THREE ESSAYS ON CRIME AMONG CHILDREN AND YOUTH

by

Lihui Zhang

SUBMITTED IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

AT

DALHOUSIE UNIVERSITY

HALIFAX, NOVA SCOTIA

DECEMBER 14, 2009

Canada

DALHOUSIE UNIVERSITY

To comply with the Canadian Privacy Act the National Library of Canada has requested that the following pages be removed from this copy of the thesis:

Preliminary Pages
    Examiners Signature Page (pii)
    Dalhousie Library Copyright Agreement (piii)

Appendices
    Copyright Releases (if applicable)

Table of Contents

List of Tables

List of Figures

Abstract

This thesis consists of three interrelated yet self-contained empirical essays that use large-scale individual level survey data to study the problem of crime among children and youth in Canada and the United States. The first essay is intended to identify from a large set of potential explanatory factors important correlates of youth criminal and educational outcomes, accounting for unobserved correlations among different youth outcomes. The second essay tries to address an empirical puzzle, that is, American teenagers on average are three times as likely to engage in fights as their Canadian peers and this cross-country violence gap has opened up among children as young as 4-5 years old. The third essay analyzes the impact on youth crime of a nation-wide policy reform in the Canadian youth criminal justice system, i.e. the superseding of the Young Offenders Act by the Youth Criminal Justice Act in 2003.

Acknowledgements

I am deeply indebted to my thesis committee members: Lars Osberg, Shelley Phipps, and Yulia Kotlyarova for their enlightening advice, enormous support, and generous help. Many thanks to Kuan Xu for his insightful comments.

I appreciate Heather Hobson and Margaret Dechman's hard work on releasing voluminous output from the Atlantic Research Data Centre.

I thank the Canadian Labour Market and Skills Researcher Network, the Social Sciences and Humanities Research Council of Canada, and the Johnson-Shoyama Graduate School of Public Policy (University of Regina Campus) for funding.

Lihui Zhang

December 14, 2009

Chapter 1

Introduction

Since Becker (1968), research on crime has gained popularity among economists. Many empirical studies by crime economists (e.g. Lochner (2007), Lochner (2004), Jacob and Lefgren (2003), Levitt (1998a), and Levitt (1997)) have confirmed Becker's notion that economic theory does provide insights into our understanding of questions about crime. Probably all crime economists will agree that crime is very costly to society. Thus, it is imperative for researchers to continue advancing their understanding of crime. Though research on crime has become increasingly prominent among economists in the United States, it has not taken off in Canada. Heckman (2008) summarizes a wealth of evidence from multiple domains - economics, neurobiology, and psychology (e.g., Francesconi (2008); Nilsson (2008); Watt et al., eds (2006); Champagne et al. (2006); Cunha et al. (2006); and Champagne and Curley (2005)) - and concludes that: 1) cognitive and socioemotional "ability gaps between the advantaged and disadvantaged open up early in the lives of children" and persist; and 2) early childhood experience has a profound effect on future outcomes, such as participation in crime, labour market performance and teenage pregnancy. The lack of economic research on crime using Canadian data, along with the perception that early life outcomes have long-lasting implications, leads to the motivation for this thesis, which uses rich information provided by large-scale individual level longitudinal survey data from Canada and the US to study the prevalence of crime among children and youth.

This thesis consists of three interrelated yet self-contained essays on crime among children and youth. The first essay provides a general overview of the joint determination of youth crime participation and school performance using a theoretical framework described in Haveman and Wolfe (1995). In this framework, youth outcomes are viewed as the output of a production process in which both individual/family background and social circumstances (e.g. neighbourhood, school, or government) may influence youth outcomes. In light of this theoretical framework, this paper considers an extensive list of potential correlates of youth outcomes, including family and personal characteristics, neighbourhood characteristics, school environment, and public policies. Though it is expected that omitted variable bias is minimized by controlling for this extensive set of explanatory variables, uncovering correlations is the primary objective of this paper. To account for the discrete nature of and possible unobserved correlations between the outcome variables, this paper uses the multivariate probit regression model to estimate the determination of Canadian youth outcomes. School quality and "peer" group are found to be important correlates of youth outcomes, while neighbourhood characteristics are not.

The second essay tries to address an empirical puzzle, that is, the United States and Canada, though sharing many cultural similarities, have starkly contrasting violent crime rates. Comparable surveys show that American teenagers on average are three times as likely to engage in fights as their Canadian peers. Moreover, this cross-country violence gap has opened up among children as young as 4-5 years old. Children learn violence young. This essay further shows that the US-Canada violence gap remains largely unexplained even after most previous hypotheses have been accounted for. Adding to explanations proposed by previous research, this paper identifies intensive post-birth maternal employment as an important policy-driven risk factor that contributes to the US-Canada violence disparity. The fact that 1/3

of American mothers and only 5% of Canadian mothers start full time work within 3 months after giving birth explains a considerable portion of the US-Canada difference in violence rates both for boys and for girls.

The last essay looks at a major policy change in the Canadian youth criminal justice system, i.e. the coming into effect of the Youth Criminal Justice Act (YCJA) on April 1, 2003, replacing the Young Offenders Act (YOA) as the Federal law that governs the administration of Canadian 12-17 year old offenders. The YCJA differs from the YOA in that it greatly reduces the use of youth courts and custodial sentences for relatively minor crime and is intended to be tougher on most serious, violent young offenders. Both the "deterrence" (Levitt (1998b); Waldo (1972); Silberman (1976); Anderson et al. (1977); Jensen et al. (1978); Becker (1968)) and the "incapacitation" (Levitt (1998b); Tauchen et al. (1994); Grogger (1991); Cameron (1988); Witte (1980); Blumstein et al. (1978); Becker (1968)) hypotheses predict that minor crime rates will increase due to the less punitive disposition of the YCJA towards minor crime. However, the "deterrence" and the "incapacitation" hypotheses predict opposite changes for most serious violent crime. Thus, the effect of the YCJA on serious violent crime is not clear. Using youth self-reported criminal activities data, this essay finds that, consistent with the predictions of economic theory, mischief (damaging or destroying something that does not belong to the youth, e.g. damaging school furniture, or writing graffiti) as the most minor form of crime increased significantly among boys after the YCJA, whereas the effect of the YCJA on other types of youth crime, such as violent crime, drug offences or impaired driving, is less conclusive.

Chapter 2

Family, School and Friends:

Determinants of Canadian Youth Outcomes

2.1 Introduction

Crime is costly to society. A conservative estimate by the Department of Justice is that crime cost Canadians $70 billion in 2003, of which 67% was borne by the victims, 19% was Criminal Justice System expenditures and 14% was on security devices and protective services[1]. Levitt and Lochner (2001) estimate that the annual social cost of youth crime in the United States is in the range of $60 to $300 billion. Research (Carrington (2007)) shows that crime usually peaks during teenage years and decreases as people mature into their twenties. Thus, to lower the costs of crime to society, an effective way is to reduce youth[2] crime. A usual resort for combatting youth crime is the criminal justice system. However, according to evidence presented by the Department of Justice[3], harsher criminal sanctions do not necessarily discourage youth from committing crime, yet they are very costly - incarceration of a youth costs $250 a day, which amounts to nearly $100,000 a year. It is becoming increasingly well recognized that preventing youth crime through social interventions is more cost-effective[4].

Various aspects of child/youth outcomes have been considered by both economists

---

[1]http://www.justice.gc.ca/eng/pi/rs/rep-rap/jr/jr12/p7.html

[2]In this paper, the following terms are used interchangeably: "youth", "child", "adolescent", "teenager", and "juvenile".

[3]http://www.justice.gc.ca/eng/pi/yj-jj/information/mythreal.html

[4]http://www.ccsd.ca/cpsd/ccsd/interventions.htm

and researchers from other social science disciplines, e.g., physical health, academic performance, behaviourial outcome, and education attainment, labour market earnings, or welfare recipiency in young adulthood. However, Canadian research on determinants of juvenile criminal behaviour is very scarce. This paper aims to fill in this gap. Given that going to school is a major component of most youth's everyday life, and often also a common location of many juvenile criminal activities, the determination of youth school outcomes is inseparable from the determination of their criminal behaviour. Thus, this paper empirically investigates the joint determination of Canadian youth academic and criminal outcomes using nationally representative micro-level survey data.

The question is then: how are youth outcomes determined? Haveman and Wolfe (1995) describe this as a hierarchical and interdependent three-level choice process. The first level of choices are made by the society or the government. The government maximizes its objective function, which measures the collective welfare of the society, by making a series of policy decisions, e.g., taxation, education spending, and child welfare policies. By doing so, the government creates a social environment made up by various units, such as neighbourhoods, schools, and organizations. The concept of "social capital" (Coleman (1988); Putnam (2000)) is one way of measuring the quality of this environment. The second level of choices are made within families, typically by parents/adults. A family is viewed as a production unit (Leibowitz (1974); Becker and Tomes (1986)) and child outcome is one of the outputs. There are two types of inputs into the family production function that determine child's outcomes. One type of inputs is inherited by the child from his/her natural parents, e.g., ability. The other type reflects various decisions made by the child's parents. Parents maximize a collective utility function of the family by deciding things like: household size, family structure, hours of paid-work, which neighbourhood to live

in, which school to send the child to, and how much time to spend with the child, etc. Finally, children, especially older ones, make their own choices. Given the environment created by the government and the parents, an adolescent is assumed to maximize his/her utility by allocating time between school, criminal activities and leisure[5]. The adolescent acquires legitimate human capital through formal education at school. Holding other factors constant, the more time the adolescent commits to school work, the better his/her academic outcomes, and most likely, the higher his/her expected future income. While engaging in criminal activities enhances an adolescent's illicit human capital, which may generate immediate payoff from the criminal world, it crowds out the acquisition of legitimate skills which are crucial for the youth's future labour market success. Participating in different leisure activities may also have differential impacts on a youth's outcomes, e.g. watching violent movies versus spending time with positive role models.

In light of the complex three-level choice process described above, this paper considers an extensive list of potential correlates of youth outcomes. These potential correlates are classified broadly into four categories: family and personal characteristics, neighbourhood characteristics, school environment, and public policies. Most family and personal characteristics capture the choices made at the individual and family level, whereas neighbourhood characteristics, school environment and public policies summarize the choices made collectively by the society. Uncovering correlations is the primary objective of this paper, though it is expected that omitted variable bias is minimized by controlling for the extensive set of explanatory variables outlined above.

---

[5]This is similar to the human capital approach in Lochner (2004). I do not allow the possibility of paid work as Lochner does, because all of the teenagers in this study are below Canada's compulsory schooling age, which is at least 16 in all Canadian provinces.

The main data set employed by this study is the masterfile of the National Longitudinal Survey of Children and Youth (NLSCY), which provides extremely rich information on Canadian children's personal and family characteristics, as well as school environment. To consider neighbourhood characteristics, the NLSCY is matched with the 2001 Census by Forward Sortation Areas[6] (FSA). The large sample size provided by the NLSCY allows the possibility of carrying out the empirical analysis separately for boys and girls.

To account for the discrete nature of and possible unobserved correlations between the outcome variables, this paper uses the multivariate probit regression model to estimate the determination of Canadian youth outcomes. The estimation is implemented using the STATA based mvprobit module provided by Cappellari and Jenkins (2003), which provides an asymptotically consistent Simulated Maximum Likelihood (SML) estimator for multivariate probit regression models. The main empirical results are summarized as follows:

1. School quality matters. However, conventional measures of school quality (e.g., class size and teacher's education attainment) pale when compared to a measure of in-class group activities. Being in a class where students work well together on group activities is connected to both less participation in crime and better academic performance.

2. Observable neighbourhood characteristics, such as neighbourhood socioeconomic status, racial heterogeneity and age composition do not seem to be correlated with youth outcomes after controlling for other factors.

3. There is strong "peer" group effect. Hanging out with kids frequently in trouble is linked to more criminal behaviour and worse academic outcomes.

---

[6]The first three characters of the postal code as of the 2001 Census year.

4. Echoing the findings in the Canadian children's outcome literature (e.g., Doo-
   ley and Stewart (2007) and Phipps and Lethbridge (2006)), family background
   is very important for Canadian youth outcomes. Socioeconomic status (e.g.
   parental education and household income) is correlated with academic out-
   comes, but not with criminal activities. Parental monitoring matters for both
   criminal and academic outcomes. Exposure to violent media is associated with
   more violent crime among boys.

The following section is an overview of the literature. Section 2.3 describes the
data and presents some descriptive evidence. Regression analysis is provided in Sec-
tion 2.4. To illustrate the relative importance of different correlates of youth out-
comes, a series of scenario analysis is conducted in Section 2.5 using the estimates
obtained in Section 2.4. Section 2.6 concludes.

2.2 Literature Review

Recently there has been a large number of Canadian studies on children's outcomes
using the NLSCY. Many of these studies focus on the relationship between family
income and child outcomes. For example, Dooley and Stewart (2004) find a posi-
tive, though moderate, effect of income on child cognitive outcomes, such as PPVT,
math, or reading scores. Dooley and Stewart (2007), however, find little evidence of
an effect of income on behavioural/emotional scores, whereas parenting style has a
consistent impact on child behavioural/emotional outcomes. Phipps and Lethbridge
(2006) consider the relationship between income and child outcomes from four dif-
ferent developmental domains: 1) cognitive; 2) social/emotional; 3) physical; and
4) behavioural. They find that income, especially long-run average income, is asso-
ciated with cognitive and behavioural, physical health outcomes, but not so much
with social/emotional outcomes. Dooley et al. (2005) study the relationship between

mother's share of income in the household and a series of child outcomes and find a moderate effect in their fixed effects model. Another area of interest in the literature of child outcomes is the importance of neighbourhood quality. Both Curtis et al. (2004) and Gagné and Ferrer (2006) find neighbourhood quality matters for child outcomes. Mostly recently, however, Oreopoulos (2007) argues that neighbourhood environment, though matters for individual's exposure to crime, may not be as important for children outcomes as previous studies suggest.

The majority of the studies described above use data from Cycles 1-3 of the NLSCY and look at children of a wide age range, usually 4-16 years old. Few economic papers have focused on the outcomes of Canadian adolescents. One example is Chowhan and Stewart (2007) who study the effect of TV watching on the behaviour outcomes of Canadian 12-15 year old adolescents. Using NLSCY Cycles 2-4, Chowhan and Stewart (2007) conclude that behaviour outcomes improve with less television viewing for both boys and girls and the effect of watching violent television is stronger in low-income families.

The cognitive measures used by these Canadian studies are PPVT scores for younger children and math and reading scores for older children. The behavioural and social/emotional outcomes are constructed continuous indices based on a series of questions asked of the PMK, the child him/herself or the teacher depending on the age range of the child and whether the child has a school record in the data. Except for math score, the adolescent outcome measures used in this paper are discrete and are different from those employed by previous studies. The behavioural outcomes in this paper measure children's engagement in criminal activities, which are more severe in nature compared to those measured by physical aggression, indirect aggression, or property offence scores. None of the studies mentioned above consider the effect of school environment on children's outcomes.

The majority of the research on youth crime has been done using US data. Levitt and Lochner (2001), whose research findings are based on multiple data sets, is probably by far the most comprehensive study on this topic. They use the National Longitudinal Survey of Youth (NLSY) to explore the correlates of crime at the individual level, use census tract-level homicide data for the city of Chicago to understand the influence of social factors and local labour market conditions on youth crime, and use state-level panel data to study the impact of the criminal justice system. Similar to this study, Mocan and Rees (2005) also use micro survey data and investigate the roles of a wide range of determinants. Using wave I of National Longitudinal Study of Adolescent Health merged with county contextual data, they study the effects of personal, family, neighbourhood characteristics, and deterrence measures on juvenile crime. The majority of the literature on youth crime/delinquency does not pay much attention to public policies other than the criminal justice related ones, e.g., the number of police officers or policing expenditure. Lindvall (2004) and Harknett et al. (2003) are two exceptions. Table 2.1 is a list of determinants of youth crime that have been considered in existing literature. These determinants, together with the theoretical framework of Haveman and Wolfe (1995), provide a guideline for determining which explanatory variables should be included in the empirical analysis carried out for this paper.

2.3   Data and Descriptives

The main data sets employed by this study are the masterfile of the National Longitudinal Survey of Children and Youth (NLSCY) and 2001 Census. The NLSCY is merged with 2001 Census by Forward Sortation Areas (FSA), i.e., the first three digits of the full postal code, to consider neighbourhood characteristics. Therefore, each neighbourhood corresponds to an FSA.

The NLSCY is an ongoing survey of Canadian children and youth designed to follow their development and well-being from birth to early adulthood. The survey began in 1994 and is jointly conducted biennially by Statistics Canada and the Human Resources Development Canada. The NLSCY surveys households with children sampled originally from the Labour Force Survey (LFS), a monthly survey that collects labour market data from a national sample of about 60,000 dwellings. The LFS sample is representative of the civilian, non-institutionalised population 15 years of age or older in Canada's ten provinces. The LFS sample is based upon a stratified, multistage design employing probability sampling at all stages of the design. The design principles of the LFS are the same for each province (Statistics Canada (2000)).

So far, there are six cycles of NLSCY available. In each cycle, the Person Most Knowledgeable (PMK) of the child is interviewed. In about 90% of the cases, the PMK is the mother of the child. In all cycles, children who are 10 years of age or older are asked to fill out a self-complete questionnaire. Up to Cycle 4, information was also collected about the school the child was attending. The crime-related questions are only asked of those who are 12-17 year old on December 31st of the reference year. In Cycle 1, the oldest child was 11 years old. Thus, this study pools Cycles 2-4 of the NLSCY. For those 16 years old and above, considerably fewer questions are asked to the PMK, compared to for those 15 years of age or younger. Therefore, in order to keep a relatively large sample size without losing much information provided by the PMK, the population of interest is 12-15 year old Canadian adolescents for the sample period 1994-2000. The number of observations is 3615, representing 2938 Canadian 12-15 year old adolescents (677 repeated observations), including 1449 boys and 1489 girls. I use the Cycle 2 cross-sectional weights in all the descriptive and regression analysis.

The dependent variables are three sets of variables representing the child's school outcomes, participation in violent crime and in property crime, respectively. Table 2.2 summarizes the means of these dependent variables (printed in bold), and their sub-components, as well as who reports each variable. The cognitive/school outcome variables are: i) a dummy variable indicating if the child's overall academic performance is above-average; ii) a dummy variable indicating if the child's math score is above average; and iii) a dummy variable indicating if the child hopes to complete university degree. Overall academic performance is assessed by the child's teacher. Math tests are administered in school or at home. Math score is available as a scaled continuous variable, which is comparable within each grade level. To be consistent with the other dependent variables, scaled math score quintiles are generated for each grade level using all children of the same grade in Cycles 2-4 of the NLSCY, and variable "math score above-average" is coded 1 if the child's scaled math score belongs to the 4th or the 5th quintile. "Hope to complete university" is coded 1 if the child's response to this question is positive. The first violent crime variable is an indicator of the child's involvement in a broad range of violent activities. The second violent crime variable indicates the child's engagement in fights with or without weapons. Similarly, the first property crime variable is a broader measure, while the second one indicates the child's engagement in thefts. The crime variables are reported by the child him/herself. Table A.1 in the Appendix provides more details of the variable definitions.

On average, more girls (62.4%) than boys (48.6%) are considered by teachers to have above-average academic performance. The percentage of students whose math score is above-average is close for boys and girls, 40.6% versus 38.9%. More girls (76.3%) hope to complete university compared to boys (69.8%).

Boys are much more violent than girls across all measures of violent crime. Overall

violent crime rate among boys (21.1%) is almost three times the rate among girls (7.9%). Getting into fights is the most common type of violent criminal behaviour. The fighting rate is 14.3% for boys, while it is only 4.9% for girls. In some cases, the boy-girl contrast is even more stark. For example, 2.2% of boys confess to have carried a gun in the past 12 months, but only 0.3% of girls admit to have done so, a 7 to 1 ratio.

Theft is the most common type of property criminal behaviour for both boys and girls. Neither overall property crime rate nor theft rate is very far apart between boys and girls, 36.1% and 29.4% versus 30.6% and 27.9%. However, a closer look reveals some interesting perceptions. Girls are less likely than boys to commit all types of property crime except for stealing from home. The gender difference appears to be larger in more serious property crime offences, e.g. arson, or break and enter. Boys are more likely to steal from stores or schools.

Summary of independent variables is presented in Table 2.3. The first column is the name of the variable. Means for boys and girls are reported in columns 2 & 3. The reporter and the data source of each variable are listed in columns 4 & 5. The independent variables are grouped into four categories: personal and family characteristics, neighbourhood characteristics, school environment and public policies. The means of most independent variables are fairly close for boys and girls. The only exception is that the percentage of boys who watch violent TV shows or movies is 20% higher than that of girls.

- Personal and family characteristics. About one third of the boys and girls are 12 years old, one third are 13 years old and another one third are 14 or 15 years old[7]. 6-7% of the teenagers are visible minorities. One third have chronic

---

[7]The number of 14 or 15 year old children is relatively small compared to 12 or 13 year old ones because in Cycle 2 of NLSCY the oldest kids are 12-13 years old.

conditions. Most of the adolescents, around 85%, live in urban areas. The majority of the PMKs have high school diploma or college degree. Around 11% of the PMKs did not graduate from high school, and 18% of the them graduated from university. 14-17% of the PMKs are immigrants. Close to 30% of the children's parents attend religious services at least once a week. A little over 20% of the children had at least one teenage parent at birth. Over 20% of the children are in "non-intact" families, i.e. do not live with both biological or adoptive parents. Income is measured in real dollars of year 2000. The mean household equivalent income[8] is around $34,000. On average, parents have 70 hours available per week for their families. Following Burton and Phipps (2007), I use "equivalent adult time available"[9] to measure available parental time. 87% of the PMKs know most of their children's friends. 62% of PMKs think good grade is important for their children. Around 10% of girls and 12% of boys often hang out with kids frequently in trouble.

- Neighbourhood characteristics. On average, around 21% of the population in a neighbourhood is between 10 and 24 years old. Of those 15-24 years old, around 37% do not go to school, i.e. either work or are idle. 8% are visible minorities. 14% of the households are low-income. The median household income is around $50,000, measured in 2000 real dollars.

- School environment. 77% of the adolescents in the sample go to public schools. The rest go to either private schools or publicly-funded Catholic schools. On

---

[8]To capture economies of scale within household with respect to income, equivalent household income is calculated using the 'Luxembourg Income Study' equivalence scale, i.e. total household income divided by the square root of family size.

[9]Similar to equivalent family income, the idea is to capture economies of scale within household with respect to time versus income. The calculation of "equivalent adult time available" is [# of parents × 112 − total parental weekly work hours]/(square root of family size), where 112 is total number of hours per week, 168 (24 hours/day × 7 days), minus sleep hours per week 56 (8 hours/day × 7 days).

average there are 27 students in a class. For boys, in 65% of the cases, the teacher reports good group activities, or "cooperation", in the child's class. For girls, this number is slightly higher, 69%. Most of the teachers have Bachelor's degree. About 13-15% have Master's degree. 9-10% do not have Bachelor's degree.

- Public policies. I use 1996, 1998 and 2000 annual data for the public policy variables corresponding to Cycles 2, 3 and 4 of the NLSCY, respectively. The average social assistance rate, i.e. the number of social assistance recipients divided by the total population in that province, is 8%. On average, each province spends $7,400 on every social assistance recipient, $6,800 on every elementary or secondary school student, $200 per resident on recreational and cultural activities, $90 per resident on housing provisions. All the expenditures are in 2000 real dollars. The average unemployment rate is 8%. The average police/civilian ratio is 178 per 100,000 population.

Figure 2.1 and 2.2 summarize the adolescent outcomes by income quintiles[10]. Higher income is associated with better school outcomes for both boys and girls across all three measures. For boys, the income gradient is U-shaped for both measures of violent crime. Boys in the first and third quintiles seem to have higher property crime rates than boys in the other quintiles. For girls, violent crime rates are highest in the bottom quintile, lowest in the top quintile and stable in the second, third and fourth quintiles. Property crime rates for girls first decline, then increase with income, with girls in the third quintile having the lowest property crime rates.

Figure 2.3 and 2.4 compare adolescent outcomes by family structure. Adolescents in intact families consistently have better school outcomes and lower crime rates than

---

[10]The cut points for income quintiles are based on equivalent family income calculated using the public file of the Survey of Labour and Income Dynamics 2003.

adolescents in lone-parent families or two-parent step families. For both boys and girls, the differences in adolescents outcomes are generally smaller when comparing between those in two-parent step families and those in lone-parent families than when comparing between those in the two types of non-intact families and those in intact families.

Figure 2.5 and 2.6 show the relationship between parental education attainment and youth outcomes. Higher parental education attainment is associated with better school outcomes and lower crime rates. This is true for both boys and girls.

Consistent with the peer influence hypothesis, Figure 2.7 and 2.8 suggest that hanging out with kids frequently in trouble is correlated with both negative school outcomes and more criminal activities.

Figure 2.9 and 2.10 illustrate the effects of parental supervision. If the PMK knows most of the child's friends, the child is more likely to perform better in school and less likely to engage in criminal activities.

Figure 2.11 and 2.12 show that a child tends to have better school outcomes and participate less in criminal activities if students generally work well together on group activities in the child's class.

Simple descriptive analysis seems to suggest that household income, family structure, parental education, parental monitoring, peer influence, and class environment are all highly correlated with academic and criminal outcomes of boys and girls. The next section is devoted to finding out whether these simple correlations are robust when controlling for a wide of range of potential determinants of youth outcomes.

2.4 Regression Analysis

Given the narrow band of the age range, 12-15, the number of children with repeated observations is small, only 483 boys and 517 girls, and the majority of these boys and

girls only have one repeated observation in the sample. In addition, the dependent variables are discrete in nature. Therefore, it is not appropriate to use longitudinal approaches such as the fixed effects model, which requires relatively longer panels and more variations in dependent and independent variables in order to obtain reliable estimates. Another drawback of fixed effects model is that it is not capable of estimating the effects of time-invariant independent variables, e.g. race, immigration status, parental education etc.

Considering that school outcomes and participation in criminal activities are simultaneously determined and may be correlated, it is useful to model the underlying relationships using a structure similar to that of a seemingly unrelated regression (SUR) model (Zellner (1962)). Cappellari and Jenkins (2003) propose a consistent simulated maximum likelihood (SML) estimator for an SUR type model suitable for three or more binary dependent variables, called the multivariate probit regression model.

The multivariate probit regression model is specified as follows[11]:

$$y_{im}^* = \beta_m' X_{im} + \epsilon_{im}$$

$$y_{im} = 1 \quad if \quad y_{im}^* > 0$$

$$m = 1, \cdots, M, \quad where\ M\ denotes\ the\ number\ of\ equations$$

$$i = 1, \cdots, N, \quad where\ N\ denotes\ the\ number\ of\ observations$$

y_{im} represents the set of binary youth outcomes, including school outcomes and

---

[11]The formulas presented here borrow heavily from Cappellari and Jenkins (2003).

engagement in criminal activities. X_{im} represents the set of explanatory variables, which in this case refers to personal and family characteristics, neighbourhood characteristics, school environment and public policies. The error terms ϵ_{im} are error terms distributed as multivariate normal, each with a mean of zero, and variance-covariance matrix V, where V has values of 1 on the leading diagonal and correlations $\rho_{jk} = \rho_{kj}$ as off-diagonal elements.

The SML estimator is implemented in STATA using the mvprobit routine provided by Cappellari and Jenkins (2003). The mvprobit routine uses the Geweke-Hajivassiliou-Keane (GHK) smooth recursive conditioning simulator, considered to be "the most popular simulation method for evaluating multivariate normal distribution functions" (Cappellari and Jenkins (2003); Hajivassiliou and Ruud (1994)). The SML estimator is asymptotically consistent as the number draws is increased as the number of observations grows. However, as Cappellari and Jenkins (2003) suggest, for sample sizes of the order of thousands, the estimates are mostly insensitive to the choice of seeds, given that the number of draws is at least as large as the square root of the sample size. This "rule of thumb" is adopted in the results presented below.

Table 2.4 and 2.5 report the multivariate probit regression estimates for two specifications of a three-equation system for boys and girls, respectively. Raw coefficients are reported[12]. Specification 1 considers the following three dependent variables: school performance above-average, engaged in violent crime, and engaged in property crime. Specification 2 substitute the two broader crime indicators in specification 1 with two more narrowly defined ones: engaged in fights and engaged in thefts. Tables A.2 and A.3 in the Appendix report the estimates for specification 1 of a five-equation system for boys and girls. The number of observations in the five-equation system

---

[12]The mvprobit module cannot report marginal effects.

drops by close to 1/3 due to the relatively high non-response rates of the two additional school outcome indicators: math score above-average and hope to complete university. The main results obtained from the five-equation and the three-equation multivariate probit regressions are similar[13]. The NLSCY provides bootstrap weights for the purpose of producing design-based standard errors. I do not report bootstrap standard errors because the time required to calculate bootstrap standard errors for simulation-based multivariate probit regressions is formidable. Bootstrap standard errors are usually more inflated compared to model-based standard errors, making the coefficients less likely to be significant. Thus, when interpreting the estimates, I will focus on results that are significant at 5% or 1% level. The multivariate probit standard errors correct for clustering by child ID, though. Regression tables are made by the user-written STATA package - estout - provided by Jann (2005) and Jann (2007).

The bottom part of Table 2.4 and 2.5 show the likelihood-ratio tests of the null hypothesis that there are no inter-equation correlations. The null hypothesis is rejected in both specifications of the multivariate probit regressions for both boys and girls. This suggests that multivariate probit regressions are more appropriate than single-equation probit regressions. As one might expect, an adolescent who commits one type of crime is likely to also commit the other type of crime. A girl who commits crime is likely to have poorer school outcomes. For boys, this negative correlation

---

[13]Single-equation probit regressions have also been considered and the main results are qualitatively similar. One drawback of multivariate or single-equation probit regressions is the failure to account for individual heterogeneity. To address this problem, a population-average model, called the Generalized Estimating Equation (GEE) (Zeger et al. (1988); Skrondal and Rabe-Hesketh (2004)), is also estimated. The GEE is a type of GMM estimator, which requires the specification of the first two moments of the error term, i.e. which explicitly specifies the within-child correlation structure for children observed on more than one occasion. The regression coefficients are interpreted as the average population response to changing independent variables, rather than as any individual's response. The GEE is implemented using STATA's xtgee command. The within-in child correlation structure is specified to be "unstructured", meaning that the pairwise correlation between any two observations of the same child from different occasions can be different. The GEE estimates, however, are very close to the single-equation probit estimates.

is either not present or small in magnitude. In Table 2.4, though ρ_{21} is significant at 10% level in specification 1, the magnitude of the correlation is moderate, only around - 0.1.

2.4.1 Personal and Family Characteristics

1. Demographic factors. Both boys and girls are more likely to commit property crime as they grow older. Visible minority status is not a significant correlate for boys' outcomes, but is positively correlated with the probability of fights for girls. The presence of chronic conditions is not significant for boys or girls.

2. Parental characteristics. PMK's education attainment is positively associated with school outcomes for both boys and girls. PMK not graduating from high school is also positively associated with the probability of engaging in fights for girls. PMK's education is not significant for boys' criminal outcomes. This is consistent with the family production idea which predicts that higher parental education attainment passes on to the child either through genetic endowment or improving the quality of other resources (time and money) invested in the child. PMK's immigration status in general is insignificant for the outcomes of boys or girls. Sons of religious parents are more likely to perform well in school, but are also more likely to commit non-theft related property crime, e.g. vandalism. Either parent being a teenager at the child's birth is not significant for boys or girls.

3. Family structure. Living in a non-intact family is associated with poorer school performance for boys, but not significant for girls' outcomes.

4. Family income. For both boys and girls, household income is positively related to the probability of above-average school performance. This, again, is

consistent with the family production hypothesis. It also agrees with the findings of Dooley and Stewart (2004), Phipps and Lethbridge (2006), and Dooley and Stewart (2007). Higher income, however, is also associated with higher probability of fights for girls.

5. Parental supervision. Equivalent adult time available is not important for boys' outcomes, though it is positively associated with the probability of violent crime for girls. This appears to be inconsistent with the hypothesis that more parental time invested in children should improve children's outcomes. However, the equivalent adult time here simply measures parental time outside of paid work, and does not necessarily measure parental time spent with children. PMK knowing most of the child's friends is connected to better school performance and lower probabilities of violent crime for boys, but not important for girls. "PMK thinks that good grade is important" is linked to better overall academic performance for boys and girls, and associated with lower likelihood of violent crime for girls. The significance of parental monitoring for children's outcomes found here is consistent with Dooley and Stewart (2007).

6. Peer effects. For both boys and girls, hanging out with kids frequently in trouble is negatively related to school outcomes and positively related to criminal activities. This is an example of choices made by children themselves matter for their own outcomes. From another perspective, the number of kids frequently in trouble present in the society is also an example of choices made by the government.

7. Exposure to media violence. Watching TV shows and movies with violent scenes is associated with more violent crime for boys, but not so important for girls' outcomes. This agrees with Chowhan and Stewart (2007).

2.4.2 Neighbourhood Characteristics

In general, few neighbourhood characteristics considered here are found to be significantly related to youth outcomes. For boys, the percentage of low-income households in the neighbourhood is associated with better overall school performance. This relationship might be related to the fact that many low-income neighbourhoods are formed by recent immigrants (Oreopoulos (2007)) whose children tend to be more motivated to have better academic outcomes. For girls, the only significant neighbourhood variable is the percentage of visible minority population, which is negatively associated with the probability of violent crime.

The insignificance of neighbourhood characteristics observed here is consistent with Ginther et al. (2000) who find that the significant effects of neighbourhood characteristics on children's outcomes either quickly shrink in size or become insignificant as more individual and family characteristic variables are controlled for.

One possible explanation for the insignificance of neighbourhood characteristics found here is that perhaps neighbourhood effects are absorbed by the "peer" effects, e.g. hanging out with delinquent neighbours. However, as Oreopoulos (2007) argues, "peer" effects at neighbourhood level are not as big as "peer" effects at classroom level.

2.4.3 School Environment

Conventional measures of school quality, such as the type of school, class size, or teacher's education attainment, are not significant for boys or girls. The single most important school-related factor is whether students work well together on group activities in the child's class. This variable is positively associated with school outcomes and negatively associated with criminal activities for both boys and girls. The

importance of the in-class group activities is consistent with the "identity" theory in high-school context in Akerlof and Kranton (2002) and in organization context in Haslam et al., eds (2003) . "Identity" is a social psychological concept. The "identity" theory in different contexts states that individuals who feel a sense of "belonging" to a certain group tend to perform better, at school or work, than otherwise. The group activity variable here simply describes the environment in the child's class. It does not indicate whether the child him/herself participates in these group activities. To the extent that the child does not belong to any group but still benefits from increased level of group activities among his/her classmates, it is consistent with the "social capital" hypothesis (Coleman (1988); Putnam (2000)) in a classroom context. Group activities among part or all of the students in the class enhance social capital and higher level of social capital is beneficial to every student in the class.

The findings from this section have important policy implications for government and educators when making resource allocation decisions hoping to improve student outcomes. The marginal return from allocating more resources towards coordinating more group activities among students may be higher than from, say, recruiting highly educated teachers or changing class size. In a world of scarce resources, the important question might not only be how much to spend but also be how to spend wisely.

2.4.4 Public Policies

For boys, both social assistance expenditure and social assistance rate are correlated with more violent and property crime. For girls, social assistance expenditure is related to more violent crime.

Education expenditure is associated with less violent crime and thefts for boys. Recreational and cultural expenditure and housing expenditure are associated with less violent crime for boys. None of education, recreational and cultural or housing

expenditure is significant for girls' outcomes. Neither unemployment rate nor the number of police officers per 100,000 population is significant for boys or girls.

These public policy variables are observed three times over a six-year period for ten provinces. The amount of variation in these variables may not be as much as that in longer panels of macro-level data. Keeping this caveat in mind, the results from this section do suggest some evidence of the important roles played by public policies in influencing youth outcomes.

2.5 Simulation

Since the multivariate probit regressions in Table 2.4 and 2.5 do not report marginal effects, it is difficult to compare the relative importance of different correlates of youth outcomes. To put the magnitude of these effects in perspective, this section constructs a variety of scenarios and compare them to a base case scenario. The base case is specified as following:

- The child is 14 years old, white, does not have chronic conditions. Currently, the child lives with both biological or adoptive parents in an urban area in Ontario.

- The PMK is a native-born Canadian, who graduated from college. Neither the PMK nor his/her spouse attends religious services more than once a week. Neither natural parent of the child was a teenager at the child's birth.

- The PMK knows most of the child's friends and thinks good grade is important for the child.

- The child does not hang out with kids frequently in trouble often or watch TV shows or movies with lots of violence.

- The child goes to a public school. Students in the child's class work well together on group activities. The teacher of the child has a Bachelor's degree.

- All continuous independent variables are set to their mean values.

Suppose Tom is a representative boy and Alice a representative girl from the base case scenario. Table 2.6 uses estimates from specification 1 of the multivariate probit regressions to simulate the probabilities of Tom's and Alice's school outcomes and criminal activities. Each hypothetical scenario changes the value of one particular independent variable relative to the base case scenario. For each scenario, the predicted probabilities, as well as the absolute and relative deviations in probabilities from the base case scenario are reported. Relative deviation is defined as the ratio of absolute deviation to the corresponding base case probabilities. These absolute deviations can be considered as marginal effects evaluated at the base case scenario. The significance stars are consistent with those in Table 2.4 and 2.5.

In base case scenario, Alice is 12% more likely than Tom to have above-average performance in school. Tom is much more likely to commit violent crime than Alice, 14.3% versus only 0.8%. Tom and Alice are almost equally likely to commit property crime.

Scenarios 1a and 1b simulate the effects of PMK's education attainment. Had the PMK not graduated from high school, Tom's probability of above-average school performance would decrease from 66.6% to 49.4%, an absolute change of 17.4% and an relative change of 25.8%. Alternatively, if the PMK had obtained a university degree, Tom and Alice's probability of above-average school performance would increase by 14% and 10.8%, respectively.

Scenario 2 simulates the change in household equivalent income. A 50% drop in income is associated with a 7.6% absolute drop of the probability of above-average

school performance for Tom, and a 3.9% absolute drop for Alice.

Scenario 3a and 3b illustrate the effects of parental supervision. Lack of parental supervision is associated with a moderate deterioration of academic performance, larger than the effect of a 50% drop in household equivalent income, but smaller than the effect of parental education. Lack of parental supervision, however, appears to be especially important for children's violent criminal behaviour. Had the PMK not known most of Tom's friends, Tom's probability of committing violent crime would increase by 9.1%, a relative movement of 63.6%. Had the PMK not considered good grade is important, Alice's probability of committing violent crime would go up from 0.8% to 1.7%, a relative change of 113.9%.

Scenario 4 shows the importance of peer influence. Hanging out with kids frequently in trouble is linked to large changes in the probabilities of above-average school performance, violent crime and property crime for both Tom and Alice. Exposure to violent media is associated with a large increase in Tom's probability of committing violent crime, as illustrated in Scenario 5.

The effect of class environment is simulated by Scenario 6. If the child did not belong to a class in which students work well together on group activities, it would be associated with poorer outcomes for both Tom and Alice. The effect on violent crime is particularly strong, a relative increase of 67.9% for Tom and of 124.2% for Alice.

