term from the original equation (2) is now composed of the non-random cross-sectional effects as well as the classical error term epsilon:

$$\mu_{pt} = \gamma_p + \varepsilon_{pt} \quad (4)$$

This method of regression essentially creates dummy variables for each province and adds them to the regression. Also note that the number of dummies is *P*-1 in order to avoid the dummy variable trap.[36]

One reason for looking at this regression where we only have provincial fixed effects is that it allows us to test for the possibility that there are no year effects. -

The second model used in this paper is two way fixed effects. This model is written as

$$\ln(crime)_{pt} = \beta_0 + \beta_1(EAR)_{pt} + \beta_K X_{ptk} + \gamma_p + \delta_t + \varepsilon_{pt} \quad (5)$$

The right hand side once again reflects our independent variables as stated in the previous section, while γ and δ represent the cross-sectional (provincial) and time series fixed effects, respectively. Looking once again at the transformation from our original error tem we can see it is composed of the cross-sectional effects, the time series effects and the classical error term epsilon:

$$\mu_{pt} = \gamma_p + \delta_t + \varepsilon_{pt} \quad (6)$$

[36] The dummy variable trap: "the situation of perfect collinearity or perfect multicollinearity, if there is more than one exact relationship among the variables."Gujarati 2004, p.303

This method imposes both time and cross sectional effects which are non-random and independent of the error term. Once again dummy variables are created to represent the provincial and year effects.

In order to address the issue of autocorrelation in the time series aspect of the data Wooldridge (2002, p.282–283) conceives of a straight forward test for autocorrelation in time series cross-sectional models, and Drukker (2003) presents the code necessary to carry out the test in STATA. Using this test command we reject the null hypothesis of no serial correlation of the first order for all regressions on property crime and total offences.[37] This means that our OLS estimators are no longer BLUE and the statistics associated with them may be invalid. To correct for this, we use the Prais-Winsten (1954) transformed regression utilizing feasible GLS to account for the AR1 type error and avoid the loss of the first observation.[38] Panel-corrected standard errors are then computed for the feasible GLS estimates to correct for heteroskedasticity and cross-sectional correlation.

Panel Data Results

Looking at Tables 2-4, we can see the results of panel regressions on the data using the methods listed above. Table 2 presents all regressions done with property crime as the dependent variable, table 3 presents all regressions done with total offences as the dependent variable and table 4 presents all regressions done with homicide as the dependent variable.[39] The (c) columns of each table have us regressing the dependent variable on only one variable, the EAR, with

[37] The p-values for these tests are: Homicide as dependent variable: **p=0.5252**, Property crime: **p=0.0000**, Total Offences: **p=0.0000.** The homicide regressions do not reject the null and therefore are estimated using only standard OLS with panel corrected standard errors.

[38] Also note that Donohue and Levitt (2001) also implement the Prais-Winsten method to correct for serial correlation in their data (see table IV notes of their paper).

[39] Just to reiterate from previously that data for Manitoba and PEI were not included in homicide regressions.

cross-sectional fixed effects; this equation helps us to identify the initial sign of the coefficient and provides a very rough validation of its predictive power. The (b) columns of each table add in all variables and continue to use cross-sectional fixed effects. The (a) columns of each table use all variables once again but with two way fixed effects for the error structure.

By examining column (c) of each table, we can see that we consistently obtain statistically significant results, at the 1% level of significance. In these regressions we are essentially saying that there are province-specific effects but no year effects/shocks. These estimates of the EAR coefficient are also all negative in value meaning that an increase in the abortion rate will reduce crime, ceteris paribus. This is just what Donohue and Levitt (2001) found in their analysis. The values of these coefficients are much smaller than those obtained in the National simple linear regression model presented in table 1. Looking at the real world implications we find that an increase of 30 abortions per 1,000 live births[40] results in a decrease in crime of 6.51% for overall crime (Table 3, column c), 10.92% for property crime (Table 2, column c) and 8.84% for homicide (Table 4, column c). Once again we see results consistent with those of Donohue and Levitt (2001), with the coefficient of the EAR for property crime having the largest value. However we must take these results with a grain of salt since we have omitted relevant variables and now must deal with the issue of our estimates being both biased and inconsistent (Gujarati 2004 p.510). In order to eliminate this problem we move to the (b) columns.

In column (b) of each table we now add in the other explanatory variables, thereby increasing the ability of our model to correctly account for the complexities associated with criminal activity, and eliminate the omitted variable issues discussed above. Here we once again

[40] We use this as our standard number to analyze real world impacts since it is about one standard deviation from the EAR values listed in the Descriptive Statistics Chart located at the end of the charts and figures section.

find that our estimated coefficients for each EAR are statistically significant to the 5% level and that all the signs are in the direction predicted by Donohue and Levitt (2001). Again, putting the coefficients in the real world context, our standard increase of 30 abortions per 1,000 live births results in a decrease in crime of 6.84% for overall crime (Table 3, column b), 6.98% for property crime (Table 2, column b) and 13.1% for homicide (Table 4, column b).

Naturally adding more variables to the regression does increase the explanatory power of the model as measured by R^2, but in correcting the miss-specified model we obtain some interesting results regarding the coefficients of EAR. The one coefficient that actually increases considerably in magnitude when we add more variables to the model is the EAR for homicide (Table 4, column b). Interestingly, however, the p value does increase, but not beyond 0.04. This result must be taken cautiously since all other coefficients in the homicide model are statistically insignificant, except for the cross sectional effects.

Looking at the property crime regression (Table 2, column b) we find some interesting results as well, namely that the unemployment rate and average income both have coefficients that are significant at the 5% level, with higher average income associated with less crime and higher unemployment rates associated with higher crime. Looking at the overall crime rate (Table 3, column b) we find only two other independent variables with coefficients significant at the 5% level -- unemployment and police expenditure per capita. In this equation we find, surprisingly, that police expenditure is positively related to higher overall crime. This may be due to increased police budgets during periods of high crime. Curiously the natural log of average income per capita seems to have a rather large effect in these regressions (Column b of Tables 2, 3 and 4) -- a 1% increase resulting in a 0.6% to 0.7% reduction in crime rates. At first

glance this would seem rather large but if we think about this it makes sense. The more money one has the less likely one is to commit crime, especially property crime.