Scenario 7a and 7b demonstrate hypothetic changes in social assistance programs. A hypothetical increase in social assistance rate of 1% is connected to large increases in Tom's probabilities of committing violent and property crime. A hypothetical 10% increase in the benefit level, i.e. social assistance expenditure per recipient, is related to large increases in the probability of violent crime for both Tom and Alice.

For comparison purposes, Table 2.7 performs the same simulations as in Table 2.6, but uses the single-equation probit estimates. Overall, the results are qualitatively similar, with a few exceptions. Exposure to violent media is associated with higher probabilities of violent and property crime for Alice using probit estimates, but not so using multivariate probit estimates. With probit estimates, Alice is more likely to commit violent crime when social assistance rate is higher (though only significant at 10%), but this relationship does not show up in multivariate probit estimates. The effect of social assistance rate on Tom's probability of property crime is significant at 5% in probit estimates and at 1% in multivariate probit estimates.

The simulation exercises in this section reveal the following. For school outcomes, peer influence, parental education, and parental supervision are the most important correlates. Household income change is related to a moderate change in school out-comes. For violent crime, group spirit in the child's class, peer influence and parental supervision appear to be most important for both boys and girls. Social assistance is also moderately important for both boys' and girls' probability of violent crime. Exposure to violent media is an important correlate of violent crime for boys, but not for girls. For property crime, peer influence, again, is shown to be most important. In addition, social assistance rate is related to more property crime for boys and in-class group "cooperation" is related to less property crime for girls.

2.6 Conclusion

This paper explores a wide range of correlates of Canadian adolescent outcomes. These correlates come from four broad categories: personal and family characteristics, neighbourhood characteristics, school environment and public policies. Compared to the other three categories, neighbourhood characteristics are found to be

least important, suggesting that government policies designed to improve youth outcomes through community-level programs may not be as effective as desired. At school level, "cooperation" through in-class group activities is highly correlated with better school outcomes and decreased levels of criminal activities for both boys and girls. More conventional measures of school quality, such as the type of school, class size and teacher's education attainment fall short compared to this group activity variable. Schools may achieve desirable outcomes if resources can be allocated wisely towards increasing the level in-classroom social "cohesion" through group activities. At personal and family level, a number of important correlates are identified: i) Parental education is strongly correlated with better school outcomes for boys and girls, but not correlated with criminal activities; ii) Household income is found to be moderately related to boys' and girls' school outcomes, though not as important for their participation in criminal activities; iii) Parental supervision is associated with both better school outcomes and fewer criminal activities for both boys and girls and the effects are large; iv) Strong peer effect is present for both boys and girls, and is important for both school outcomes and criminal outcomes; v) Exposure to media violence is connected to moderately increased level of violent crime for boys. These findings are consistent with the family production hypothesis, where children's outcome is an output which responds to parental investment in children. The importance of exposure to media violence and peer influence suggest choices made by children themselves also matter. Finally, public policies also appear to play an important role. In particular, higher social assistance rate or expenditure is associated with more crime among teenagers. Other public expenditures, such as education, recreational and cultural, as well as housing expenditure seem to be related to improved outcomes among boys, but not girls. These results are consistent with the hypothesis that society's investment in children matter for their outcomes.

Table 2.1: Overview of Youth Crime Determinants in the Literature

Determinant	Work
Demographic factors (e.g. gender, age and area of residence)	Levitt and Lochner (2001)
Family structure	Antecol and Bedard (2007); Comanor and Phillips (2002); Levitt and Lochner (2001)
Parental supervision	Aizer (2004)
Exposure to media violence	Bhattacharya and Munasib (2007); Chowhan and Stewart (2007); Huesmann and Taylor (2006); Levin and Carlsson-Paige (2003)
Peer influence	Haynie (2005); Kreager (2004)
School environment	Eitle and Eitle (2003); Ross (1995)
Residential mobility	Haynie and South (2005)
Geographic concentration of juveniles	Jacob and Lefgren (2003)
Criminal justice system	Lochner (2007); Mocan and Rees (2005); Levitt and Lochner (2001); Levitt (1998a)
Local community or neighbourhood characteristics	Aizer (2008); Kling et al. (2005); Mocan and Rees (2005); Levitt and Lochner (2001)

Table 2.2: Summary of Dependent Variables

| Variable | Boys | | Girls | | |
	Obs	Mean	Obs	Mean	Reporter
School performance above-average	1787	48.6%	1828	62.4%	Teacher
Math score above average	1496	40.6%	1577	38.9%	Test
Hope to complete university degree	1568	69.8%	1593	76.3%	Child
Violent crime	1787	21.1%	1828	7.9%	Child
Carried gun	1782	2.2%	1826	0.3%	Child
Carried knife	1784	9.0%	1825	2.8%	Child
Engaged in robbery	1779	2.2%	1826	1.1%	Child
Engaged in fights	1787	14.3%	1828	4.9%	Child
Fought and injured someone	1786	10.4%	1828	2.5%	Child
Fought with weapon	1786	6.6%	1827	3.1%	Child
Property crime	1787	36.1%	1828	30.6%	Child
Sold drugs	1779	3.8%	1822	2.6%	Child
Arson	1782	3.0%	1821	0.8%	Child
Break and enter	1782	3.1%	1827	1.1%	Child
Used or bought or tried to sell something known as stolen	1782	7.8%	1826	2.1%	Child
Vandalism	1785	15.9%	1826	6.6%	Child
Engaged in thefts	1787	29.4%	1828	27.9%	Child
Stole from stores or school	1784	19.6%	1828	13.1%	Child
Stole vehicle	1783	2.6%	1824	1.4%	Child
Stole from home	1783	17.7%	1827	22.0%	Child

Data source: NLSCY cycles 2-4

Table 2.3: Summary of Independent Variables

Variable	Means for boys	Means for girls	Reporter	Data Source
Personal and family characteristics				
Child is 12 years old	33.2%	34.6%	PMK	NLSCY
Child is 13 years old	33.9%	32.6%	PMK	NLSCY
Child is 14 years old	18.0%	17.4%	PMK	NLSCY
Child is 15 years old	14.9%	15.4%	PMK	NLSCY
Child is visible minority	7.3%	6.2%	PMK	NLSCY
Child has chronic condition	33.5%	27.9%	PMK	NLSCY
Resides in urban area	84.8%	84.9%	PMK	NLSCY
Atlantic	10.1%	9.5%	PMK	NLSCY
Quebec	21.6%	22.1%	PMK	NLSCY
Ontario	37.6%	34.9%	PMK	NLSCY
Prairie	8.9%	9.9%	PMK	NLSCY
West	21.8%	23.6%	PMK	NLSCY
PMK does not have high school diploma	10.8%	10.7%	PMK	NLSCY
PMK has high school diploma	71.9%	70.6%	PMK	NLSCY
PMK has university degree	17.3%	18.7%	PMK	NLSCY
PMK is an immigrant	17.4%	13.5%	PMK	NLSCY
PMK or spouse attends religious services at least once a week	25.8%	29.9%	PMK	NLSCY
Either parent was a teenager at the child's birth	21.4%	22.0%	PMK	NLSCY
Family is not intact	20.7%	22.8%	PMK	NLSCY
Number of children in the household	2.2	2.2	PMK	NLSCY
Times child moved in his/her lifetime	0.8	0.8	PMK	NLSCY
Equivalent household income	34320.2	34331.2	PMK	NLSCY
Equivalent adult time available (hours/week)	69.7	70.3	PMK	NLSCY
PMK knows most of the child's friends	86.9%	87.0%	PMK	NLSCY
PMK thinks good grade is important	61.9%	62.0%	PMK	NLSCY
Child often hangs out with kids frequently in trouble	11.5%	9.7%	PMK	NLSCY
Child watches TV shows or movies with lots of violence	69.3%	47.6%	PMK	NLSCY
Neighbourhood characteristics				
% of population 10-24 years old	20.6%	20.7%		Census 2001, Table 95F0495XCB01003
% of 15-24 year olds who are not in school	37.4%	37.8%		Census 2001, Table 95F0495XCB01004
% visible minority	8.1%	8.2%		Census 2001, Table 95F0495XCB01005
% low-income households	14.0%	14.2%		Census 2001, Table 95F0495XCB01006
Median household income	50438.4	49912.7		Census 2001, Table 95F0495XCB01007
School environment				
Child attends public school	77.3%	77.1%	PMK	NLSCY
Child attends Catholic school or private school	22.5%	22.6%	PMK	NLSCY
Class size	27.0	26.6	Teacher	NLSCY

Table 2.3: Summary of Independent Variables

Variable	Means for boys	Means for girls	Reporter	Data Source
Students work well together on group activities in this student's class	65.0%	69.1%	Teacher	NLSCY
Teacher has Master's degree	15.1%	13.2%	Teacher	NLSCY
Teacher has Bachelor's degree	75.4%	76.7%	Teacher	NLSCY
Teacher does not have bachelor's degree	9.4%	10.1%	Teacher	NLSCY
Public policies				
Social assistance expenditure per recipient	7439.9	7442.9		CANSIM Table 3850001: Canadian Economic Observer, November 2004, Catalogue no. 11-010.
Social assistance rate (# recipients/population)	8.4%	8.32%		CANSIM Table 051-0001; Canadian Economic Observer, November 2004, Catalogue no. 11-010;
Elementary/secondary education expenditure per student	6829.7	6822.6		CANSIM Table 3850001; Summary public school indicators for the provinces and territories, 1996-1997 to 2002-2003, Catalogue no. 81-595-MIE2004022.
Per capita recreational and cultural expenditure	212.2	214.5		CANSIM Table 3850001; CANSIM Table 051-0001.
Per capita housing expenditure	91.2	89.0		CANSIM Table 3850001; CANSIM Table 051-0001.
Unemployment rate	7.6%	7.6%		CANSIM Table 2820086.
# of police officers per 100,000 population	177.7	177.5		Trends in police personnel and expenditures for Canada, provinces and territories, Table 254-0002.
Number of observations	1787	1828		

Table 2.4: Three-equation Multivariate Probit Regression, Boys, 12-15 Years Old

	Specification 1			Specification 2		
	School performance above-average	Violent crime	Property crime	School performance above-average	Engaged in fights	Engaged in thefts
Personal and family characteristics						
Child is 13 years old	0.103	0.049	0.516***	0.103	-0.024	0.455***
Child is 14 years old	0.214	0.011	0.363***	0.214	-0.210	0.316**
Child is 15 years old	0.179	0.080	0.511***	0.181	-0.134	0.505***
Child is visible minority	0.239	-0.085	0.113	0.238	0.043	0.013
Child has chronic condition	-0.125	-0.042	-0.119	-0.125	-0.004	-0.153
Resides in urban area	0.107	0.053	0.086	0.108	-0.087	-0.053
Atlantic	0.058	-0.320	0.300	0.068	-1.106**	0.284
Quebec	0.346	0.016	0.217	0.352	-0.332	0.065
Prairie	0.066	0.273	0.168	0.067	-0.081	0.120
West	0.003	-0.055	-0.148	0.008	-0.247	-0.351
PMK's does not have high school diploma	-0.443***	0.002	0.041	-0.444***	0.080	-0.014
PMK's has university degree	0.436***	-0.236	-0.155	0.436***	-0.145	-0.101
PMK is an immigrant	-0.056	-0.165	-0.250	-0.056	-0.307	-0.126
PMK or spouse attends religious services at least once a week	0.373***	0.073	0.200**	0.374***	0.142	0.171
Either parent was a teenager at the child's birth	0.123	0.142	-0.209	0.121	0.401	-0.113
Family is not intact	-0.733***	-0.177	0.219	-0.731***	-0.334	0.094
Number of children in the household	-0.019	0.040	0.012	-0.019	0.055	-0.023
Times child moved in his/her lifetime	0.015	0.067*	0.064*	0.016	-0.009	0.043
Log of equivalent household income	0.289***	-0.072	-0.009	0.289***	-0.068	-0.150
Equivalent adult time available	0.007*	0.001	0.001	0.007*	0.001	-0.000
PMK knows most of the child's friends	0.340**	-0.341**	-0.051	0.341**	-0.255*	-0.051
PMK thinks good grade is important	0.296***	0.035	-0.070	0.296***	0.119	-0.045
Child often hangs out with kids frequently in trouble	-0.464***	0.275**	0.470***	-0.464***	0.321**	0.478***
Child watches TV shows or movies with lots of violence	0.017	0.224**	0.151	0.016	0.113	0.205*
Neighbourhood characteristics						
% of population 10-24 years old	-0.040*	0.011	-0.012	-0.040*	0.009	-0.007
% of 15-24 year olds who are not in school	0.008	0.001	0.006	0.008	0.006	0.010
% visible minority	-0.003	-0.008	0.003	-0.003	-0.008	0.006
% low-income households	0.034***	0.006	0.010	0.034***	0.018	0.019
Log of median household income	0.101	0.564	0.049	0.103	0.757	0.200
School environment						
Child attends Catholic school or private school	-0.037	-0.074	-0.001	-0.036	-0.173	0.043

Continued...

Table 2.4: Three-equation Multivariate Probit Regression, Boys, 12-15 Years Old

	Specification 1			Specification 2		
	School performance above-average	Violent crime	Property crime	School performance above-average	Engaged in fights	Engaged in thefts
Class size	0.010	-0.010	-0.007	0.010	-0.005	-0.010
Students work well together on group activities in this student's class	0.110	-0.361***	-0.110	0.110	-0.357***	-0.168*
Teacher has Master's degree	-0.142	0.204	0.062	-0.141	0.259	0.040
Teacher does not have Bachelor's degree	0.208	0.075	-0.099	0.207	-0.027	-0.069
Public policies						
Log of social assistance expenditure per recipient	0.492	1.017***	0.834**	0.494	0.500	1.186***
Social assistance rate (# recipients/population)	0.090	0.214***	0.201***	0.091	0.056	0.277***
Log of elementary/secondary education expenditure per student	0.524	-2.532**	-1.658	0.532	-1.975	-3.074**
Log of per capita recreational and cultural expenditure	-0.934	-0.869	0.512	-0.934	-1.418**	1.102*
Log of per capita housing expenditure	-0.204	-0.496**	0.024	-0.202	-0.568***	0.099
Unemployment rate	-0.102	-0.066	-0.102	-0.103	0.036	-0.098
# of police officers per 100000 population	-0.009	-0.007	-0.018	-0.009	0.004	-0.018
Constant	-6.866	14.096	5.403	-7.001	13.013	10.282
Observations	1787	1787	1787	1787	1787	1787
rho21		-0.111*			-0.086	
rho31		-0.017			-0.001	
rho32		0.612***			0.404***	

likelihood ratio test of rho21=ro31=rho32=0 for specification 1: p-value=0
likelihood ratio test of rho21=rho31=rho32=0 for specification 2: p-value=0

$*p < 0.1$ $**p < 0.05$ $***p < 0.01$

Table 2.5: Three-equation Multivariate Probit Regressions, Girls, 12-15 Years Old

	Specification 1			Specification 2		
	School performance above-average	Violent crime	Property crime	School performance above-average	Engaged in fights	Engaged in thefts
Personal and family characteristics						
Child is 13 years old	-0.023	-0.020	0.214**	-0.024	0.012	0.251**
Child is 14 years old	0.248*	-0.206	0.547***	0.247*	-0.027	0.547***
Child is 15 years old	0.188	-0.067	0.536***	0.187	0.012	0.607***
Child is visible minority	0.266	0.230	-0.002	0.266	0.562**	0.057
Child has chronic condition	-0.139	-0.178	-0.019	-0.139	-0.160	0.004
Resides in urban area	-0.034	0.018	0.142	-0.034	0.219	0.111
Atlantic	-0.191	1.035*	-0.040	-0.205	1.230**	-0.056
Quebec	-0.359	0.465	-0.264	-0.366	-0.173	-0.228
Prairie	0.295	0.587**	0.228	0.291	0.389	0.250
West	0.490	0.357	0.180	0.481	-0.017	0.246
PMK's does not have high school diploma	-0.182	0.080	0.118	-0.181	0.385**	0.131
PMK's has university degree	0.448***	-0.225	0.036	0.449***	-0.221	-0.020
PMK is an immigrant	0.039	0.310*	0.022	0.039	-0.002	0.019
PMK or spouse attends religious services at least once a week	0.120	0.076	0.138	0.119	0.164	0.170*
Either parent was a teenager at the child's birth	-0.132	0.267	0.188	-0.134	0.276	0.211
Family is not intact	0.018	0.252	-0.122	0.017	0.103	-0.139
Number of children in the household	0.064	0.112	-0.050	0.063	0.205**	-0.048
Times child moved in his/her lifetime	-0.052*	0.029	0.054*	-0.051*	0.005	0.052*
Log of equivalent household income	0.183**	0.093	0.104	0.184**	0.291**	0.120
Equivalent adult time available	-0.005	0.008**	-0.004	-0.005	0.002	-0.004
PMK knows most of the child's friends	0.187	-0.224	-0.009	0.187	-0.072	0.018
PMK thinks good grade is important	0.193**	-0.292***	-0.059	0.192**	-0.171	-0.046
Child often hangs out with kids frequently in trouble	-0.453***	0.348**	0.386***	-0.454***	0.605***	0.320**
Child watches TV shows or movies with lots of violence	-0.015	0.175	0.141	-0.017	0.043	0.100
Neighbourhood characteristics						
% of population 10-24 years old	-0.025	-0.021	-0.011	-0.024	-0.043	0.002
% of 15-24 year olds who are not in school	-0.010	-0.003	0.007	-0.011	0.016*	0.005
% visible minority	0.000	-0.019***	-0.009	0.000	-0.009	-0.008
% low-income households	0.008	0.022	0.008	0.009	0.009	0.007
Log of median household income	0.029	0.188	0.021	0.032	-0.013	-0.019
School environment						
Child attends Catholic school or private school	-0.141	-0.054	0.051	-0.144	0.128	-0.002

Continued...

Table 2.5: Three-equation Multivariate Probit Regressions, Girls, 12-15 Years Old

	Specification 1			Specification 2		
	School performance above-average	Violent crime	Property crime	School performance above-average	Engaged in fights	Engaged in thefts
Class size	-0.007	-0.016	0.001	-0.007	-0.014	0.003
Students work well together on group activities in this student's class	0.190**	-0.311***	-0.278***	0.191**	-0.358***	-0.279***
Teacher has Master's degree	-0.195	0.173	0.009	-0.193	-0.082	0.003
Teacher does not have Bachelor's degree	0.065	-0.055	0.071	0.064	-0.041	0.123
Public policies						
Log of social assistance expenditure per recipient	0.325	1.262***	0.390	0.323	1.342***	0.206
Social assistance rate (# recipients/population)	0.065	0.091	0.062	0.065	0.101	0.075
Log of elementary/secondary education expenditure per student	-1.247	0.113	-0.720	-1.278	-0.482	0.222
Log of per capita recreational and cultural expenditure	0.215	-0.500	-0.063	0.219	-0.385	-0.157
Log of per capita housing expenditure	0.165	0.088	0.028	0.163	0.043	-0.041
Unemployment rate	0.088	-0.098	0.009	0.089	-0.092	-0.002
# of police officers per 100000 population	0.010	-0.007	0.004	0.010	-0.003	0.003
Constant	2.220	-13.137	-0.112	2.456	-10.314	-5.830
Observations	1828	1828	1828	1828	1828	1828
rho21	-0.373***			-0.295***		
rho31	-0.210***			-0.218***		
rho32	0.547***			0.492***		

likelihood ratio test of rho21=ro31=rho32=0 for specification 1: p-value=0
likelihood ratio test of rho21=rho31=rho32=0 for specification 2: p-value=0

*$p < 0.1$ **$p < 0.05$ ***$p < 0.01$

Table 2.6: Simulations Using Multivariate Probit Estimates

	Tom			Alice		
	School performance above-average	Violent crime	Property crime	School performance above-average	Violent crime	Property crime
Base scenario						
Probability	66.6%	14.3%	31.2%	78.3%	0.8%	30.8%
Scenario 1a: PMK does not have high school diploma						
Probability	49.4%	14.4%	32.7%	72.6%	1.0%	35.0%
Absolute deviation from base	-17.2%***	0.0%	1.5%	-5.7%	0.2%	4.3%
Relative deviation from base	-25.8%***	0.3%	4.7%	-7.3%	24.1%	13.9%
Scenario 1b: PMK has university degree						
Probability	80.7%	9.6%	26.0%	89.1%	0.4%	32.0%
Absolute deviation from base	14.0%***	-4.7%	-5.3%	10.8%***	-0.4%	1.3%
Relative deviation from base	21.1%***	-32.6%	-16.8%	13.7%***	-47.2%	4.2%
Scenario 2: Equivalent household income decreases by 50%						
Probability	59.0%	15.5%	31.5%	74.4%	0.7%	28.3%
Absolute deviation from base	-7.6%***	1.2%	0.2%	-3.9%**	-0.1%	-2.5%
Relative deviation from base	-11.3%***	8.1%	0.7%	-5.0%**	-16.3%	-8.1%
Scenario 3a: PMK does NOT know most of the child's friends						
Probability	53.6%	23.4%	33.1%	72.5%	1.5%	31.1%
Absolute deviation from base	-13.1%**	9.1%**	1.8%	-5.9%	0.7%	0.3%
Relative deviation from base	-19.6%**	63.6%**	5.8%	-7.5%	80.4%	1.0%
Scenario 3b: PMK does NOT think good grade is important						
Probability	55.3%	13.5%	33.8%	72.3%	1.7%	32.9%
Absolute deviation from base	-11.3%***	-0.8%	2.5%	-6.1%**	0.9%***	2.1%
Relative deviation from base	-17.0%***	-5.4%	8.1%	-7.8%**	113.9%***	6.8%
Scenario 4: Child often hangs out with kids frequently in trouble						
Probability	48.6%	21.4%	49.2%	63.0%	2.0%	45.3%
Absolute deviation from base	-18.0%***	7.1%**	18.0%***	-15.4%***	1.2%**	14.6%***
Relative deviation from base	-27.0%***	49.8%**	57.6%***	-19.6%***	145.3%**	47.5%***
Scenario 5: Child watches TV shows or movies with lots of violence						
Probability	67.2%	20.0%	36.8%	77.9%	1.3%	35.9%
Absolute deviation from base	0.6%	5.7%**	5.5%	-0.4%	0.5%	5.1%
Relative deviation from base	0.9%	39.6%**	17.7%	-0.6%	59.2%	16.6%
Scenario 6: Students do NOT work well together on group activities in the child's class						
Probability	62.5%	24.0%	35.2%	72.4%	1.8%	41.1%
Absolute deviation from base	-4.1%	9.7%***	4.0%	-6.0%**	1.0%***	10.4%***
Relative deviation from base	-6.1%	67.9%***	12.8%	-7.6%**	124.2%***	33.7%***
Scenario 7a: Provincial social assistance rate increases by 1 percentage point						
Probability	69.8%	19.7%	38.7%	80.2%	1.0%	33.0%
Absolute deviation from base	3.2%	5.4%***	7.4%***	1.9%	0.2%	2.2%
Relative deviation from base	4.8%	37.6%***	23.8%***	2.4%	27.8%	7.2%
Scenario 7b: Provincial social assistance expenditure per recipient increases by 10%						
Probability	68.3%	16.6%	34.1%	79.2%	1.1%	32.1%
Absolute deviation from base	1.7%	2.3%***	2.9%**	0.9%	0.3%***	1.3%
Relative deviation from base	2.5%	16.1%***	9.2%**	1.1%	38.1%***	4.3%

Table 2.7: Simulations Using Single-equation Probit Estimates

	Tom			Alice		
	School perfor-mance above-average	Violent crime	Property crime	School perfor-mance above-average	Violent crime	Property crime
Base scenario:						
Probability	65.5%	10.3%	29.3%	79.4%	0.6%	33.0%
Scenario 1a: PMK does not have high school diploma						
Probability	48.2%	10.2%	31.2%	73.9%	0.6%	37.4%
Absolute deviation from base	-17.3%***	-0.1%	2.0%	-5.5%	0.0%	4.4%
Relative deviation from base	-26.4%***	-1.2%	6.7%	-6.9%	7.6%	13.3%
Scenario 1b: PMK has university degree						
Probability	79.8%	7.0%	23.9%	89.8%	0.3%	34.2%
Absolute deviation from base	14.3%***	-3.3%	-5.4%	10.4%***	-0.3%	1.2%
Relative deviation from base	21.8%***	-32.4%	-18.3%	13.1%***	-50.2%	3.5%
Scenario 2: Equivalent household income decreases by 50%						
Probability	57.8%	11.4%	29.4%	75.5%	0.5%	30.4%
Absolute deviation from base	-7.7%***	1.1%	0.2%	-3.9%**	-0.1%	-2.6%
Relative deviation from base	-11.7%***	10.8%	0.6%	-4.9%**	-17.0%	-7.9%
Scenario 3a: PMK does NOT know most of the child's friends						
Probability	52.2%	18.2%	30.9%	73.7%	1.0%	33.2%
Absolute deviation from base	-13.3%**	7.9%**	1.6%	-5.6%	0.4%	0.1%
Relative deviation from base	-20.3%**	77.0%**	5.6%	-7.1%	74.6%	0.4%
Scenario 3b: PMK does NOT think good grade is important						
Probability	54.1%	10.0%	32.1%	73.4%	1.3%	35.0%
Absolute deviation from base	-11.4%***	-0.3%	2.8%	-6.0%**	0.7%***	1.9%
Relative deviation from base	-17.4%***	-3.1%	9.6%	-7.5%**	121.4%***	5.9%
Scenario 4: Child often hangs out with kids frequently in trouble						
Probability	47.4%	16.2%	47.1%	64.1%	1.6%	47.6%
Absolute deviation from base	-18.1%***	5.9%**	17.8%***	-15.3%***	1.0%**	14.5%***
Relative deviation from base	-27.6%***	57.2%**	61.0%***	-19.2%***	162.5%**	44.0%***
Scenario 5: Child watches TV shows or movies with lots of violence						
Probability	66.0%	15.1%	35.1%	78.8%	1.1%	38.4%
Absolute deviation from base	0.6%	4.8%**	5.8%	-0.6%	0.5%**	5.3%*
Relative deviation from base	0.8%	46.5%**	19.8%	-0.7%	80.7%**	16.1%*
Scenario 6: Students do NOT work well together on group activities in the child's class						
Probability	61.4%	18.2%	33.1%	73.5%	1.4%	43.5%
Absolute deviation from base	-4.1%	7.9%***	3.8%	-5.8%**	0.8%***	10.5%***
Relative deviation from base	-6.3%	76.5%***	13.0%	-7.3%**	131.9%***	31.6%***
Scenario 7a: Provincial social assistance rate increases by 1 percentage point						
Probability	68.8%	14.6%	36.4%	81.2%	0.9%	35.4%
Absolute deviation from base	3.3%	4.3%***	7.1%**	1.8%	0.3%*	2.4%
Relative deviation from base	5.1%	41.8%***	24.3%**	2.2%	45.9%*	7.2%
Scenario 7b: Provincial social assistance expenditure per recipient increases by 10%						
Probability	67.2%	12.2%	32.0%	80.2%	0.9%	34.4%
Absolute deviation from base	1.7%	1.9%***	2.7%**	0.9%	0.3%***	1.4%
Relative deviation from base	2.6%	18.7%***	9.4%**	1.1%	44.9%***	4.2%

Figure 2.1: Summary of School Outcomes by Income Quintile
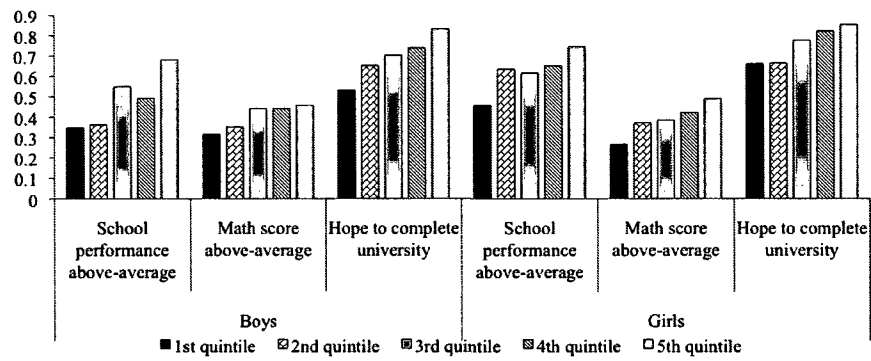
Figure 2.2: Summary of Criminal Activities by Income Quintile
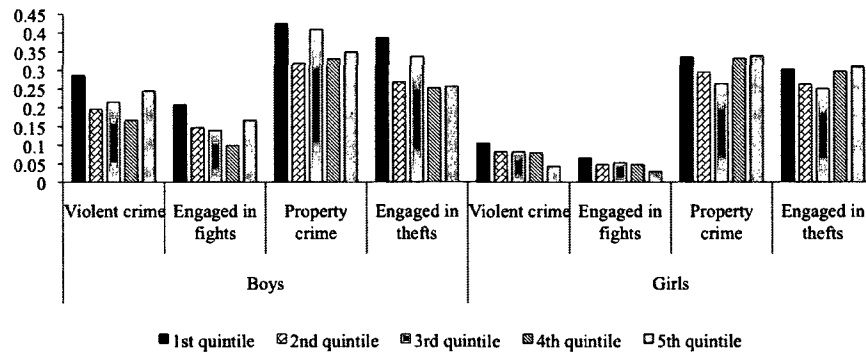
Figure 2.3: Summary of School Outcomes by Family Structure
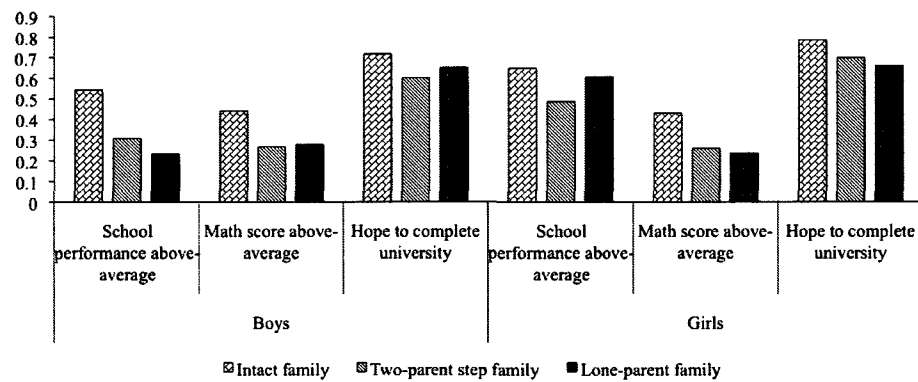
Figure 2.4: Summary of Criminal Activities by Family Structure

☒ Intact family   ☒ Two-parent step family   ■ Lone-parent family
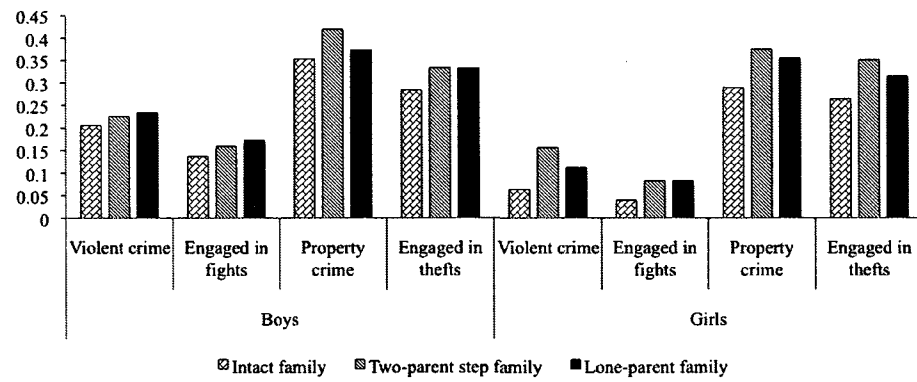
Figure 2.5: Summary of School Outcomes by PMK's Education Attainment

☒ PMK did not graduate from high school ☒ PMK graduated from high school or college ■ PMK graduated from university
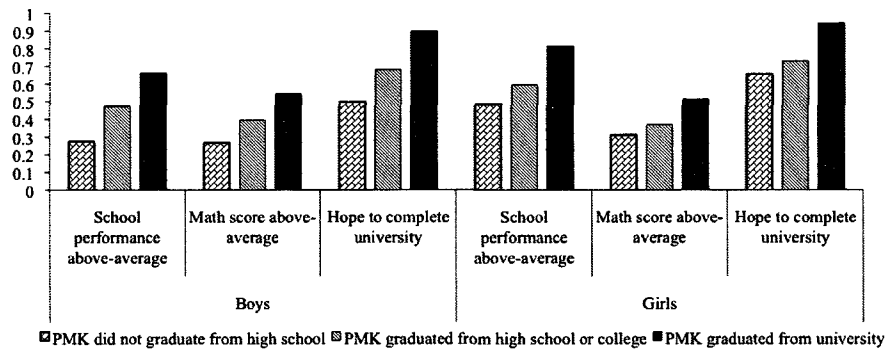
Figure 2.6: Summary of Criminal Activities by PMK's Education Attainment

☒ PMK did not graduate from high school ☒ PMK graduated from high school or college ■ PMK graduated from university
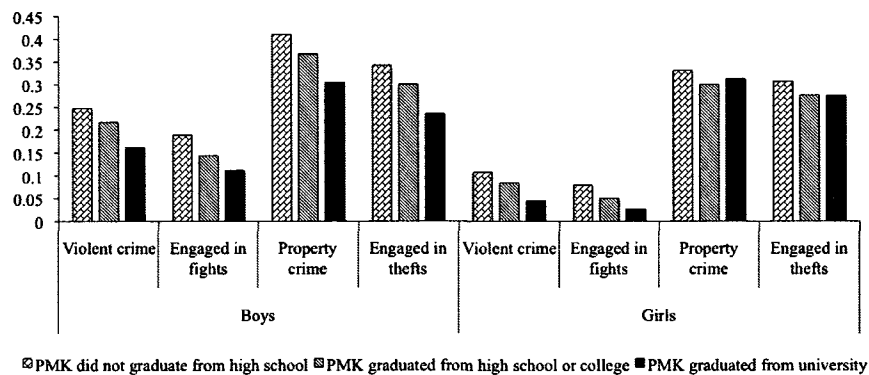
Figure 2.7: Summary of School Outcomes by Whether Child Hangs Out with Kids Frequently in Trouble
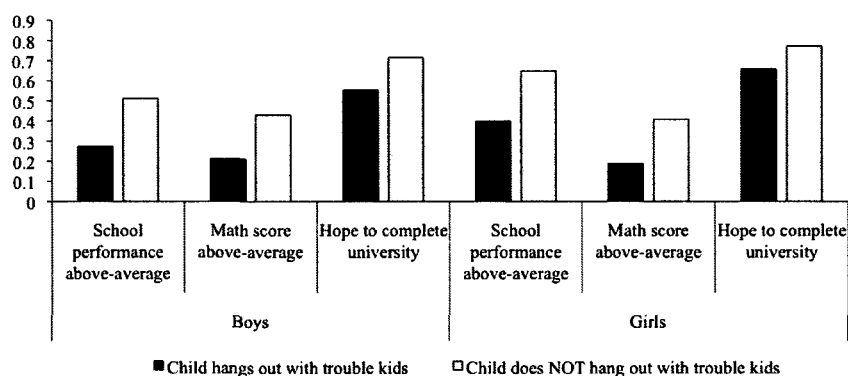
Figure 2.8: Summary of Criminal Activities by Whether Child Hangs Out with Kids Frequently in Trouble
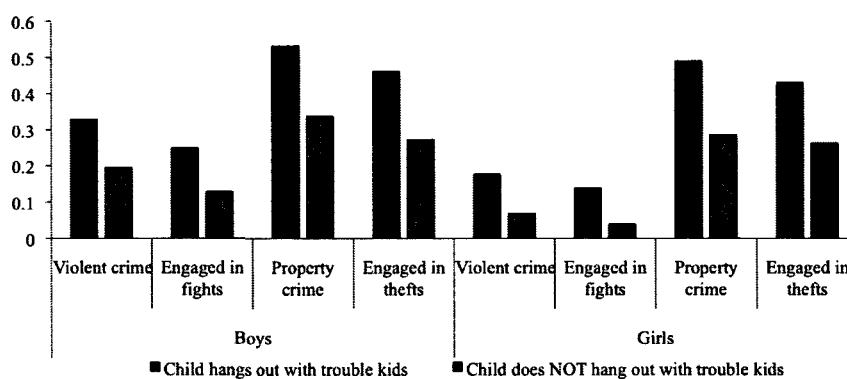
Figure 2.9: Summary of School Outcomes by Whether PMK Knows Most of the Child's Friends
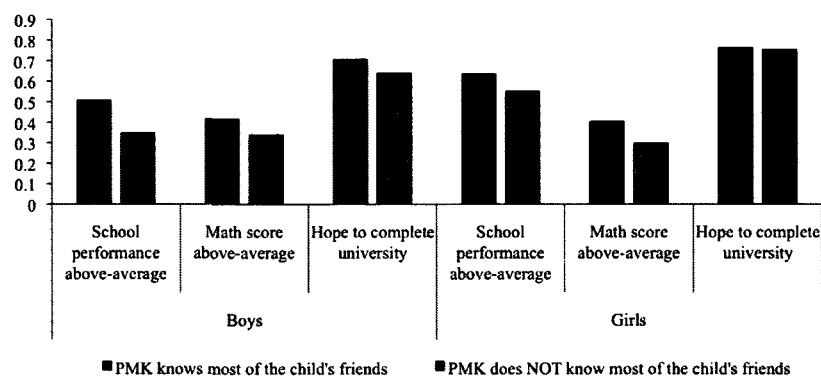
Figure 2.10: Summary of Criminal Activities by Whether PMK Knows Most of the Child's Friends
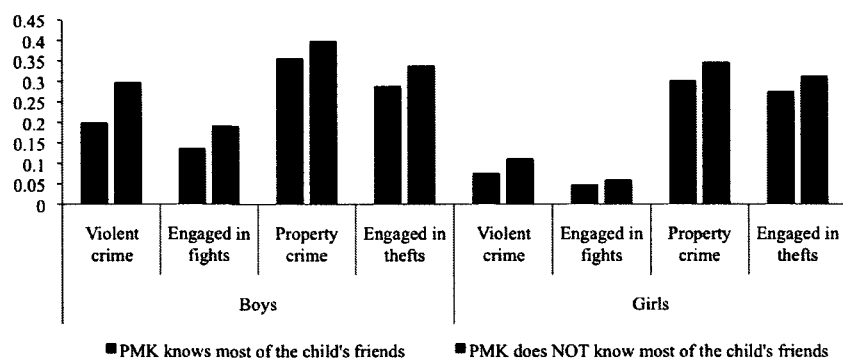
Figure 2.11: Summary of School Outcomes by Whether Students in Child's Class Work Well Together on Group Activities
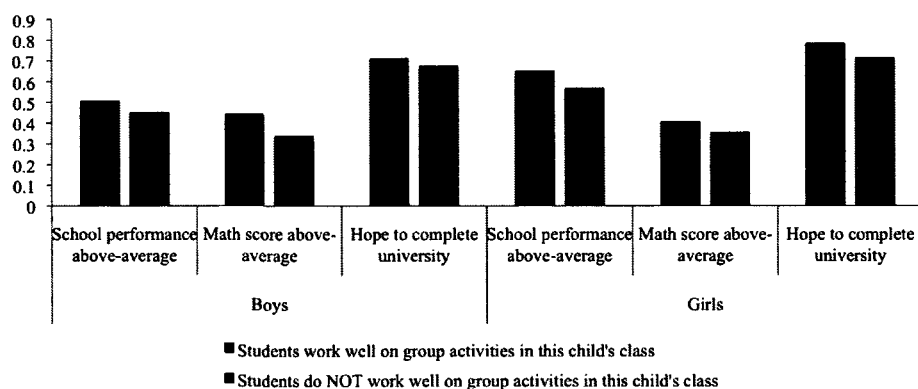
Figure 2.12: Summary of Criminal Activities by Whether Students in Child's Class Work Well Together on Group Activities
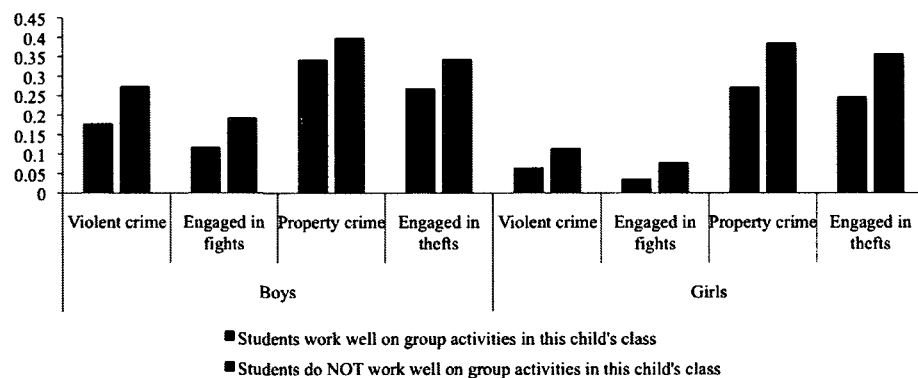
Chapter 3

Learning Violence Young

3.1 Introduction

Since Becker (1968), research on crime has gained popularity among economists. Many empirical studies by crime economists (e.g. Lochner (2007), Lochner (2004), Jacob and Lefgren (2003), Levitt (1998a), and Levitt (1997)) have confirmed Becker's notion that economic theory does provide insights into our understanding of questions about crime. Probably all crime economists will agree that crime is very costly to society, particularly violent crime. One of the stylized facts in the literature of crime is that violent crime rate in the United States is much higher than in most OECD countries, including its nearest neighbour, Canada. Given that Canada and the US share some cultural similarities, this disparity in the prevalence of violence is puzzling. Previous studies have proposed the following potential causes for the violence disparity between Canada and US:

1. Firearms are more easily accessible in the US (Ouimet (1999); Krug et al. (1998)), which lowers the cost of committing crime both due to easier procurement of weapons and possibly due to a decreased likelihood of being hurt when committing violent crime, a point which is debatable because victims may also obtain firearms more easily.

2. There is more poverty and inequality in the US (Ouimet (1999)). Poverty and

inequality may cause more violent and property crime because the disadvantaged are more likely to benefit from forced redistribution of wealth. Poverty and inequality may also cause more crime if they are associated with social exclusion.

3. There are more "non-intact"[1] and/or lone-parent families in the US. The breakdown of marriage often is a lagged response to past exposure to low-income status. Lone-parenthood is usually associated with more financial pressure and time crunch. Both may limit the available resources to invest in children, therefore, result in more problem behaviour.

4. Compared to Canada, the US has a more ethnically and racially heterogeneous population, of which a larger fraction has relatively high violence rates (e.g. blacks and Hispanics), though why a particular racial or ethnic group is prone to violence is often not clear (Lenton (1989)).

5. There are more large cities in the US than in Canada (Ouimet (1999)). Typically there is more crime in cities than in suburbs or in rural areas. This may be because the cost of committing crime is lower in larger cities due to a lower probability of being caught.

6. Part of the long-term legacy of slavery in the US south is a violent "southern" culture, which is not present in Canada (Ouimet (1999)).

7. "Violence" culture differs between Canada and the US (Lipset (1990)). This paper prefers to classify "culture" as a "non-explanation" because it is a residual factor which absorbs all remaining differences that cannot be explained by observable factors.

---

[1] "Intact" means a child's biological mother and father are both present in the family.

Adding to existing literature, this paper will examine a policy-relevant question:

8. Can the US-Canada difference in post-birth maternal employment patterns, which is likely largely driven by their different maternity leave provisions, help explain the US-Canada violence gap?

Heckman (2008) summarizes a wealth of evidence from multiple domains - economics, neurobiology, and psychology (e.g., Francesconi (2008); Nilsson (2008); Watt et al., eds (2006); Champagne et al. (2006); Cunha et al. (2006); and Champagne and Curley (2005)) - and concludes that: 1) cognitive and socioemotional "ability gaps between the advantaged and disadvantaged open up early in the lives of children" and persist; and 2) early childhood experience has a profound effect on future outcomes, such as participation in crime, labour market performance and teenage pregnancy. Consistent with Heckman (2008), this paper finds that the US-Canada violence gap has opened up by age 4-5 and persists into teenage years. Children learn violence young. In addition, this paper shows that the US-Canada violence gap remains largely unexplained even after most previous hypotheses have been accounted for. This suggests that there are important risk factors which are likely to have been in effect in early childhood and are missing in previous research attempting to explain the US-Canada violence disparity. This paper identifies intensive early maternal employment as one of these important risk factors.

Haveman and Wolfe (1995) point out that governments make policy decisions and create an environment within which parents allocate resources within the family so that children's outcomes are conditioned by these processes (Becker and Tomes (1986); Leibowitz (1974)). An important child-relevant public policy difference between Canada and the US is their maternity leave policies[2]. Canadian maternity leave policy differs from American policy in that it not only allows longer job-protected

---

[2]See Phipps (1999) for a more complete international comparison of policies for young children.

leave but also provides cash benefits. Consistent with this policy difference, this paper shows that mothers in Canada and the US exhibit very different post-birth employment patterns. About 1/3 of American mothers return to work full time by the first 3 months, while only 5% of Canadian mothers do so.

Potentially there are both advantages and disadvantages to maternal employment after birth. One immediate advantage is that maternal labour market participation brings in extra income, which can be used to buy more resources for investing in child's development. However, a mother's participation in the labour market results in the need to substitute for mother's care using other types of child care (e.g., father's care, relative-provided care, or centre child care). If non-maternal care is of lower quality compared to maternal care, then post-birth maternal employment will have a harmful effect on child's development. Moreover, post-birth maternal employment may have an effect on mother's own well-being, for example, maternal depression, which will indirectly affect the child's well-being. A working mother may be stressed out from having to work long hours. A mother may feel out-of-touch if she has to stay at home to take care of her child and does not get the opportunity to socialize. Thus, the net effect of post-birth maternal employment on child's outcomes is not clear a priori. Empirical evidence is needed to clarify this relationship. Even if early childhood maternal employment is found to be liable for children's aggressive behaviour, the question that remains to be answered is whether the magnitude of the effect is large enough to contribute to the US-Canada violence gap among children.

Research in both Canada and the US has examined the effect of early maternal employment on children's outcomes. Berger et al. (2005) and Han et al. (2001)) find that intensive maternal employment in a child's early life has a detrimental effect on children's behavioural outcomes. However, no study has examined if the US-Canada difference in maternal employment is connected to the difference in violence among

children between these two countries. To the author's knowledge, this paper is the first to test this hypothesis. Empirical findings in this paper suggest that perhaps because existing maternity leave coverage in the United States is limited, a much higher percentage of American mothers start to work full time within the first 3 months, which in turn causes a higher violence rate among American children than among Canadian children.

The contributions of this paper to the literature are summarized as follows. First, previous research mostly focuses on adults and late teenagers. This paper is the first to find that the US-Canada violence disparity exists among young teenagers, and more importantly, among children as young as 4-5 years old. Second, previous studies attempting to explain the Canada-US violent crime disparity have used aggregate level data, and are mostly descriptive. This paper is the first to take advantage of rich information provided by large-scale micro-data to investigate the underlying reasons for the US violence premium in comparison to its neighbour, Canada. Third, this paper shows that hypotheses proposed by previous studies, stand-alone or taken together, are either irrelevant or limited in accounting for the US-Canada violence gap among children. There remains much to be explained. Fourth, this paper finds that a policy-driven difference in post-birth maternal employment patterns explains a sizable portion of the US-Canada violence rate differences, both for boys and for girls. This result is robust to different measures of violence reported by mothers and children, respectively. This finding may be of interest to Canadian and US authorities. Early childhood interventions, in particular, proper provisions of maternity benefits, may be more effective in reducing violence rates than interventions later in life, such as class size reduction, community rehabilitation programs, adult literacy programs or increased policing expenditure.

The rest of this paper is organized as follows. A literature review is provided in Section 3.2. Section 3.3 describes the data. Section 3.4 shows that the US-Canada violence gap opens up in early childhood and persists into teenage years. In Section 3.5, I show that previously proposed hypotheses in the literature are limited in explaining the observed US-Canada violence disparity among children. In Section 3.6, I investigate the role of full time early maternal employment in accounting for the US-Canada difference in children's violent behaviour. Section 3.7 concludes.

3.2 Literature Review

There are surprisingly few recent US-Canada comparative studies on crime. Gannon (2002) compares a set of crime types between the US and Canada and notes that the US has higher violent crime rate and Canada has higher property crime rate. However, Gannon (2002) does not provide any explanations for these observed differences. Ouimet (1999) also compares both violent and property crime between Canada and the US. He concludes that there is no significant difference in the rate of property crime between these two nations and the difference in violent crime rate "shrinks dramatically when controlling for region and removing the effect of metropolises" (p. 389, Ouimet (1999)). Ouimet proposes two reasons accounting for the US-Canada violent crime gap: residential segregation of the poor and the availability of firearms. Both Gannon (2002) and Ouimet (1999) are descriptive studies.

Not confined to North America, Neumayer (2003) and Soares (2004) use more sophisticated statistical techniques to study crime across a large number of countries. Focusing on homicide rates, Neumayer (2003) claims that economic growth, higher income levels, respect for human rights, and the abolition of the death penalty are negatively associated with homicide rates, while income inequality has no effect. Soares (2004) finds that income inequality increases crime rates, while education and

growth reduce crime. Akiba et al. (2002) study the effect of education system on school violence across 37 nations and state that education systems which produce more inequality in student achievements are linked with more school violence.

To the author's knowledge, this paper is the first to try to explain the US-Canada violence gap by examining the role played by the rather different patterns of maternal employment in early months of children's life in these two countries. However, studies on the relationship between early childhood maternal employment and child outcomes (e.g. cognitive skills, health and problem behaviour etc.) are available in both Canada and the US.

Most Canadian research on maternal employment and child outcomes is done using the National Longitudinal Survey of Children and Youth (NLSCY). The findings are mixed. Using the maternity leave expansion that took place across Canada at the end of 2000 as a source of exogenous variation, Baker and Milligan (forthcoming) and Baker and Milligan (2008) find mothers' time away from work post-birth increased significantly after this policy change. However, little or no change is found in the range of child outcome measures considered in their papers, including physical health, motor-social development, and temperament etc. Baker et al. (2008) look at another policy change which took place in the late 1990s in Quebec, i.e. the introduction of universal and highly-subsidized childcare. They find that as a result of this change mothers' labour supply increased and children's outcomes, ranging from aggression to motor-social skills to illness, worsened. Gagné (2003) studies the effect of parental labour market participation on the cognitive development of pre-school children. She finds that children's school readiness score improves with less parental labour market participation if parents exhibit above-average education level or parenting skills. But this effect is otherwise small. Sherlock et al. (2008) study the relationship between duration of maternity leave and the performance on the Motor

and Social Development (MSD) scale among children up to 2 years of age. They find that one month of maternity leave is associated with an increase of 3% in the odds of impaired performance on the MSD.

The majority of the US studies on post-birth maternal employment and child outcomes are based on the NLSY79 Child/Young Adult (CNLSY79) or the National Institute of Child Health and Human Development Study of Early Child Care (NICHD-SECC). There is considerable evidence that better child outcomes are associated with less or no maternal labour market participation during early months of the child's life. Using CNLSY79, Baum II (2003) and Ruhm (2004) find that early maternal employment has detrimental effect on child's cognitive development. Also using CNLSY79, Berger et al. (2005) find that mother's returning to work within 12 weeks increases externalising behaviour problems among children and this effect is stronger if the mother returned full-time. Han et al. (2001) find that maternal employment in the 1st year of a child's life has persistent negative effects on White children's cognitive and behavioural outcomes. Claiming that CNLSY79 does not contain rich enough information on childcare quality or home environment, Brooks-Gunn et al. (2002) turn to NICHD-SECC instead. However, the negative associations between maternal employment during the first year of life and children's cognitive outcomes are still found, and these associations are more pronounced when mothers were working 30 hours or more per week. Similar to the Canadian case, there is no unanimity in the empirical evidence on the relationship between post-birth maternal employment and American children's outcomes. Some researchers have found mixed results or no effect of early maternal employment on child outcomes (Aughinbaugh and Gittleman (2004); Waldfogel et al. (2002); Harvey (1999); Blau and Grossberg (1992); Leibowitz (1977)).

3.3 Data

For the US, I use the National Longitudinal Survey of Youth 79 (NLSY79) and the Child/Young Adult of NLSY 79 (CNLSY79). The NLSY79 follows a nationally representative sample of men and women who were between 14 and 21 years old on December 31, 1978. The CNLSY79 surveys the biological children born to those women interviewed by the NLSY79. For Canada, I use the National Longitudinal Survey of Children and Youth (NLSCY), in which the Person Most Knowledgeable (PMK) answers most of the questions and children aged 10 years or above answer a self-complete questionnaire. In more than 90% of the cases, the PMK is the mother of the child.

There are two near-identical questions regarding children's violent behaviour available in the CNLSY79 and the NLSCY. The first question is asked to mothers of 4-11 year old children: "How often would you say that your child is cruel, bullies or is mean to others?" The wording of this question is identical for both countries. The second question, self-completed by 12-14 year old children, is formulated as follows in the NLSCY: "During the past 12 months, about how many times have you fought with someone to the point where they needed care for their injuries (for example, because they were bleeding, or had broken bones)?"[3] Based on the responses to these two questions, I construct two binary dependent variables: "bullying" for 4-11 year olds and "fighting" for 12-14 year olds. As one can see, the level of cross-country comparability in these variables is high due to the similarity in the original survey questions. This improves upon existing studies using official records which are mostly subject to the bias caused by either different definitions of crime types or different levels of effectiveness of the criminal justice system across different countries (Miguel

---

[3]The exact wording of the US question is: "In the last year, about how many times (if ever) have you hurt someone badly enough to need bandages or a doctor?"

et al. (2008); Soares (2004)).

"Bullying" and "fighting" are available in both countries' data sets at a biennial frequency for the periods 1994-2004 and 1996-2004, respectively. Thus, I analyze "bullying" behaviour by pooling 6 cycles (1994-2004) of cross-sectional data and analyze "fighting" behaviour by pooling 5 cycles (1996-2004) of cross-sectional data. Cross-sectional sampling weights are employed in the data analysis.[4].

The NLSCY is a nationally representative sample of Canadian children, while the CNLSY surveys children born to a nationally representative sample of American women who were 14 to 21 years old in 1978. To ensure data comparability, the Canadian sample is constructed to mirror image the American sample. A Canadian child is kept in the sample if the PMK is the biological mother and was between 14 and 21 years old as of December 31, 1978. Since the mothers of the American children were already present in the US at the time when the NLSY79 was first conducted in 1979, the percentage of immigrant mothers is very low, only about 4%, in the US sample. To address this issue, the decision was made to exclude children of immigrant mothers in both countries. The US children whose mothers are military members are also excluded because the NLSCY survey subjects are civilians. The total number of observations[5] in the 4-11 age group is 12,864 in the US sample and 25,830 in the Canadian sample. The total number of observations in the 12-14 age group is 4,444 in the US sample and 5,229 in the Canadian sample.

---

[4]In Cycles 5 and 6 of the NLSCY, cross-sectional weights for the original cohort are not available anymore. For those observations, I use longitudinal weights instead. The NLSCY also provides bootstrap weights to reflect the complex survey design. However, to facilitate direct comparison with the US results, the Canadian results are not bootstrapped because bootstrap weights are not supplied in the CNLSY79.

[5]The number of observations stated here and in the next sentence includes repeated observations of some children who appear more than once in the surveys.

3.4 US-Canada Violence Gap: A First Look

This section provides a first look at the US-Canada violence gap based on the comparative samples of children constructed as described in the previous section. Figure 3.1 illustrates the violence rates measured by bullying and fighting in both Canada and the US. With a bullying rate of 20.3% and a fighting rate of 27.4%, American boys are 1.6 times as likely to bully and 2.4 times as likely to engage in fights compared to Canadian boys. American girls are 1.7 times as likely as Canadian girls to bully. The incidence of fights among Canadian girls is extremely low, only 2.4%, about 1/6 of the fighting rate among their American counterparts, 14.2%. In both countries, boys are more violent than girls, and more so in terms of fighting than bullying. The NLSY79 oversamples disadvantaged American families. One concern is that the over-sampling of children from disadvantaged families will result in upward biases in the US violence rates. However, all results presented in this paper are weighted, which takes into account the oversampling issue. As a precaution, Appendix Tables B.1 and B.2 compare the means of the dependent variables for different subsamples with and without the oversampled observations. As one can see, the bullying rate and the fighting rate remain virtually the same with and without the oversampled observations.

Since the bullying rates in Figure 3.1 are reported for a relatively wide age group, 4 to 11, one possibility is that the US bullying rates are higher than the Canadian ones for certain subgroups, say young teenagers, which could drive up the average bullying rates for the whole 4-11 year old sample. To address this issue, Figure 3.2 tracks the US-Canada bullying ratio by age group and gender. As shown in Figure 3.2, the US-Canada bullying rate gap is present for all age groups, from 4-5 year old pre-schoolers to 10-11 year old young teenagers. This suggests that the US-Canada

violence disparity is not an issue limited to adults and older teenagers whom previous research mostly focuses on, but has formed in early childhood. Children learn violence young. A consequent question is: to what extent is the US-Canada violence gap due to the violent behaviour children pick up by age 4-5, or due to continued learning as they grow into teenagers?

Since both the CNLSY79 and the NLSCY are longitudinal data sets, it is possible to identify a group of children in both Canada and the US whose mothers reported their bullying behaviour in every interview between when the children were 4-5 years old and when they were 10-11 years old.

Table 3.1 provides the transition probabilities of bullying behaviour between every two consecutive periods and the average transition probabilities. In general, these transition probabilities suggest that American boys and girls are more likely than their Canadian peers to remain bullies in the next period if they bullied in the current period and that they are also more likely to become bullies in the next period even if they were not bullies in the current period. The only exception is the transition from 8/9 years old to 10/11 years old. The number of periods in the data is not long enough to tell whether there is a convergence in transition probabilities between Canada and the US by age 8 to 9 or this is simply due to variabilities in the sample estimates.

Following Osberg (1977), one useful way of characterizing the importance of these transitions relative to the initial US-Canada violence gap is to calculate the ergodic bullying probabilities, assuming that the bullying behaviour follows a two-state Markov process. Let $P_0 = [p_0, 1 - p_0]$ denote the initial distribution of bullying behaviour in the population, where p_0 is the initial probability of bullying for a representative child in the population. Let T denote the transition probability matrix. Then the ergodic or steady-state distribution of bullying is $P = [p, 1 - p] = P_0 T^n$,

where p is the ergodic or steady-state bullying probability, n is the number of periods and $n \to \infty$. The intuition of the ergodic bullying probability is described as follows. If the average child keeps learning (or unlearning) bullying behaviour at the same rate as when he/she learned (or unlearned) bullying at a certain age, say at 4/5, 6/7 or 8/9, then eventually after many periods this child's probability of bullying will converge to an invariant steady-state value. As $n \to \infty$, the initial bullying distribution P_0 becomes trivial.

Table 3.1 calculates the ergodic bullying probability associated with each transition matrix and the corresponding US/Canda relative bullying ratio. As is seen, the US ergodic bullying probability is always higher than the Canadian one except when the 8/9 to 10/11 transition matrices are used. Suppose the estimates of transition probabilities fluctuate from one year to another around the true values, which justifies using long-run average transition probabilities rather than the transition probabilities between two arbitrary periods. The consequent ergodic distributions of bullying suggest that conditional on their initial violent behaviour US boys and girls become slightly more violent than their Canadian peers as they grow up, with an ergodic US/Canada bullying ratio of 1.2 for both boys and girls. This is consistent with the "skill multiplier process" portrayed in Cunha et al. (2006), that is, "skill attainment at one stage of the life cycle raises skill attainment at later stages of the life cycle (self productivity)" and "early investment facilitates later investment (complementarity)". A higher ergodic bullying probability among US children may also suggest that compared to Canadian children US children are exposed to more of other violence-causing risk factors (e.g., "peer" group influence) as they grow up. However, the key point is: no matter what drives the US transition process different from the Canadian process, the implied ergodic US/Canada bullying ratio of 1.2 is considerably lower than the actual observed US/Canada bullying ratio (see Figure 3.2), suggesting that the initial

distribution of aggressive behaviour retains an important influence.

Thus, the implications from this section are as follows: 1) Violence rates among American children are much higher compared to among Canadian children. This sharp contrast is present regardless of gender, age group, measures of violence and reporters (mother and self) of violent behaviour; 2) Children learn violence young. The US/Canada violence gap has opened up among children as young as 4-5 years old; 3) Not only do American children start off with higher probabilities of bullying compared to Canadian children, but also the transition mechanisms manifest this disadvantage as they grow up. However, the early stage aggressive behaviour retains an important influence as children grow up. and 4) Public policies aiming to reduce the US violence rate will yield a higher benefit-cost ratio if directed towards early childhood rather than later in the life cycle.

The question then is: Why do we observe such compelling contrast in violence rates between two countries which not only share the longest border in the world but also share some cultural similarities? Can the hypotheses enumerated in Section 3.1 explain this gap away? I examine these hypotheses by simple descriptives in the next section.

3.5 US-Canada Violence Gap: Previous Explanations

This section will examine whether explanations offered by previous studies can account for all or most of the US-Canada violence gap.

- Availability of firearms. It is generally observed that firearms are much more easily accessible in US than in Canada. This fact has been used by many to explain the enormous US-Canada difference in homicide rates. However, the types of violence examined here are much less serious than homicides. Mocan and Tekin (2003) provide evidence that gun availability at home does not

influence the likelihood of youth fighting. Thus, it is unlikely that the availability of firearms can directly explain why we see such a compelling difference in non-lethal violence rates in these two countries. It also does not explain why we observe such different levels of violence between these two countries among children as young as 4 or 5 years old, most of whom do not have the ability to operate a firearm.

- Racial composition, poverty and family structure. Figure 3.3 illustrates the relative US/Canada violence ratio by race, poverty[6] status and family structure[7]. The relative US/Canada bullying ratio is almost constant (1.5 - 1.7) across different subgroups. The relative US/Canada fighting ratio even has a tendency to increase when comparing among presumably more advantaged groups. The US/Canada fighting ratio is 3.2 for the non-poor versus 2.3 for the poor and 3.3 for children in intact families versus 2.3 for children in non-intact famiilies. The US/Canada fighting ratio for Blacks is suppressed by the Atlantic Research Data Centre (ARDC) for confidentiality reasons. Nevertheless, the US/Canada fighting ratio within the White population is very high, 2.8. Thus, Figure 3.3 suggests that race, poverty status and family structure cannot explain away the US-Canada violence gap.

- "Southern" bias or large city effect. Figure 3.4 and Figure 3.5 rank bullying rates and fighting rates of different geographic areas in Canada and the US. The highest bullying rate is found in non-central-city[8]areas of the West region and

---

[6]I use the Luxemburg Income Study definition of poverty line, i.e. half of the median equivalent family income. Family equivalent income is defined as family income divided by the square root of family size. For the US, the poverty line is calculated using the Current Population Survey 2003. For Canada, it is calculated using the Survey of labour Income and Dynamics 2003.

[7]See Appendix Table B.3 for US-Canada comparisons of actual violence rates among these subgroups.

[8]US central city boundaries are defined by the US Census Bureau. For details, please refer to Appendix 6 of the NLSY 79 Codebook.

the highest fighting rate is found in the central city areas of the Northcentral region. So the "Southern" bias is not well supported by the data. The central city effect (i.e., crime rates are higher in large cities) is not obvious in Figure 3.4, where the three Canadian large cities (Montreal in Quebec, Toronto in Ontario and Vancouver in British Columbia) rank 1, 2, and 6 out of 8 Canadian geographic areas and the four US large city areas rank 2, 3, 4, and 7 out of 8 US geographic areas. Figure 3.5 does suggest a central city effect, with the central city areas consistently ranking higher than non-central-city areas. One exception is the South region where fighting rates in central city and non-central-city areas are close. If central city effect explains the US-Canada violence gap, then US non-central-city areas should have around the same violence rates as Canadian non-central-city areas, or at least as Canadian central city areas. However, this is not the case. In Figure 3.4, bullying rates in all Canadian areas are lower than in the US areas, except that the bullying rate (13.9%) in non-central-city areas of Ontario, Canada is slightly higher than the bullying rate (13.7%) in non-central-city areas of the Northeast region in the US. Similarly, in Figure 3.5, fighting rates in most Canadian areas are much lower than in the US areas. Two exceptions are Toronto and Vancouver, where the fighting rates are close to the lowest fighting rate found in the US areas (i.e., 17.7% in non-central-city areas of the Northeast region). Thus, neither the "southerness" bias nor the presence of more large cities in the US can explain away the US-Canada violence rate difference.

- Culture differs. The problem with cultural explanation is that "culture" is such an intangible concept that is usually very hard to measure properly. In addition, even if measurement is not a problem, it is still very difficult to empirically disentangle "causation" from "correlation" with cultural explanation (Miguel et

al. (2008)). Does more violence cause the formation of a violent "culture"? Or, does "violent culture" cause higher tolerance of violent behaviour? This paper considers "culture" as a residual factor for explaining cross-country variations in violence levels, i.e. as a last resort when other factors, such as demographics, social policy, economic development, and legal institution, have been explored and have failed to account for all the differences.

- All taken together. If none of the above hypotheses can explain the US-Canada difference in violence rates alone, a natural question to ask is if they taken together will explain it. To answer this question, I compute the violence rates in Canada and the US for those children who are white, from intact, non-poor families, and live in non-central cities. The resulting bullying rates are 10.5% for Canada and 15.6% for the US, and fighting rates are 5.1% for Canada and 17.9% for the US. Clearly, the US violence rates are still much higher than the Canadian ones, especially the fighting rate.

Now it is fair to say that conventional wisdom about why US violence rates are higher than Canadian rates is far from conclusive, at least not for violence among children. It is likely that there are other important factors in play that have not been accounted for. Since the US-Canada violence gap is present among young children, some of these factors will likely have an effect on violence in early childhood. Moreover, given the prevalence of the US-Canada violence gap among different demographic, regional, socioeconomic and racial groups, some of these factors will likely affect the majority of children living in the same country, for example, a social policy. One of the most important child-related policy differences between Canada and US is the difference in their maternity leave policies. The rest of the paper investigates the hypothesis that different post-birth maternal employment patterns in Canada and the

US, which are likely responses to their different maternity leave policies, may have played a role in causing the violence rate gap between these two countries.

3.6 Post-birth Maternal Employment and Children's Violent behaviour

3.6.1 Maternity Leave Policy in Canada and US - An Overview

Before 1993, the United States did not offer a national policy providing any maternity leave benefits. The primary source of maternity leave coverage was provided by employers in most states. Employer provided maternity benefits typically do not exceed 6 weeks (Berger et al. (2005)). In 1993, the Federal Family and Medical Leave Act (FMLA) was passed. Under FMLA (effective August 5, 1993), women who work for an employer with 50 or more employees and who have worked at least 1250 hours for that employer in the prior year are entitled to 12 weeks of unpaid leave.

In Canada, maternity benefits were first introduced in 1971 under the Unemployment Insurance (replaced by Employment Insurance in 1997)[9]. Under the UI legislation, women with 20 weeks of insurable employment were eligible for 15 weeks of benefits at an income replacement rate of 2/3 up to a ceiling (maximum insurable earnings). These benefits were reinforced by the introduction of an additional 10 weeks of parental benefits in 1990, which could be shared between mothers and fathers, and further reinforced in 2001, when parental leave was extended from 10 weeks to 35 weeks, which made the maximum length of available leave for parents 50 weeks. In 1997, eligibility condition changed from 20 weeks to 700 hours and then further changed to 600 hours in 2001. Income replacement was first reduced to 60% in 1990, then 57% in 1993 and finally 55% in 1994. Income replacement has always been

---

[9]In Canada, provincial governments are in charge of legislations on job-protected maternity/parental leave and the federal government funds the income compensation. With some variations, the duration of job-protected leave in most provinces has been in keeping with the federal UI/EI rules. Thus, the introduction will focus on the federal legislation.

up to a ceiling, meaning that the effective replacement rate is higher for low-income women and lower for high-income women.[10].

It is easy to see that Canadian maternity leave policy is much more generous than the American policy. Eligible Canadian mothers can not only take longer job-protected leave, but also receive some income compensation. As a result, most working Canadian mothers have much more flexibility than American mothers in deciding when to go back to work and whether to work full-time or part-time after giving birth. Research from both Canada (e.g., Baker and Milligan (2008); Phipps (2001); and Marshall (1999)) and the US (e.g., Berger and Waldfogel (2004); Klerman and Leibowitz (1998b); Klerman and Leibowitz (1998a); and Waldfogel (1998)) shows that maternity leave legislation has a large impact on women's post-birth work decisions. Thus, the sharply contrasting Canadian and US maternity leave policies are likely to predict sharply contrasting work behaviour among new mothers in these two countries, as will be demonstrated in the next subsection.

3.6.2   Empirical Analysis

Because the CNLSY and the NLSCY do not provide comparable information on the take-up of maternity leave benefits, this paper will focus on the difference in early maternal employment behaviour between Canada and the US, which is likely largely driven by their different maternity leave policies. US new mothers covered either by the FMLA or their employer provided maternity leave provisions likely will have returned to work by 12 weeks if they do not want to lose their jobs. In Canada, however, typically a new mother covered by the Unemployment/Employment Insurance can stay home for up to 15 weeks before 1990, 6 months between 1990 and 2000 and a year starting in 2001. In both countries, new mothers who do not qualify

---

[10]See Phipps (2006) for a thorough discussion of the evolution of Canadian maternity and parental benefits.

for any maternity leave benefits may have to start full time work soon after giving birth if they need income to support their families. Some low-income mothers who qualify for maternity leave benefits may also have to start full time work soon after birth because they cannot afford to stay home longer or work part-time. This may be particularly true for the US mothers because most of them do not receive any income compensation while on leave.

Since the percentage of visible minorities is extremely low in the Canadian sample after excluding children born to immigrant mothers, the analysis henceforth will focus on the White population. Figure 3.6 shows that the biggest difference in post-birth work patterns between Canada and the US emerges by the first three months. For 4 to 11 year old US children, almost half of their mothers have started to work and 1/3 of their mothers have started to work full time (35 or more hours per week) by the first three months after birth. For 4 to 11 year old Canadian children, only 12% of their mothers started working during the first three months after birth and even fewer, 5%, started working full time. This cross-country contrast stands for 12-14 year old children as well. By the end of the first year, however, the Canada-US difference in maternal employment rate has largely disappeared. Is there a connection between this sharp contrast in Canadian and American mothers' post-birth employment pattern and the sharp contrast in violence among their children? The rest of this section formally addresses this issue.

The empirical model is specified as follows:

$$Y = F(X\beta) \tag{3.6.1}$$

where Y is the probability of bullying or fighting. F is the functional form. For example, F denotes an identity function for linear probability models and cumulative normal distribution function for probit models. $X = (D, \Gamma)$, where D represents the

variable of interest, i.e. whether the mother started to work full time within 3 months after giving birth, and Γ is a set of other control variables, including whether the child was the first born, number of siblings, child's age, whether child was underweight (less than 5.5 pounds) at birth, mother's education level, mother's age, family structure, region and a set of dummy variables indicating the specific year the child was born.

The focus on whether the mother started to work full time within 3 months after giving birth is closely tied to the policy of interest - most American mothers who qualify for the FMLA coverage have full-time jobs and are entitled to up to 3 months of job-protected leave without income replacement. This is also where the biggest cross-country divergence is observed when comparing post-birth maternal employment between Canada and the US.

The first born child might have better outcomes because of less competition for resources from younger siblings in early childhood and first-time mothers may have systematically different post-birth work behaviour. More siblings may imply more competition for resources within families, more opportunities for bullying and fighting and require more non-labour-market maternal time. Birth weight captures children's health status at birth - underweight children may be less likely to bully or fight others and may require more maternal care. Children born to more educated mothers may behave differently than those born to less educated ones, due to, say, intergenerational transfer of endowments or higher quality of parental investment. More educated mothers may have a higher opportunity cost of caring for children compared to less educated mothers. Children from lone-parent families may have worse outcomes and lone mothers may have to return to work sooner and work longer hours because of financial stress. Birth year dummies are included to control for possible cohort effects and different macroeconomic conditions at the time the child was born. Different cohorts may have different tendencies towards violence. Macroeconomic conditions

(e.g., labour market prosperity) may influence the timing and intensity of maternal employment after birth. Appendix Table B.4 reports the means of the independent variables.

The main empirical strategies carried out in this paper in estimating the "causal" effect of returning to work full time within 3 months are linear probability regressions, probit regressions and propensity score matching. Linear probability and probit models are appropriate if the following three assumptions are true (Caliendo and Hujer (2006)): 1) All "confounding variables" have been included, i.e. all variables that predict both early maternal employment and childrens violent behaviour have been controlled for; 2) The functional form is correct; 3) The treatment effect is homogeneous across different subgroups in the population. Apparently, each of these three assumptions is very strong and in practice there is no way to ensure that these assumptions are met. The linear probability and probit estimator are biased if any of these assumptions is not met.

To check the robustness of the empirical results, I also use propensity score matching (Heckman et al. (1997); Rosenbaum and Rubin (1983)) to estimate the "causal" effect of early childhood maternal employment. The idea of propensity score matching is to find a group among the comparison population (those whose mothers did not start working full time during the first 3 months) that have the same or similar propensity to be treated as the treatment group (those whose mothers started working full time during the first 3 months). The key identification assumption of propensity score matching is that conditional on Γ, potential outcomes $Y(D = 0)$ and $Y(D = 1)$ are independent of D. Thus, propensity score matching also requires assumption 1), that is, "selection on observables". However, due to its non-parametric nature, propensity score matching is more immune to functional form misspecification. Propensity score matching also allows treatment effect to be heterogeneous in

the population. Propensity score matching estimates are biased if there are important unobserved variables which influence both post-birth maternal employment and children's violent behaviour, but are omitted from Γ. The magnitude of the bias depends on the level of importance of the omitted variables (Rosenbaum (2002)).

The propensity score matching procedures are implemented as follows. First, I estimate the propensity of working full time during the first 3 months after birth using probit regression models, controlling for Γ. Using the predicted probabilities of working full time in the first 3 months after birth obtained from the first step, the matching and the estimation of treatment effects are then carried out using a STATA user-written program called "psmatch2" (Leuven and Sianesi (2003)). Since the choice of matching algorithms is not trivial (Caliendo and Kopeinig (2008)), I report results from one-to-one matching with and without replacement, 5 nearest neighbour matching and kernel density matching with three different bandwidths - 0.01, 0.06 and 0.1.

Table 3.2 presents the linear probability, probit and propensity score matching estimates of the causal effect of working full time in the first 3 months after birth for Canadian and US boys and girls separately. Due to the extremely low incidence of fighting among Canadian girls, results on Canadian girls' fighting behaviour have been suppressed by the ARDC in order to protect respondents' confidentiality. Wald tests reject pooling Canadian and US data so results based on the pooled samples are not reported. In cases where a child appears more than once in the sample, only one appearance is kept and the selection is random, though main results are robust if only the first-time appearance is kept. Thus, the regression samples do not contain repeated observations. For 4-5 year old children, one concern is that mother's observation of the child's bullying behaviour may be systematically different depending on whether the child has started school. If a child has not started school,

the mother may not have an opportunity to observe any potential bullying behaviour the child may have. Since most children would have started school by the time they are six in both countries, I exclude 4-5 year old children from the samples, though the main results do not change when including them.

As seen in Table 3.2, linear probability and probit regressions suggest a negative association between intensive early maternal employment and Canadian boys' probability of bullying and fighting and the association is statistically significant at 10% level for fighting. However, propensity score matching estimates suggest that intensive early maternal employment increases bullying and fighting for Canadian boys and that linear probability and probit regression results are biased. For Canadian girls, linear probability, probit and propensity score matching (except when using 1-to-1 matching with replacement) all point to a positive connection between full time maternal employment within 3 months after birth and girls' probability of bullying. Though propensity score matching estimates for Canadian children have the correct sign, they are never statistically significant probably due to the combination of the extremely small proportion (only about 5%) of Canadian mothers who start working full time within the first 3 months and the lower violence rates among Canadian children.

Baker and Milligan (forthcoming) and Baker and Milligan (2008) also find statistically insignificant effects of post-birth maternal employment on Canadian children's outcomes. However, the results here should be interpreted differently from theirs, because the effects found in their studies hinge on the changes in post-birth maternal employment induced by the expansion of parental leave coverage from 10 to 35 weeks in 2000. Therefore, the results in Baker and Milligan (forthcoming) and Baker and Milligan (2008) are relevant for new mothers who qualify for EI and whose post-birth work behaviour is affected by the 2000 expansion of parental leave. This expansion

of benefits is not relevant for the Canadian mothers considered in this paper for two reasons: 1) All the children considered in this Section were born before 1998 and are not affected by this policy change in 2000; 2) Many of the mothers who start working full time within 3 months after birth mostly likely do not qualify for EI. Phipps (2001) and Marshall (1999) find that women who are not eligible for maternity benefits return to paid work much more quickly than women who are eligible. Moreover, women who do not receive benefits are more likely to return to paid jobs within six weeks after giving birth (Marshall (1999)).

For US children, Table 3.2 shows considerable evidence that intensive early maternal employment is associated with higher probability of violence. Where significant, intensive early maternal employment predicts 5.4 to 7.6 percentage points of increase in bullying probability for US boys and 4.7 to 6.5 percentage points of increase for US girls. Similarly, full time maternal employment within the first 3 months increases the probability of fighting by around 7 percentage points (where significant) for US boys and girls. Unlike for Canadian children, linear probability and probit estimates for the US children are fairly close to propensity score matching estimates, suggesting that "selection bias" is not as serious for US children. This is consistent with the fact that much more US mothers work full time within 3 months after birth than Canadian mothers, therefore are less likely to be a "selected" group.

Thus, the general observations from Table 3.2 are the follows: 1) there is considerable evidence that mother working full time during the first 3 months after birth causes more violent behaviour among both boys and girls; 2) This effect is robust to different measures of violence, different reporters of violent behaviour and different empirical techniques; 3) This effect is still present even after children enter teenage years; 4) For US children, linear probability and probit regressions provide reasonably close approximation to the propensity score matching estimates, which may be

closer to the real "causal" effects of early maternal employment if the "selection on observables" assumption stated earlier is satisfied.