Finally, looking at our models that incorporate two way fixed effects we can identify an emerging pattern. The coefficients of the EAR for total offences (Table 3, column a) and property crime (Table 2, column a) EAR are always statistically significant with p always strictly less than 0.01, while the coefficients of the EAR for Homicide (Table 4, column a) are always statistically significant with $p < 0.10$. In this two way model, a one standard deviation increase in the EAR results in a 6.86% decrease in total crime (Table 3, column a), a 5.83% decrease in property crime (Table 2, column a) and an 11.92% decrease in homicide (Table 4, column a).

Now that we can begin to see that our hypothesis holds true in the previous regression, we need to look at some sensitivity analysis to find out how robust these results are to data manipulation. Here we will drop four provinces -- Manitoba, British Columbia, New Brunswick and Prince Edward Island -- and re-run the previous regressions. The results for each calculated EAR are presented in Table 5. The reasons for excluding these provinces in this section were that no data were available for Manitoba regarding the age breakdown of crimes, so that a national average was used instead for previous regressions. British Columbia and New Brunswick were removed because they only had the age breakdown for the years 2001-2003 available.[41] Finally, Prince Edward Island was removed because no induced abortions were performed past 1983. It is interesting to see that as we remove questionable provinces the coefficients of our EAR for both total offences and property crime shoot up for all three types of regressions. On the other hand we only see a slight movement for homicide with regards to the coefficient of its EARs. The results of these regressions strongly support those of the previous regressions.

[41] Statistics Canada did not have any public data available for the years outside of 2001-2003, because they we updating the figures.

Lastly, a few words on the fixed effects themselves and what they indicate. Although not shown, all provincial fixed effect coefficients were significant up to the 1% level except those for Manitoba and Alberta in some instances. One exception is the regression on homicide with two way fixed effects in which only Ontario had a significant coefficient at the 5% level. The reason that Manitoba and Alberta frequently had insignificant coefficients was because Saskatchewan was chosen as the reference province, and since these three provinces share many similar characteristics (all being Prairie Provinces) this was not unexpected. Regarding the year fixed effects, we found all years coefficients to be jointly significant at the 5%. These results would lead us to believe that the two way fixed effects models for all three regressions best fit our data.

Section VII: Conclusion

While Canada does share many similarities with our neighbour to the South there are still some distinguishing factors: Canada suffered through a less pronounced crack epidemic during the late 1980s early 1990s, we have fewer homicides committed by firearms and abortions are publicly funded in Canada. We do however share just as many similarities with the US, such as popular culture and trends in criminal activity. As a result crime rates in both Canada and the US followed a similar path, with a large drop following 1991. This drop fuelled many debates and ignited examinations of the phenomenon. Equally compelling was the hypothesis put forward by Donohue and Levitt suggesting that the majority of the decline in crime was due to the legalization of abortion nationwide.

In this paper we have examined the literature to identify theories regarding the factors which are thought to impact crime and the mechanisms through which abortion is thought to influence the propensity to commit crime. We tied the two theories together and examined

studies in the US, beginning with Donohue and Levitt (2001) and their findings which favour the link of abortion reducing crime, as well as studies that oppose these findings and actually observe that abortion may have increased crime. As seen in the literature this has stimulated much interest in the US but far less in Canada; however, we manage to examine a paper which began the analysis from a Canadian perspective (Sen 2007). Modeling our paper on that of Donohue and Levitt (2001), we constructed an EAR closely resembling theirs but with Canadian data, and using the most up to date information and data from Statistics Canada we produced some interesting findings. The findings presented in this paper add to the debate, by further supporting the idea that the legalization of abortion not only in the US but also within Canada was a major point in history for its societal and cultural impacts, its effect on crime and, in turn, the economy. As shown in our paper the legalization of abortion in 1969 within Canada had a dramatic and pronounced effect, ranging from a decline in crime of 5.8% to 13.1% following a one standard deviation decrease in abortions compared to Donohue and Levitt (2001) which averaged a 10% decline in crime.

While our study made the best use of the data available, some limitations and future considerations are worth mentioning. First, while abortion was legal from 1969 with the approval of the doctors, it was not until 1988 that abortion was completely legalized. As mentioned earlier abortions for the most part were not very restrictive; however, the fact that they were still not 100% the free choice of the mother may have impacted our findings. For the purpose of our study the impact should be minimal and not in favour of our findings since it is a restriction against receiving an induced abortion. Future studies may want to examine the impact of the 1988 decision to completely legalize abortions in Canada, in order to verify our findings. This

examination may have to wait some years since the cohorts born during this period are only now beginning to turn 20 years old and not enough data is available on crime for them.

As a final remark, while the decline in crime rates is beneficial for society the conclusions in this paper in no way suggest the use of abortion as tool to achieve this goal. In fact, other ways through which society can lower crime are implicit in this paper's conclusion. More specifically, the proper use of contraception and investment in human capital at young ages may be the most effective means through which crime in Canada can be reduced. Thus, one could argue that our results imply that policies to improve child welfare would reduce crime as well, maybe just as effectively as abortion has done in the past.