To get an idea of the effects of other independent variables, Table 3.3 reports the estimates of marginal effects from probit regressions. The estimates from linear probability regressions are very similar and have been omitted to conserve space. Having more siblings is associated with higher (2-5 percentage points) probability of bullying behaviour for boys and girls from both Canada and the US. US children of mothers with a college or university degree are 6-10 percentage points less likely to bully or fight. This effect is also negative but not significant for Canadian children. Children of lone mothers are more likely to be violent in both countries, with the effect significant for bullying behaviour among Canadian boys (7 percentage points), Canadian girls (5 percentage points) and US boys (8 percentage points).

The empirical results presented so far established that intensive early maternal employment increases aggressive behaviour among US boys and girls. The estimates for the Canadian samples are generally not as reliable as for the US samples because very small number of children exist in the sample whose mothers start working within the first 3 months after birth and the Canadian violence rates are much lower. Propensity score matching estimates suggest that intensive early maternal employment also increases violence for Canadian children, though these estimates are not significant. Linear probability and probit estimates for Canadian boys are of the wrong signs. The evidence presented to this point is not sufficient to answer the question of how much the difference in post-birth maternal employment patterns between Canada and the US contribute to the US-Canada violence gap. The rest of this section tries to answer this question by resorting to the famous Blinder-Oaxaca decomposition (Blinder (1973) and Oaxaca (1973)).

The original Blinder-Oaxaca decomposition is only appicable to linear models.

Fairlie (1999) and Fairlie (2005) extended this technique to binary choice models, such as probit and logit models. Jann (2008) and Jann (2006) provide two STATA user-written programs to implement Blinder-Oaxaca decomposition based on OLS and binary choice estimates, respectively.

$$Y^{CA} = F(X^{CA}\beta^{CA}) \qquad (3.6.2)$$

$$Y^{US} = F(X^{US}\beta^{US}) \qquad (3.6.3)$$

$$\bar{Y}^{US} - \bar{Y}^{CA} =$$

$$[\sum_{i=1}^{N^{US}} \frac{F(X_i^{US}\hat{\beta}^*)}{N^{US}} - \sum_{i=1}^{N^{CA}} \frac{F(X_i^{CA}\hat{\beta}^*)}{N^{CA}}]$$

$$+[\sum_{i=1}^{N^{US}} \frac{F(X_i^{US}\hat{\beta}^{US})}{N^{US}} - \sum_{i=1}^{N^{US}} \frac{F(X_i^{US}\hat{\beta}^*)}{N^{US}}]$$

$$+\sum_{i=1}^{N^{CA}} \frac{F(X_i^{CA}\hat{\beta}^*)}{N^{CA}} - \sum_{i=1}^{N^{CA}} \frac{F(X_i^{CA}\hat{\beta}^{CA})}{N^{CA}}] \qquad (3.6.4)$$

Let Equation 3.6.2 and Equation 3.6.3 represent the empirical model for Canada and US, respectively. A general formulation of the Blinder-Oaxaca decomposition can be expressed as in Equation 3.6.4, where $\bar{Y}^{CA}$ and $\bar{Y}^{US}$ denote the average probability of violent behaviour in Canada and US, N^{CA} and N^{US} denote the number of observations in Canada and US, and $\hat{\beta}^{CA}$ and $\hat{\beta}^{US}$ denote the estimates from equation 3.6.2 and equation 3.6.3, respectively. $\hat{\beta}^*$ is a weighted average of $\hat{\beta}^{CA}$ and $\hat{\beta}^{US}$. The first part of the right-hand-side of Equation 3.6.4 is the explained part, i.e. the part of violence rate difference due to differences in observed characteristics. The second part is the unexplained part, i.e. the part of violence rate difference due to differences

in coefficients on the observed characteristics and/or differences in unobserved characteristics. As is well-known, the decomposition results will vary depending on what $\hat{\beta}^*$ is, i.e. the "index number problem"(Oaxaca (1973)). Since $\hat{\beta}^{CA}$ is less reliable for reasons explained before, the decomposition is carried out with $\hat{\beta}^* = \hat{\beta}^{US}$. To check the robustness of decomposition results, I also report results where $\hat{\beta}^*$ is the vector of coefficients from the Canada-US pooled regressions (Neumark (1988)) with a country fixed effect dummy. In addition, the linear probability decomposition program provided by Jann (2008) also allows $\hat{\beta}^*$ to be the average of $\hat{\beta}^{CA}$ and $\hat{\beta}^{US}$ (Reimers (1983)) and the corresponding results are also reported. One caveat is that using average coefficients may contaminate the results because the Canadian coefficients are less reliable.

Table 3.4 presents the decomposition results based on linear probability (Column 3-5) and probit models (Column 6-7). For each subsample (6-11 year old boys, 6-11 year old girls and 12-14 year old boys), both the total and explained US-Canada difference in violence rates are reported. In addition, the contribution of full time early maternal employment to the explained part of Equation 3.6.4 is also reported. For comparison, the contributions of mother's education and lone-mothers are also reported. Decomposition results using probit models are fairly close to the results based on linear probability models. Results using coefficients from pooled models are close to those using coefficients from the US equation because coefficients obtained from the pooled models are dominated by the coefficients obtained from the US equations due to the larger population size in the US. Using the average of US and Canadian coefficients usually results in smaller explained part, as well as smaller individual contributions by early maternal employment. For boys, 38.1-65.7% of the total US-Canada difference in bullying rate is "explained" depending on the choice of decomposition methods. For girls, the part explained by observed characteristics

accounts for a smaller share, 15.3-34.9%, of the total differences in bullying rate. Decompositions of differences in fighting rates are only conducted for boys and the explained share is much smaller in this case compared to bullying, with the largest estimate of explained share being 10.4% and the smallest estimate of explained share being -2.6%. The negative explained share here means that observable characteristics widen the US-Canada difference in boys' fighting rates.

Table 3.4 also reports the contribution of full time early maternal employment as a percentage of the explained part and of the total difference. As can be seen, full time early maternal employment explains a fairly sizable portion of the explained differences in US-Canada bullying rates for boys (12.4-33.5%) and for girls (36.7-94.3%). Full time early maternal employment also contributes to the explained differences in boys' fighting rates, though the estimates are less stable, range from a low of 7.1% to a high of 366.2%. Even in terms of shares of total US-Canada differences in violence rates, the contribution of full time early maternal employment is still quite considerable: 4.7-14.5% for boys' bullying rates, 10.1-14.5% for girls' bullying rates and -0.2-6.7% for boys' fighting rates. When compared to the contributions of mother's education and lone-mother status, the contribution of full time early maternal employment always fares better, except when using average coefficients to decompose differences in boys' fighting rates where the estimates become less stable.

Thus, the Blinder-Oaxaca decomposition exercises suggest that full time early maternal employment does play an important role in accounting for the observed US-Canada differences in children's violence rates. The contribution of full time early maternal employment is much larger than the contribution of maternal education or lone-motherhood in explaining the differences. Lone motherhood has often been blamed as an important reason that US children may have worse outcomes than Canadian ones.

3.7 Conclusion

This paper examines the relationship between two empirical regularities between Canada and the US. One is that the violence rate in the United States is much higher compared to in Canada. This comparison stands not only among adults and older teenagers as previous studies have revealed, but also among younger, namely 4-14 year old, children. Second, consistent with the different maternity leave policies in Canada and the US, mothers in Canada have the privilege to stay longer at home and/or work less intensively after giving birth compared to mothers in the US. Empirical analysis carried out in this paper suggests that this difference in post-birth maternal employment contributes to the higher violence rates among US children compared to among Canadian children. This echoes the conclusion in Heckman (2008) that quality of parenting matters and that proper measures of disadvantages are not necessarily family income, parental education or lone-parenthood. Given that the US-Canada violence gap has opened up in early childhood and tends to manifest itself as children grow up, public policies oriented towards early childhood may have higher economic returns than policy interventions later in life, such as increased education expenditure, elevated policing expenditure, or juvenile rehabilitation programs. In particular, these findings suggest that some legislative changes on compensated maternity leaves that have recently happened (e.g. in California, Massachusetts, New York, New Jersey, and Washington) may be expected to have favorable impacts on children's behavioural outcomes.

Table 3.1: Transition Probabilities of Bullying

	Canadian Boys			US Boys			Ergodic US/Canada Bullying Ratio - Boys
	Transition Matrix		Ergodic Probability of Bullying	Transition Matrix		Ergodic Probability of Bullying	
	Bully	Not bully		Bully	Not bully		
4/5 to 6/7	0.28	0.72	0.10	0.47	0.53	0.13	1.3
	0.08	0.92		0.08	0.92		
6/7 to 8/9	0.44	0.56	0.14	0.53	0.47	0.19	1.4
	0.09	0.91		0.11	0.89		
8/9 to 10/11	0.45	0.55	0.11	0.53	0.47	0.10	0.9
	0.07	0.93		0.05	0.95		
Mean Transition Probabilities	0.39	0.61	0.12	0.51	0.49	0.14	1.2
	0.08	0.92		0.08	0.92		

	Canadian Girls			US Girls			Ergodic US/Canada Bullying Ratio - Girls
	Transition Matrix		Ergodic Probability of Bullying	Transition Matrix		Ergodic Probability of Bullying	
	Bully	Not bully		Bully	Not bully		
4/5 to 6/7	0.30	0.70	0.11	0.34	0.66	0.14	1.3
	0.09	0.91		0.11	0.89		
6/7 to 8/9	0.46	0.54	0.11	0.52	0.48	0.14	1.3
	0.07	0.93		0.08	0.92		
8/9 to 10/11	0.38	0.62	0.07	0.31	0.69	0.07	1.0
	0.05	0.95		0.05	0.95		
Mean Transition Probabilities	0.38	0.62	0.10	0.39	0.61	0.12	1.2
	0.07	0.93		0.08	0.92		

Table 3.2: The Effect of Working Full Time During the First 3 Months After Birth

	Linear Probability	Probit	Propensity Score Matching						No. of Observations
			1-to-1 matching without replacement	1-to-1 matching with replacement	5 nearest-neighbour	kernel matching, b=0.01	kernel matching, b=0.06	kernel matching, b=0.1	
Bullying, 6-11 years old									
Boys									
Canada	-0.020	-0.023	0.017	0.023	0.010	0.008	0.006	0.006	2,519
US	0.056**	0.061**	0.054*	0.057	0.062**	0.076***	0.069***	0.059**	1,215
Girls									
Canada	0.020	0.021	0.006	-0.006	0.007	0.022	0.024	0.025	2,476
US	0.052*	0.053**	0.040	0.065**	0.036	0.047*	0.038	0.034	1,179
Fighting, 12-14 years old									
Boys									
Canada	-0.046*	-0.040*	0.000	-0.007	0.001	0.002	0.005	0.011	1,531
US	0.043	0.045	0.051	0.042	0.071*	0.072*	0.058	0.053	802
Girls									
US	0.033	0.031	0.067**	0.071**	0.040	0.024	0.023	0.022	816

Note: 1. * 10%; ** 5%; *** 1%

2. b stands for bandwidth.

3. Canadian girls' resutls on fighting are suppressed by the Atlantic Research Data Centre (ARDC) due to the extremely low incidence of fighting among Canadian girls.

Table 3.3: Probit Estimates of Bullying and Fighting Behaviour

| | Bullying, 6-11 Year Old | | | | Fighting, 12-14 Year Old | | | |
| | Boys | | Girls | | Boys | | Girls | |
	Canada	US	Canada	US	Canada	US	Canada	US
First child	0.030	-0.040	0.008	0.054*	-0.016	-0.008		-0.022
Number of siblings	0.049***	0.026**	0.022**	0.028**	-0.002	0.015		0.010
Child age in months	-0.001	-0.001	0.000	-0.000	0.001	0.001		0.001
Low birth weight	0.005	-0.037	-0.051***	-0.006	-0.001	-0.004		0.006
Mother has college or university degree	-0.012	-0.064**	-0.005	-0.065**	-0.02	-0.103***		-0.057**
Mother's age	-0.005	-0.055	-0.035	-0.085	-0.101*	0.018		0.047
Mother's age squared	0.000	0.001	0.000	0.001	0.001*	-0.000		-0.001
Lone mother	0.067**	0.081**	0.052*	0.003	0.067	0.065		0.028
Rural	0.007	-0.048*	0.006	0.009	-0.044***	-0.059*		-0.015
Atlantic	-0.032*		-0.026		0.011			
Quebec	-0.019		-0.033*		-0.046**			
Manitoba and Saskatchewan	0.002		-0.010		-0.041**			
Alberta and British Columbia	-0.026		0.020		0.037			
Northeast		-0.030		-0.057*		-0.000		-0.034
South		-0.014		-0.026		0.024		0.022
West		0.032		-0.012		-0.051		-0.009
Full-time work within 3 months after birth	-0.023	0.061**	0.021	0.053*	-0.040**	0.045		0.031
Number of observations	2519	1215	2476	1179	1531	802		816
pseudo R^2	0.047	0.078	0.047	0.045	0.095	0.032		0.043

Note: 1. To conserve space, the marginal effects of birth year dummies have been omitted.
2. Standard errors correct for clustering within household.
3. Results for Canadian girls' fighting behaviour are suppressed by the Atlantic Research Data Centre to protect respondents' confidentiality.

Table 3.4: Oaxaca-Blinder Decomposition of US-Canada Violence Rates

		Linear Probability			Probit	
		US Beta's	Pooled Model Beta's	Ave. of US and Canadian Beta's	US Beta's	Pooled Model Beta's
Bullying, 6-11 Years Old, Boys						
Total Difference (%)		8.8	8.8	8.8	8.8	8.8
Explained Difference (%)	Absolute Difference (%)	3.8	5.1	3.4	4.1	5.8
	Fraction of Total Difference	43.2	57.7	38.1	46.2	65.7
Difference Explained by	Absolute Difference (%)	1.3	1.2	0.4	1.2	1.1
Early Maternal Employment	Fraction of Explained Difference	33.5	23.2	12.4	28.4	18.3
	Fraction of Total Difference	14.5	13.4	4.7	13.1	12.0
Difference Explained by	Absolute Difference (%)	0.2	0.2	0.1	0.2	0.3
Mother's Education	Fraction of Explained Difference	4.7	3.3	3.3	6.1	4.4
	Fraction of Total Difference	2.0	1.9	1.3	2.8	2.9
Difference Explained by	Absolute Difference (%)	0.1	0.1	0.1	0.2	0.2
Lone Parenthood	Fraction of Explained Difference	3.5	2.6	3.7	4.0	3.0
	Fraction of Total Difference	1.5	1.5	1.4	1.8	2.0
Bullying, 6-11 Years Old, Girls						
Total Difference (%)		9.2	9.2	9.2	9.2	9.2
Explained Difference (%)	Absolute Difference (%)	1.4	2.7	1.5	1.5	3.2
	Fraction of Total Difference	15.3	29.6	16.1	16.2	34.9
Difference Explained by	Absolute Difference (%)	1.3	1.3	0.9	1.2	1.2
Early Maternal Employment	Fraction of Explained Difference	94.3	46.9	62.6	83.8	36.7
	Fraction of Total Difference	14.5	13.9	10.1	13.6	12.8
Difference Explained by	Absolute Difference (%)	0.2	0.0	0.1	0.2	0.2
Mother's Education	Fraction of Explained Difference	15.4	0.7	8.0	12.9	6.7
	Fraction of Total Difference	2.4	0.2	1.3	2.1	2.3
Difference Explained by	Absolute Difference (%)	0.0	0.0	0.1	0.0	0.0
Lone Parenthood	Fraction of Explained Difference	-0.5	0.2	4.4	0.4	0.5
	Fraction of Total Difference	-0.1	0.1	0.7	0.1	0.2
Fighting, 12-14 Years Old, Boys						
Total Difference (%)		14.5	14.5	14.5	14.5	14.5
Explained Difference (%)	Absolute Difference (%)	0.3	0.4	-0.4	0.5	1.5
	Fraction of Total Difference	1.8	3.1	-2.6	3.4	10.4
Difference Explained by	Absolute Difference (%)	0.9	0.9	0.0	1.0	0.9
Early Maternal Employment	Fraction of Explained Difference	366.2	201.7	7.1	198.1	62.1
	Fraction of Total Difference	6.4	6.2	-0.2	6.7	6.5
Difference Explained by	Absolute Difference (%)	0.3	0.3	0.2	0.2	0.4
Mother's Education	Fraction of Explained Difference	111.5	58.0	-45.1	45.2	28.0
	Fraction of Total Difference	2.0	1.8	1.2	1.5	2.9
Difference Explained by Lone	Absolute Difference (%)	0.3	0.3	0.3	0.3	0.3
Parenthood	Fraction of Explained Difference	103.8	59.0	-69.4	52.3	20.1
	Fraction of Total Difference	1.8	1.8	1.8	1.8	2.1

Figure 3.1: Canada and US Violence Rate Comparison by Gender
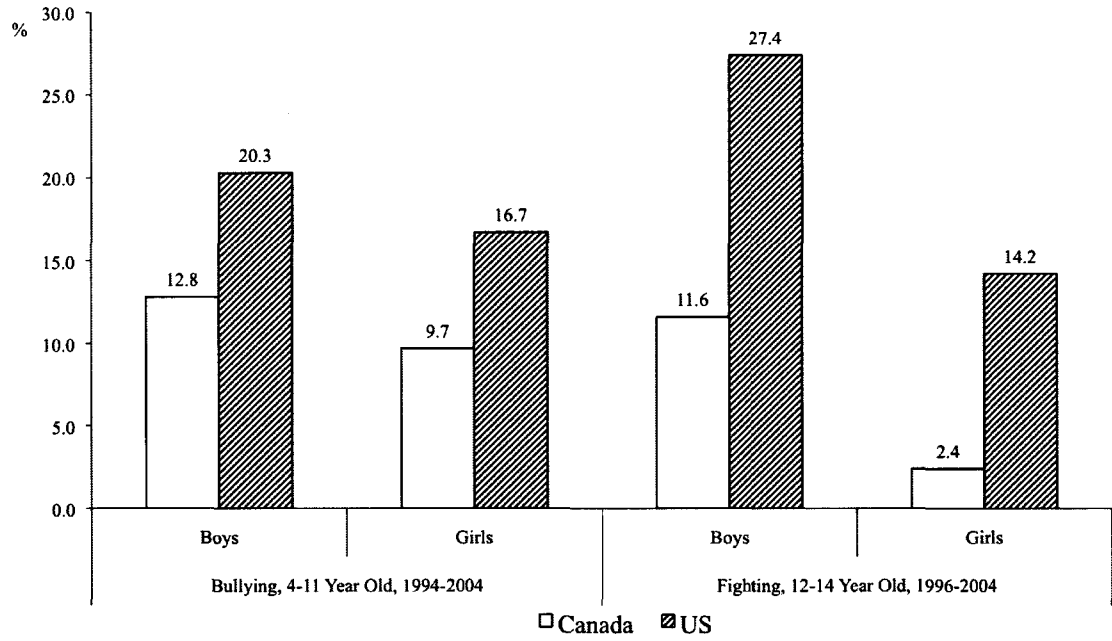
Figure 3.2: US/Canada Relative Bullying Ratio by Age and Gender
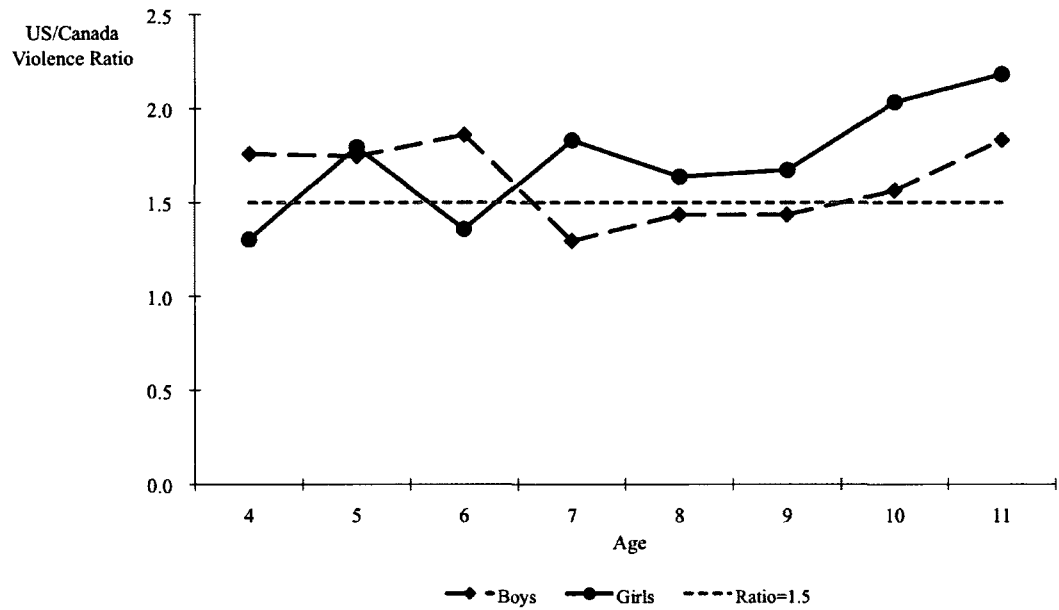
Figure 3.3: US/Canada Relative Violence Ratio by Race, Poverty Status and Family Structure

US/Canada Violence Ratio

Bullying, 4-11 Years Old — Fighting, 12-14 Years Old

Values:
- Black 1.5
- White 1.6
- Poor 1.6
- Non-poor 1.6
- Nonintact 1.7
- Intact 1.6
- White 2.8
- Poor 2.3
- Non-poor 3.2
- Nonintact 2.3
- Intact 3.3

☐ Relative Violence Ratio By Race   ☐ Relative Violence Ratio By Poverty Status   ▨ Relative Violence Ratio By Family Structure
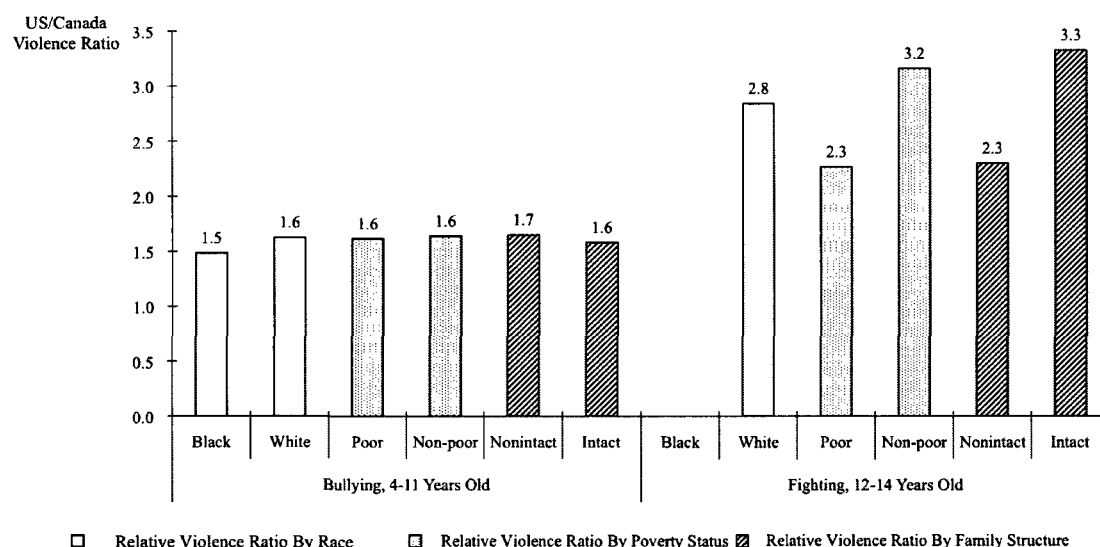
Note: 1. The US/Canada fighting ratio for Blacks is suppressed by the Atlantic Research Data Centre to protect respondents' confidentiality.

2. I use the Luxemburg Income Study definition of poverty line, i.e. half of the median equivalent family income. Family equivalent income is defined as family income divided by the square root of family size. For the US, the poverty line is calculated using the Current Population Survey 2003. For Canada, it is calculated using the Survey of labour Income and Dynamics 2003.

Figure 3.4: Canada and US Bullying Rate by Region

Bullying Rate

Values: 7.5, 7.5, 7.9, 9.9, 12.1, 12.6, 13.3, 13.7, 13.9, 14.8, 15.9, 17.4, 17.4, 19.0, 19.5, 21.8

☐ Non-central-city, Canada   ☐ Central City, Canada

■ Non-central-city, US   ▨ Central City, US
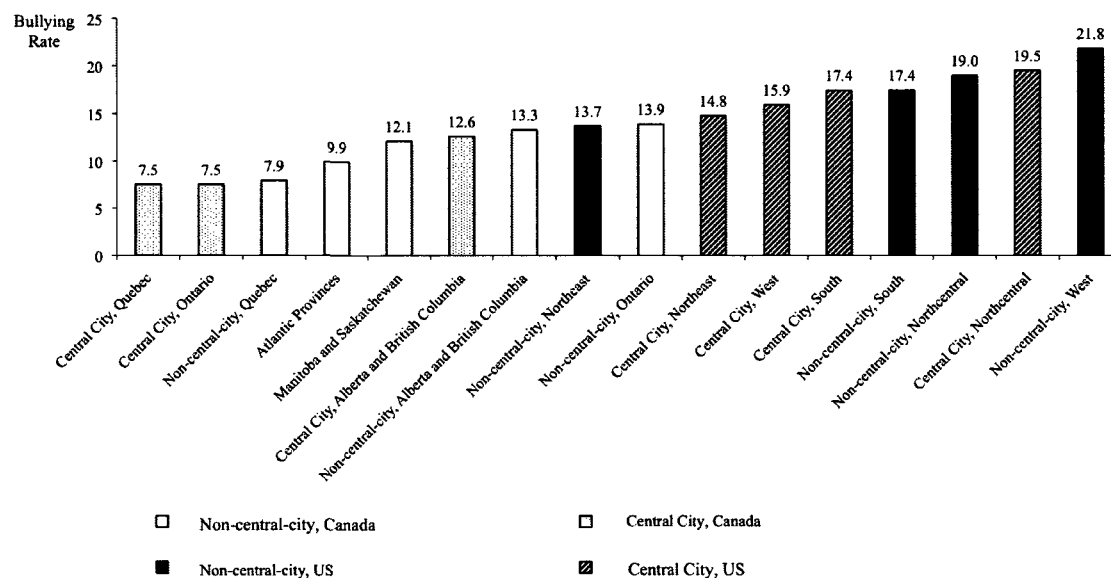
Figure 3.5: Canada and US Fighting Rate by Region

☐ Non-central-city, Canada	☐ Central City, Canada
■ Non-central-city, US	▨ Central City, US
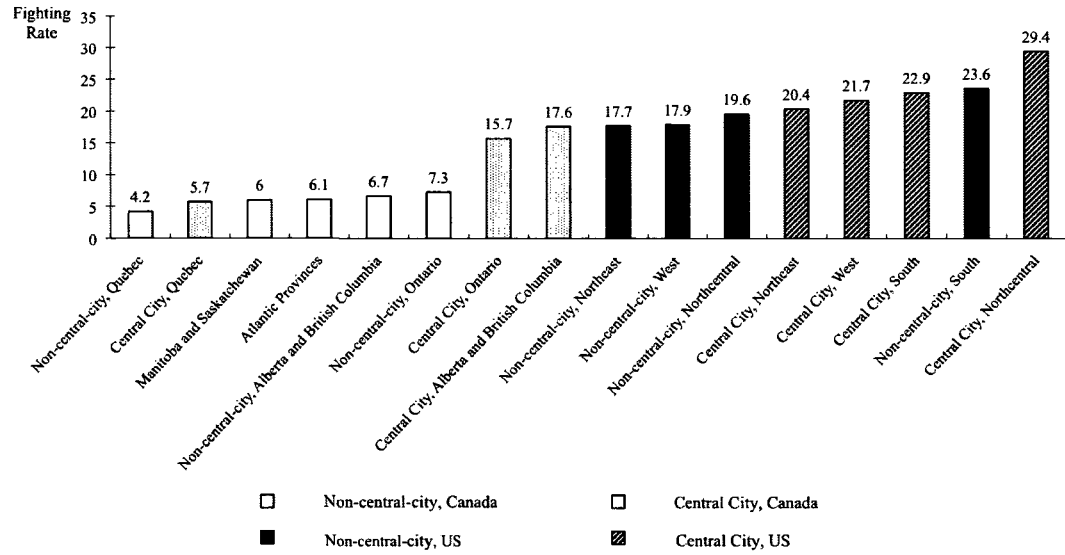
Figure 3.6: Percentage of Mothers Starting to Work After Birth

☐ Canada ▨ US
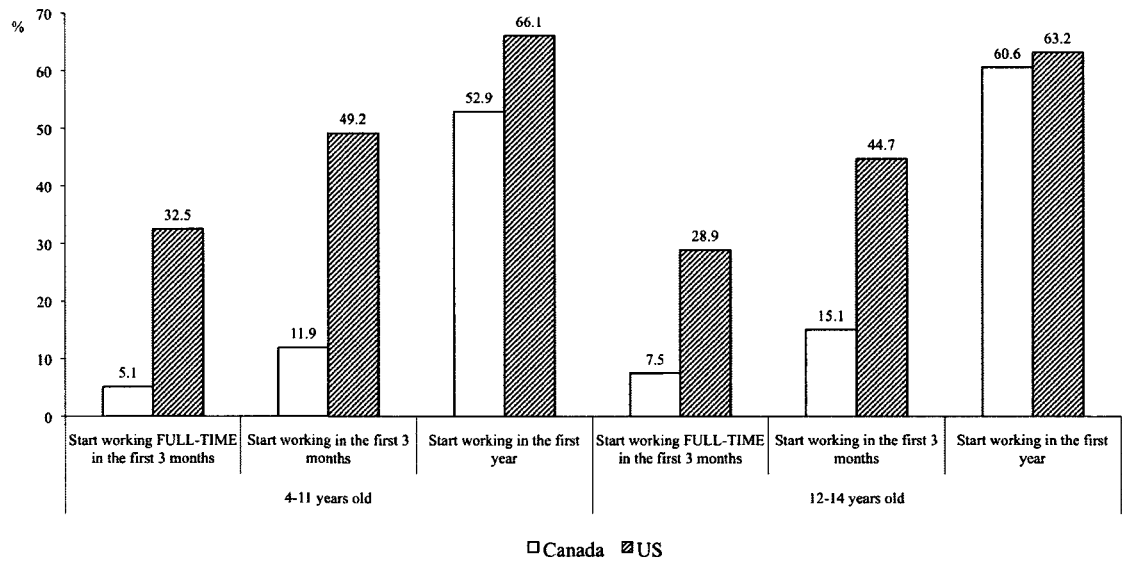
Chapter 4

Evaluating The Youth Criminal Justice Act With Perpetrator Self-report Data

4.1 Introduction

On April 1, 2003, the Youth Criminal Justice Act (YCJA) replaced the Young Offenders Act (YOA) as the Federal law that governs the administration of Canadian 12-17 year old offenders. The YCJA differs from the YOA in three major ways. First, the YCJA greatly reduces the use of youth courts and custodial sentences while increases the use of extrajudicial measures[1] for relatively minor youth criminal behavior. Second, the YCJA omits deterrence from its statement of sentencing purpose, i.e. deterrence is not an objective of sentencing in youth court (Bala et al. (2009)). Third, the YCJA was intended to be tougher on most serious, violent young offenders. For example, the YCJA facilitates the imposition of adult sentences for the most serious offenders. The Federal government also sets aside special funding for "intensive rehabilitative custody and supervision" (IRCS), which is a sentence reserved for most serious offences (Bala (2007)). However, IRCS orders and adult sentences are rarely made (Bala et al. (2009)).

The rationale behind this policy change is stated in the Preamble of the YCJA: "Canadian society should have a youth criminal justice system that commands respect, takes into account the interests of victims, fosters responsibility and ensures

---

[1]These measures include taking no further action, informal police warnings, police cautions, police referrals to a program or agency in the community, pre-charge screening programs, youth justice committees, conferences, and extrajudicial sanctions (Department of Justice Canada (2003)).

accountability through meaningful consequences and effective rehabilitation and rein-
tegration, and that reserves its most serious intervention for the most serious crimes
and reduces the over-reliance on incarceration for non-violent young persons."

Before the YCJA, large numbers of youth were imprisoned for minor offences
(Doob and Cesaroni (2004); Doob and Sprott (2004)). According to Bala and Anand
(2004), Canadian youth were "given custodial sentences at a rate four times higher
than that of adults, and that Canada's youth incarceration rate was twice that of the
United States and ten to fifteen times that of many European countries, Australia,
and New Zealand". This was coupled with research findings showing that custody was
expensive yet largely ineffective in reducing recidivism (Federal-Provincial-Territorial
Task Force on Youth Justice (1996)). Doob (2001) found in a national survey that
54% of judges believed that at least half of the cases presented before them could
have been dealt with as adequately or more adequately outside the youth court. It
was under these circumstances that the YCJA came into force.

If extrajudicial measures are indeed less expensive than custody, and are more
effective in dissociating offenders from recidivism, then the YCJA is a more successful
policy than the YOA assuming that youth crime rates under the YCJA are no higher
than before. If, however, youth crime rates increased after the YCJA, the external
costs imposed by these crime activities on victims and on society in general, as well
as the potentials costs born by the offenders themselves, may offset or even exceed
the benefits from substituting formal custody for extrajudicial measures.

It is not clear a priori whether the YCJA should be expected to have increased, de-
creased or had no effect on Canadian youth crime. On the one hand, the "deterrence"
hypothesis (Levitt (1998b); Waldo (1972); Silberman (1976); Anderson et al. (1977);
Jensen et al. (1978); Becker (1968)) suggests that a less punitive criminal justice sys-
tem may lead to higher crime rates. In particular, since the YCJA is less punitive on

minor offenders and more punitive on most serious offenders (e.g., repeat violent of-
fenders), one may expect that minor crime rates will increase and most serious violent
crime rates will decrease under the YCJA. On the other hand, the "incapacitation"
hypothesis (Levitt (1998b); Tauchen et al. (1994); Grogger (1991); Cameron (1988);
Witte (1980); Blumstein et al. (1978); Becker (1968)) suggests that letting more of-
fenders remain in the communities rather than sending them in custody will increase
both minor and serious crime, assuming that these offenders commit both minor and
serious crime. Thus, economic theory predicts that minor crime should increase after
the YCJA, whereas the effect of the YCJA on more serious crime is ambiguous. Ex-
isting studies (e.g. Bala et al. (2009); Carrington and Schulenberg (2005)) claim that
recorded youth crime rates have not increased since the YCJA came into effect in
2003. However, these studies mostly use police reported aggregate statistics and are
highly descriptive. Thus, it is important to use alternative data sources and employ
more sophisticated quantitative methods to empirically investigate whether different
types of youth crime rates have increased, decreased or remained constant under the
YCJA compared to under the YOA?

This paper tries to address the above question using youth self-reported criminal
activities from four Cycles of the National Longitudinal Survey of Children and Youth
(NLSCY), including two Cycles before and two Cycles after the YCJA came into
force. These self-reported criminal activities include property offence, violent crime,
gang membership, drug-related crime and impaired driving. The main empirical
methodology employed in this paper is the Donald-Lang (D-L) two-step procedure
(Donald and Lang (2007)). Among others, Donald and Lang (2007) try to correct the
downward bias in estimated standard errors introduced by the failure to account for
group-specific errors when the dependent variable is at individual level whereas some
regressors are at group level. That is, some regressors are constant for all members

within the same group, e.g. observations from the same Cycle of the NLSCY. In particular, the D-L procedure is suitable for accounting for the group-specific errors when the number of groups is small as in this paper, while methods proposed by previous researchers are mostly only appropriate when the number of groups is large.

In contrast to the conclusions in Bala et al. (2009) and Carrington and Schulenberg (2005) that youth crime did not change after the YCJA, this paper finds that mischief (damaging or destroying something that does not belong to the youth, e.g. damaging school furniture, or writing graffiti) increased significantly among boys after the YCJA. This is true both in terms of the percentage of offenders (youth that committed mischief in the past 12 months) and in terms of the percentage of repeat offenders (youth that committed mischief at least 3 times in the past year). This finding is consistent with the predictions of economic theory, i.e. both "deterrence" and "incapacitation" hypotheses suggest that minor crime will increase after the YCJA[2].

The evidence on other types of youth crime, such as violent crime, drug offences or impaired driving, is less conclusive. For example, the empirical analysis shows that violence decreased among 14/15 year olds, but increased among 16/17 year olds. This could be due to the relatively low violence rates among Canadian youth (i.e., a small sample problem) and/or that the self-reported violence crime measures used in the paper do not differentiate levels of severity of the violent crime - a first-time minor assault offender is likely treated differently from a multiple-time aggravated assault offender (Carrington and Schulenberg (2005)). Moreover, this is also consistent with the predictions of economic theory - "deterrence" and "incapacitation" work in opposite directions for more serious crime, such as violent crime.

The contribution of this research is two-fold. First, existing evidence on how YCJA affected youth crime is largely anecdotal or descriptive. It is necessary to have

---

[2]Author's own calculation using the Uniform Crime Reporting Survey (UCR) data shows that more than 90% of mischief incidents are relatively minor, i.e. mischief under $5,000.

a more rigorous examination of this question. Second, the majority of existing studies rely on official crime data (e.g. the UCR), which capture only part of actual levels of youth crime. Thus, it is useful to also look at other data sources, such as self-reported youth crime as in this paper.

Section 4.2 provides a portrait of youth crime trends in the past thirty years and briefly explains the background for the YCJA. Section 4.3 reviews related literature. Section 4.4 discusses three alternative crime data sources - official, perpetrator self-report and victimization data. Data used in this analysis are described in Section 4.5. An outline of the identification strategies is in Section 4.6. Empirical results are presented in Section 4.7. Finally, Section 4.8 concludes.

4.2   Background

4.2.1   Youth Crime Trends in Canada

Figures 4.1-4.5 compare trends in police-reported youth and adult crime rates (number of youth/adults charged per 100,000 population) in the past thirty years. Figure 4.1 shows that the rate of youth charged with any crime is higher than the rate of adult charged. Throughout most of the past thirty years, the trend of youth crime rate was closely in line with that of the adult crime rate. Crime rates started to climb up in the mid-1980s, reached peak levels in the early 1990s, and then started to slowly decline throughout the 1990s. The continuous decline in crime rates in the 1990s was also observed in the United States (Levitt (2004)). The rate of youth charged experienced two discrete changes following the two legislative reforms. First, it increased substantially right after the YOA replaced the Juvenile Delinquents Act (JDA) in 1984. Whether this increase was due to changes in police recording or charging practices or due to actual increase in youth crime is debatable (Carrington

(1999)). Second, there appeared to be a sudden dip in the rate of youth charged in 2003. The general perception is that actual youth crime has not decreased since the YCJA (Bala et al. (2009); Carrington and Schulenberg (2005)). Therefore, this dip in the rate of youth charged more likely reflects the change of practices, i.e. diversion to extrajudicial measures, in the youth criminal justice system.

Figure 4.2 shows the trends in violent crime rates. The youth violent crime rate was lower than the adult violent crime rate until in the mid-1980s when it took off and surpassed the adult rate. In the 1990s, the adult violent crime rate declined somewhat, whereas the youth violent crime rate remained at high levels. The rate of youth charged with violent crime increased sharply following the introduction of the YOA in 1984, but took a dip around 2003. The dip seen in 2003 may again be due to the YCJA's more lenient approach towards less serious violent crime.

Figure 4.3 depicts the trends in property crime rates. The rate of youth charged with property crime is at least twice as high as the rate of adults charged with property crime. In the 1990s, declines in property crime rates occurred both among youth and adults, though the decline was more remarkable among youth.

Trends in drug offence rates are illustrated in Figure 4.4. Before the mid-1990s, the youth drug offence rate was lower than the adult drug offence rate. The adult drug offence rate has been relatively stable over the past 20 years after declining sharply in the late 1970s and early 1980s. The youth drug offence rate, on the other hand, has increased several folds compared to the late 1970s.

Thus, the decline in the total crime rate since the 1990s observed in Figure 4.1 is largely due to the decline in property crime rate. This is particularly so for youth.

Figure 4.5 tracks the trends of mischief offence. The patterns of changes in mischief rates are remarkably close to those seen in Figure 4.3, i.e. the patterns of changes in property crime rates. This is not surprisingly, probably, because mischief is one

major type of property crime.

Figure 4.6 shows that Canadian youth incarceration rate has been on a downward trend since the mid-1990s. This is consistent with the observation that youth crime rates were declining in the 1990s. In 2003, right after the YCJA came in to effect, the youth incarceration rate seemed to have decreased much further than what it would have been should it have followed its previous trend. The trend flattened out again after 2004.

Figures 4.1-4.6 are not ideal for observing how youth crime rates have changed after the YCJA, because a large number of youth who would have been charged under the YOA but have been diverted to extrajudicial measures under the YCJA are not reflected in Figures 4.1-4.6.

Figure 4.7 (duplicated from Figure 1 in Bala et al. (2009)) decomposes the rate of youth accused (1986-2007) into two components: the rate of youth charged and the rate of youth cleared otherwise (diverted by police). As seen in Figure 4.7, after the YCJA, the rate of youth charged decreased while the rate of youth diverted by police increased, suggesting that the rate of youth chargeable may have increased or decreased or remained constant after the YCJA. Bala et al. (2009) claim that recorded youth crime has not increased since the YCJA. However, they only look at police reported aggregate statistics, which may have masked some effects of the YCJA that exist at a more disaggregated level.

4.2.2   The Youth Criminal Justice Act

The Youth Criminal Justice Act (YCJA) came into force on April 1, 2003 (enacted in February 2002), replacing the Young Offenders Act (YOA) which had been in place since April 2, 1984. An important goal of this reform was to reduce Canada's

over-reliance on the use of courts and custody in dealing with young offenders, especially non-violent offenders. This goal reflects the perception by the Parliament that community-based measures are more effective for dealing with young offenders and that under the YOA Canada was making excessive use of expensive and often ineffective court-based and/or custodial measures.

More specifically, as stated in Section 39 (1) of the YCJA, a youth justice court shall not commit a person to custody ... unless

(a) the young person has committed a violent offence; [or]

(b) the young person has failed to comply with non-custodial sentences; [or]

(c) the young person has committed an indictable offence for which an adult would be liable to imprisonment for a term of more than two years and has a history that indicates a pattern of findings of guilt ... or

(d) in exceptional cases where the young person has committed an indictable offence, the aggravating circumstances of the offence are such that the imposition of a non-custodial sentence would be inconsistent with the purpose and principles set out in section 38[3].

Thus, the YCJA intends to reduce the use of courts and custodial sentences for the majority of the young offenders, except for the relatively small number of violent offenders, repeat offenders, and those who fail to comply with non-custodial sentences. The applicable age range under the YCJA remains 12 to 17, which is the same as under the YOA.

Consistent with its objectives, the YCJA resulted in substantial reductions in the use of courts and in the number of youth in custody. As of 2006, 42% of apprehended youth suspects eventually faced police charging, down from 56% in 2002. During the first year under the YCJA, the number of custodial sentences declined by 44%

---

[3]See Appendix C.1 for the content in Section 38 of the YCJA.

compared to the last year under the YOA. By 2004/2005, the number of incarcerated youth population decreased by over 50% since the YCJA came into force (Bala (2007)).

4.3 Literature Review

To the author's knowledge, no other economic research that evaluates the outcomes of the YCJA has been made available. There are some published studies in other disciplines, e.g. criminology, law and sociology. However, most of these publications use official data, provide descriptive analysis and focus on assessing how practices in the Canadian youth criminal justice system have changed in response to the new policy regime.

Most recently, Bala et al. (2009) use data from a number of official sources[4] to assess the impact of the YCJA five years after it came into force. They conclude that the YCJA has brought about significant reductions in the use of youth court, youth custody and the related expenditures in the youth justice system. However, they claim that recorded youth crime has not increased in the YCJA.

Sprott (2001) and Department of Justice Canada (2004) provide some general background for the enactment of the YCJA. Bala (2007) provides a survey of how the diversionary provisions of the YCJA are being applied, and reviews how the courts are interpreting the detention and sentencing principles in the YCJA. It includes a discussion of the way in which the Convention on the Rights of the Child has affected the treatment of juvenile offenders in Canada's courts.

Using the 1986-2003 UCR Survey, Carrington and Schulenberg (2005) examine the extent to which police charging practices with young persons are changing in response

---

[4]These data sources are Uniform Crime Reporting Survey, Youth Court Survey, Integrated Criminal Court Survey, Corrections Key Indicators Report and Youth Custody and Community Services Survey.

to the YCJA. They find that the YCJA has been remarkably successful in bringing about changes in police charging practices with young persons which are consistent with its objectives, principles and provisions. In 2003, there was a substantial reduction at the national level and in most provinces and territories in the number of young persons charged or recommended by police to be charged, and a corresponding increase in the use of extrajudicial measures with apprehended young persons. Levels of charging were reduced in 2003 by more than one-third for minor offences such as theft under $5,000, while levels of charging for serious property and violent offences (other than common assault) decreased only slightly. They also conclude that there is no evidence of an increase at the national level in youth crime in 2003. However, as they recognize, changes in reported annual rates of chargeable young persons do not necessarily mirror changes in levels of actual youth crime, because only a small proportion of youth crimes are reflected in UCR statistics. In addition, UCR data understate the rates of youth involved in less serious offences because only the most serious offence is counted when a youth is chargeable with several incidents.

Using 1991/2 - 2003/4 data provided by the Canadian Centre for Justice Statistics, Doob and Sprott (2005) focus on the use of custody and attempts to answer the question: Was there a reduction in the use of custodial sentences in the first year of the implementation of the Youth Criminal Justice Act which can reasonably be attributed to the change in legislation itself? They conclude that there is strong evidence that equivalent cases under the YCJA are less likely to receive a custodial sentence than under the YOA and this change is more dramatic for minor cases than for serious cases, largely due to the fact that minor cases are much less likely to be referred to courts and found guilty.

4.4 Three Potential Data Sources: Official, Perpetrator Self-report and Victimization Data

Until the mid-1900s, research on crime relied almost entirely on official data, such as police, court and prison records. Official data necessarily paint only partial pictures of crime in a society, because a substantial amount of crime is not reported to or recorded by law enforcement entities. This is the so-called "dark figure of crime" (Biderman and Reiss, Jr. (1967)). Using victimization survey data, Frank and Carrington (2007) suggest that fewer than 25% of young offenders are recorded in the UCR statistics. Also using victimization survey data, Mihorean et al. (2001) note that almost 60% of victimization incidents are not reported to police. Furthermore, official data often are only available in aggregate counts and lack specific details of individual crime incidents (Cantor and Lynch (2000)).

Recognizing the shortcomings of official data, some scholars (Porterfield (1943); Porterfield (1946); Wallerstein and Wyle (1947); Biderman and Reiss, Jr. (1967)) began to publish studies based on surveys of criminals and victims in the mid-1900s. The availability of detailed information in criminal or victim reported data greatly expanded the range of crime information that can be studied by researchers and enhanced our understanding of the causes and consequences of crime. For example, criminal reported information may help researchers focus on the social determinants of crime and therefore suggest possible preventative measures. Victimization data may help us identify the most vulnerable group and better estimate the costs born by victims, particularly non-monetary costs (Cantor and Lynch (2000)).

Though criminal or victim reported data can uncover much of the hidden crime that fails to be recorded by the police, there remain concerns of under-reporting. This is particularly so for criminal self-reported data. Golub et al. (2002) mention that

offenders may "fail to recall events", "be confused by the questions", hide information out of "fear of legal consequences" in spite of "reassurances of confidentially", "distort their answers to impress the interviewers", or purposefully "undermine efforts to improve the efficiency of policing". For victimization data, under-reporting might also be considerable when it comes to sensitive incidents or memory decay.

Other criticisms of perpetrator self-report and victimization data include the representativeness in the selection of delinquency items (Gibbons (1979)) and the fact that the response categories are often truncated (Elliott and Ageton (1980)). Truncated responses may be problematic when a small percentage of the population commit a disproportionately large number of serious offences (Elliott and Ageton (1980)) or when a small number of victims account for a relatively large portion of victimization (Sparks (1981); Nelson (1980)).

Nevertheless, as Thornberry and Krohn (2000) state, the perpetrator self-reporting and the victim reporting "methodology has become much more sophisticated in design, making it more reliable and valid and extending its applicability to a myriad of issues" and it "continues to advance".

4.5 Data

The main data used in the paper are Cycle 3, 4, 6 and 7 of the NLSCY[5]. The NLSCY started in 1994 and is an on-going longitudinal survey of factors that influence Canadian children's social, emotional and behavioural development over time. The survey is conducted biennially by Statistics Canada and sponsored by Human

---

[5]Cycle 5 of the NLSCY was conducted between September 2002 and June 2003, which encompassed the period right before and after the YCJA came into force (April 1, 2003). To facilitate a more clear pre- and post- comparison of the Canadian youth crime rates, I leave out Cycle 5 in the analysis.

Resources and Social Development Canada. The target population is civilian, non-institutionalized residents living in Canada's ten provinces. Excluded are residents of the Yukon, Nunavut and the Northwest Territories, people living on Indian reserves, full-time members of the Canadian Armed Forces and inmates of institutions, i.e., incarcerated youth.

In each of these four cycles, 12-17 year old youth were given a short booklet comprising a battery of questions on their participation in delinquent or criminal activities in the past 12 months, along with other questions of private nature. To ensure confidentiality, the youth completed these questionnaires in private (away from parents and interviewers) and returned the booklet in a sealed envelope to the Statistics Canada interviewer. Based on a summary of field surveys, Harrison (1995) suggests that less-confrontational interview procedures, such as self-administered questionnaires, are more likely to yield honest self-report delinquency. Studies also show that juveniles are more likely to validly self-report their delinquent behaviour than adults (Junger-Tas and Marshall (1999)).

I group these self-reported delinquency questions into five broad categories: 1) property crime (including mischief and theft); 2) violent crime (including assault and weapon possession); 3) drug-related offence (including drug trafficking, marijuana use, and other drug use); 4) gang membership; and 5) impaired driving.Table 4.1 lists the actual survey questions. Based on the categorical responses[6] to these questions, I

---

[6]For most questions, the categorical responses available for respondents to choose from are: 1. Never; 2. Once or twice; 3. Three or four times; 4. Five times or more. A few exceptions are weapon possession, gang membership, marijuana use, other drug use. The weapon possession question is different in Cycle 6 and 7 from Cycle 3 and 4. It is not possible to extract repeat offending information in a comparable manner before and after the YCJA. The available responses to the gang membership question are: 1. Yes; 2. No. The response categories for the marijuana use question are: 1. I have never done it; 2. I have done it, but not during the past 12 months; 3. A few times; 4. About once or twice a month; 5. About 1-2 days a week; 6. About 3-5 days a week; 7. About 6-7 days a week. The response categories for the four questions on other drug (hallucinogens, glue or solvents, downers etc., and ecstasy etc.) use are: 1. I have never done it; 2. I have not done it in the past 12 months; 3. 1 or 2 times; 4. 3 to 5 times; 5. 6 to 9 times; 6. 10 times or more.

define two classes of binary dependent variables. The first class indicates whether a youth is an offender. For example, a youth is a theft offender if he/she stole something from a store or school during the past 12 months. The second class indicates whether a youth is a repeat offender, i.e. whether he/she committed a type of crime multiple times or whether he/she committed multiple types of crime. For most questions, a youth is defined as a repeat offender if he/she committed a crime at least 3 times in the past year[7]. For example, a youth is a repeat mischief offender if he/she intentionally damaged others' things for at least 3 times in the past 12 months. A repeat user of other drugs is a youth who used any of the four kinds of drugs for at least 3 times in the past 12 months. The aggregate dependent variables (Property Crime Offender, Violent Crime Offender, Drug-related Crime Offender) are coded 1 if any variable that belongs to that category takes the value 1. For instance, a youth is a violent offender if he/she indicated at least once for any of the assault (fight, attack or sexual) questions or for the weapon possession question. Similarly, a youth is a violent repeat offender if he/she indicated at least 3 times in any of the assault or weapon possession questions.

Beginning in Cycle 5, cross-sectional weights are not available in the NLSCY anymore. Thus, I use longitudinal weights and the corresponding longitudinal bootstrap weights in the data analysis. Bootstrap weights are supplied by Statistics Canada for researchers to take into account the complex survey design.

To ensure that the respondent was at least 12 years old 12 months prior to the survey, I keep in the sample those youth who were at least 14 years old by December 31 of each survey year (e.g., December 31, 1998 for Cycle 3 and December 31, 2000 for Cycle 4). I also consider 14/15 year old and 16/17 year old youth separately, because some questions (e.g., theft and impaired driving) are only available for 16/17 year

---

[7]Marijuana use is an exception. A youth is defined as a repeat Marijuana user if he/she used Marijuana at least once a month in the past year. This is due to design of the survey question.

old youth and there are no 16/17 year old youth in Cycle 3. Therefore, I analyze the self-reported criminal activities of 14/15 year old youth using four Cycles (Cycle 3, 4, 6 and 7) of data, and use three Cycles (Cycle 4, 6 and 7) for 16/17 year old youth.

Quebec has long been known for its more pro-rehabilitation approach to juvenile crime compared to the rest of Canada (Trépanier (2004)). Switching to the YCJA may not impact Quebec as much as other provinces. The per capita rate of youth cases brought to court in Quebec is much lower than in other provinces, and unlike the rest of Canada this rate only declined somewhat after the YCJA (Bala et al. (2009)). Thus, I exclude Quebec in the baseline analysis, but use Quebec as a comparison group for the rest of Canada in the robustness checks. I also exclude from the sample those youth who did not answer any of the these delinquency questions under consideration. About 25% of the 14/15 year olds and 30% of the 16/17 year olds are discarded because of non-response.

Appendix Table C.1 presents a list of other data sources used in this paper.

4.6 Identification Strategy

The central task here is to evaluate how youth crime changed after the introduction of the YCJA compared to before. The available data at hand are several nationally representative cross-sections of Canadian youth who are at the same point in their lives during each of the NLSCY Cycles under consideration. For example, four 14/15 year old cross-sections (Cycle 3, 4, 6 and 7) and three 16/17 year old cross-sections (Cycle 4, 6 and 7) are available for analysis. Cycle 3 and 4 are pre-YCJA and Cycle 6 and 7 are post-YCJA.

To account for any observable differences between these cohorts that may have contributed to the differences in their crime rates, one way to evaluate the change in youth crime after the YCJA is to estimate the following model:

$$y_{it} = \alpha + X_{it}\beta + POST_t\gamma + \eta_{it}, \quad t = 1, 2, ...T \tag{4.6.1}$$

where y_{it} denotes individual i's[8] criminal behaviour in period t; X_{it} is a vector of individual characteristics or explanatory variables; $POST_t$ is the policy variable, indicating whether the observation is before or after the policy change; and $\eta_{it} = \theta_t + \epsilon_{it}$, where θ_t is a common group error, and ϵ_{it} is an individual-specific error. T is the number of cross-sections or cycles used in the analysis. For example, T is 4 (Cycles 3, 4, 6 and 7) for 14/15 year old youth and is 3 (Cycles 4, 6 and 7) for 16/17 year old youth.

Standard OLS regressions of equation 4.6.1 that do not account for the group-specific error, i.e., θ_t, will result in estimated standard errors that are biased downward dramatically (Kloek (1981); Moulton (1990)). To correct for this bias, a few techniques have been applied widely in empirical research: i) feasible GLS; ii) standard error correction using the error covariance matrix proposed in Moulton (1990); and iii) STATA cluster command based on a robust covariance estimator developed by Liang and Zeger (1986). Donald and Lang (2007) show that these techniques are only appropriate asymptotically, i.e., when the number of groups goes to infinity $(T \to \infty)$. They propose, instead, a two-step procedure which is more appropriate when the number of groups is small.

This paper employs the Donald-Lang two-step procedure (D-L procedure thereafter). A D-L two-step procedure modified to suit the question at hand is described below[9]. The first step estimates equation 4.6.2 below without a constant, where $D = [D_1, ..., D_T]$ is a set of year dummies. For example, for 14/15 year old youth, D represents four year dummies (year 1998, 2000, 2004 and 2006), or equivalently, four

---

[8]Note that i does not stand for the same individual when t changes.

[9]See Baker and Milligan (forthcoming) for another application of the D-L two-step procedure.

cycle dummies (Cycle 3, 4, 6 and 7).

$$y_{it} = X_{it}\beta + \sum_{t=1}^{T} D_t \mu_t + \epsilon_{it} \qquad (4.6.2)$$

The second step estimates equation 4.6.3 below, where, μ_t is a coefficient obtained from the first step for the year dummy D_t.

$$\mu_t = \alpha + POST_t \gamma + \theta_t \qquad (4.6.3)$$

Donald and Lang (2007) prove that under some general conditions, the t-statistics for the coefficient estimate $\hat{\gamma}$ follows a t-distribution with $(T-2)$ degrees of freedom. Their Monte Carlo simulations also show that the two-step procedure outperforms conventional procedures used to correct for the group error.

4.7 Empirical Results

4.7.1 Descriptive Analysis

Panel A of Table 4.2 presents the percentages of young offenders by age group and gender. For both 14/15 and 16/17 year old youth, boys are more likely to be offenders than girls. This is particularly true for violent crime. For all violent crime measures, boys are 2-3 times as likely to be an offender as girls. One exception is drug-use. Boys and girls are almost equally likely to be drug users. However, girls seem to be less likely to sell drugs than boys. 16/17 year old youth are more likely to commit mischief and drug offences than their younger counterparts. However, the age effect is not apparent for violent crime or for gang membership.

Panel B of Table 4.2 reports the percentages of young repeat offenders. For the same crime, the percentage of repeat offenders is much lower than that of offenders. The general patterns in comparisons between boys and girls and between the two

age groups are similar to in Panel A. The means of dependent variables by year are available in Appendix Tables C.2 (14/15 year olds) and Appendix Table C.3 (16/17 year olds).

Appendix Table C.4 provides the means of independent variables for both age groups. Because boys and girls are often different in their propensity to commit crime (Levitt and Lochner (2001)), gender is controlled for whenever the full sample is being considered. Region of residence might matter as there might be regional differences in policies and other social conditions (Levitt and Lochner (2001)). Crime rates may be different in urban areas from rural areas (Ouimet (1999)). Children in lone-parent families may be more likely to commit crime than children in two-parent families (Antecol and Bedard (2007)). Number of siblings is also included. More siblings may mean more limited resources for each child. The age of Person Most Knowledgeable (PMK) is also included. Family socio-economic status, such as household income and parental education are also important determinants (Dooley and Stewart (2004)). Finally, I also include province-level official unemployment rate to control for local economic conditions (Mocan and Rees (2005)).

4.7.2 Multivariate Analysis

Table 4.3 reports the baseline results from the second step of the D-L procedure, i.e. effects of the YCJA on the percentages of young offenders (Panel A) and young repeat offenders (Panel B) in Canadian provinces other than Quebec. These second step results are weighted by the sum of longitudinal individual weights by cycle[10].

[10]Results from the first steps are presented in Appendix Tables C.5-C.8. Bootstrap weights are applied to account for the complex survey design. For example, Appendix Table C.5 shows that for 14/15 year old boys coming from a lone parent family is connected to a higher probability of sexual offence and a higher probability of drug-related offences. Higher household income is associated with a lower probability of committing assault. Higher socio-economic status, measured by higher household income or higher level of PMK's education, is associated with higher probabilities of drug offences. For 14/15 year old girls, coming from a lone parent family is also connected to higher probabilities of drug offences. However, higher PMK's education level is correlated with

The most striking evidence in Table 4.3 is a large increase in mischief after the YCJA. Panel A shows that the percent of 14/15 year old male mischief offenders increased by 10 percentage points after the YCJA. Given that the mean mischief rate for 14/15 year old boys was 17% in 1998 and 15% in 2000 (see Appendix Table C.2), this change is dramatic - a relative increase of about 60%. Similarly, the percent of 16/17 year old male mischief offenders increased by 11 percentage points, a relative increase of 46% compared to in 2000 when 24% of 16/17 year old boys were mischief offenders (see Appendix Table C.3). Panel B shows that the percentage of mischief repeat offenders, i.e. those who committed mischief at least 3 times in the past year, increased by 2.5 percentage points among 14/15 year old boys. This is an increase of around 90% relative to the two periods before the YCJA - the percentage of male repeat mischief offenders was 2.6 in 1998 and 2.9 in 2000.

The effect of the YCJA on the percentage of female mischief offenders and repeat offenders is positive, though not significant. In Canada, female youth are much less likely than their male counterparts to be sentenced to custody (Taylor-Butts and Bressan (2008)). If deterrence effect is small when the probability of receiving sanction is low, then further reducing the probability of sanction, i.e. reducing the use of custody, may not have a noticeable effect on the percentage of female youth offenders. In addition, even if there was truly an increase in the percentage female mischief offenders, it might not show up in these results if female offenders are more likely to underreport their criminal activities than male offenders due to, say, social stigma (Golub et al. (2002)).

Note that when pooling 14/15 year old boys and girls together and controlling for gender, the effect of YCJA on mischief is again positive and significant, both in terms

---

lower probabilities of drug offences and mischief, and higher household income is linked with a lower probability of violent crime for 14/15 year old girls. Appendix Table C.6 shows the first-step results for 16/17 year old offenders. Appendix Tables C.7 and C.8 report the first-step results for 14/15 and 16/17 year old repeat offenders, respectively.

of the percentage of offenders and the percentage of repeat offenders.

The evidence on violent crime is mixed. After the YCJA, there appears to be a decrease in the percentage of 14/15 year old female violent offenders, but an increase in the percentage of 16/17 year olds male and female violent offenders. The effect of the YCJA on the percentage of violent repeat offenders is not significant for 14/15 year olds. But the percentage of 16/17 year old male assault repeat offenders increased by 2 percentage points after the YCJA[11]. These mixed findings for violent crime might be because these survey questions cannot necessarily separate minor from serious violent offenders. Under the YCJA, minor violent offenders are treated more leniently, whereas serious violent offenders are intended to be treated more punitively, than under the YOA.

As one can see in Panel A of Table 4.3, the effect of the YCJA is not significant for the percentage of gang members, drug offenders or impaired drivers. In Panel B, there appears to be a 2.7 point decrease in the percentage of 14/15 year olds that committed at least two types of crime. For 16/17 year old boys, there is a 2.3 point decrease in the percentage of repeat users of drugs (mostly hard drugs) and a 2.2 point drop in the percentage of frequent impaired drivers.

To summarize, the results reported in Table 4.3 show that after the YCJA mischief offenders and repeat offenders increased dramatically among boys. The changes in violent offenders and repeat offenders are not as clear. There appears to be some degree of decrease in the percentage of repeat offenders of other crime, such as hard drug using and impaired driving.

---

[11]Due to the relatively low incidences of violent crime repeat offence, a considerable number of cells in Panel B of Table 4.3 are suppressed by the Research Data Centre, making it harder to tell whether the percentage of violent repeat offenders increased or decreased after the YCJA.

4.7.3 Robustness Checks

The results presented in Section 4.7.2 are simple before-after comparisons of Canadian (excluding Quebec) youth crime rates controlling for the observed socio-demographic characteristics of different cohorts. These comparisons can uncover the causal effects of the YCJA on Canadian youth self-reported crime rates only if there are no un-observed factors that are confounded with the effect of the youth criminal justice policy change. This may not necessarily be true for a number of reasons. First, for different cohorts, i.e. youth from different NLSCY cycles, there may be unobserved differences in their tendency towards committing crime (e.g., differences in ability or preferences). Simple before/after comparisons will not be able to disentangle these unobserved cohort differences from the effect of the YCJA. Second, there may be other national-level policies that the author is not aware of and that may have taken place around the same time as the YCJA and that may also have an effect on youth crime. Simple before-after comparisons also cannot remove these potential confound-ing effects. Third, there may also be the possibility that different Canadian provinces had their own policy changes during the period 1998-2006, that also affected youth crime. Controlling for time-invariant region fixed effects as in Section 4.7.2 is not sufficient if provincial policies have changed during the period 1998-2006.

To address these concerns, the following robustness checks were implemented.

First, I check the robustness of the results for different types of crime by controlling for the corresponding adult crime rates in the first step of the D-L procedure. That is, I check whether the results are robust conditional on the general crime trends in the society. The main results as presented in Table 4.4 remain essentially the same as in Section 4.7.2.

Second, to address the concern that different provinces may have different policy

changes during the period 1998-2006, I insert a full-set of region-year interaction terms (3 regions × 4 years = 12 interaction terms) in the first step of the D-L, instead of only time-invariant region fixed effect terms. Then I regress in the second step the coefficients of the 12 interaction terms against a constant and the $POST$ variable to obtain the estimates of the YCJA effect. Here the regressions are weighted by the sum of weights by Region-Year, instead of by year as in Tables 4.3 and 4.4. Again, the results (Table 4.5) are similar to the baseline results in Section 4.7.2.

Third, I implement a specification that controls for both adult crime rates and region-year interactions. Again, the main results (Table 4.6) are virtually unchanged.

Fourth, I use the D-L two-step version of the difference-in-difference (DID) strategy to address the potential concerns of unobserved cohort differences and any other national policy changes. To use the DID strategy, a comparison group is needed. The comparison group should have been exposed to the same policy and social environment changes during the period 1998-2006, with the exception of the regime change from the YOA to the YCJA. The identification assumption is that in the absence of the change from the YOA to the YCJA, the comparison and treatment groups should have had the same changes in their crime rates after April 1, 2003 when the YCJA came into force. Here, I consider two candidates for the comparison group. First, I use Quebec as a comparison group for the rest of Canada. Though the YCJA is a national policy which is also applicable in Quebec, the changes in Quebec are expected to be smaller than in the rest of Canada, due to the more rehabilitative approach already entrenched in Quebec before the YCJA (Bala et al. (2009); Trépanier (2004)). Table 4.7 presents the second step results. Though the effect of the YCJA on the percentage of male mischief offenders is not significant, it remains large and significant when pooling male and female mischief offenders. The insignificant coefficients for boys may be because the smaller number of observations available in Quebec -

only about 200+ in each year. A large portion of the results on percentage repeat offenders have been suppressed by the RDC due to confidentiality reason. Second, I consider a younger Canadian cohort who are below the minimum enforcement age of the YOA and the YCJA, i.e. 12 years old. Of the crime measures considered in this paper, the gang membership question[12] is asked to 10-11 year old youth as well. Because there are no 10-11 year old youth in Cycle 7 of the NLSCY, I use Cycle 3, 4 and 6 and compare 14/15 year old (treatment group) with 10-11 year old (comparison group) Canadian youth. The second-step results from the D-L procedure are shown in Table 4.8. Consistent with the findings in Section 4.7.2, no effect of the YCJA is found on the percentage of youth gang members.

Fifth, as mentioned earlier in Section 4.5, 25% of the 14/15 year olds and 30% of the 16/17 year olds are discarded because of non-response to the crime questions of interest. If the discarded observations are systematically different from those remaining in the sample, i.e. the selection is not random, then failing to account for this non-random selection may result in biased results (Heckman (1979)). To address this concern, I implement in the first step the Heckman's selection model instead of the simple OLS and use in the second step the year dummy coefficients obtained from the Heckman's selection model to estimate the effect of the YCJA. Table 4.9 summarizes the second step results. The strong effect of the YCJA on the percentage of male mischief offenders remains, though the effect on the percentage of male mischief repeat offender becomes insignificant.

Finally, the results presented so far focus on the prevalence (percentage of offenders or repeat offenders) and variety (percentage of offenders who commit multiple types of crime) of crime. The results on the percentage of offenders may not be generalized

---

[12]However, the gang membership question wording is slightly different for 10-11 year old youth. The question for 10-11 year old youth is: During the past 12 months, were you part of a group that did bad things?

to the incidence of crime in the society, because a small number of offenders may account for a large share of the crime incidences in the society. Even if there is a large increase in the percentage of offenders, there may actually be a decrease in the total number of incidents if the average number of offences committed by the most serious offenders decreases by a lot. The results on the percentage of repeat offenders can only to a limited degree capture this bias.

To get a closer look at this issue, I present in Table 4.10 estimates of the percentage of mischief offenders in the truncated top response category (percentage of offenders who committed mischief at least 5 times in the past 12 months), the average number of mischief offences in the population, the average number of mischief offences in the top response category, and the percentage of incidents accounted for by the top response category. These estimates presented in Table 4.10 assume that the frequencies of mischief offences follow a Pareto distribution (Kleiber and Kotz (2003)), with a Cumulative Distribution Function (CDF) characterized by equation 4.7.1 and a Probability Density Function (PDF) characterized by equation 4.7.2:

$$F(x) = 1 - (\frac{x}{x_0})^{-\alpha}, \quad x \geq x_0 > 0 \tag{4.7.1}$$

$$f(x) = \frac{\alpha x_0^{\alpha}}{x^{\alpha+1}}, \quad x \geq x_0 > 0 \tag{4.7.2}$$

where x denotes the number of offences committed by an individual, x_0 is a scale or the minimum possible value of x, α is a shape parameter measuring the heaviness of the right tail. Rearranging equation 4.7.1 provides the following equation:

$$ln[1 - F(x)] = \alpha ln x_0 - \alpha ln x \tag{4.7.3}$$

Let $y = ln[1 - F(x)]$, $\gamma = \alpha ln x_0$, and $\theta = -\alpha$. We arrive at the following equation:

$$lny = \gamma + \theta lnx \tag{4.7.4}$$

where y is the probability that the number of offences is at least x. Equation 4.7.4 can be estimated using OLS. From $\hat{\gamma}$ and $\hat{\theta}$, we can recover $\hat{x}_0$ and $\hat{\alpha}$, therefore the CDF and PDF.

Table 4.10 reports the estimates for 14/15 year olds and for 16/17 year olds. Within each age group, three different sets of estimates are reported - a set of estimates using all observations, a set using only observations before the YCJA and a set using only observations after the YCJA.

The percentage of mischief offenders that committed at least 5 offences in the past year increased dramatically (0.8% to 1.8% for 14/15 year olds and 1% to 2.2% for 16/17 year olds) after the YCJA with the mean percentage of incidents in this category increasing only slightly. As a result, the percentage of mischief incidents committed by those offenders in this truncated response category also increased (13-15% before the YCJA and 25-28% after the YCJA). These patterns are consistent with the main results presented in previous sections, i.e. mischief increased after the YCJA both in terms of prevalence and incidence.

4.7.4 Discussions

The biggest change brought by the YCJA is the reduced use of custody or incarceration on youth who commit relatively minor crime, e.g. mischief. In theory, there are two effects associated with this change: deterrence and incapacitation (Levitt (1998b); Tauchen et al. (1994); Grogger (1991); Cameron (1988); Witte (1980); Blumstein et al. (1978); Becker (1968)). Deterrence means that more severe punishment can lead to fewer offences, and incapacitation means that taking criminals into custody can remove them from the streets and therefore lower the incidence of crime activities.

Levitt (1998b) shows that the deterrence effect dominates incapacitation effect for minor crime, whereas the reverse is true for more serious crime.

The deterrence hypothesis predicts that the YCJA will increase the occurrence of minor crime. If minor crime and severe crime are substitutable, the deterrence hypothesis also predicts fewer occurrences of more serious crime activities, such as serious violent crime. Assuming some minor crime offenders also commit some serious crime, the incapacitation hypothesis suggests that the YCJA will increase the occurrence of all types of crime, because some offenders now at large would have been incarcerated under the YOA. Hence, the YCJA should lead to unambiguous increases in minor crime rates, but its effect on more serious crime is not clear due to the competing effects of deterrence and incapacitation. Thus, the empirical evidence shown in this paper is largely consistent with the these predictions. Mischief as a most minor crime[13] (Mihorean et al. (2001); Brantingham and Easton (1998)) increased dramatically after the YCJA, whereas no obvious patterns of changes are detected for other types crime.

One question that one may ask might be: is the YCJA for better or for worse? The empirical results presented so far have not answered this question and a full assessment of the magnitudes of the costs and benefits of the YCJA is beyond the scope of the current paper. However, it is possible to pinpoint a few areas worth considering when one attempts to conduct a full cost-benefit analysis of the YCJA.

The results shown in Section 4.7.2 and 4.7.3 have established that, after the YCJA replaced the YOA, mischief increased significantly, particularly among boys. This increase in mischief offences may not be so worrisome if it is just part of the rebellious phase of a young teen growing up and will tame as the teenager matures. However, if it is a precursor of other more serious problems which have long-lasting implications,

---

[13]Brantingham and Easton (1998) estimate that the property loss caused by an average incident of mischief is only about 28% of the loss caused by a theft or by breaking and entering.

then it could potentially be costly for the youth who engage in mischief in their teenage years.

To get a closer look at this issue, I make use of the longitudinal feature of the NLSCY and investigate whether outcomes in early adulthood are connected with an individual's mischief behavior in teenage years. Table 4.11 reports the OLS regression results of a series of outcomes (post-secondary enrolment, numeracy score, teenage pregnancy, depression score and a few other scores measuring non-cognitive skills) at age 20/21 on the same set of explanatory variables (measured at age 14/15) as considered earlier, as well as an indicator of whether the individual was a mischief offender at age 14/15.

Panel A shows the results for boys. A 14/15 year old male mischief offender receives lower numeracy and is more likely to get others pregnant by age 20/21. However, the other outcomes at age 20/21, including post-secondary enrolment, depression score and other non-cognitive skills, are not significantly associated with whether the male youth was a mischief offender at age 14/15.

Results for girls are shown in Panel B. A 14/15 year old female mischief offender is about 30% less likely to be enrolled in a post-secondary institution by age 20/21. The other outcomes are not significantly correlated with mischief offender status at age 14/15.

In Table 4.12, I consider the criminal activities of a group of individuals who were 14/15 in 1998 and 22/23 in 2006. The results show that a male mischief offender at age 14/15 is 15% more likely to be an impaired driver at age 22/23. For girls, no significant correlations have been identified. However, when pooling boys and girls and controlling for gender, the coefficient in front of mischief offender status at age 14/15 becomes significant in all three regressions - theft, assault and impaired driving.

Tables 4.11 and 4.12 present highly preliminary correlational results, which suggest

possible long-term implications of engaging in minor crime such as mischief as a young teenager. These long-term implications could potentially be deleterious for these youth, who represent a non-negligible proportion (about 1/4 to 1/3) of the Canadian youth population.

Furthermore, the cost of crime is not limited to the offenders themselves. Rather, a significant part of the cost of crime is its external cost to victims and society in general (Cohen (1998)), which in the case of property crime includes the value of the property lost during the incident and the pain and suffering endured by the victims. Brantingham and Easton (1998) estimate that an average incident of mischief costs $638 (in $1996). Using victimization data from the General Social Survey, Leung (2004) provides an estimate of the cost of pain and suffering from mischief. An average incident of mischief causes pain and suffering valued at about $2,500 (in $1999).

The analysis is incomplete if we only consider the costs without considering the benefits associated with the YCJA. Due to the reduced use of incarceration, the YCJA is a much less expensive act compared to the YOA (Bala et al. (2009)). Sansfaçon and Welsh (1999) refer to a study by the RAND corporation which shows that it costs families 7 times the amount in additional taxes to achieve a 10% reduction in youth crime through incarceration than through social development programs. Moreover, research shows that incarceration can be more deleterious for juveniles than for adults because juveniles "may be more susceptible to the negative effects of inmate subculture" (Cesaroni and Peterson-Badali (2005)). Howell (1997) argues that incarceration may increase the likelihood of school failure, which further contributes to more juvenile delinquency. There is also evidence (McAra and McVie (2007); Laub and Sampson (2003)) that the further a youth penetrates into the youth criminal justice system the less likely he/she will abstain from recidivism.

A well-informed assessment of whether the YCJA is a good or bad act requires paying close attention to the costs and benefits pointed out above.

4.8 Conclusion

Using 4 Cycles of the NLSCY, 2 Cycles before and 2 Cycles after the initiation of the YCJA in 2003, this paper performs before/after comparisons of the effect of YCJA on Canadian youth self-reported crime rates. By using the two-step D-L procedure proposed by Donald and Lang (2007), the empirical results in this paper account for common group errors that may exist in each of the NLSCY Cycles. The baseline results and a series of robustness checks show that mischief among Canadian youth, particularly boys, increased dramatically after the YCJA. Using official data (UCR), Taylor-Butts and Bressan (2008) also find that mischief rate (total accused) increased considerably - from 1997 to 2006 it increased by 46%. Since mischief is a very minor type of crime, this finding is consistent with both the "deterrence" and the "incapacitation" hypothesis.

The results on other types of crime, such as violent crime, gang membership, drug offences and impaired driving, are less conclusive. For example, violent crime appears to have decreased among 14/15 year olds, but increased slightly among 16/17 year olds. These mixed findings may be because the violent crime questions in the NLSCY are not designed to differentiate less serious from more serious violent offenders, or because "deterrence" and "incapacitation" effects work in opposite directions for more serious crime.

This paper also shows that engaging in mischief at age 14/15 is connected to a higher probability of participation in crime activities, as well as poorer non-criminal outcomes (post-secondary education, numeracy score, and teen pregnancy) at a later stage in these youth's lives (in their early 20's). Though these findings are preliminary

and should not be interpreted as causal relationships, they suggest some potential areas that may be worth further investigation in conjunction with other possible benefits and costs of the YCJA as discussed in Section 4.7.4.

The results presented in this paper may be of value to policy makers who are interested in making a well-informed evaluation of the YCJA's impact on the Canadian society six years after it came into force.

Table 4.1: NLSCY Self-complete Questions, 14-17 Year Old

---

1. Property Crime

  1.1 Mischief

    During the past 12 months, about how many times have you intentionally damaged or destroyed anything that didn't belong to you (for example, damaged a bicycle, car, school furniture, broken windows or written graffiti)?

  1.2 Theft (Not Available for 14-15 Year Old Youth)

    During the past 12 months, about how many times have you stolen something from a store or school?

---

2. Violent Crime

  2.1 Assault - Fight

    During the past 12 months, about how many times have you fought with someone to the point where they needed care for their injuries (for example, because they were bleeding, or had broken bones)?

  2.2 Assault - Attack (Not Available for 14-15 Year Old Youth)

    During the past 12 months, about how many times have you attacked someone with the idea of seriously hurting him/her?