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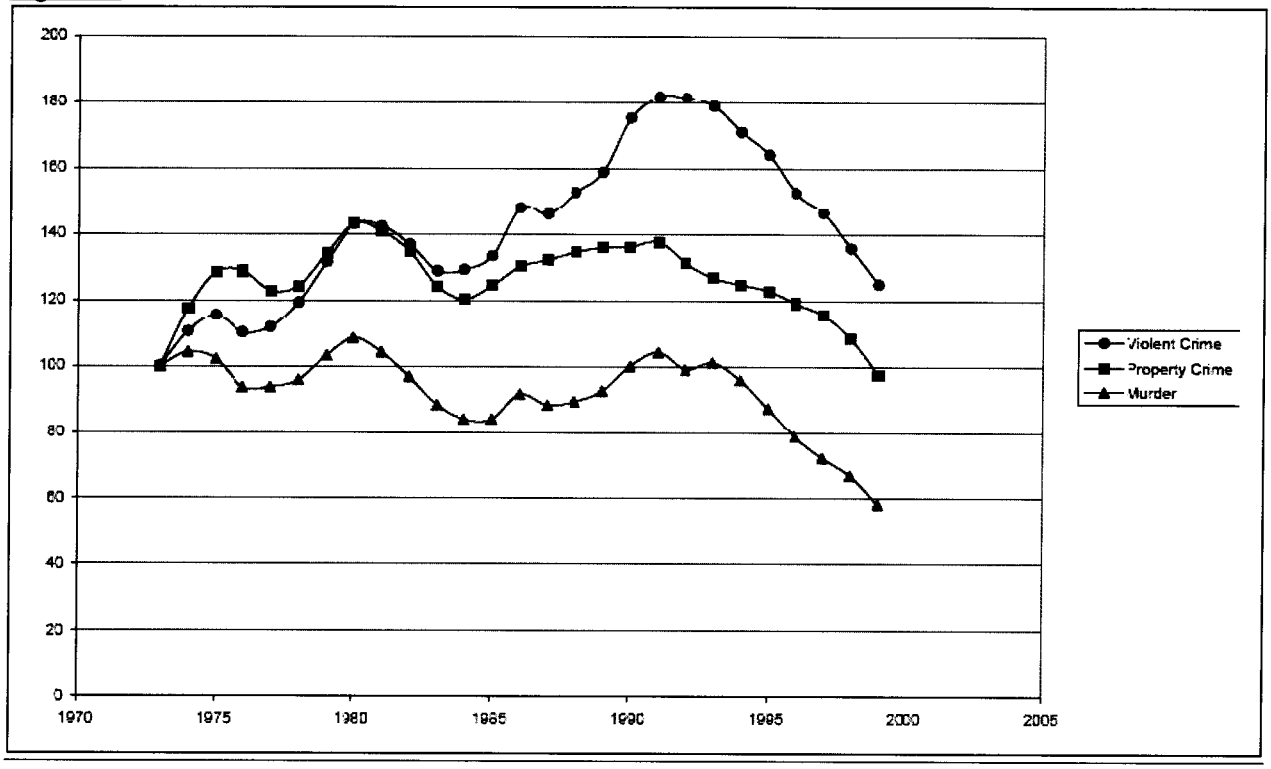
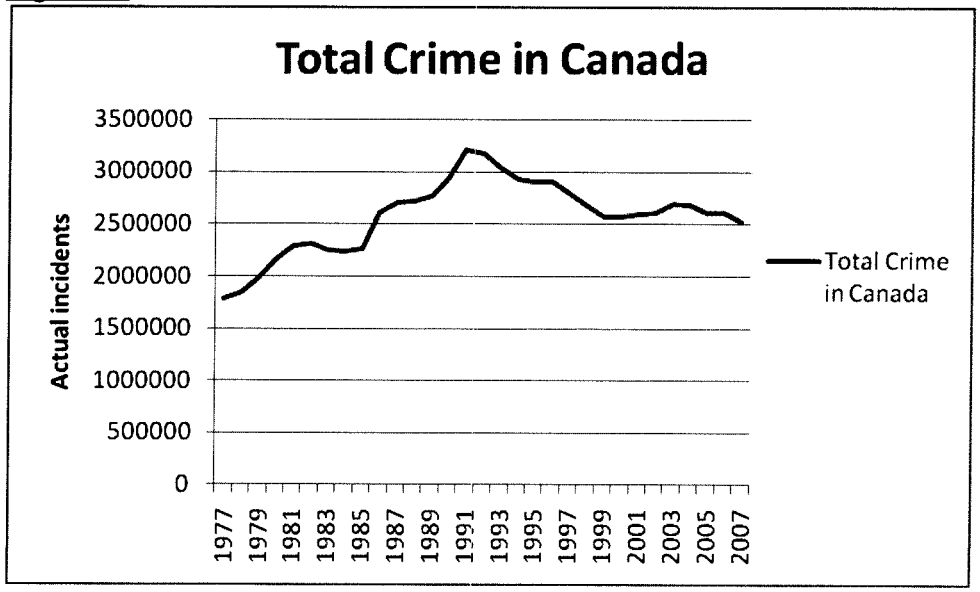
Figures and Tables

Figure 1a **US Crime Statistics**



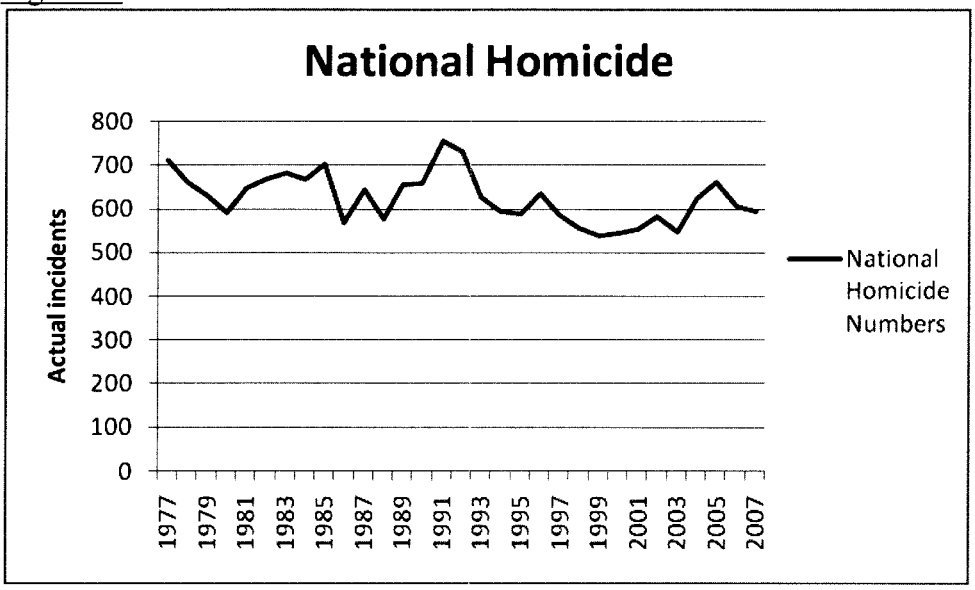
Source: Donohue, John, and Steven Levitt. (2001) "The Impact of Legalized Abortion on Crime." Quarterly Journal of Economics 116(2):379-420.