  2.3 Assault - Sexual

    During the past 12 months, have you attempted to touch anyone in a sexual way while knowing that they would probably object to this?

  2.4 Weapon Possession [14]

    During the past 12 months, about how many times have you carried a weapon for the purpose of defending yourself or using it in a fight?

---

3. Gang Membership

  In the past 12 months, were you part of a gang that broke the law by stealing, hurting someone, damaging property, etc.?

---

4. Drugs

  4.1 Drug Trafficking

    During the past 12 months, about how many times have you sold any drugs?

  4.2 Tried Marijuana

    Which of the following best describes your experience with using marijuana and cannabis products (also known as a joint, pot, grass or hash) in the past 12 months?

  4.3 Tried Other Drugs

    4.3.1 In the past 12 months, how often did you do hallucinogens like LSD/acid, magic mushrooms?

    4.3.2 In the past 12 months, how often did you do glue or solvents?

    4.3.3 In the past 12 months, how often did you do drugs without a prescription or advice from a doctor: Downers, uppers, tranquilizers, Ritalin, etc.?

    4.3.4 In the past 12 months, how often did you do other drugs like ecstasy, crack, cocaine, heroin or speed, etc.?

---

5. Impaired Driving (Not Available for 14-15 Year Old Youth)

  In the past 12 months, how many times have you operated a motorized vehicle (e.g., car, motorcycle, boat) after you have been drinking alcohol or doing drugs?

---

[14]Note: This question is asked in Cycle 6 and 7. In Cycle 3 and 4, three separate questions are asked to the youth about whether they carried a: i) knife; 2) gun; and 3) stick/club in the past 12 months. If a youth indicates he/she carried a knife, gun or stick/club in the past 12 months, then the weapon possession variable is coded 1, and 0 otherwise.

Table 4.2: Means of Dependent Variables, 1998-2006

	14-15 year old			16-17 year old		
	Boys	Girls	Full Sample	Boys	Girls	Full Sample
A. Percentage of Offenders						
Property Crime	21.4	11.9	16.7	39.9	25.0	32.4
Mischief	21.4	11.9	16.7	30.4	15.1	22.7
Theft	n.a.	n.a.	n.a.	25.3	15.8	20.5
Violent Crime	22.4	8.0	15.3	25.9	10.9	18.3
Assault - Fight	11.6	3.6	7.7	10.7	4.2	7.4
Assault - Attack	n.a.	n.a.	n.a.	11.7	5.2	8.4
Assault - Sexual	4.5	1.3	2.9	4.9	0.7	2.8
Weapon Possession	15.2	5.5	10.4	14.7	5.4	10.0
Gang Membership	4.0	2.9	3.4	3.1	1.4	2.2
Drugs	22.1	23.0	22.6	40.4	41.0	40.7
Drug Trafficking	8.1	5.0	6.6	14.4	7.2	10.8
Tried Marijuana	20.9	21.3	21.1	39.3	40.0	39.7
Tried Other Drugs	7.9	9.5	8.7	17.9	14.8	16.3
Impaired Driving	n.a.	n.a.	n.a.	13.9	8.6	11.2
B. Percentage of Repeat Offenders						
Property Crime	4.1	1.7	2.9	11.5	6.0	8.7
Mischief	4.1	1.7	2.9	7.6	2.6	5.1
Theft	n.a.	n.a.	n.a.	7.3	4.5	5.9
Violent Crime	2.8	0.7	1.7	4.1	1.0	2.6
Assault - Fight	1.9	0.4	1.2	2.8	0.7	1.7
Assault - Attack	n.a.	n.a.	n.a.	2.2	0.6	1.4
Assault - Sexual	1.4	0.4	0.9	1.0	−	0.6
Weapon Possession	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Gang Membership	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Drugs	13.1	11.6	12.4	26.4	19.2	22.7
Drug Trafficking	2.8	2.0	2.4	6.3	2.3	4.3
Tried Marijuana	11.9	10.2	11.1	25.0	17.4	21.2
Tried Other Drugs	2.2	4.1	3.2	5.4	5.9	5.6
Impaired Driving	n.a.	n.a.	n.a.	5.1	2.6	3.9
Committed Any Crime Repeatedly	15.8	12.4	14.1	32.6	22.8	27.6
Committed At Least 2 Types of Crime	23.2	13.7	18.5	42.5	29.0	35.7
Committed At Least 3 Types of Crime	12.4	7.1	9.8	28.1	16.9	22.4
N	2,247	2,313	4,560	1,332	1,445	2,777

Data Source: NLSCY Cycles 3, 4, 6 and 7.

Note: 1. n.a. means that this variable is not asked to this age group in the survey.

2. − means that this output is suppressed by Statistics Canada's Research Data Centre due to confidentiality considerations.

Table 4.3: The Effect of YCJA on the Percentages of Canadian Young Offenders and Repeat Offenders, Second Step Results, Non-Quebec, 1998-2006

	A. Percentage Offenders						B. Percentage Repeat Offenders					
	14-15 year old			16-17 year old			14-15 year old			16-17 year old		
	Boys	Girls	Full Sample	Boys	Girls	Full Sample	Boys	Girls	Full Sample	Boys	Girls	Full Sample
Property Crime	10.0**	2.3	6.1**	10.0**	7.9	8.5	2.5***	0.0	1.3***	-0.3	0.0	-1.2
Mischief	10.0**	2.3	6.1**	11.1***	10.0	10.2	2.5***	0.0	1.3***	2.4	1.6	1.8
Theft	n.a.	n.a.	n.a.	2.2	1.9	1.8	n.a.	n.a.	n.a.	-0.9	-0.7	-0.7
Violent Crime	-5.3	-4.4***	-4.9**	3.8	1.0	2.3	-0.8	–	-0.8	0.5	–	3.5
Assault - Fight	-0.7	-3.6	-2.2	4.3*	1.3**	2.7*	-0.8	–	-0.7	0.7	–	0.4
Assault - Attack	n.a.	n.a.	n.a.	5.2	0.8	2.8	n.a.	n.a.	n.a.	2.1*	–	1.2
Assault - Sexual	-2.6	–	-1.6	-3.5	–	-1.6	–	–	–	–	–	–
Weapon Possession	-4.2	-1.8	-3.0*	2.4	-0.6	0.7	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Gang Membership	1.0	0.4	0.7	0.4	–	0.2	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Drugs	-2.3	-2.5	-2.6	-6.3	-3.3	-4.8	-0.8	-1.6	-1.2	-6.0	0.7	-2.6
Drug Trafficking	3.03e-04	-2.6	-1.3	-0.1	-0.4	-0.2	0.9	-0.1	0.4	-0.2	–	0.8
Tried Marijuana	-2.0	-2.6	-2.4	-7.3	-2.8	-5.1	-0.4	-1.8	-1.1	-4.2	0.5	-1.8
Tried Other Drugs	-0.6	-1.7	-1.2	-7.0	-4.5	-5.8	-0.8	-0.7	-0.8	-2.3**	0.8	-0.6
Impaired Driving	n.a.	n.a.	n.a.	-1.3	-0.6	-0.8	n.a.	n.a.	n.a.	-2.2**	-0.8	-1.3
Committed Any Crime Repeatedly	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.8	-1.1	-0.2	-5.0	-1.8	-3.4
Committed At Least 2 Types of Crime	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-3.1	-2.2	-2.7**	2.4	-0.2	0.8
Committed At Least 3 Types of Crime	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1.3	-2.1	-0.5	-0.6	0.7	-0.2
N	2,247	2,313	4,560	1,332	1,445	2,777	2,247	2,313	4,560	1,332	1,445	2,777

Data Source: NLSCY Cycles 3, 4, 6 and 7.
Note: 1. n.a. means that this variable is not asked to this age group in the survey.
2. – means that this output is suppressed by Statistics Canada's Research Data Centre due to confidentiality reasons.
3. *, ** and *** mean 10%, 5% and 1% level significance, respectively.

112

Table 4.4: The Effect of YCJA on the Percentages of Canadian Young Offenders and Repeat Offenders, Second Step Results, Non-Quebec, 1998-2006, Controlling for Adult Crime Rates

| | A. Percentage Offenders | | | | | | B. Percentage Repeat Offenders | | | | | |
| | 14-15 year old | | | 16-17 year old | | | 14-15 year old | | | 16-17 year old | | |
	Boys	Girls	Full Sample	Boys	Girls	Full Sample	Boys	Girls	Full Sample	Boys	Girls	Full Sample
Property Crime	10.0**	2.3	6.1**	9.2*	7.2	7.9*	2.6***	0.2	1.5***	-0.6	0.6	-0.0
Mischief	10.0**	2.3	6.1**	11.0***	10.1	10.2	2.6***	0.2	1.5***	2.4	1.6	1.8
Theft	n.a.	n.a.	n.a.	2.6	1.8	1.8	n.a.	n.a.	n.a.	-1.0	-0.0	-0.3
Violent Crime	-5.4*	-4.2***	-4.9**	4.2	1.3	2.7	-0.9	–	-0.8	0.3	–	0.4
Assault - Fight	-1.0	-3.4	-2.3	4.2*	1.6**	2.8*	-0.8	–	-0.8	0.7	–	0.4
Assault - Attack	n.a.	n.a.	n.a.	5.4	0.8	3.0	n.a.	–	n.a.	2.0*	–	1.2
Assault - Sexual	-2.7	–	-1.6	-2.9	–	-1.3	–	–	–	–	–	–
Weapon Possession	-4.8	-1.7	-3.2*	0.5	-0.4	-0.2	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Gang Membership	0.7	0.3	0.5	0.4	–	0.2	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Drugs	-2.7	-3.2	-3.1	-5.2	-3.7	-4.6	-1.0	-2.0	-1.6	-5.3	0.4	-2.4
Drug Trafficking	-2.6	-3.1	-2.9	-0.3	-1.6	-1.0	0.2	-1.3	-0.6	0.2	–	0.7
Tried Marijuana	-2.7	-3.4	-3.1	-6.7	-6.3	-6.5	-0.2	-3.5	-1.7	-5.1	1.7	-1.9
Tried Other Drugs	-0.9	-1.5	-1.4	-7.6	-5.2	-6.4	0.1	-0.0	-0.1	-2.2***	1.7*	-0.1
Impaired Driving	n.a.	n.a.	n.a.	-0.1	0.7	0.5	n.a.	n.a.	n.a.	-2.0***	-0.4	-1.0*
Committed Any Crime Repeatedly	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.8	-1.3	-0.3	-5.1	-1.8	-3.4
Committed At Least 2 Types of Crime	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-3.3	-2.2	-2.8*	2.3	-0.2	0.8
Committed At Least 3 Types of Crime	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1.0	-2.2	-0.7	-0.7	0.8	-0.2
N	2,247	2,313	4,560	1,332	1,445	2,777	2,247	2,313	4,560	1,332	1,445	2,777

Data Source: NLSCY Cycles 3, 4, 6 and 7.

Note: 1. n.a. means that this variable is not asked to this age group in the survey.

2. – means that this output is suppressed by Statistics Canada's Research Data Centre due to confidentiality reasons.

3. *, ** and *** mean 10%, 5% and 1% level significance, respectively.

Table 4.5: The Effect of YCJA on the Percentages of Canadian Young Offenders and Repeat Offenders, Second Step Results, Non-Quebec, 1998-2006, Controlling for Region-Year Interactions

	A. Percentage Offenders						B. Percentage Repeat Offenders					
	14-15 year old			16-17 year old			14-15 year old			16-17 year old		
	Boys	Girls	Full Sample	Boys	Girls	Full Sample	Boys	Girls	Full Sample	Boys	Girls	Full Sample
Property Crime	9.9***	2.1	6.0***	10.0*	8.2	8.7***	–	–	1.2**	-0.2	–	-0.0
Mischief	9.9***	2.1	6.0***	11.1**	10.0***	10.2***	–	–	1.2**	2.4*	–	1.8**
Theft	n.a.	n.a.	n.a.	2.1	2.1	1.8	n.a.	n.a.	n.a.	-0.8	–	-0.7
Violent Crime	-5.4	-4.7***	-5.0**	3.7	1.0	2.2	–	–	–	–	–	–
Assault - Fight	-0.6	–	-2.1	4.3**	–	2.7***	–	–	–	–	–	–
Assault - Attack	n.a.	n.a.	n.a.	5.1*	0.6	2.7*	n.a.	n.a.	n.a.	–	–	–
Assault - Sexual	–	–	–	–	–	-1.6*	–	–	–	–	–	–
Weapon Possession	-4.4*	–	-3.1**	2.4	–	0.7	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Gang Membership	–	–	0.7	–	–	0.3	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Drugs	-2.1	-2.8	-2.5	-6.1	-3.2	-4.7	-0.7	-1.6	-1.2	-6.0	0.3	-2.7
Drug Trafficking	0.0	–	-1.2	-0.2	–	-0.2	–	–	–	–	–	0.7
Tried Marijuana	-1.8	-2.9	-2.4	-7.2	-2.7	-5.0	-0.3	-1.7	-1.1	-4.2	0.1	-1.9
Tried Other Drugs	-0.6	-1.9	-1.2	-6.9**	-4.6*	-5.7**	–	–	-0.9	–	0.7	-0.6
Impaired Driving	n.a.	n.a.	n.a.	-1.0	-0.4	-0.5	n.a.	n.a.	n.a.	–	–	-1.3
Committed Any Crime Repeatedly	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.8	-1.3	-0.3	-4.8	-2.1	-3.3
Committed At Least 2 Types of Crime	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-3.0	-2.4	-2.6*	2.4	-0.2	0.9
Committed At Least 3 Types of Crime	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1.0	-2.2	-0.6	-0.6	0.6	-0.2
N	2,247	2,313	4,560	1,332	1,445	2,777	2,247	2,313	4,560	1,332	1,445	2,777

Data Source: NLSCY Cycles 3, 4, 6 and 7.

Note: 1. n.a. means that this variable is not asked to this age group in the survey.
2. – means that this output is suppressed by Statistics Canada's Research Data Centre due to confidentiality reasons.
3. *, ** and *** mean 10%, 5% and 1% level significance, respectively.

114

Table 4.6: The Effect of YCJA on the Percentages of Canadian Young Offenders and Repeat Offenders, Second Step Results, Non-Quebec, 1998-2006, Controlling for Region-Year Interactions and Adult Crime Rates

	A. Percentage Offenders						B. Percentage Repeat Offenders					
	14-15 year old			16-17 year old			14-15 year old			16-17 year old		
	Boys	Girls	Full Sample	Boys	Girls	Full Sample	Boys	Girls	Full Sample	Boys	Girls	Full Sample
Property Crime	9.9***	2.0	5.9***	9.0	8.1	8.1**	–	–	1.4**	-0.3	–	0.1
Mischief	9.9***	2.0	5.9***	11.1**	10.1***	10.2***	–	–	1.4**	2.4*	–	1.9**
Theft	n.a.	n.a.	n.a.	2.0	2.2	1.8	n.a.	n.a.	n.a.	-0.9	–	-0.4
Violent Crime	-5.5	-4.5***	-5.0**	4.0	1.2	2.5	–	–	–	–	–	–
Assault - Fight	-1.0	–	-2.2	4.2**	–	2.8***	–	–	–	–	–	–
Assault - Attack	n.a.	n.a.	n.a.	5.3*	0.7	2.8*	n.a.	n.a.	n.a.	–	–	–
Assault - Sexual	–	–	–	–	–	-1.3	–	–	–	–	–	–
Weapon Possession	-3.8	–	-3.1**	0.6	–	-0.8	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Gang Membership	–	–	0.4	–	–	0.2	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Drugs	-2.5	-3.6	-3.1	-5.0	-3.6	-4.5	-0.9	-2.2	-1.6	-5.2	0.0	-2.5
Drug Trafficking	-3.0	–	-3.3**	-0.4	–	-1.1	–	–	–	–	–	0.8
Tried Marijuana	-3.5	-3.9	-3.6**	-8.2	-6.9	-7.3*	-0.1	-4.4**	-2.2	-6.3	2.7	-1.8
Tried Other Drugs	-0.2	-2.2	-1.3	-8.2**	-4.5*	-6.5**	–	–	-0.1	–	2.2	-0.2
Impaired Driving	n.a.	n.a.	n.a.	0.2	0.8	0.6	n.a.	n.a.	n.a.	–	–	-0.9
Committed Any Crime Repeatedly	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.6	-1.5	-0.5	-4.8	-2.1	-3.3
Committed At Least 2 Types of Crime	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-3.3	-2.4	-2.8*	2.3	-0.1	0.8
Committed At Least 3 Types of Crime	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.6	-2.3	-0.9	-0.6	0.7	-0.1
N	2,247	2,313	4,560	1,332	1,445	2,777	2,247	2,313	4,560	1,332	1,445	2,777

Data Source: NLSCY Cycles 3, 4, 6 and 7.

Note: 1. n.a. means that this variable is not asked to this age group in the survey.

2. – means that this output is suppressed by Statistics Canada's Research Data Centre due to confidentiality reasons.

3. *, ** and *** mean 10%, 5% and 1% level significance, respectively.

Table 4.7: The Effect of YCJA on the Percentages of Canadian Young Offenders and Repeat Offenders, Difference-in-Difference Using Quebec as the Control Group, Second Step Results, 1998-2006

	A. Percentage Offenders						B. Percentage Repeat Offenders					
	14-15 year old			16-17 year old			14-15 year old			16-17 year old		
	Boys	Girls	Full Sample	Boys	Girls	Full Sample	Boys	Girls	Full Sample	Boys	Girls	Full Sample
Property Crime	0.104	0.061	0.083*	0.095	0.104	0.099***	–	–	–	-0.037	–	-0.010
Mischief	0.104	0.061	0.083*	0.052	0.109	0.083*	–	–	–	–	–	-0.008
Theft	n.a.	n.a.	n.a.	0.076*	0.043	0.054	n.a.	n.a.	n.a.	–	–	–
Violent Crime	0.097	–	0.059	0.157**	0.033	0.092	–	–	–	–	–	–
Assault - Fight	0.008	–	0.004	0.039	–	0.020	–	–	–	–	–	–
Assault - Attack	n.a.	n.a.	n.a.	0.071	–	0.014	n.a.	n.a.	n.a.	–	–	–
Assault - Sexual	–	–	–	–	–	–	–	–	–	–	–	–
Weapon Possession	0.088	–	0.051	–	–	0.086*	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Gang Membership	0.000	–	0.045	–	–	0.059	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Drugs	0.117	0.090**	0.103*	-0.085	0.100	0.018	0.079*	0.039	0.058*	-0.069	0.088	0.013
Drug Trafficking	0.008	0.009	0.008	0.066	–	0.050	–	–	–	0.064	–	0.052
Tried Marijuana	0.104	0.071***	0.087	-0.084	0.132	0.032	0.090	0.040	0.065*	-0.057	0.111	0.029
Tried Other Drugs	0.077**	-0.016	0.029	-0.014	-0.004	-0.007	–	-0.010	0.019	0.048	-0.026	0.010
Impaired Driving	n.a.	n.a.	n.a.	-0.051	-0.028	-0.034	n.a.	n.a.	n.a.	-0.042	-0.015	-0.026*
Committed Any Crime Repeatedly	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.120*	0.035	0.077*	-0.064	0.035	-0.012
Committed At Least 2 Types of Crime	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.087	0.028	0.058	0.041	0.114	0.083
Committed At Least 3 Types of Crime	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.089	-0.001	0.044	0.078***	0.029	0.050
N	2,780	2,844	5,624	1,631	1,791	3,422	2,780	2,844	5,624	1,631	1,791	3,422

Data Source: NLSCY Cycles 3, 4, 6 and 7.

Note: 1. n.a. means that this variable is not asked to this age group in the survey.

2. – means that this output is suppressed by Statistics Canada's Research Data Centre due to confidentiality reasons.

3. *, ** and *** mean 10%, 5% and 1% level significance, respectively.

Table 4.8: Difference-in-Difference Estimates of the Effect of YCJA on the Percentages of Canadian Young Offenders Using 14/15 Year Olds as the Treatment Group and 10/11 Year Olds as the Control Group, Non-Quebec, 1998 - 2004

	Boys	Girls	Full Sample
Gang Membership	-0.8	1.4	0.3
N	4,108	4,232	8,340

Data Source: NLSCY Cycles 3, 4, 6 and 7.
Note: 1. n.a. means that this variable is not asked to this age group in the survey.
    2. − means that this output is suppressed by Statistics Canada's Research Data Centre due to confidentiality reasons.
    3. *, ** and *** mean 10%, 5% and 1% level significance, respectively.

Table 4.9: The Effect of YCJA on the Percentages of Canadian Young Offenders and Repeat Offenders, Second Step Results, Non-Quebec, 1998-2006, Using Heckman's Selection Model

	A. Percentage Offenders						B. Percentage Repeat Offenders					
	14-15 year old			16-17 year old			14-15 year old			16-17 year old		
	Boys	Girls	Full Sample	Boys	Girls[4]	Full Sample	Boys	Girls	Full Sample	Boys	Girls[4]	Full Sample
Property Crime	0.098**	0.034	0.061**	0.109**		0.094	0.038	0.000	0.022	-0.001		0.001
Mischief	0.098**	0.034	0.061**	0.116***		0.107	0.038	0.000	0.022	0.025		0.019
Theft	n.a.	n.a.	n.a.	0.028		0.023	n.a.	n.a.	n.a.	-0.008		-0.006
Violent Crime	-0.008	-0.029	-0.020	0.040		0.026	-0.008	–	0.001	-0.005		-0.010
Assault - Fight	0.021	–	-0.003	0.020*		-0.000	-0.008	–	-0.007	-0.001		-0.007*
Assault - Attack	n.a.	n.a.	n.a.	0.029		-0.001	n.a.	n.a.	n.a.	0.021*		0.012
Assault - Sexual	-0.026	–	-0.016	-0.042		-0.029***	–	–	–	–		–
Weapon Possession	-0.006	-0.007	-0.007	0.000		-0.024*	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Gang Membership	0.010	0.004	0.007	0.005		0.003	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Drugs	0.018	-0.026	-0.026	-0.047		-0.031	-0.009	-0.017	-0.013	-0.051		-0.017
Drug Trafficking	-0.002	-0.026	-0.014	0.003		0.002	0.008	-0.001	0.004	-0.000		0.009
Tried Marijuana	-0.023	-0.027	-0.026	-0.059		-0.034	-0.005	-0.019	-0.012	-0.034		-0.011
Tried Other Drugs	0.017	-0.018	0.008	-0.064		-0.052	0.004	-0.007	-0.008	0.021**		-0.005
Impaired Driving	n.a.	n.a.	n.a.	-0.010		-0.005	n.a.	n.a.	n.a.	0.021**		-0.012
Committed Any Crime Repeatedly	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.039	-0.012	0.022	-0.044		-0.028
Committed At Least 2 Types of Crime	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	-0.029	-0.006	0.003	0.033		0.017
Committed At Least 3 Types of Crime	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	0.039	-0.009	0.015	-0.002		0.001
N	3,113	3,038	6,151	2,023		4,064	3,113	3,038	6,151	2,023		4,064

Data Source: NLSCY Cycles 3, 4, 6 and 7.

Note: 1. n.a. means that this variable is not asked to this age group in the survey.

2. – means that this output is suppressed by Statistics Canada's Research Data Centre due to confidentiality reasons.

3. *, ** and *** mean 10%, 5% and 1% level significance, respectively.

4. Heckman's selection model does not converge for 16/17 year old girls.

Table 4.10: Estimated Pareto Distributions of Youth Mischief Offences in the Past 12 Months, 1998-2006

	14/15 Year Olds			16/17 Year Olds		
	Pooled	Pre-YCJA	Post-YCJA	Pooled	Pre-YCJA	Post-YCJA
Percent of Youth Who Committed Mischief 5 Times or More	1.4%	0.8%	1.8%	1.8%	1.0%	2.2%
Per Capita Mischief Offences in the Population	0.860	0.752	1.001	1.088	0.897	1.206
Per Capita Mischief Offences Among Youth Who Committed Mischief 5 Times or More	13.267	11.860	15.080	13.601	12.958	13.969
Percent Mischief Offences Committed by Offenders Who Committed Mischief 5 Times or More	21.1%	13.0%	27.7%	22.3%	15.0%	25.0%

Data Source: NLSCY Cycles 3, 4, 6 and 7.

Table 4.11: OLS Regressions of Outcomes at Age 20/21 Against Explanatory Variables at Age 14/15

	Postsecondary Education Participation	Numeracy Score	Pregnancy	Depression Score	Interpersonal Competency Score	Intrapersonal Competency Score	Stress Manage- ment Score	Adaptability Score	General Mood Score	5-factor Emotional Quotient
					Panel A - Boys					
Lone Parent	-0.090	-0.404	0.007	-0.133	-0.078	-0.079	-0.368	0.435	-0.135	-0.225
Number of siblings	0.000	0.391	-0.037***	-0.595**	0.441**	0.114	0.444**	0.222	0.295	1.517*
Log of Household Equivalent Income	0.206***	1.392*	0.024	-0.981	-0.119	0.088	-0.261	-0.148	0.181	-0.259
PMK Age	0.011*	0.068	-0.002	0.012	0.026	-0.065	0.082**	0.026	0.031	0.100
PMK Has University Degree	0.095*	1.315*	-0.039	-0.085	-0.735**	-0.137	-0.148	-0.095	-0.292	-1.407
Atlantic Canada	-0.055	0.004	-0.000	-0.462	0.422	1.021	2.430***	0.906	1.169*	5.948**
Western Canada	-0.055	0.786	0.038	-0.468	-0.227	0.478	-0.046	0.178	-0.121	0.262
Live in Rural Area	-0.036	-0.311	0.068	0.938	-0.563*	-0.044	-0.096	-0.173	-0.288	-1.163
Unemployment Rate	0.023	0.074	0.001	-0.200	-0.007	-0.041	-0.286**	-0.063	-0.110	-0.508
Year 2000	0.022	0.509	0.030	-0.580	0.105	0.114	-0.153	-0.076	-0.114	-0.124
Mischief Offender	-0.019	-1.526*	0.116**	0.265	-0.273	0.100	-0.249	-0.346	-0.435	-1.204
Constant	-2.178***	4.697	-0.078	16.561**	12.639***	12.559***	12.403***	12.368***	9.693***	59.662***
N	589	589	759	589	589	589	589	589	589	589
R-sq	0.680	0.952	0.131	0.458	0.966	0.924	0.945	0.959	0.965	0.976
					Panel B - Girls					
Lone Parent	-0.196**	-0.686	0.157**	1.120	-0.329	-0.145	0.157	-0.993**	0.230	-1.079
Number of siblings	0.025	0.800**	-0.005	-0.368	0.215**	-0.145	0.165	0.170	0.083	0.488
Log of Household Equivalent Income	0.090*	1.095**	-0.035	-1.145*	-0.420***	0.028	-0.135	-0.084	0.084	-0.527
PMK Age	-0.005	0.181***	-0.006	0.011	0.003	-0.027	0.015	-0.021	0.001	-0.030
PMK Has University Degree	0.118**	0.400	-0.007	0.899	0.235	-0.428	-0.113	0.073	-0.003	-0.235
Atlantic Canada	-0.035	-0.393	0.216**	0.216	-0.590*	-0.701	-0.981	0.661	-1.199**	-2.810
Western Canada	0.032	0.415	0.080**	-0.022	-0.215	0.405	-0.151	0.380	0.020	0.438
Live in Rural Area	-0.100*	-1.128	0.007	-0.981	-0.195	0.206	0.165	0.198	0.062	0.436
Unemployment Rate	0.015	0.048	-0.019*	-0.165	0.085**	0.090	0.218***	0.015	0.117*	0.525**
Year 2000	-0.006	-0.129	-0.061**	0.678	-0.340*	0.107	-0.018	-0.230	-0.137	-0.618
Mischief Offender	-0.312***	-1.034	0.022	0.879	0.102	-0.811	-0.470	-0.406	-0.230	-1.815
Constant	-0.162	2.667	0.819*	18.292**	17.340***	11.528***	10.795***	13.224***	10.476***	63.363***
N	759	759	759	759	759	759	759	759	759	759
R-sq	0.735	0.944	0.196	0.588	0.984	0.929	0.938	0.951	0.967	0.981
					Panel C - Full Sample					

Table 4.11: OLS Regressions of Outcomes at Age 20/21 Against Explanatory Variables at Age 14/15

	Postsecondary Education Participation	Numeracy Score	Pregnancy	Depression Score	Interpersonal Competency Score	Intrapersonal Competency Score	Stress Management Score	Adaptability Score	General Mood Score	5-factor Emotional Quotient
Gender - Male	-0.063	0.877*	-0.056***	-1.795***	-1.090***	-0.110	0.237	0.138	0.130	-0.695
Lone Parent	-0.150**	-0.525	0.075**	0.603	-0.244	-0.135	-0.154	-0.321	0.026	-0.829
Number of siblings	0.017	0.595**	-0.018*	-0.460**	0.324***	-0.025	0.307**	0.200	0.184	0.991**
Log of Household Equivalent Income	0.146***	1.169***	-0.014	-1.059***	-0.298**	0.031	-0.173	-0.084	0.125	-0.398
PMK Age	0.004	0.126***	-0.004	0.007	0.017	-0.045	0.049**	0.003	0.018	0.041
PMK Has University Degree	0.115***	0.864*	-0.015	0.454	-0.266	-0.287	-0.152	-0.022	-0.169	-0.896
Atlantic Canada	-0.026	-0.317	0.120*	-0.085	-0.090	0.136	0.600	0.794*	-0.110	1.331
Western Canada	-0.005	0.603	0.060**	-0.243	-0.191	0.440	-0.113	0.310	-0.055	0.392
Live in Rural Area	-0.078*	-0.689	0.029	-0.131	-0.401**	0.102	0.016	0.039	-0.138	-0.381
Unemployment Rate	0.018*	0.067	-0.011	-0.187*	0.043	0.022	-0.016	-0.014	0.011	0.046
year 2000	0.000	0.146	-0.017	0.090	-0.133	0.097	-0.048	-0.169	-0.117	-0.370
Mischief Offender	-0.159***	-1.298***	0.069**	0.538	-0.111	-0.284	-0.270	-0.399	-0.298	-1.363
Constant	-1.153**	3.953	0.473*	18.427***	15.704***	12.353***	11.102***	12.317***	9.994***	61.470***
N	1348	1348	1348	1348	1348	1348	1348	1348	1348	1348
R-sq	0.700	0.947	0.145	0.532	0.975	0.926	0.940	0.954	0.965	0.978

Data Source: NLSCY Cycles 3, 4, 6 and 7.

Note: 1. Regression sample pools the following two longitudinal samples: 1) a group of youth who were 14/15 in 1998 and 20/21 in 2004; 2) a group of youth who were 14/15 in 2000 and 20/21 in 2006.

2 *, ** and *** mean 10%, 5% and 1% level significance, respectively.

Table 4.12: OLS Regressions of Outcomes at Age 22/23 Against Explanatory Variables at Age 14/15

	Boys			Girls			Full Sample		
	Theft	Assault - Attack	Impaired Driving	Theft	Assault - Attack	Impaired Driving	Theft	Assault - Attack	Impaired Driving
Gender - Male							0.047**	0.037	0.102**
Number of siblings	-0.044**	0.007	0.015	-0.024*	—	0.023	-0.034***	-0.010	0.020
Log of Household Equivalent Income	0.009	0.007	0.031	-0.005	—	-0.031	0.005	0.014	0.001
PMK Age	0.000	-0.003	-0.007	0.001	—	-0.002	0.001	-0.001	-0.004
PMK Has University Degree	0.087*	0.040	-0.044	0.030	—	-0.001	0.057**	0.004	-0.018
Unemployment Rate	-0.000	0.005	0.001	-0.003	—	-0.000	-0.002	0.002	0.000
Mischief Offender	0.077	0.106	0.146*	0.055	—	0.082	0.070*	0.098*	0.121**
Constant	0.002	0.031	0.176	0.098	—	0.503	-0.015	-0.077	0.257
N	389	389	389	475	—	475	864	864	864
R-sq	0.061	0.036	0.028	0.035	—	0.016	0.058	0.042	0.039

Data Source: NLSCY Cycles 3 and 7.

Note: 1. – means that this output is suppressed by Statistics Canada's Research Data Centre due to confidentiality reasons.

2. *, ** and *** mean 10%, 5% and 1% level significance, respectively.

Figure 4.1: Youth vs Adults Charged (per 100,000), All Crime
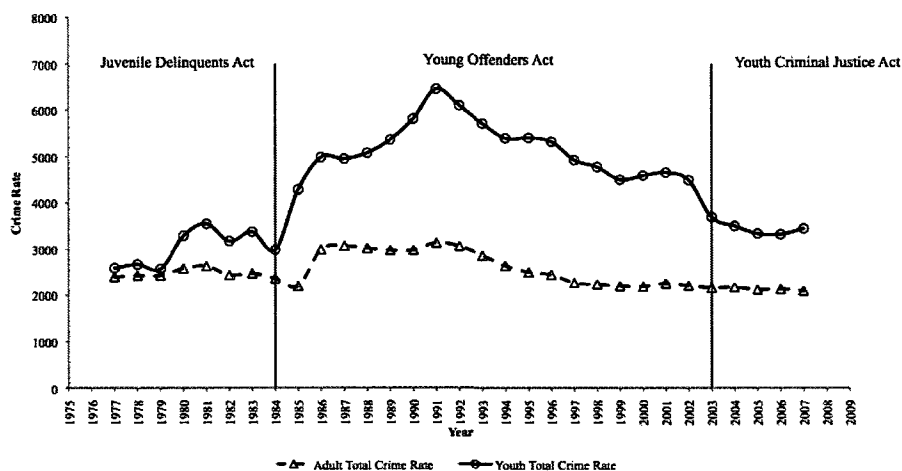
Data source: Uniform Crime Reporting Survey (CANSIM Table 252-0014)
Note: The rate of total persons charged (per 100,000) is calculated by using the total of adult (18 years of age and over) and youth population (12 to 17 years of age) as the base.

Figure 4.2: Youth vs Adults Charged (per 100,000), Violent Crime
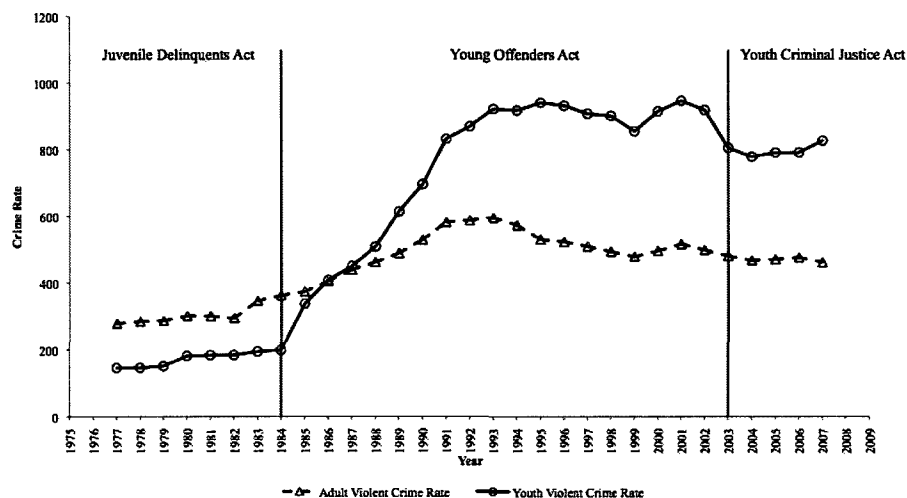
Data source: Uniform Crime Reporting Survey (CANSIM Table 252-0014)
Note: The rate of total persons charged (per 100,000) is calculated by using the total of adult (18 years of age and over) and youth population (12 to 17 years of age) as the base.

Figure 4.3: Youth vs Adults Charged (per 100,000), Property Crime
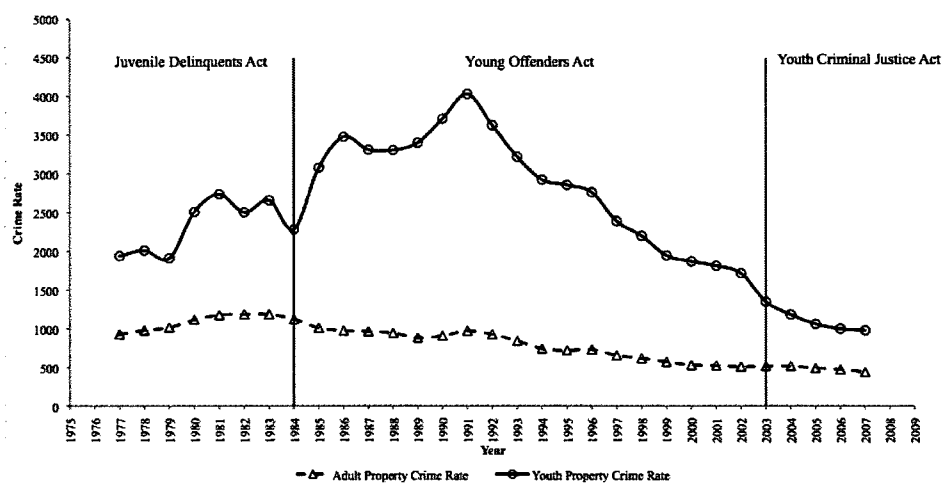
Data source: Uniform Crime Reporting Survey (CANSIM Table 252-0014)
Note: 1. The rate of total persons charged (per 100,000) is calculated by using the total of adult (18 years of age and over) and youth population (12 to 17 years of age) as the base.
2. Property crime here does not include mischief.

Figure 4.4: Youth vs Adults Charged (per 100,000), Drug Offence
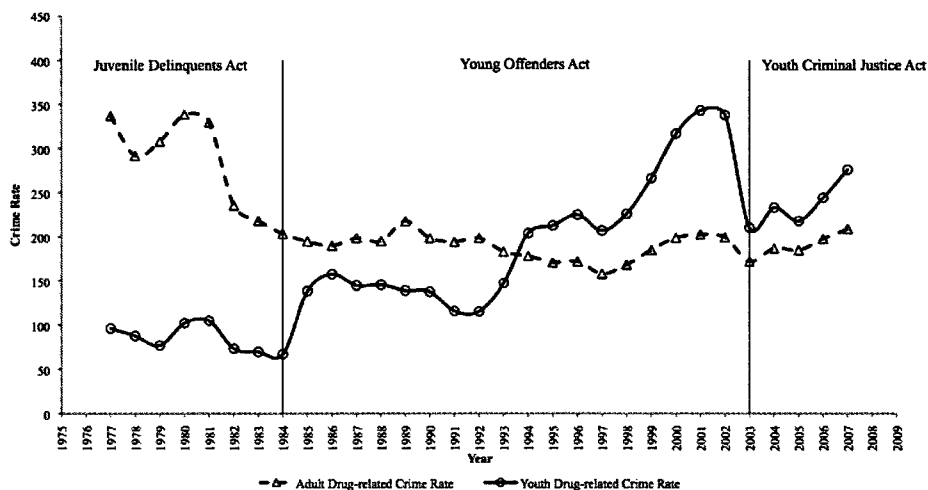
Data source: Uniform Crime Reporting Survey (CANSIM Table 252-0014)
Note: The rate of total persons charged (per 100,000) is calculated by using the total of adult (18 years of age and over) and youth population (12 to 17 years of age) as the base.