Figure 1b



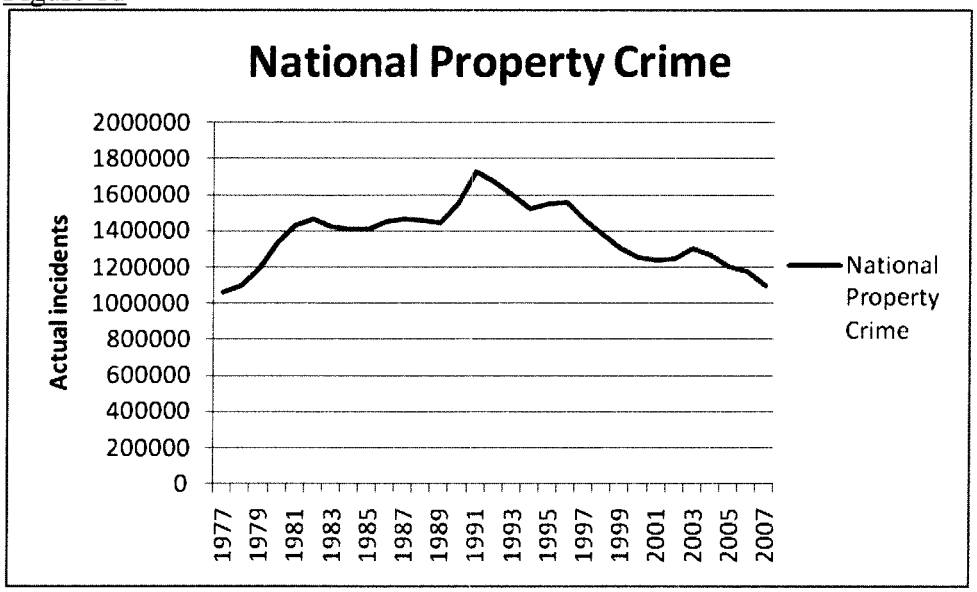
Source: Statistics Canada, CANSIM, table 252-0013.

Figure 1c



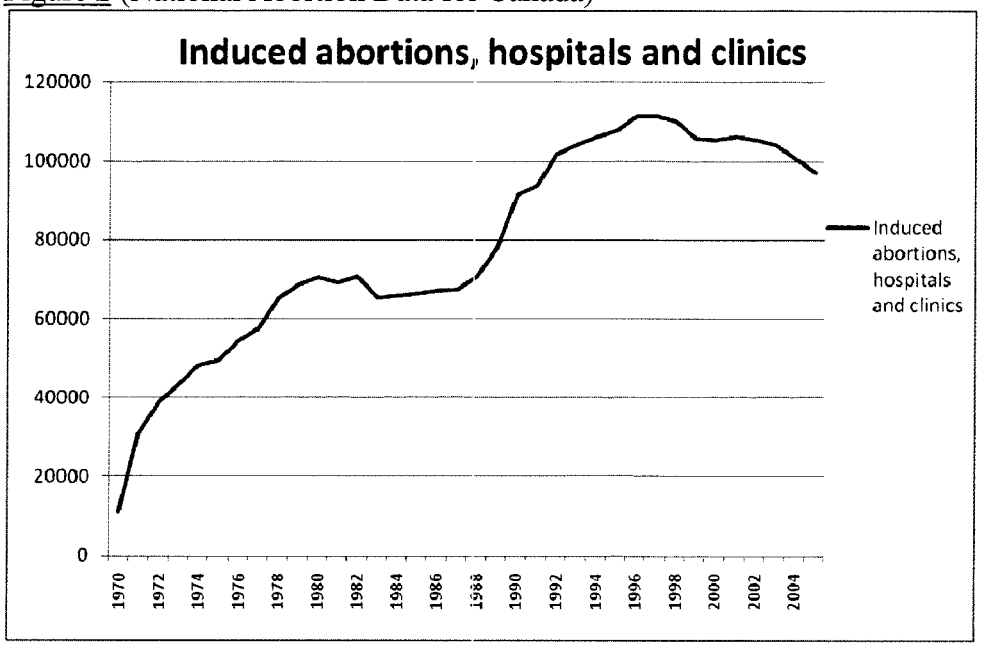
Source: Statistics Canada, CANSIM, table 252-0013.

Figure 1d



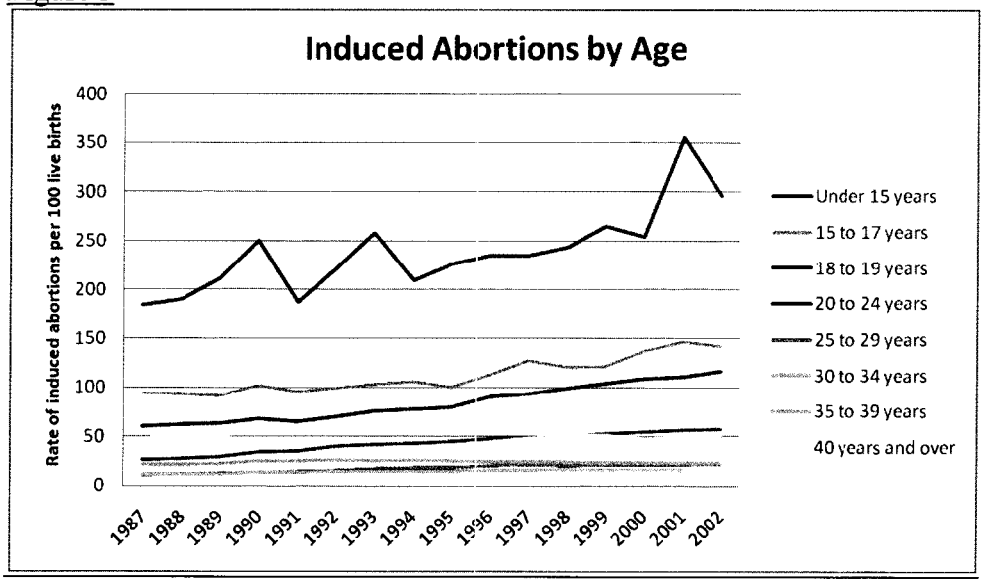
Source: Statistics Canada, CANSIM, table 252-0013.

Figure 2 (National Abortion Data for Canada)



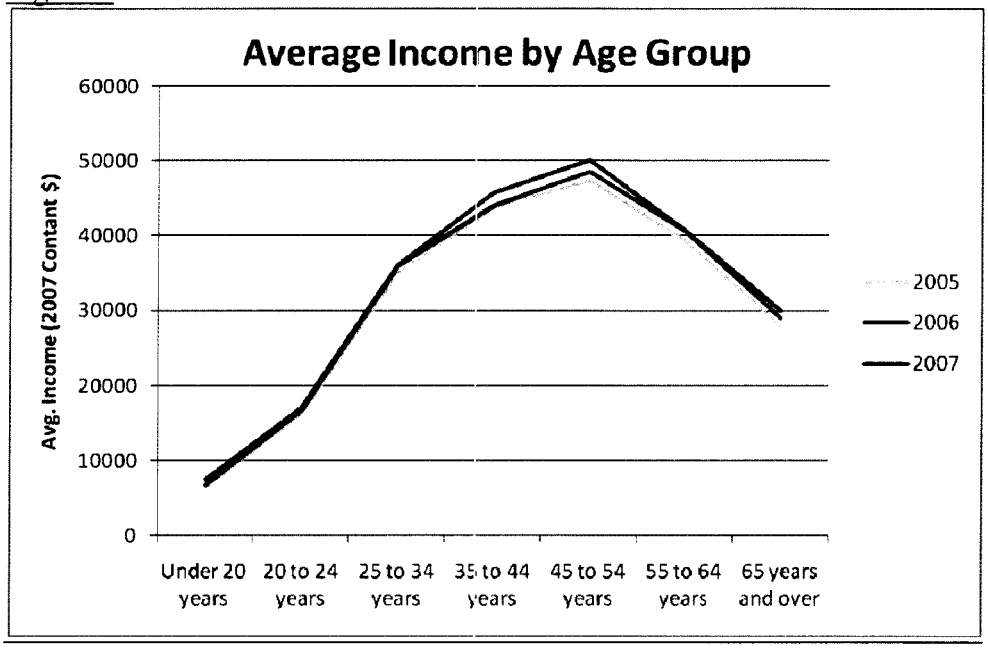
Source: Statistics Canada, CANSIM, table 106-9005.

Figure 3



Source: Statistics Canada, CANSIM, table 106-9024.

Figure 4



Source: Statistics Canada, CANSIM, table 202-0407.

Table 1: National Data Estimates of the Relationship between Abortion Rates and Crime (OLS)

Variables	Property Crime	Total Crime	Homicide
	(a)	(b)	(c)
Effective Abortion Rate (EAR)	**-0.004904**	**-0.007154**	**-0.0151**
	(0.00409)	(0.00324)	(0.00983)
	[0.26]	[0.05]	[0.15]
Beer consumption per capita (litres)	**0.003943**	**-0.003542**	**-0.009349**
	(0.01310)	(0.00854)	(0.02750)
	[0.77]	[0.69]	[0.74]
Ln(Average National Income per Capita)	**1.0008**	**1.9039**	**4.6301**
	(2.40690)	(1.64050)	(5.23350)
	[0.69]	[0.27]	[0.40]
National Unemployment Rate (percent unemployed)	**0.0283**	**0.0166**	**0.0148**
	(0.02190)	(0.01610)	(0.04940)
	[0.22]	[0.32]	[0.77]
Ln(police per 100,000) (t-1)	**0.000578**	**0.002182**	**0.000703**
	(0.00720)	(0.00534)	(0.01650)
	[0.94]	[0.69]	[0.97]
Ln(police expenditure per capita)	**0.001306**	**0.002039**	**0.006067**
	(0.00139)	(0.00114)	(0.00337)
	[0.37]	[0.10]	[0.10]
After tax low income (percent of individuals in low income)	**0.0638**	**0.0669**	**0.1446**
	(0.06490)	(0.04420)	(0.14070)
	[0.35]	[0.16]	[0.33]
Prisoners per Capita	**-0.0315**	**-0.0243**	**-0.0792**
	(0.01750)	(0.01320)	(0.04120)
	[0.10]	[0.09]	[0.08]
Constant	**-8.2166**	**-17.0139**	**-55.1122**
	(26.29080)	(18.03310)	(57.41130)
	[0.76]	[0.37]	[0.36]
R-Squared	0.9893	0.9866	0.8891

Notes: The top values for each variable represent the estimated coefficients for that variable, the ( ) values represent the standard errors and the [ ] values represent the p-values of the coefficients. The number of observations was 20.

Table 2: Panel-data Estimates of the Relationship between Abortion Rates and Property Crime (AR1 & PCSE*)

Variables	Two-Way Fixed Effects (a)	One-Way Fixed Effects (b)	One-Way Fixed Effects (c)
Effective Abortion Rate (EAR)	**-0.0020006**	**-0.0024103**	**-0.0038537**
	(0.00042)	(0.00056)	(0.00065)
	[0.00]	[0.00]	[0.00]
Beer consumption per capita (litres)	**0.0021351**	**0.0029408**	-
	(0.00159)	(0.00206)	-
	[0.18]	[0.15]	-
Ln(Average Provincial Income per Capita)	**-0.0024813**	**-0.6795534**	-
	(0.24755)	(0.27392)	-
	[0.99]	[0.01]	-
Provincial Unemployment Rate (percent unemployed)	**0.0079225**	**0.0191649**	-
	(0.00667)	(0.00815)	-
	[0.24]	[0.02]	-
Ln(police per 100,000) (t-1)	**-0.0006239**	**-0.0007911**	-
	(0.00130)	(0.00149)	-
	[0.63]	[0.60]	-
Ln(police expenditure per capita)	**0.0004264**	**0.0004148**	-
	(0.00082)	(0.00070)	-
	[0.61]	[0.55]	-
After tax low income (percent of individuals in low income)	**-0.0034352**	**0.0028402**	-
	(0.00443)	(0.00519)	-
	[0.44]	[0.58]	-
Constant	**3.848337**	**11.14342**	**4.198006**
	(2.69998)	(2.92479)	(0.05014)
	[0.154]	[0.00]	[0.00]
R-Squared	**0.9872**	**0.9785**	**0.972**
1 std deviation increase results in a decrease in crime of (%)	5.83%	6.98%	10.92%

Notes: The top values for each variable represent the estimated coefficients for that variable, the ( ) values represent the panel corrected standard errors and the [ ] values represent the p-values of the coefficients. * PCSE notes that the procedure utilized panel corrected standard errors and AR1 notes that the Prais-Winsten method to correct for serial correlation is also utilized. The number of observations was 200.