Figure 4.5: Youth vs Adults Charged (per 100,000), Mischief
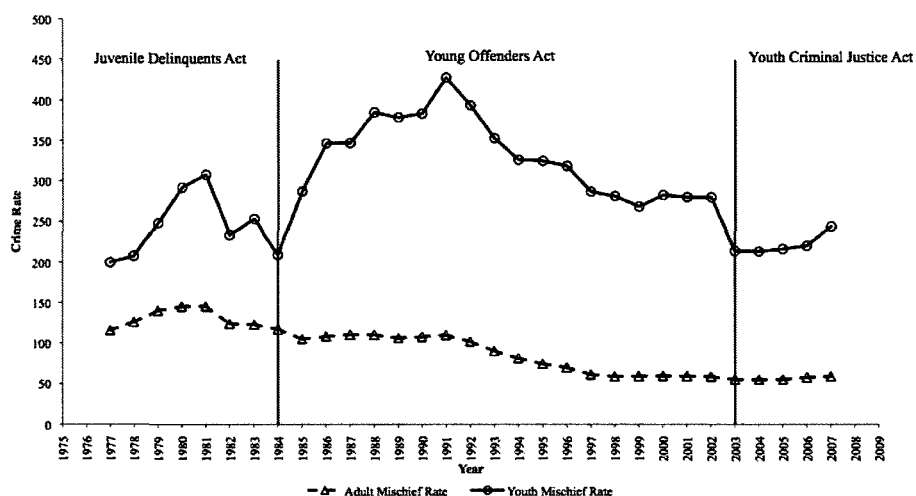
Data source: Uniform Crime Reporting Survey (CANSIM Table 252-0014)
Note: The rate of total persons charged (per 100,000) is calculated by using the total of adult (18 years of age and over) and youth population (12 to 17 years of age) as the base.

Figure 4.6: Youth Incarceration Rate
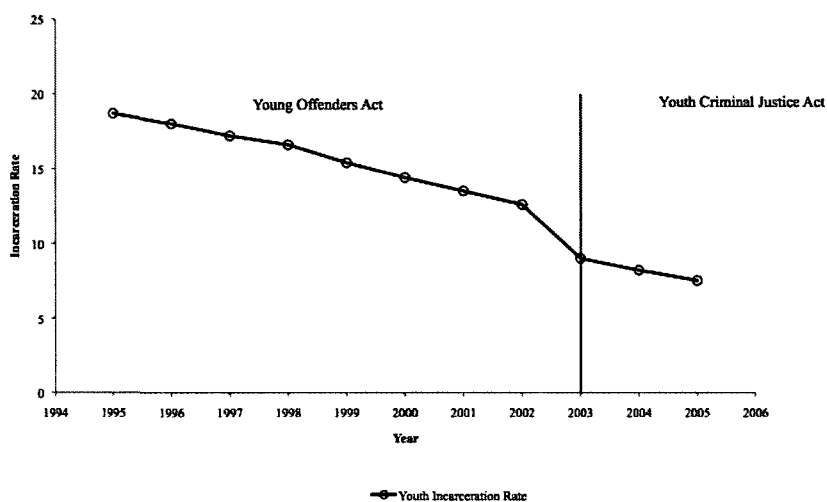
Data Source: Reproduced from Table 9 in Milligan (2008) and Table 5 in Calverley (2007).
Note: 1) Incarceration rate is the average daily counts of remand, secure and open custody per 10,000 youth aged 12 to 17 in the population. 2) Figures exclude Ontario and Nunavut for all reference years due to incomplete data.

Figure 4.7: Rates of police-reported youth crime, youth charged, and youth cleared otherwise; Canada, 1986-2007
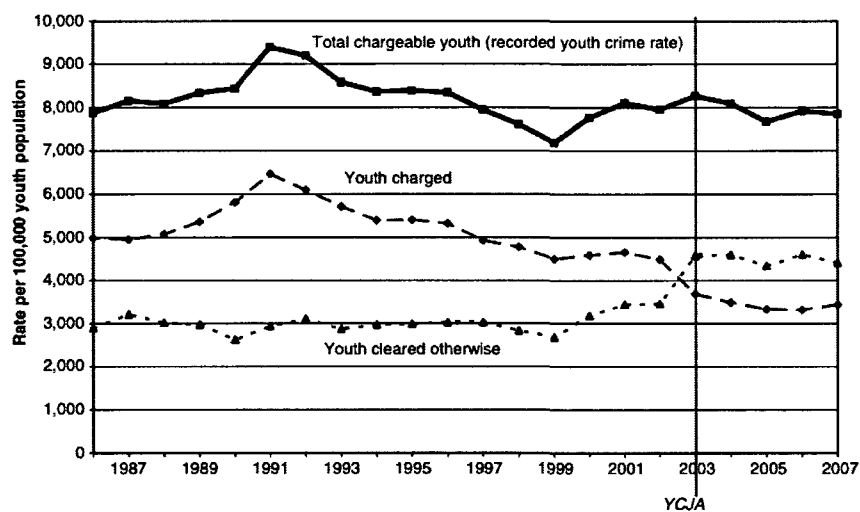
Figure is a duplicated from Bala et al. (2009).
Data Source: Statistics Canada, Canadian Centre for Justice Statistics, Uniform Crime Reporting Survey

Chapter 5

Conclusion

The three essays in this thesis use large-scale individual level survey data collected by Statistics Canada and the US Bureau of Labour Statistics during the past fifteen years to answer three research questions related to crime among children and youth. The first essay asks the question: What are the most important correlates of Canadian youth outcomes, including participation in various criminal activities and academic performance or aspiration? An extensive set of explanatory variables are examined, with the following variables found to be especially important for almost all youth outcomes considered in the essay: "cooperation" through in-class group activities, "peer" group effects, and parental supervision.

The principal research question in the second essay is: Why is violence much more prevalent among American children than among Canadian children? Empirical analysis carried out in this essay shows that full-time maternal employment during the first three months post-birth increases violence significantly for these children and this effect is still present even after these children become teenagers. Consistent with the very different maternity leave policies in Canada and the US, American mothers are six times as likely to start working full-time within the first three months after giving birth. This difference in post-birth maternal employment accounts for a sizeable portion of the observed US-Canada violence gap among children and youth.

Finally, the last essay addresses the question: What is the impact of the YCJA on Canadian youth crime rates? The baseline results and a series of robustness checks

show that the more lenient treatment of minor crime under the YCJA leads to a dramatic increase in mischief among Canadian youth, particularly boys. This finding should not be interpreted as suggesting that the YCJA has failed compared to its predecessor, the YOA. A well-informed assessment of the YCJA's success or failure requires paying close attention to all relevant costs and benefits brought by this policy change, such as those discussed in Section 4.7.4.

Bibliography

Aizer, Anna (2004) 'Home alone: supervision after school and child behavior.' *Journal of Public Economics* 88(9-10), 1835–1848

Aizer, Anna (2008) 'Neighborhood violence and urban youth.' NBER Working Papers 13773, National Bureau of Economic Research, Inc, February

Akerlof, George A., and Rachel E. Kranton (2002) 'Identity and schooling: Some lessons for the economics of education.' *Journal of Economic Literature* 40(4), 1167–1201

Akiba, Motoko, Gerald K. LeTendre, David P. Baker, and Brian Goesling (2002) 'Student victimization: National and school system effects on school violence in 37 nations.' *American Educational Research Journal* 39(4), 829–853

Anderson, Linda S., Theodore G. Chiricos, and Gordon P. Waldo (1977) 'Formal and informal sanctions: A comparison of deterrent effects.' *Social Problems* 25, 103–112

Antecol, Heather, and Kelly Bedard (2007) 'Does single parenthood increase the probability of teenage promiscuity, substance use, and crime?' *Journal of Population Economics* 20(1), 55–71

Aughinbaugh, Alison, and Maury Gittleman (2004) 'Maternal employment and adolescent risky behavior.' *Journal of Health Economics* 23(4), 815–838

Baker, Michael, and Kevin Milligan (2008) 'Maternal employment, breastfeeding, and health: Evidence from maternity leave mandates.' *Journal of Health Economics* 27(4), 871–887

Baker, Michael, and Kevin Milligan (forthcoming) 'Evidence from maternity leave expansions of the impact of maternal care on early child development.' *Journal of Human Resources*

Baker, Michael, Jonathan Gruber, and Kevin Milligan (2008) 'Universal child care, maternal labor supply, and family well-being.' *Journal of Political Economy* 116(4), 709–745

Bala, Nicholas C. (2007) 'Responding to young offenders: Diversion, detention and sentencing under Canada's Y.C.J.A.' Legal Studies Research Paper 07-10, Queen's University, October

Bala, Nicholas C., and Sanjeev Anand (2004) 'The first months under the Youth Criminal Justice Act: A survey and analysis of case law.' *Canadian Journal of Criminology and Criminal Justice*

Bala, Nicholas, Peter J. Carrington, and Julian V. Roberts (2009) 'Evaluating the Youth Criminal Justice Act after five years: A qualified success.' *Canadian Journal of Criminology and Criminal Justice* 51(2), 131–168

Baum II, Charles L. (2003) 'Does early maternal employment harm child development? an analysis of the potential benefits of leave taking.' *Journal of Labor Economics* 21(2), 409–49

Becker, Gary S. (1968) 'Crime and punishment: An economic approach.' *Journal of Political Economy* 76, 169–217

Becker, Gary S, and Nigel Tomes (1986) 'Human capital and the rise and fall of families.' *Journal of Labor Economics* 4(3), S1–39

Berger, Lawrence M., and Jane Waldfogel (2004) 'Maternity leave and the employment of new mothers in the United States.' *Journal of Population Economics* 17(2), 331–349

Berger, Lawrence M., Jennifer Hill, and Jane Waldfogel (2005) 'Maternity leave, early maternal employment and child health and development in the US.' *Economic Journal* 115(501), F29–F47

Bhattacharya, Samrat, and Abdul Munasib (2007) 'Can too much TV ground you for life? television and child outcomes.' *SSRN eLibrary*

Biderman, Albert D., and Albert J. Reiss, Jr. (1967) 'One exploring the "dark figure" of crime.' *Annuals of the American Academy of Politial and Social Science* 374, 1–15

Blau, Francine D, and Adam J Grossberg (1992) 'Maternal labor supply and children's cognitive development.' *The Review of Economics and Statistics* 74(3), 474–81

Blinder, Alan S. (1973) 'Wage discrimination: Reduced form and structural estimates.' *The Journal of Human Resources* 8(4), 436–455

Blumstein, Alfred, Daniel Nagin, and Jacqueline Cohen (1978) *Deterrence and Incapacitation: Estimating the Effects of Criminal Sanctions on Crime Rates* (Washington, D.C.: National Academy of Sciences)

Brantingham, Paul, and Stephen T. Easton (1998) 'The costs of crime - who pays and how much? 1998 update.' Fraser Institute

Brooks-Gunn, Jeanne, Wen-Jui Han, and Jane Waldfogel (2002) 'Maternal employment and child cognitive outcomes in the first three years of life: the NICHD study of early child care.' *Child Development* 73(4), 1052–72

Burton, Peter, and Shelley Phipps (2007) 'Families, time and money in Canada, Germany, Sweden, the United Kingdom and the United States.' *Review of Income and Wealth* 53(3), 460–483

Caliendo, Marco, and Reinhard Hujer (2006) 'The microeconometric estimation of treatment effects: An overview.' *AStA Advances in Statistical Analysis* 90(1), 199–215

Caliendo, Marco, and Sabine Kopeinig (2008) 'Some practical guidance for the implementation of propensity score matching.' *Journal of Economic Surveys* 22(1), 31–72

Calverley, Donna (2007) 'Youth custody and community services in canada, 2004/2005.' *Juristat*

Cameron, Samuel (1988) 'The economics of crime deterrence: A survey of theory and evidence.' *Kyklos* 41(2), 301–23

Cantor, David, and James P. Lynch (2000) 'Self-report surveys as measures of crime and criminal victimization.' In *Criminal Justice - Measurement and Analysis of Crime and Justice,* ed. David Duffee, vol. 4 (National Institute of Justice) pp. 85–138

Cappellari, Lorenzo, and Stephen P. Jenkins (2003) 'Mvprobit: Stata module to calculate multivariate probit regression using simulated maximum likelihood.' *The Stata Journal* 3(3), 278–294

Carrington, Peter J. (1999) 'Trends in youth crime in Canada, 1977-1996.' *Canadian Journal of Criminology* 41(1), 1–32

Carrington, Peter J. (2007) 'The development of police-reported delinquency among canadian youth born in 1987 and 1990.' Crime and Justice Research Paper Series 85-561-MIE2007009, Statistics Canada

Carrington, Peter J., and Jennifer L. Schulenberg (2005) 'The impact of the Youth Criminal Justice Act on police charging practices with young persons: A preliminary statistical assessment.' Technical Report, Department of Justice, Canada

Cesaroni, Carla, and Michele Peterson-Badali (2005) 'Young offenders in custody: Risk and adjustment.' *Criminal Justice and Behavior* 32, 251–277

Champagne, Frances A., and James P. Curley (2005) 'How social experiences influence the brain.' *Current Opinion in Neurobiology* 15, 704–709

Champagne, Frances A., Ian C.G. Weaver, Josie Diorio, Sergiy Dymov, Moshe Szyf, and Michael J. Meaney (2006) 'Maternal care associated with methylation of the estrogen receptor-alpha1b promoter and estrogen receptor-alpha expression in the medical preoptic area of female offspring.' *Endocrinology* 147(6), 2909–2915

Chowhan, James, and Jennifer M. Stewart (2007) 'Television and the behaviour of adolescents: Does socio-economic status moderate the link?' *Social Science and Medicine* 65(7), 1324–1336

Cohen, Mark A. (1998) 'The monetary value of saving a high-risk youth.' *Journal of Quantitative Criminology* 14(1), 5–34

Coleman, James S. (1988) 'Social capital in the creation of human capital.' *The American Journal of Sociology* 94, S95–S120

Comanor, William S., and Llad Phillips (2002) 'The impact of income and family structure on delinquency.' *Journal of Applied Economics* 5(2), 209–232

Cunha, Flavio, James J. Heckman, Lance Lochner, and D.V. Masterov (2006) *Interpreting the Evidence on Life Cycle Skill Formation,* vol. 1 of *Handbook of the Economics of Education,*

Curtis, Lori J., Martin D. Dooley, and Shelley A. Phipps (2004) 'Child well-being and neighbourhood quality: evidence from the Canadian National Longitudinal Survey of Children and Youth.' *Social Science and Medicine* 58(10), 1917–1927

Department of Justice Canada (2003) *Youth Criminal Justice Act: Resource Manual for Police*

— (2004) 'The Youth Criminal Justice Act: Summary and background'

Donald, Stephen G, and Kevin Lang (2007) 'Inference with difference-in-differences and other panel data.' *The Review of Economics and Statistics* 89(2), 221–233

Doob, Anthony N. (2001) 'Youth court judges' view of the youth justice system: The results of a survey.' Technical Report, Department of Justice Canada, Ottawa

Doob, Anthony N., and Carla Cesaroni (2004) *Responding to youth crime in Canada* (Toronto, Ontario: University of Toronto Press)

Doob, Anthony N., and Jane B. Sprott (2004) 'Changing models of youth justice in canada.' In *Crime and justice: A review of the research,* ed. M. Tonry and A. Doob, vol. 31 (Chicago, IL: University of Chicago Press) pp. 185–242

— (2005) 'The use of custody under the Youth Criminal Justice Act.' Technical Report, Youth Justice Policy, Department of Justice, Canada

Dooley, Martin, and Jennifer Stewart (2004) 'Family income and child outcomes in Canada.' *Canadian Journal of Economics* 37(4), 898–917

— (2007) 'Family income, parenting styles and child behavioural-emotional outcomes.' *Health Economics* 16(2), 145–162

Dooley, Martin, Ellen Lipman, and Jennifer Stewart (2005) 'Exploring the good mother hypothesis: Do child outcomes vary with the mother's share of income?' *Canadian Public Policy* 31(2), 123–144

Eitle, David, and Tamela McNulty Eitle (2003) 'Segregation and school violence.' *Social Forces* 82(2), 589–616

Elliott, Delbert S., and Suzanne S. Ageton (1980) 'Reconciling race and class differences in self-reported and official estimates of delinquency.' *American Sociological Review* 45(1), 95–110

Fairlie, Robert W (1999) 'The absence of the African-American owned business: An analysis of the dynamics of self-employment.' *Journal of Labor Economics* 17(1), 80–108

Fairlie, Robert W. (2005) 'An extension of the Blinder-Oaxaca decomposition technique to logit and probit models.' *Journal of Economic and Social Measurement* 30, 305–316

Federal-Provincial-Territorial Task Force on Youth Justice (1996) 'A review of the Young Offenders Act and the youth justice system in Canada.' Technical Report, Department of Justice, Canada, Ottawa

Francesconi, Marco (2008) 'Adult outcomes for children of teenage mothers.' *Scandinavian Journal of Economics* 110(1), 93–117

Frank, Ove, and Peter J. Carrington (2007) 'Estimation of offending and co-offending using available data with model support.' *Journal of Mathematical Sociology* 31(1), 1–46

Gagné, Lynda G. (2003) 'Parental work, child-care use and young children's cognitive outcomes.' Technical Report 89-594-XIE, Statistics Canada, October

Gagné, Lynda G., and Ana Ferrer (2006) 'Housing, neighbourhoods and development outcomes of children in Canada.' *Canadian Public Policy* 32(3), 275–300

Gannon, Maire (2002) 'Crime comparisons between Canada and the United States.' *Juristat*

Gibbons, Don C. (1979) *The criminological enterprise: Theories and perspectives* (Upper Saddle River, New Jersey: Prentice Hall)

Ginther, Donna, Robert Haveman, and Barbara Wolfe (2000) 'Neighbourhood attributes as determinants of children's outcomes: How robust are the relationships?' *Journal of Human Resources* 35(4), 603–642

Golub, Andrew, Bruce D. Johnson, Angela Taylor, and Hilary James Liberty (2002) 'The validity of aresttes' self-reports: Variations across questions and person.' *Justice Quarterly* 19(3), 477–502

Grogger, Jeffrey (1991) 'Certainty vs. severity of punishment.' *Economic Inquiry* 29(2), 297–309

Hajivassiliou, Vassilis A., and Paul A. Ruud (1994) 'Classical estimation methods for LDV models using simulation.' In *Handbook of Econometrics*, ed. R. F. Engle and D. McFadden, vol. 4 (Amsterdam) pp. 2383–2441

Han, Wen-Jui, Jane Waldfogel, and Jeanne Brooks-Gunn (2001) 'The effects of early maternal employment on later cognitive and behavioral outcomes.' *Journal of Marriage and the Family* 63(2), 336–354

Harknett, Kristen, Irwin Garfinkel, Jay Bainbridge, Timothy Smeeding, and Nancy Folbre (2003) 'Do public expenditures improve child outcomes in the U.S.: A comparison across fifty states.' Working Papers 958, Princeton University, Center for Research on Child Wellbeing, March

Harrison, Lana (1995) 'The validity of self-reported data on drug use.' *Journal of Drug Issues* 25, 91–111

Harvey, Elizabeth (1999) 'Short-term and long-term effects of early parental employment on children of the National Longitudinal Survey of Youth.' *Developmental Psychology* 35(2), 445–59

Haslam, S. A., D. van Knippenberg, M. Platow, and N. Ellemers, eds (2003) *Social identity at work: Developing theory for organizational practice* (New York: Psychology Press)

Haveman, Robert, and Barbara Wolfe (1995) 'The determinants of children's attainments: A review of methods and findings.' *Journal of Economic Literature* 33(4), 1829–1878

Haynie, Dana L., and Scott J. South (2005) 'Residential mobility and adolescent violence.' *Social Forces* 84(1), 361–374

Haynie, Dana L., D. Wayne Osgood (2005) 'Reconsidering peers and delinquency: How do peers matter?' *Social Forces* 84(2), 1109–1130

Heckman, James J. (1979) 'Sample selection bias as a specification error.' *Econometrica* 47(1), 153–61

— (2008) 'Schools, skills, and synapses.' NBER Working Papers 14064, National Bureau of Economic Research, Inc, June

Heckman, James J., Hidehiko Ichimura, and Petra E. Todd (1997) 'Matching as an econometric evaluation estimator: Evidence from evaluating a job training programme.' *Review of Economic Studies* 64(4), 605–54

Howell, James C. (1997) *Juvenile Justice and Youth Violence* (London, UK: Sage)

Huesmann, L. Rowell, and Laramie D. Taylor (2006) 'The role of media violence in violent behavior.' *Annual Review of Public Health* 27, 393–415

Jacob, Brian A., and Lars Lefgren (2003) 'Are idle hands the devil's workshop? incapacitation, concentration, and juvenile crime.' *American Economic Review* 93(5), 1560–1577

Jann, Ben (2005) 'Making regression tables from stored estimates.' *The Stata Journal* 5(3), 288–308

— (2006) 'Fairlie: Stata module to generate nonlinear decomposition of binary outcome differentials.' Statistical Software Components, Boston College Department of Economics

Jann, Ben (2007) 'Making regression tables simplified.' *The Stata Journal* 7(2), 227–244

Jann, Ben (2008) 'A Stata implementation of the Blinder-Oaxaca decomposition.' ETH Zurich Sociology Working Papers 5, ETH Zurich, Chair of Sociology, May

Jensen, Gary F., Maynard L. Erickson, and Jack P. Gibbs (1978) 'Perceived risk of punishment and self-reported delinquency.' *Social Forces* 57, 57–78

Junger-Tas, Josine, and Ineke Haen Marshall (1999) 'The self-report methodology in crime research.' In *Crime and justice: A review of research,* ed. Michael Tonry, vol. 25 (Chicago: University of Chicago Press) pp. 291–367

Kleiber, Christian, and Samuel Kotz (2003) *Statistical Size Distributions in Economics and Actuarial Sciences* (Hoboken, New Jersey: Wiley-Interscience)

Klerman, Jacob Alex, and Arleen Leibowitz (1998a) 'FMLA and the labor supply of new mothers: evidence from the June CPS.' RAND, mimeo

— (1998b) 'Labor supply effects of state maternity leave legislation.' In *Gender and Family Issues in the Gender and Family Issues in the Workplace,* ed. Francine Blau and Ronald Ehrenberg (New York: Russell Sage Foundation) pp. 65–91

Kling, Jeffrey R., Jens Ludwig, and Lawrence F. Katz (2005) 'Neighborhood effects on crime for female and male youth: Evidence from a randomized housing voucher experiment.' *The Quarterly Journal of Economics* 120(1), 87–130

Kloek, Teun (1981) 'OLS estimation in a model where a microvariable is explained by aggregates and contemporaneous disturbances are equicorrelated.' *Econometrica* 49(1), 205–07

Kreager, Derek A. (2004) 'Strangers in the halls: Isolation and delinquency in school networks.' *Social Forces* 83(1), 351–390

Krug, Etienne G., Kenneth E. Powell, and Linda L. Dahlberg (1998) 'Firearm-related deaths in the United States and 35 other high- and upper-middle income countries.' *International Journal of Epidemiology* 27, 214–221

Laub, John H., and Robert J. Sampson (2003) *Shared Beginnings, Divergent Lives: Delinquent Boys to Age 70* (Cambridge, MA: Harvard University Press)

Leibowitz, Arleen (1974) 'Home investments in children.' *Journal of Political Economy* 82(Part II), S111–S131

— (1977) 'Parental inputs and children's achievement.' *The Journal of Human Resources* 12(2), 242–251

Lenton, Rhonda L. (1989) 'Homicide in Canada and in the U.S.A.: A critique of the Hagan thesis.' *Canadian Journal of Sociology* 14(2), 163–178

Leung, Ambrose (2004) 'The cost of pain and suffering from crime in Canada.' Research and Statistics Division Methodological Series, Department of Justice Canada, May

Leuven, Edwin, and Barbara Sianesi (2003) 'Psmatch2: Stata module to perform full mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing.' Statistical Software Components, Boston College Department of Economics

Levin, Diane E., and Nancy Carlsson-Paige (2003) 'Marketing violence: The special toll on young children of color.' *The Journal of Negro Education* 72(4), 427–437

Levitt, Steven D. (1997) 'Using electoral cycles in police hiring to estimate the effect of police on crime.' *American Economic Review* 87(3), 270–90

— (1998a) 'Juvenile crime and punishment.' *Journal of Political Economy* 106(6), 1156–1185

— (1998b) 'Why do increased arrest rates appear to reduce crime: Deterrence, incapacitation, or measurement error?' *Economic Inquiry* 36(3), 353–72

— (2004) 'Understanding why crime fell in the 1990s: Four factors that explain the decline and six that do not.' *Journal of Economic Perspectives* 18(1), 163–190

Levitt, Steven D., and Lance Lochner (2001) 'The determinants of juvenile crime.' In *Risky Behavior among Youths: An Economic Analysis,* ed. J. Gruber (University of Chicago Press) pp. 327–73

Liang, Kung-Yee, and Scott L. Zeger (1986) 'Longitudinal data analysis using generalized linear models.' *Biometrika* 73(1), 13–22

Lindvall, Lars (2004) 'Does public spending on youths affect crime rates?' Working Paper Series 2004:3, Uppsala University, Department of Economics

Lipset, Seymour (1990) *Continental divide: the values and institutions in the United States and Canada* (New York: Routledge)

Lochner, Lance (2004) 'Education, work, and crime: A human capital approach.' *International Economic Review* 45(3), 811–843

— (2007) 'Individual perceptions of the criminal justice system.' *American Economic Review* 97(1), 444–460

Marshall, Katherine (1999) 'Employment after childbirth.' *Perspectives on Labour and Income* 11(3), 18–25

McAra, Lesley, and Susan McVie (2007) 'Youth justice? the impact of system contact on patterns of desistance from offending.' *European Journal of Criminology* 4, 315–345

Miguel, Edward, Sebastian M. Saiegh, and Shanker Satyanath (2008) 'National cultures and soccer violence.' NBER Working Papers 13968, National Bureau of Economic Research, Inc, April

Mihorean, Karen, Sandra Besserer, Dianne Hendrick, and Jodi-Anne Brzozowski (2001) 'A profile of criminal victimization: Results of the 1999 General Social Survey.' Technical Report 85-553-XIE, Statistics Canada, Ottawa

Milligan, Shelly (2008) 'Youth custody and community services in canada, 2005/2006.' *Juristat*

Mocan, H. Naci, and Daniel I. Rees (2005) 'Economic conditions, deterrence and juvenile crime: Evidence from micro data.' *American Law and Economics Review* 7(2), 319–349

Mocan, H. Naci, and Erdal Tekin (2003) 'Guns, drugs and juvenile crime: Evidence from a panel of siblings and twins.' NBER Working Papers 9824, National Bureau of Economic Research, Inc, July

Moulton, Brent R (1990) 'An illustration of a pitfall in estimating the effects of aggregate variables on micro unit.' *The Review of Economics and Statistics* 72(2), 334–38

Nelson, James F. (1980) 'Multiple victimization in American cities: A statistical analysis of rare events.' *American Journal of Sociology* 85, 871–891

Neumark, David (1988) 'Employers' discriminatory behavior and the estimation of wage discrimination.' *The Journal of Human Resources* 23(3), 279–295

Neumayer, Eric (2003) 'Good policy can lower violent crime: Evidence from a cross-national of panel of homicide rates, 1980-97.' *Journal of Peace Research* 40(6), 619–640

Nilsson, J. Peter (2008) 'Does a pint a day affect your child's pay? the effect of prenatal alcohol exposure on adult outcomes.' Working Paper Series 2008:4, IFAU - Institute for Labour Market Policy Evaluation, March

Oaxaca, Ronald (1973) 'Male-female wage differentials in urban labor markets.' *International Economic Review* 14(3), 693–709

Oreopoulos, Philip (2007) 'Neighbourhood effects in Canada: A critique.' Working Paper

Osberg, Lars (1977) 'Stochastic process models and the distribution of earnings.' *Review of Income and Wealth* 23(3), 205–217

Ouimet, Marc (1999) 'Crime in Canada and in the United States: a comparative analysis.' *The Canadian Review of Sociology and Anthropology* 36(3), 389–408

Phipps, Shelley (1999) 'An international comparison of policies and outcomes for young children.' Technical Report F05, Canadian Policy Research Networks, April

— (2001) 'Unemployment insurance-employment insurance transition: An evaluation of the pre-2001 maternity and parental benefits program in Canada.' Technical Report SP-AH133-03-00E, Human Resources Development Canada, Strategic Evaluation and Monitoring, Evaluation and Data Development

— (2006) 'Working for working parents: the evolution of maternity and parental benefits in Canada.' *IRPP Choices*

Phipps, Shelley, and Lynn Lethbridge (2006) 'Income and the outcomes of children.' Analytical Studies Branch Research Paper Series 2006281e, Statistics Canada, Analytical Studies Branch, May

Porterfield, Austin (1943) 'Delinquency and outcome in court and college.' *American Journal of Sociology* 49, 199–208

— (1946) *Youth in trouble* (Fort Worth: Leo Potishman Foundation)

Putnam, Robert D. (2000) *Bowling alone: the collapse and revival of American community* (New York: Simon and Schuster)

Reimers, Cordelia W. (1983) 'Labor market discrimination against Hispanic and Black men.' *The Review of Economics and Statistics* 65(4), 570–79

Rosenbaum, Paul R. (2002) *Observational Studies* (Springer)

Rosenbaum, Paul R., and Donald B. Rubin (1983) 'The central role of the propensity score in observational studies for causal effects.' *Biometrika* 70, 41–50

Ross, Lee E. (1995) 'School environment, self-esteem, and delinquency.' *Journal of Criminal Justice* 23(6), 555–567

Ruhm, Christopher (2004) 'Parental employment and child cognitive development.' *Journal of Human Resources* 39(1), 155–92

Sansfaçon, Daniel, and Brandon Welsh (1999) 'Crime prevention digest II: Comparative analysis of successful community safety.' Report, International Centre for the Prevention of Crime

Sherlock, Richard L., Anne R. Synnes, and Mieke Koehoorn (2008) 'Working mothers and early childhood outcomes: lessons from the Canadian National Longitudinal Study on Children and Youth.' *Early Human Development* 84, 237–242

Silberman, Matthew (1976) 'Towards a theory of criminal deterrence.' *American Sociological Review* 41, 442–461

Skrondal, Anders, and Sophia Rabe-Hesketh (2004) *Generalized Latent Variable Modeling: Multilevel, Longitudinal, and Structural Equation Models* (Chapman & Hall/CRC)

Soares, Rodrigo R. (2004) 'Development, crime and punishment: accounting for the international differences in crime rates.' *Journal of Development Economics* 73(1), 155–184

Sparks, Richard F. (1981) 'Multiple victimization: Evidence theory and future research.' *Journal of Criminal Law and Criminology* 72, 762–778

Sprott, Jane B. (2001) 'Background for YCJA.' Technical Report, Department of Justice, Canada

Statistics Canada (2000) 'Microdata user guide, national longitudinal survey of children and youth data, cycle 4'

Tauchen, Helen, Ann Dryden Witte, and Harriet Griesinger (1994) 'riminal deterrence: Revisiting the issue with a birth cohort.' *The Review of Economics and Statistics* 76(3), 399–412

Taylor-Butts, Andrea, and Angela Bressan (2008) 'Youth crime in Canada, 2006.' *Juristat*

Thornberry, Terence P., and Marvin D. Krohn (2000) 'The self-report method for measuring delinquency and crime.' In *Criminal Justice - Measurement and Analysis of Crime and Justice,* ed. David Duffee, vol. 4 (National Institute of Justice) pp. 33–83

Trépanier, Jean (2004) 'What did Quebec not want? opposition to the adoption of the Youth Criminal Justice Act in Quebec.' *Canadian Journal of Criminology and Criminal Justice* 46(3), 273–99

Waldfogel, Jane (1998) 'The family gap for young women in the United States and Britain: Can maternity leave make a difference?' *Journal of Labor Economics* 16(3), 505–45

Waldfogel, Jane, Han Wen-jui, and Jeanne Brooks-Gunn (2002) 'The effects of early maternal employment on child cognitive development.' *Demography* 39(2), 369–392

Waldo, Gordon P. (1972) 'Perceived penal sanction and self-reported criminality: A neglected approach to deterrence research.' *Social Problems* 19, 522–540

Wallerstein, James S., and Clement J. Wyle (1947) 'Our law-abiding law-breakers.' *Probation* 25, 107–112

Watt, Norman F., Catherine Ayoub, Robert H. Bradley, Jini E. Puma, and Whitney A. LeBoeuf, eds (2006) *The Crisis in Youth Mental Health: Critical Issues and Effective Programs, Vol4: Early Intervention Programs and Policies* (Westport, CT: Praeger Publishers)

Witte, Ann Dryden (1980) 'Estimating the economic model of crime with individual data.' *The Quarterly Journal of Economics* 94(1), 57–84

Zeger, Scott L., Kung-Yee Liang, and Paul S. Albert (1988) 'Models for longitudinal data: A generalized estimating equation approach.' *Biometrics* 44(4), 1049–1060

Zellner, Arnold (1962) 'An efficient method of estimating seemingly unrelated regressions and tests for aggregation bias.' *Journal of the American Statistical Association* 57(298), 348–368

Appendix A

Appendix for Chapter 2

A.1 Definitions of Dependent Variables

- The first two dependent variables on academic performance are based on the child's teacher's answer to the question: Compared to the other students in the class you teach this student, how would you rate this students current academic achievement?

  - School Performance Below Average is a dummy variable coded 1 if the teacher answers Below the middle of the class but above the bottom or Near the bottom of the class.

  - School Performance Above Average is a dummy variable coded 1 if the teacher answers Above the middle of the class but not at the top or Near the top of the class.

- The scaled math score is an equal interval score derived from the raw score for each combination of grade and test level. Scores on this variable increase as the child's grade level and ability increase.

- The variable on the child's academic aspiration is the child's answer to the question - How far do you hope to go in school? - is university degree or above.

- The criminal activity variables are defined according to the youth's answers to the questions listed in Table A.1. Each of these questions asks the youth about

one particular criminal activity in the past 12 months. The possible answers for the youth to choose from are Never, Once or twice, Three or tour times and Five times or more. The dependent variables are defined as follows:

- Violent Crime is a dummy variable coded 1 if the youth's answer to any of questions 1 to 5 indicates at least once.

- Engaged in Fights is a dummy variable coded 1 if the youth's answer to question 1 or 2 indicates at least once.

- Property Crime is a dummy variable coded 1 if the youth's answer to any of questions 6-13 indicates at least once.

- Engaged in Thefts is a dummy variable coded 1 if the youth's answer to question 6, 7 or 8 indicates at least once.

A.2 Appendix Tables for Chapter 2

Table A.1: Youth Self-completed Questions

	Question
1	During the past 12 months, about how many times have you fought with someone to the point where they needed care for their injuries (for example, because they were bleeding, or had broken bones)?
2	During the past 12 months, about how many times have you been in a fight where you hit someone with something other than your hands (for example, a stick, club, knife, or rock)?
3	During the past 12 months, about how many times have you threatened someone in order to get their money or things?
4	During the past 12 months, about how many times have you carried a knife for the purpose of defending yourself or using it in a fight?
5	During the past 12 months, about how many times have you carried a gun other than for hunting or target shooting?
6	During the past 12 months, about how many times have you stolen something from a store or school?
7	During the past 12 months, about how many times have you taken a car, motorbike, or motorboat without permission?
8	During the past 12 months, about how many times have you taken money from your parents without their permission?
9	During the past 12 months, about how many times have you used or bought or tried to sell something you knew was stolen?
10	During the past 12 months, about how many times have you broken into, or snuck into, a house or building with the idea of stealing something?
11	During the past 12 months, about how many times have you damaged or destroyed anything that didn't belong to you (for example, damaged a bicycle, car, school furniture, broken windows or written graffiti)?
12	During the past 12 months, about how many times have you set fire on purpose to a building, a car, or something else not belonging to you?
13	During the past 12 months, about how many times have you sold any drugs?

Table A.2: Five-equation Multivariate Probit Regressions, Boys, 12-15 Years Old

| | Specification 1 | | | | |
	School performance above-average	Math score above-average	Hope to complete university degree	Violent crime	Property crime
Personal and family characteristics					
Child is 13 years old	0.168	0.136	-0.289**	0.041	0.530***
Child is 14 years old	0.221	0.232	0.093	-0.038	0.398**
Child is 15 years old	0.253	0.091	-0.487***	-0.053	0.392**
Child is visible minority	0.008	0.258	0.018	-0.025	-0.118
Child has chronic condition	-0.195	0.006	0.196*	0.139	0.008
Resides in urban area	0.023	-0.074	0.044	0.035	0.080
Atlantic	0.274	0.489	0.898*	-0.576	0.182
Quebec	0.225	-0.103	0.978***	0.014	0.137
Prairie	-0.086	0.190	0.665**	0.268	0.106
West	-0.099	0.678	0.245	-0.197	-0.315
PMK's does not have high school diploma	-0.412**	-0.395**	-0.445***	-0.011	0.138
PMK's has university degree	0.504***	0.376**	0.633***	-0.194	-0.061
PMK is an immigrant	0.201	-0.067	0.446**	-0.110	-0.210
PMK or spouse attends religious services at least once a week	0.530***	0.227*	0.126	0.054	0.188
Either parent was a teenager at the child's birth	0.069	-0.498**	0.204	0.176	0.023
Family is not intact	-0.624**	0.045	-0.257	-0.309	-0.075
Number of children in the household	0.012	0.018	-0.048	0.012	0.004
Times child moved in his/her lifetime	0.018	0.046	0.069**	0.048	0.043
Log of equivalent household income	0.167	-0.001	0.200*	-0.170	-0.019
Equivalent adult time available	0.007*	0.001	0.001	-0.001	0.001
PMK knows most of the child's friends	0.347**	-0.003	0.271*	-0.413**	-0.060
PMK thinks good grade is important	0.277**	0.100	0.256**	0.005	-0.119
Child often hangs out with kids frequently in trouble	-0.398***	-0.340**	-0.158	0.252	0.434***
Child watches TV shows or movies with lots of violence	0.111	0.080	-0.154	0.229**	0.075
Neighbourhood characteristics					
% of population 10-24 years old	-0.036	-0.050*	-0.043*	0.011	-0.032
% of 15-24 year olds who are not in school	0.007	-0.005	0.001	-0.011	-0.001
% visible minority	0.000	-0.013	0.003	-0.014	0.003
% low-income households	0.031**	0.032*	0.023	0.002	0.013
Log of median household income	0.013	0.399	0.803**	0.607	0.175

School environment

Continued...