Table 3: Panel-data Estimates of the Relationship between Abortion Rates and Total Offences (AR1 & PCSE*)

Variables	Two-Way Fixed Effects (a)	One-Way Fixed Effects (b)	One-Way Fixed Effects (c)
Effective Abortion Rate (EAR)	**-0.0023706**	**-0.0023624**	**-0.0022456**
	(0.00044)	(0.00060)	(0.00059)
	[0.00]	[0.00]	[0.00]
Beer consumption per capita (litres)	**0.0028296**	**0.0019313**	-
	(0.00143)	(0.00178)	-
	[0.05]	[0.28]	-
Ln(Average Provincial Income per Capita)	**0.4439854**	**-0.2595378**	-
	(0.23085)	(0.24828)	-
	[0.05]	[0.30]	-
Provincial Unemployment Rate (percent unemployed)	**0.0007144**	**0.0160553**	-
	(0.00600)	(0.00712)	-
	[0.91]	[0.02]	-
Ln(police per 100,000) (t-1)	**0.0018401**	**0.0013033**	-
	(0.00119)	(0.00139)	-
	[0.12]	[0.35]	-
Ln(police expenditure per capita)	**0.0018467**	**0.0012759**	-
	(0.00078)	(0.00061)	-
	[0.02]	[0.04]	-
After tax low income (percent of individuals in low income)	**-0.0055861**	**-0.0014922**	-
	(0.00376)	(0.00454)	-
	[0.14]	[0.74]	-
Constant	**-.7697845**	**7.113244**	**5.011461**
	(2.49785)	(2.64107)	(0.04895)
	[0.758]	[0.01]	[0.00]
R-Squared	**0.9917**	**0.9863**	**0.9846**
1 std deviation increase results in a decrease in crime of (%)	6.86%	6.84%	6.51%

Notes: The top values for each variable represent the estimated coefficients for that variable, the ( ) values represent the panel corrected standard errors and the [ ] values represent the p-values of the coefficients. * PCSE notes that the procedure utilized panel corrected standard errors and AR1 notes that the Prais-Winsten method to correct for serial correlation is also utilized. The number of observations was 200.

Table 4: Panel-data Estimates of the Relationship between Abortion Rates and Homicide (PCSE˜)

Variables	Two-Way Fixed Effects (a)	One-Way Fixed Effects (b)	One-Way Fixed Effects (c)
Effective Abortion Rate (EAR)	**-0.0042325**	**-0.0046808**	**-0.0030843**
	(0.00235)	(0.00223)	(0.00068)
	[0.07]	[0.04]	[0.00]
Beer consumption per capita (litres)	**-0.0087815**	**-0.0015373**	-
	(0.00942)	(0.00980)	-
	[0.35]	[0.88]	-
Ln(Average Provincial Income per Capita)	**2.667585**	**0.971932**	-
	(1.03622)	(0.97612)	-
	[0.01]	[0.32]	-
Provincial Unemployment Rate (percent unemployed)	**-0.0006306**	**0.028773**	-
	(0.03556)	(0.03181)	-
	[0.99]	[0.37]	-
Ln(police per 100,000) (t-1)	**0.0083668**	**0.006612**	-
	(0.00453)	(0.00448)	-
	[0.07]	[0.14]	-
Ln(police expenditure per capita)	**0.008613**	**0.0022689**	-
	(0.00499)	(0.00224)	-
	[0.08]	[0.31]	-
After tax low income (percent of individuals in low income)	**0.0010742**	**0.0247797**	-
	(0.02700)	(0.02930)	-
	[0.97]	[0.40]	-
Constant	**-35.32702**	**-15.78911**	**-3.469215**
	(11.39732)	(10.68874)	(0.07618)
	[0.00]	[0.14]	[0.00]
R-Squared	**0.7324**	**0.6578**	**0.6322**
1 std deviation increase results in a decrease in crime of (%)	11.92%	13.10%	8.84%

Notes: The top values for each variable represent the estimated coefficients for that variable, the ( ) values represent the panel corrected standard errors and the [ ] values represent the p-values of the coefficients. ˜PCSE notes that the procedure utilized panel corrected standard errors. The number of observations was 160 since Manitoba and PEI were dropped.

Table 5

	Panel-data Estimates of the Relationship between the Effective Abortion Rate and Crime								
	Ln(Total Offences per Capita) PCSE & AR1*			Ln(Property Crime per Capita) PCSE & AR1*			Ln(Homicide per Capita) PCSE~		
	Single Variable	One-way Fixed	Two-way Fixed	Single Variable	One-way Fixed	Two-way Fixed	Single Variable	One-way Fixed	Two-way Fixed
Variable									
Effective Abortion Rate (EAR) Coefficent	**-.0029146**	**-.0038349**	**-.0055829**	**-.0047583**	**-.0036447**	**-.0041568**	**-.0033418**	**-.0073079**	**-.0059723**
	(.0007103)	(.000859)	(.0006793)	(.0006277)	(.0007426)	(.0007238)	(.0008812)	(.0027091)	(.0028647)
	[<.0001]	[<.0000]	[<.0001]	[<.0001]	[<.0001]	[<.0001]	[<.0001]	[0.007]	[0.037]
1 std deviation increase results in a decrease in crime of (%)	8.37%	10.87%	15.42%	13.30%	10.36%	11.72%	9.54%	19.69%	16.40%

Appendix: Descriptive Statistics

***Note that all values are before any logs are taken except the EAR for all three crime types.**

National Averages

Variable	N	Mean	Std Dev
After Tax low income (%)	200	11.78	2.87
Average Income	200	46203.50	5775.44
Beer consumption per capita (litres)	200	84.83	9.38
EAR Homicide	200	40.19	40.31
EAR Property Crime	200	43.99	42.43
EAR Total Crime	200	37.72	38.80
Homicide per 1,000 residents	200	0.02	0.01
Police Exp. Per Capita	200	148.68	42.97
Police per 100,000 residents	200	175.21	17.87
Prisoners per 1,000 residents	20	7.10	0.56
Property Crime per 1,000 residents	200	45.96	16.07
Total Crime per 1,000 residents	200	98.84	29.18
Unemployment rate (%)	200	9.70	3.80

Alberta

Variable	N	Mean	Std Dev
Total Crime per 1,000 residents	20	111.63	14.77
Beer consumption per capita (litres)	20	90.20	2.36
EAR Total Crime	20	57.13	32.96
Average Income	20	53255.00	6507.93
Unemployment rate (%)	20	6.28	1.93
Police per 100,000 residents	20	163.98	7.72
Police Exp. Per Capita	20	153.05	33.11
After Tax low income (%)	20	11.91	2.80
Property Crime per 1,000 residents	20	55.16	10.66
EAR Property Crime	20	63.91	34.58
Homicide per 1,000 residents	20	0.02	0.00
EAR Homicide	20	59.05	33.38

British Columbia

Variable	N	Mean	Std Dev
Total Crime per 1,000 residents	20	141.59	16.43
Beer consumption per capita (litres)	20	85.24	7.73
EAR Total Crime	20	91.88	55.19
Average Income	20	48920.00	3300.65
Unemployment rate (%)	20	8.14	1.64
Police per 100,000 residents	20	173.12	5.66
Police Exp. Per Capita	20	145.30	36.05
After Tax low income (%)	20	13.87	1.68
Property Crime per 1,000 residents	20	74.72	11.27
EAR Property Crime	20	101.14	59.19
Homicide per 1,000 residents	20	0.03	0.01
EAR Homicide	20	95.77	54.22

Manitoba

Variable	N	Mean	Std Dev
Total Crime per 1,000 residents	20	121.93	6.55
Beer consumption per capita (litres)	20	79.90	5.23
EAR Total Crime	20	33.42	23.11
Average Income	20	45415.00	3136.25
Unemployment rate (%)	20	6.50	1.68
Police per 100,000 residents	20	193.15	2.97
Police Exp. Per Capita	20	160.40	37.36
After Tax low income (%)	20	13.80	2.05
Property Crime per 1,000 residents	20	56.19	6.28
EAR Property Crime	20	38.73	25.67
Homicide per 1,000 residents	20	0.03	0.01
EAR Homicide	20	34.67	23.71

New Brunswick

Variable	N	Mean	Std Dev
Total Crime per 1,000 residents	20	77.18	5.63
Beer consumption per capita (litres)	20	79.33	3.22
EAR Total Crime	20	8.99	5.57
Average Income	20	42775.00	2332.58
Unemployment rate (%)	20	11.12	1.49
Police per 100,000 residents	20	171.74	2.53
Police Exp. Per Capita	20	128.65	22.71
After Tax low income (%)	20	10.69	1.57
Property Crime per 1,000 residents	20	31.44	3.96
EAR Property Crime	20	13.51	7.86
Homicide per 1,000 residents	20	0.01	0.00
EAR Homicide	20	10.11	6.94

Newfoundland and Labrador

Variable	N	Mean	Std Dev
Total Crime per 1,000 residents	20	66.52	3.86
Beer consumption per capita (litres)	20	98.93	9.71
EAR Total Crime	20	10.93	8.39
Average Income	20	42435.00	2794.78
Unemployment rate (%)	20	17.12	1.81
Police per 100,000 residents	20	151.18	4.98
Police Exp. Per Capita	20	115.40	28.53
After Tax low income (%)	20	12.46	2.65
Property Crime per 1,000 residents	20	26.12	2.49
EAR Property Crime	20	13.57	9.97
Homicide per 1,000 residents	20	0.01	0.01
EAR Homicide	20	17.72	16.40

Nova Scotia

Variable	N	Mean	Std Dev
Total Crime per 1,000 residents	20	91.02	6.74
Beer consumption per capita (litres)	20	80.22	4.22
EAR Total Crime	20	35.96	24.90
Average Income	20	43380.00	2738.92
Unemployment rate (%)	20	10.57	1.91
Police per 100,000 residents	20	170.45	4.31
Police Exp. Per Capita	20	126.25	32.30
After Tax low income (%)	20	11.05	1.88
Property Crime per 1,000 residents	20	40.32	5.50
EAR Property Crime	20	45.06	29.38
Homicide per 1,000 residents	20	0.02	0.01
EAR Homicide	20	39.17	29.14

Ontario

Variable	N	Mean	Std Dev
Total Crime per 1,000 residents	20	80.99	16.99
Beer consumption per capita (litres)	20	86.73	9.84
EAR Total Crime	20	71.62	44.07
Average Income	20	55760.00	4218.31
Unemployment rate (%)	20	7.44	1.77
Police per 100,000 residents	20	190.44	7.31
Police Exp. Per Capita	20	196.20	39.07
After Tax low income (%)	20	10.74	1.63
Property Crime per 1,000 residents	20	41.22	10.09
EAR Property Crime	20	82.41	47.61
Homicide per 1,000 residents	20	0.02	0.00
EAR Homicide	20	75.71	48.32

Prince Edward Island

Variable	N	Mean	Std Dev
Total Crime per 1,000 residents	20	82.53	8.66
Beer consumption per capita (litres)	20	79.44	3.67
EAR Total Crime	20	6.69	2.85
Average Income	20	42780.00	2513.25
Unemployment rate (%)	20	13.57	2.27
Police per 100,000 residents	20	147.98	5.99
Police Exp. Per Capita	20	107.50	25.48
After Tax low income (%)	20	7.15	1.40
Property Crime per 1,000 residents	20	33.57	4.41
EAR Property Crime	20	8.36	4.14
Homicide per 1,000 residents	20	0.01	0.01
EAR Homicide	20	6.52	2.78

Quebec

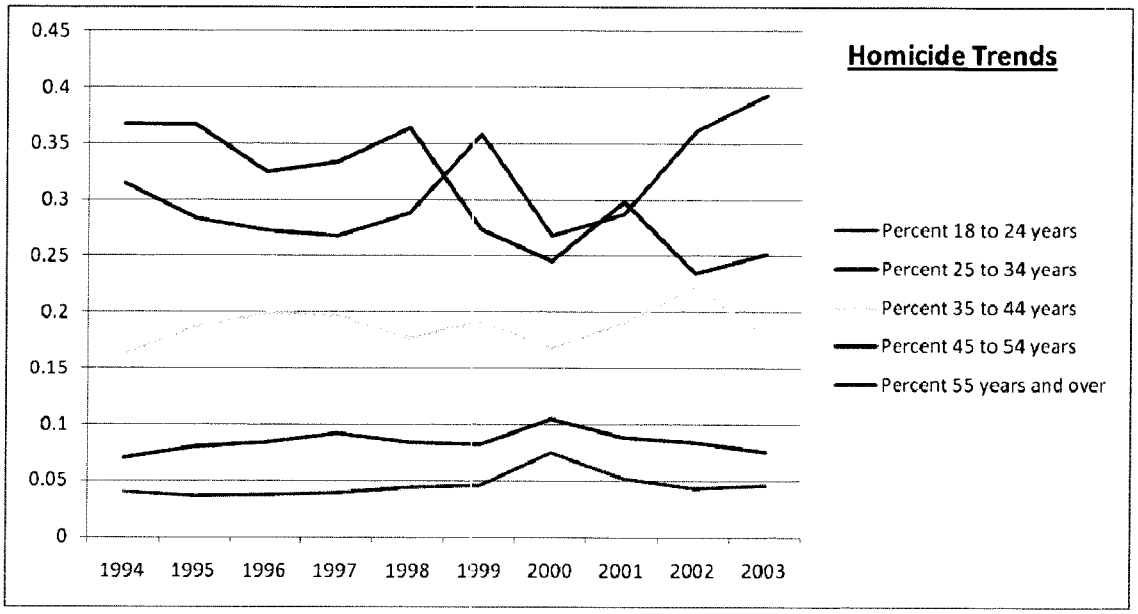
Variable	N	Mean	Std Dev
Total Crime per 1,000 residents	20	73.01	11.03
Beer consumption per capita (litres)	20	94.27	3.46
EAR Total Crime	20	29.91	25.73
Average Income	20	43290.00	2825.24
Unemployment rate (%)	20	10.06	1.77
Police per 100,000 residents	20	197.35	8.18
Police Exp. Per Capita	20	196.45	29.21
After Tax low income (%)	20	14.60	2.49
Property Crime per 1,000 residents	20	41.07	8.10
EAR Property Crime	20	38.06	31.56
Homicide per 1,000 residents	20	0.02	0.01
EAR Homicide	20	29.20	26.45

Saskatchewan

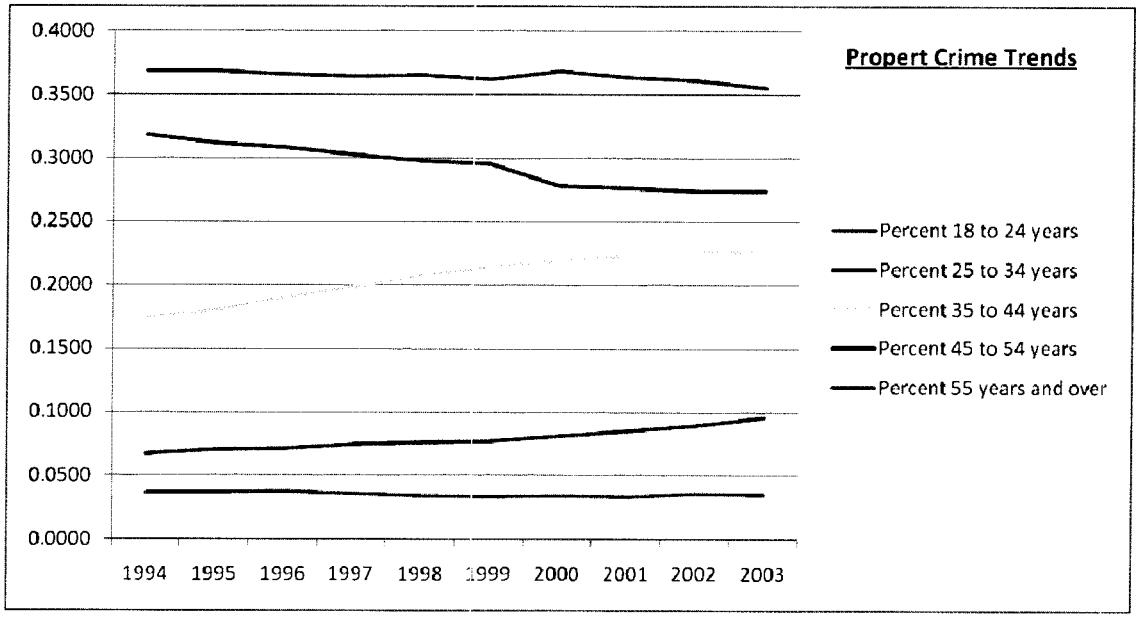
Variable	N	Mean	Std Dev
Total Crime per 1,000 residents	20	142.01	14.67
Beer consumption per capita (litres)	20	74.02	3.74
EAR Total Crime	20	30.70	17.31
Average Income	20	44025.00	3814.36
Unemployment rate (%)	20	6.25	1.11
Police per 100,000 residents	20	192.78	7.07
Police Exp. Per Capita	20	157.60	34.64
After Tax low income (%)	20	11.58	2.09
Property Crime per 1,000 residents	20	59.78	5.86
EAR Property Crime	20	35.16	18.50
Homicide per 1,000 residents	20	0.03	0.01
EAR Homicide	20	34.03	19.05

Appendix: Other Relevant Information

National Age Trends in Homicide



National Age Trends in Property Crime



Data Appendix

Effective Abortion Rate (EAR)
We assume for the age groups 18-24, 25-34, 35-44, that crime is distributed evenly within the group so that the weight for one age bracket within the group is $1/10^{th}$ of the actual weight, except 18-24 is $1/7^{th}$. Therefore the only years which are calculable with our data are from 1988 to 2009. The lag for the effective abortion rate; 1982 would be time lagged (18-24) years would be 1958-1964. First year available is 1988 for one year data of 1970.
Data for the abortion rate is the abortions per 1,000 live births calculated using the induced abortions in hospitals in clinics number from CANSIM table 106-9005, as well as the number of live births estimate from table 053-0001.

The weights used to calculate the effective abortion rate are derived from the adult criminal court survey CANSIM table 252-0022, and proxy the likelihood of an individual at any age above 18 to be arrested and trialed for their crimes. The data is only available for the years 1994 to 2003, therefore a simple average was taken for these years and applied to all years with missing values. Please note that no data is available for Manitoba, or the territories regarding the age breakdown of crimes, while B.C. and New Brunswick only have the years 2001-2003.

For a better estimate of the EAR we used provincial weights for each group from the CANSIM table 252-0022. Note that this data is only available for the years 1994 to 2003 (except NB and BC are only 2001-2003 while Manitoba contains no information).

Note that for our Homicide EAR the PEI numbers are calculated using the national average only, because averages for PEI don't add up close enough to one.

Prisoners
Prisoners per 1,000 residents are only National Data, lagged one year, referenced CANSIM data for table 251-0001.

Beer
Beer is total per capita sales by volume in litres referenced CANSIM data for table 183-0006.

Average Income
Average income is the natural log of average after tax income from all family unit types, referenced CANSIM table 202-0603. It is in 2007 constant dollars.

Unemployment
Unemployment rate is for 15 years and over and does not include any territories, referenced CANSIM data table 282-0002.

Police
Lagged Police per 100,000 (t-1) is lagged one year and is the rate of police per 100,000 residents of province. Referenced CANSIM data table 254-0002.
Per capita cost of Police is referenced CANSIM data table 254-0002.

Population
Population is by province and territory, 1st quarter values. Referenced CANSIM data table 051-0005.

Poverty
Before Tax (After Tax) Low Income is the percentage of all persons in low income cut-offs before tax (after tax) 1992 base dollars. Referenced CANSIM data Table 202-0802

Crime
Total Crime, Violent Crime, Property Crime, and Homicide are all based off CANSIM data table 252-0013 and then broken down to per 1,000 people based off the population file referenced above. Finally a natural log is taken of this value.