Table A.2: Five-equation Multivariate Probit Regressions, Boys, 12-15 Years Old

	Specification 1				
	School performance above-average	Math score above-average	Hope to complete university degree	Violent crime	Property crime
Child attends Catholic school or private school	0.065	0.285**	0.011	0.113	0.021
Class size	0.012	0.002	0.018**	-0.010	-0.010
Students work well together on group activities in this student's class	-0.035	0.329***	0.013	-0.311***	-0.095
Teacher has Master's degree	-0.180	-0.137	0.228	0.167	-0.138
Teacher does not have Bachelor's degree	0.281*	0.240	0.131	0.052	-0.078
Public policies					
Log of social assistance expenditure per recipient	0.612	1.070**	0.034	0.796*	0.452
Social assistance rate (# recipients/population)	0.094	0.053	0.064	0.212**	0.173**
Log of elementary/secondary education expenditure per student	0.559	-1.841	2.240*	-2.239	-1.353
Log of per capita recreational and cultural expenditure	-0.615	1.310**	-0.687	-1.233*	0.396
Log of per capita housing expenditure	-0.275	0.372	-0.055	-0.713***	-0.079
Unemployment rate	-0.114	0.128	-0.161**	-0.099	-0.129
# of police officers per 100000 population	-0.008	0.028**	-0.025**	-0.013	-0.022*
Constant	-7.846	-12.735	-22.002**	18.956*	7.936
Observations	1313	1313	1313	1313	1313
rho21			0.362***		
rho31			0.292***		
rho41			-0.118*		
rho51			0.032		
rho32			0.254***		
rho42			-0.061		
rho52			0.025		
rho43			0.076		
rho53			-0.010		
rho54			0.566***		

Likelihood ratio test of rho21=rho31=rho41=rho51=rho32=rho42=rho52=rho43=rho53=rho54=0 for specification 1: p-value=0

$*p < 0.1$ $**p < 0.05$ $***p < 0.01$

Table A.3: Five-equation Multivariate Probit Regressions, Girls, 12-15 Years Old

| | Specification 1 | | | | |
	School performance above-average	Math score above-average	Hope to complete university degree	Violent crime	Property crime
Personal and family characteristics					
Child is 13 years old	0.018	-0.137	-0.141	-0.062	0.319***
Child is 14 years old	0.224	-0.237*	-0.254*	-0.149	0.644***
Child is 15 years old	0.192	-0.154	-0.203	-0.191	0.440***
Child is visible minority	0.243	-0.117	0.304	0.469*	0.031
Child has chronic condition	-0.188*	-0.176	-0.125	-0.072	0.041
Resides in urban area	0.035	-0.006	0.271**	-0.125	0.066
Atlantic	0.188	0.463	0.250	0.717	-0.277
Quebec	-0.183	0.719*	-0.501	0.283	-0.303
Prairie	0.341	0.358	0.082	0.601*	0.291
West	0.544	1.245**	-0.336	0.306	0.195
PMK's does not have high school diploma	-0.090	-0.135	-0.027	0.031	0.089
PMK's has university degree	0.371**	0.292*	0.847***	-0.076	0.167
PMK is an immigrant	0.167	0.287	-0.143	0.364*	0.018
PMK or spouse attends religious services at least once a week	0.143	0.231*	-0.044	0.105	0.140
Either parent was a teenager at the child's birth	-0.228	-0.516**	0.033	0.526***	0.171
Family is not intact	0.128	0.264	-0.131	0.091	-0.098
Number of children in the household	0.089	0.146**	0.146**	0.116	-0.037
Times child moved in his/her lifetime	-0.053*	-0.029	-0.000	0.034	0.056*
Log of equivalent household income	0.236**	0.112	0.222**	0.207**	0.117
Equivalent adult time available	-0.002	0.006	0.005	0.011**	-0.006
PMK knows most of the child's friends	0.321*	0.325*	0.022	-0.217	-0.249
PMK thinks good grade is important	0.171	0.069	0.061	-0.233**	-0.071
Child often hangs out with kids frequently in trouble	-0.438***	-0.358*	-0.174	0.298*	0.359**
Child watches TV shows or movies with lots of violence	0.020	0.115	0.084	0.079	0.076
Neighbourhood characteristics					
% of population 10-24 years old	-0.033	-0.036	-0.031	-0.021	-0.009
% of 15-24 year olds who are not in school	-0.015*	-0.018**	-0.012	0.003	0.006
% visible minority	-0.001	0.001	-0.002	-0.023***	-0.013*
% low-income households	0.006	-0.008	0.026*	0.032*	0.015
Log of median household income	-0.205	0.237	0.532	0.311	0.049
School environment					

Continued...

Table A.3: Five-equation Multivariate Probit Regressions, Girls, 12-15 Years Old

	Specification 1				
	School performance above-average	Math score above-average	Hope to complete university degree	Violent crime	Property crime
Child attends Catholic school or private school	-0.286**	0.182	0.089	0.098	0.062
Class size	-0.017*	-0.002	0.016*	-0.013	0.003
Students work well together on group activities in this student's class	0.259**	0.078	0.130	-0.354***	-0.283***
Teacher has Master's degree	-0.186	0.342**	0.262	-0.230	-0.030
Teacher does not have Bachelor's degree	0.159	0.312*	0.174	-0.187	-0.024
Public policies					
Log of social assistance expenditure per recipient	0.206	-0.334	-0.828*	1.083**	0.320
Social assistance rate (# recipients/population)	0.053	-0.132	-0.303***	0.026	0.068
Log of elementary/secondary education expenditure per student	-0.240	1.789	0.996	0.457	-0.450
Log of per capita recreational and cultural expenditure	0.492	0.285	0.610	-0.856	-0.323
Log of per capita housing expenditure	0.368*	0.543**	0.200	0.081	0.004
Unemployment rate	0.041	0.167**	0.184**	-0.044	-0.001
# of police officers per 100000 population	0.003	0.026**	0.023*	-0.005	0.001
Constant	-4.362	-25.652**	-16.389	-15.896	0.052
Observations	1390	1390	1390	1390	1390
rho21			0.509***		
rho31			0.266***		
rho41			-0.384***		
rho51			-0.196***		
rho32			0.209***		
rho42			-0.245***		
rho52			-0.101		
rho43			0.003		
rho53			-0.102		
rho54			0.567***		

Likelihood ratio test of rho21=rho31=rho41=rho51=rho32=rho42=rho52=rho43=rho53=rho54=0 for specification 1: p-value=0

$*p < 0.1$ $**p < 0.05$ $***p < 0.01$

Appendix B

Appendix for Chapter 3

Table B.1: US Violence Rate by Region: With and Without Oversample

		US	Northeast	Northcentral	South	West
Bullying, 4-11 year olds						
Overall (%)	With oversample	18.5	15.1	20.2	17.8	21.2
	Without oversample	18.3	15.1	20.0	17.2	21.1
Central City (%)	With oversample	17.4	14.8	19.5	17.4	15.9
	Without oversample	17.0	14.7	19.0	17.1	14.4
Non-Central-City (%)	With oversample	17.9	13.7	19.0	17.4	21.8
	Without oversample	17.7	13.9	18.9	17.0	21.9
Central City Status Unknown (%)	With oversample	24.9	29.3	28.0	20.2	25.1
	Without oversample	24.1	27.1	27.8	18.3	25.0
Fighting, 12-14 year olds						
Overall (%)	With oversample	20.9	18.7	21.7	22.6	18.2
	Without oversample	20.5	18.1	21.5	22.5	17.0
Central City (%)	With oversample	20.8	20.4	29.4	22.9	21.7
	Without oversample	24.4	16.3	30.1	23.5	20.6
Non-Central-City (%)	With oversample	21.1	17.7	19.6	23.6	17.9
	Without oversample	20.1	17.7	19.5	23.7	17.0
Central City Status Unknown (%)	With oversample	31.4	35.8	26.2	10.8	14.6
	Without oversample	17.5	33.9	27.6	3.6	11.3

Table B.2: US Violence Rate by Race, Poverty Status and Family Structure

	Bullying, 4-11 year olds, 1994-2004		Fighting, 12-14 year olds, 1996-2004	
	without oversample	With oversample	Without oversample	With oversample
Black	20.6	20.8	31.0	26.6
Hispanic	17.1	18.1	28.3	23.4
Non-black & Non-Hispanic	18.2	18.2	19.7	19.7
White	18.1	18.1	19.9	19.9
Poor	26.4	26.0	26.5	26.3
Non-poor	16.9	16.9	19.2	19.6
Intact	16.2	16.3	18.0	18.3
Non-intact	24.6	24.1	24.4	24.4

Table B.3: Canada-US Violence Rate Comparison by Race, Poverty Status and Family Structure

	Bullying, 4-11 year olds, 1994-2004		Fighting, 12-14 year olds, 1996-2004	
	Canada	US	Canada	US
Black	14.0	20.8	_[1]	26.6
Aboriginal	20.4		5.8	
Hispanic		18.1		23.4
Non-black & Non-aboriginal	11.2		6.9	
Non-black & Non-Hispanic		18.2		19.7
White	11.2	18.1	7.0	19.9
Poor	16.5	26.0	11.6	26.3
Non-poor	10.3	16.9	6.2	19.6
Intact	10.3	16.3	5.5	18.3
Non-intact	14.6	24.1	10.6	24.4

Note: 1. This number is suppressed for confidentiality reasons due to the small number of respondents represented by this statistic.

Table B.4: Means of Independent Variables

Variable Name/Definition	6-11 Year Old		12-14 Year Old	
	Canada	US	Canada	US
First child (=1 if the child was first born)	44.0%	43.3%	49.6%	43.4%
Number of siblings	1.4	1.5	1.3	1.5
Child age in months	110.7	107.5	160.2	155.4
Low birth weight (=1 if birth weight of child ¡ 5.5 lb)	6.0%	6.1%	5.4%	5.2%
Mother has college or university degree (=1 if the mother has a college or university degree)	40.9%	37.6%	37.5%	35.6%
Mother's age	37.6	36.7	40.6	39.9
Lone mother (=1 if a single mother)	12.1%	14.2%	14.5%	17.4%
Rural (=1 if residing in a rural area)	16.6%	32.2%	15.1%	38.3%
Atlantic (=1 if residing in Atlantic provinces)	9.3%		9.6%	
Quebec (=1 if residing in Quebec)	24.8%		26.0%	
Ontario (=1 if residing in Ontario)	35.5%		33.8%	
Manitoba and Saskatchewan (=1 if residing in Manitoba or Saskatchewan)	8.2%		8.7%	
Alberta and British Columbia (=1 if residing in Alberta or British Columbia)	22.2%		21.9%	
Northeast (=1 if residing in Northeast region)		18.9%		18.1%
Northcentral (=1 if residing in Northcentral region)		34.7%		35.2%
South (=1 if residing in South region)		30.0%		29.8%
West (=1 if residing in West region)		16.4%		16.9%
Full-time work within 3 months after birth (=1 if the mother started to work full time within 3 months after birth)	5.9%	30.0%	7.3%	29.3%
Number of observations	4,995	2,394	3,027	1,618

Note: A set of birth year dummies have also been included in the regressions, but are not reported here to conserve space. The 6-11 year old children were born during years 1983-1994 and the 12-14 year old children were born during years 1983-1992.

Appendix C

Appendix for Chapter 4

C.1 Section 38, PART 4 of the Youth Criminal Justice Act

SENTENCING

Purpose and Principles

Purpose

38. (1) The purpose of sentencing under section 42 (youth sentences) is to hold a young person accountable for an offence through the imposition of just sanctions that have meaningful consequences for the young person and that promote his or her rehabilitation and reintegration into society, thereby contributing to the long-term protection of the public.

Sentencing principles

(2) A youth justice court that imposes a youth sentence on a young person shall determine the sentence in accordance with the principles set out in section 3 and the following principles:

(a) the sentence must not result in a punishment that is greater than the punishment that would be appropriate for an adult who has been convicted of the same offence committed in similar circumstances;

(b) the sentence must be similar to the sentences imposed in the region on similar young persons found guilty of the same offence committed in similar circumstances;

(c) the sentence must be proportionate to the seriousness of the offence and the

degree of responsibility of the young person for that offence;

(d) all available sanctions other than custody that are reasonable in the circumstances should be considered for all young persons, with particular attention to the circumstances of aboriginal young persons; and

(e) subject to paragraph (c), the sentence must

(i) be the least restrictive sentence that is capable of achieving the purpose set out in subsection (1),

(ii) be the one that is most likely to rehabilitate the young person and reintegrate him or her into society, and

(iii) promote a sense of responsibility in the young person, and an acknowledgement of the harm done to victims and the community.

Factors to be considered

(3) In determining a youth sentence, the youth justice court shall take into account

(a) the degree of participation by the young person in the commission of the offence;

(b) the harm done to victims and whether it was intentional or reasonably foreseeable;

(c) any reparation made by the young person to the victim or the community;

(d) the time spent in detention by the young person as a result of the offence;

(e) the previous findings of guilt of the young person; and

(f) any other aggravating and mitigating circumstances related to the young person or the offence that are relevant to the purpose and principles set out in this section.

C.2 Appendix Tables for Chapter 4

Table C.1: List of Supplementary Data Sources

Data Title	Source	Note
Canadian Adult Crime Rates by Province	CANSIM Table 2520014	
Canadian Youth Incarceration Rate by Province	CANSIM Table 2510008	
Canadian Unemployment Rate by Province	CANSIM Table 2820086	Official unemployment rates
Canadian Consumer Price Index	CANSIM Table 3870007	

Table C.2: Means of Dependent Variables by Year, 14/15 Year Olds

	Boys				Girls				Full Sample			
	1998	2000	2004	2006	1998	2000	2004	2006	1998	2000	2004	2006
Percentage Offenders												
Property Crime	17.2	15.4	27.1	24.7	11.3	10.3	11.8	14.1	14.2	12.9	19.6	19.4
Mischief	17.2	15.4	27.1	24.7	11.3	10.3	11.8	14.1	14.2	12.9	19.6	19.4
Violent Crime	24.4	26.5	21.4	18.0	10.6	10.4	5.8	6.0	17.2	18.6	13.7	12.0
Assault - Fight	13.1	12.0	12.5	9.2	7.1	4.3	1.6	2.0	10.0	8.3	7.2	5.6
Assault - Sexual	3.8	7.0	3.8	3.1	–	2.8	1.1	0.7	2.1	5.0	2.5	1.9
Weapon Possession	15.7	18.8	14.5	12.0	6.3	6.8	4.1	5.2	10.9	13.0	9.4	8.6
Gang Membership	3.8	3.8	3.5	4.8	3.6	2.0	4.9	1.1	3.7	2.9	4.2	2.9
Drugs	26.0	20.9	25.2	17.0	27.2	22.7	21.8	21.0	26.6	21.8	23.6	19.0
Drug Trafficking	8.1	8.2	11.5	4.5	8.4	4.9	2.6	4.5	8.3	6.6	7.1	4.5
Tried Marijuana	24.4	19.6	23.8	16.3	25.7	20.5	20.7	18.7	25.1	20.1	22.3	17.5
Tried Other Drugs	8.2	8.2	9.5	5.6	13.4	9.0	6.0	10.2	10.9	8.6	7.8	7.9
Percentage Repeat Offenders												
Property Crime	2.6	2.9	5.3	5.2	1.8	1.4	1.7	1.8	2.2	2.2	3.5	3.5
Mischief	2.6	2.9	5.3	5.2	1.8	1.4	1.7	1.8	2.2	2.2	3.5	3.5
Violent Crime	2.7	3.8	3.3	1.4	0.8	1.3	–	–	1.7	2.6	1.9	0.8
Assault - Fight	1.8	2.9	2.1	0.9	0.8	0.7	–	–	1.3	1.9	1.1	0.5
Assault - Sexual	1.6	1.5	1.8	0.5	–	0.9	–	–	0.8	1.2	1.1	–
Drugs	12.2	13.4	16.9	9.6	15.8	10.4	8.9	11.9	14.0	11.9	13.0	10.8
Drug Trafficking	2.6	2.5	5.1	1.0	2.6	1.9	1.1	2.3	2.6	2.3	3.1	1.6
Tried Marijuana	10.1	12.3	15.5	9.2	13.9	9.6	8.4	9.5	12.1	11.0	12.0	9.4
Tried Other Drugs	3.8	2.2	2.4	0.9	5.6	3.6	2.2	5.3	4.7	2.9	2.3	3.1
Committed Any Crime Repeatedly	13.5	15.7	19.7	13.6	15.9	11.2	9.8	13.0	14.8	13.5	14.8	13.3
Committed At Least 2 Types of Crime	23.5	25.8	23.7	20.1	17.9	13.0	11.4	13.1	20.6	19.5	17.7	16.6
Committed At Least 3 Types of Crime	12.3	11.2	16.1	9.8	10.4	7.0	4.0	7.5	11.4	9.1	10.2	8.6
N	544	547	565	591	594	548	591	580	1,138	1,095	1,156	1,171

Data Source: NLSCY Cycles 3, 4, 6 and 7.

Note: – means that this output is suppressed by Statistics Canada's Research Data Centre due to confidentiality considerations.

Table C.3: Means of Dependent Variables by Year, 16/17 Year Olds

	Boys			Girls			Full Sample		
	2000	2004	2006	2000	2004	2006	2000	2004	2006
Percentage Offenders									
Property Crime	34.1	41.9	43.5	19.0	25.2	30.9	26.4	33.4	37.3
Mischief	24.1	33.3	33.9	8.3	16.1	21.2	16.1	24.5	27.6
Theft	24.4	23.3	28.0	14.0	17.8	15.8	19.1	20.5	22.0
Violent Crime	23.8	24.9	28.7	10.3	11.1	11.2	16.9	17.9	20.1
Assault - Fight	8.6	11.5	12.1	3.4	4.8	4.4	6.0	8.1	8.3
Assault - Attack	9.0	10.4	15.7	4.8	7.6	3.3	6.8	8.9	9.5
Assault - Sexual	7.1	3.6	4.0	–	0.9	–	3.8	2.2	2.3
Weapon Possession	14.0	15.3	14.9	5.9	4.4	5.8	9.8	9.8	10.4
Gang Membership	3.1	3.4	2.8	1.4	1.7	1.2	2.2	2.5	2.0
Drugs	45.0	41.2	35.2	43.5	43.3	36.1	44.2	42.2	35.7
Drug Trafficking	14.8	15.3	13.2	7.7	9.0	4.9	11.2	12.1	9.1
Tried Marijuana	44.5	39.2	34.3	42.2	42.8	35.0	43.3	41.0	34.6
Tried Other Drugs	22.9	16.6	14.1	18.1	16.4	9.8	20.5	16.5	11.9
Impaired Driving	14.5	14.1	13.0	9.0	9.3	7.3	11.7	11.7	10.2
Percentage Repeat Offenders									
Property Crime	12.4	12.3	9.8	6.0	7.5	4.4	9.1	9.8	7.1
Mischief	6.8	9.4	6.9	1.5	4.1	2.1	4.1	6.7	4.5
Theft	8.1	6.0	7.6	5.1	4.2	4.0	6.6	5.1	5.9
Violent Crime	4.3	4.8	3.3	0.8	1.2	–	2.5	3.0	2.2
Assault - Fight	2.8	2.8	2.8	–	–	–	1.7	1.6	1.9
Assault - Attack	1.1	2.8	2.6	–	–	–	0.7	1.9	1.6
Assault - Sexual	1.5	1.2	–	–	–	–	0.7	0.7	–
Drugs	30.6	26.4	22.3	19.5	22.1	15.9	24.9	24.2	19.1
Drug Trafficking	6.3	6.6	6.1	1.4	5.0	–	3.8	5.8	3.5
Tried Marijuana	28.0	26.2	21.1	17.9	19.8	14.5	22.9	22.9	17.8
Tried Other Drugs	7.0	4.9	4.2	5.4	6.9	5.4	6.2	5.9	4.8
Impaired Driving	6.2	4.2	5.0	3.2	2.9	1.7	4.7	3.5	3.4
Committed Any Crime Repeatedly	36.0	31.6	30.0	24.7	26.2	17.4	30.3	28.9	23.8
Committed At Least 2 Types of Crime	41.3	41.9	44.1	29.0	32.0	26.1	35.0	36.8	35.2
Committed At Least 3 Types of Crime	29.7	29.9	25.2	16.6	20.8	13.2	23.0	25.1	19.3
N	466	436	430	538	442	465	1,004	878	895

Data Source: NLSCY Cycles 4, 6 and 7.

Note: – means that this output is suppressed by Statistics Canada's Research Data Centre due to confidentiality considerations.

Table C.4: Means of Independent Variables, 1998-2006

	14-15 year old	16-17 year old
Male youth (%)	50.2	49.6
Lone-parent family (%)	19.5	22.4
Number of siblings	1.4	1.3
Household income ($2003)	84189	86393
Household Equivalent Income ($2003)	40730	42789
PMK's age	43.4	45.3
PMK has post-secondary degree (%)	46.7	48.3
Region		
Atlantic provinces (%)	10.4	10.5
Ontario (%)	49.8	50.7
West (%)	39.9	38.8
Live in rural area (%)	14.4	15.1
Provincial unemployment rate (%)	6.7	6.4

Data Source: NLSCY Cycle 3, 4, 6 and 7.

Table C.5: Linear Probability Regressions of the Probability of Being a Young Offender, 14-15 Years Old, Non-Quebec, 1998-2006

	Gender - Male	Lone Parent	Number of siblings	Log of Household Equivalent Income	PMK Age	PMK Has University Degree	Atlantic Canada	Western Canada	Live in Rural Area	Unemployment Rate	year 1998	year 2000	year 2004	year 2006	R^2
Boys (N=2,247)															
Property Crime		0.016	0.006	-0.018	-0.002	-0.018	0.053	0.077***	-0.001	-0.005	0.424	0.407	0.524*	0.505	0.236
Mischief		0.016	0.006	-0.018	-0.002	-0.018	0.053	0.077***	-0.001	-0.005	0.424	0.407	0.524*	0.505	0.236
Violent Crime		0.041	-0.006	-0.035	-0.006**	-0.021	0.050	0.071***	0.018	-0.010	0.893***	0.918***	0.867***	0.840***	0.249
Assault - Fight		0.027	0.001	-0.039*	-0.006***	-0.006	-0.024	0.017	0.008	-0.003	0.784***	0.783***	0.789***	0.764***	0.139
Assault - Sexual		0.039*	-0.001	-0.001	-0.001	-0.099	0.064**	0.003	0.010	-0.009**	0.158	0.184	0.152	0.141	0.062
Weapon Possession		0.029	-0.005	-0.033	-0.002	-0.020	0.053	0.053*	-0.027	-0.011	0.666***	0.691***	0.649***	0.626***	0.172
Gang Membership		-0.008	-0.011	-0.020	-0.004***	0.000	-0.004	0.012	-0.026*	-0.001	0.426**	0.433**	0.430**	0.449**	0.060
Drugs		0.061	-0.009	0.076***	-0.002	0.048*	-0.043	0.009	-0.001	0.012	-0.554*	-0.583*	-0.555*	-0.632**	0.243
Drug Trafficking		0.046*	0.004	0.047**	0.001	0.003	-0.063*	0.005	-0.000	0.015**	-0.579***	-0.561**	-0.539**	-0.600***	0.104
Tried Marijuana		0.058	-0.008	0.077***	-0.002	0.049*	-0.056	0.013	0.001	0.013	-0.602*	-0.628*	-0.602*	-0.671**	0.231
Tried Other Drugs		0.050*	-0.008	0.033**	-0.002	0.005	0.002	0.020	-0.009	0.005	-0.229	-0.217	-0.211	-0.245	0.092
Girls (N=2,313)															
Property Crime		0.042	0.010	-0.024	-0.001	-0.047***	-0.003	0.015	-0.004	-0.004	0.417***	0.406**	0.422**	0.448**	0.137
Mischief		0.042	0.010	-0.024	-0.001	-0.047***	-0.003	0.015	-0.004	-0.004	0.417***	0.406**	0.422**	0.448**	0.137
Violent Crime		0.003	-0.016**	-0.025*	-0.002	-0.021	0.042	-0.002	-0.008	-0.007	0.535***	0.531***	0.486***	0.491***	0.099
Assault - Fight		0.013	-0.004	-0.012	-0.002*	-0.011	0.006	0.002	-0.002	-0.002	0.302**	0.276**	0.250*	0.256*	0.058
Assault - Sexual		—	—	—	—	—	—	—	—	—	—	—	—	—	—
Weapon Possession		-0.017	-0.008	-0.020	-0.001	-0.016	0.015	0.004	-0.008	-0.002	0.331**	0.336**	0.307**	0.324**	0.063
Gang Membership		-0.002	-0.007	-0.011	-0.003***	0.007	0.010	0.007	-0.015	-0.002	0.290**	0.275**	0.305**	0.268**	0.049
Drugs		0.141***	-0.014	0.015	-0.004	-0.061**	0.025	0.012	0.049	0.000	0.281	0.243	0.241	0.231	0.256
Drug Trafficking		0.021	-0.013**	-0.004	-0.002	-0.027*	-0.017	0.009	0.029	-0.000	0.223	0.192	0.171	0.192	0.074
Tried Marijuana		0.135***	-0.010	0.020	-0.003	-0.047*	0.043	0.012	0.040	-0.001	0.194	0.146	0.155	0.130	0.236
Tried Other Drugs		0.085***	-0.006	0.004	-0.005***	-0.044**	-0.019	0.019	0.014	0.007	0.261	0.231	0.204	0.253	0.132
Full Sample (N=4,560)															
Property Crime	0.096***	0.034	0.008	-0.019	-0.001	-0.032*	0.028	0.045***	-0.000	-0.005	0.368**	0.351*	0.419**	0.420**	0.196
Mischief	0.096***	0.034	0.008	-0.019	-0.001	-0.032*	0.028	0.045***	-0.000	-0.005	0.368**	0.351*	0.419**	0.420**	0.196
Violent Crime	0.145***	0.021	-0.011	-0.030***	-0.004***	-0.020	0.046	0.036***	0.008	-0.008*	0.651***	0.661***	0.614***	0.600***	0.205
Assault - Fight	0.082***	0.020	-0.002	-0.025***	-0.004***	-0.008	-0.008	0.011	0.005	-0.002	0.506***	0.492***	0.482***	0.471***	0.116
Assault - Sexual	0.032***	0.019	-0.000	-0.002	-0.001*	-0.009	0.036**	0.001	0.005	-0.005**	0.095	0.118*	0.095	0.087	0.049
Weapon Possession	0.098***	0.005	-0.007	-0.026**	-0.002	-0.018	0.032	0.031*	-0.015	-0.006	0.449***	0.464***	0.429***	0.424***	0.138
Gang Membership	0.012	-0.007	-0.009*	-0.017**	-0.003***	0.004	0.002	0.009	-0.021**	-0.001	0.369***	0.365***	0.378***	0.371***	0.052
Drugs	-0.009	0.110***	-0.011	0.049***	-0.003*	-0.013	-0.003	0.007	0.026	0.005	-0.158	-0.197	-0.182	-0.227	0.239
Drug Trafficking	0.030***	0.040**	-0.005	0.025**	-0.000	-0.002	-0.040	0.006	0.017	0.007	-0.228	-0.238*	-0.235*	-0.257*	0.079
Tried Marijuana	-0.004	0.104***	-0.008	0.051***	-0.003	-0.002	-0.001	0.009	0.022	0.005	-0.222	-0.264	-0.245	-0.293	0.224
Tried Other Drugs	-0.016	0.073***	-0.006	0.021**	-0.003***	-0.021*	-0.006	0.018	0.004	0.005	0.001	-0.010	-0.020	-0.013	0.104

Data Source: NLSCY Cycles 3, 4, 6 and 7.
Note: 1. — means that this output is suppressed by Statistics Canada's Research Data Centre due to confidentiality reasons.
2. *, ** and *** mean 10%, 5% and 1% level significance, respectively.
3. Inferences are made with standard errors generated using bootstrap weights to account for the complex survey design.

Table C.6: Linear Probability Regressions of the Probability of Being a Young Offender, 16-17 Year Old, Non-Quebec, 2000-2006

	Gender - Male	Lone Parent	Number of siblings	Log of Household Equivalent Income	PMK Age	PMK Has University Degree	Atlantic Canada	Western Canada	Live in Rural Area	Unemployment Rate	year 2000	year 2004	year 2006	R^2
Boys (N=1,332)														
Property Crime		0.029	0.004	0.090**	-0.004	-0.034	-0.048	0.016	-0.024	-0.001	-0.428	-0.332	-0.324	0.412
Mischief		-0.020	0.017	0.031	-0.004	-0.072	0.024	0.001	-0.050	-0.013	0.199	0.310	0.310	0.321
Theft		-0.002	-0.006	0.069	-0.002	-0.002	-0.099	0.000	-0.002	0.008	-0.432	-0.433	-0.388	0.265
Violent Crime		0.065	-0.007	-0.006	-0.005	-0.025	-0.019	-0.017	0.010	-0.008	0.569	0.587	0.624	0.267
Assault - Fight		0.035	0.008	-0.010	-0.006**	-0.049**	0.025	-0.010	0.025	-0.011	0.522*	0.562*	0.567*	0.132
Assault - Attack		0.095**	-0.024*	0.009	-0.007***	-0.002	-0.005	-0.018	-0.001	-0.007	0.368	0.393	0.445	0.155
Assault - Sexual		-0.006	0.000	-0.007	0.001	0.009	-0.061*	0.015	0.023	0.012*	0.014	-0.029	-0.015	0.061
Weapon Possession		0.008	0.006	0.026	-0.005*	-0.022	0.047	-0.010	-0.070**	-0.012	0.174	0.204	0.193	0.160
Gang Membership		0.010	-0.007	0.015	-0.002**	-0.002	0.015	0.008	0.005	-0.002	-0.013	-0.005	-0.012	0.041
Drugs		0.039	-0.008	0.144***	-0.000	-0.016	-0.063	0.045	0.013	0.019	-1.187***	-1.217**	-1.279***	0.427
Drug Trafficking		0.028	-0.020	0.038	-0.002	0.008	-0.068	-0.016	0.012	0.006	-0.191	-0.181	-0.202	0.155
Tried Marijuana		0.042	-0.010	0.149***	0.001	-0.023	-0.050	0.041	0.006	0.016	-1.251***	-1.295***	-1.352***	0.417
Tried Other Drugs		0.064	-0.014	0.074**	-0.003	-0.014	-0.056	0.031	0.025	0.010	-0.494	-0.552	-0.576	0.201
Impaired Driving		0.071*	-0.004	0.096***	0.001	-0.047*	0.036	0.072**	0.098***	0.002	-0.951**	-0.952**	-0.975**	0.175
Girls (N=1,445)														
Property Crime		0.045	-0.004	-0.027	0.006*	0.043	-0.002	0.043	-0.015	-0.005	0.180	0.230	0.288	0.271
Mischief		0.038	0.001	-0.009	0.001	0.024	0.026	0.041	-0.025	-0.011	0.197	0.275	0.319	0.176
Theft		0.015	0.000	-0.015	0.006*	0.014	-0.013	0.041	0.000	0.002	0.007	0.034	0.019	0.169
Violent Crime		0.011	-0.014	-0.072***	-0.001	-0.012	-0.009	0.003	-0.018	-0.004	0.958***	0.961***	0.976***	0.129
Assault - Fight		-0.007	-0.013*	-0.025*	-0.001	-0.025	-0.014	0.006	-0.004	-0.003	0.390***	0.403***	0.403**	0.059
Assault - Attack		0.019	-0.001	-0.045***	0.000	-0.015	0.016	-0.015	0.001	-0.005	0.548***	0.574***	0.538***	0.079
Assault - Sexual		–	–	–	–	–	–	–	–	–	–	–	–	–
Weapon Possession		0.010	-0.007	-0.040**	-0.001	-0.001	-0.040	0.013	-0.027	0.005	0.510***	0.489***	0.518***	0.071
Gang Membership		–	–	–	–	–	–	–	–	–	–	–	–	–
Drugs		0.090	-0.032*	0.075*	0.001	-0.021	-0.066	-0.013	-0.024	0.007	-0.373	-0.372	-0.440	0.425
Drug Trafficking		-0.008	0.000	0.029	-0.001	-0.048*	-0.020	-0.009	-0.000	-0.000	-0.139	-0.122	-0.164	0.087
Tried Marijuana		0.090	-0.028	0.087**	0.000	-0.019	-0.086	-0.012	-0.016	0.009	-0.513	-0.504	-0.579	0.416
Tried Other Drugs		0.021	-0.029**	0.000	0.000	-0.066**	0.015	-0.008	0.007	-0.007	0.261	0.248	0.185	0.172
Impaired Driving		0.006	-0.024***	0.017	-0.000	-0.022	0.014	0.037	0.057**	-0.005	-0.023	-0.017	-0.041	0.106
Full Sample (N=2,777)														
Property Crime	0.145***	0.028	0.001	0.039	0.001	-0.000	-0.018	0.029	-0.018	-0.004	-0.258	-0.187	-0.158	0.350
Mischief	0.154***	0.004	0.009	0.016	-0.002	-0.026	0.032	0.000	-0.037	-0.012*	0.083	0.175	0.195	0.267
Theft	0.091***	0.003	-0.001	0.032	0.002	0.002	-0.052	0.019	0.001	0.004	-0.303	-0.292	-0.280	0.220
Violent Crime	0.152***	0.037	-0.010	-0.036	-0.003	-0.022	-0.014	-0.007	-0.002	-0.006	0.646**	0.656**	0.682**	0.223
Assault - Fight	0.070***	0.012	-0.004	-0.016	-0.003*	-0.038***	0.009	-0.001	0.011	-0.008	0.396***	0.422**	0.425**	0.105
Assault - Attack	0.066**	0.056**	-0.011	-0.017	-0.003*	-0.011	0.006	-0.017	0.004	-0.007	0.401*	0.425*	0.432*	0.115
Assault - Sexual	0.042***	-0.004	-0.001	-0.005	0.001	0.005	-0.021	0.009	0.009	0.005	0.003	-0.016	-0.010	0.048

Continued ....

Table C.6: Linear Probability Regressions of the Probability of Being a Young Offender, 16-17 Year Old, Non-Quebec, 2000-2006

	Gender - Male	Lone Parent	Number of siblings	Log of Household Equivalent Income	PMK Age	PMK Has University Degree	Atlantic Canada	Western Canada	Live in Rural Area	Unemployment Rate	year 2000	year 2004	year 2006	R^2
Weapon Possession	0.096***	0.006	0.000	-0.004	-0.003**	-0.014	0.004	0.002	-0.048***	-0.003	0.267	0.270	0.278	0.129
Gang Membership	0.017**	0.005	-0.005*	0.007	-0.001**	-0.006	0.011	0.002	0.002	-0.002	0.011	0.017	0.011	0.030
Drugs	-0.010	0.064*	-0.019	0.114***	-0.000	-0.023	-0.066	0.015	-0.008	0.013	-0.806**	-0.820**	-0.888**	0.423
Drug Trafficking	0.073***	0.011	-0.009	0.032	-0.001	-0.020	-0.047	-0.012	0.006	0.003	-0.188	-0.174	-0.206	0.128
Tried Marijuana	-0.012	0.066*	-0.018	0.122***	0.000	-0.025	-0.070	0.014	-0.007	0.013	-0.903***	-0.919***	-0.987***	0.414
Tried Other Drugs	0.032	0.042	-0.021**	0.040*	-0.001	-0.044*	-0.022	0.012	0.015	0.001	-0.165	-0.200	-0.246	0.182
Impaired Driving	0.053***	0.041*	-0.013	0.060***	0.000	-0.038**	0.021	0.055***	0.078***	-0.001	-0.561***	-0.558***	-0.580***	0.144

Data Source: NLSCY Cycles 4, 6 and 7.

Note: 1. - means that this output is suppressed by Statistics Canada's Research Data Centre due to confidentiality reasons.

2. *, ** and *** mean 10%, 5% and 1% level significance, respectively.

3. Inferences are made with standard errors generated using bootstrap weights to account for the complex survey design.

Table C.7: Linear Probability Regressions of the Probability of Being a Young Repeat Offender, 14-15 Years Old, Non-Quebec, 1998-2006

	Gender - Male	Lone Parent	Number of siblings	Log of Household Equivalent Income	PMK Age	PMK Has University Degree	Atlantic Canada	Western Canada	Live in Rural Area	Unemployment Rate	year 1998	year 2000	year 2004	year 2006	R^2
Boys (N=2,247)															
Property Crime		0.022	-0.005	0.006	-0.001	-0.014	0.003	-0.008	-0.023**	-0.001	0.026	0.029	0.053	0.054	0.051
Mischief		0.022	-0.005	0.006	-0.001	-0.014	0.003	-0.008	-0.023***	-0.001	0.026	0.029	0.053	0.054	0.051
Violent Crime		0.021*	-0.000	-0.005	-0.002**	-0.007	-0.002	0.005	0.007	-0.002	0.176*	0.188**	0.183*	0.166*	0.041
Assault - Fight		0.009	-0.001	0.005	-0.002***	-0.007	0.007	-0.003	-0.004	-0.003*	0.078	0.088	0.082	0.070	0.031
Assault - Sexual		—	—	—	—	—	—	—	—	—	—	—	—	—	—
Drugs		0.063**	0.008	0.056***	0.001	0.035	0.015	-0.032	-0.013	-0.000	-0.519**	-0.509***	-0.481**	-0.562**	0.153
Drug Trafficking		0.007	-0.003	0.009	-0.000	0.002	-0.028	0.012	-0.013	0.008**	-0.126	-0.117	-0.095	-0.130	0.043
Tried Marijuana		0.071**	0.004	0.056***	0.001	0.038*	0.011	-0.035	0.001	-0.002	-0.530**	-0.511**	-0.488***	-0.561**	0.144
Tried Other Drugs		-0.002	-0.001	0.007	-0.001	-0.006	0.009	0.011	-0.009	0.003	-0.013	-0.023	-0.021	-0.032	0.032
Committed Drugs		0.080**	0.007	0.047**	0.000	0.021	-0.004	-0.032	-0.016	-0.000	-0.386	-0.365	-0.333	-0.400	0.173
Committed Any Crime Repeatedly		0.076*	0.006	0.028	-0.003	0.022	0.001	0.040	-0.005	-0.000	0.036	0.069	0.040	0.007	0.241
Committed At Least 2 Types of Crime		0.062*	-0.002	0.030	-0.002	-0.011	0.009	0.033	-0.002	0.002	-0.147	-0.151	-0.108	-0.165	0.136
Girls (N=2,313)															
Property Crime		0.005	-0.001	-0.014**	0.000	0.004	-0.000	-0.005	0.002	-0.002	0.167**	0.163**	0.164**	0.166**	0.023
Mischief		0.005	-0.001	-0.014**	0.000	0.004	-0.000	-0.005	0.002	-0.002	0.167**	0.163**	0.164**	0.166**	0.023
Violent Crime		—	—	—	—	—	—	—	—	—	—	—	—	—	—
Assault - Fight		—	—	—	—	—	—	—	—	—	—	—	—	—	—
Assault - Sexual		—	—	—	—	—	—	—	—	—	—	—	—	—	—
Drugs		0.052*	-0.023***	-0.014	-0.004**	-0.023	-0.027	0.014	0.034	0.004	0.445**	0.406**	0.390**	0.429**	0.140
Drug Trafficking		0.004	-0.006	0.001	-0.002*	-0.025***	-0.018	0.007	0.012	0.002	0.081	0.080	0.072	0.088	0.037
Tried Marijuana		0.040	-0.018***	-0.012	-0.003*	-0.015	-0.026	0.022	0.039	0.005	0.370**	0.341*	0.327*	0.346**	0.121
Tried Other Drugs		0.047**	-0.002	-0.003	-0.002*	-0.014	0.000	-0.010	0.015	-0.002	0.187*	0.168*	0.156	0.185*	0.062
Committed Any Crime Repeatedly		0.061*	-0.022**	-0.015	-0.004**	-0.023	-0.026	0.009	0.048*	0.003	0.473**	0.440**	0.425**	0.464**	0.148

Table C.7: Linear Probability Regressions of the Probability of Being a Young Repeat Offender, 14-15 Years Old, Non-Quebec, 1998-2006

	Gender - Male	Lone Parent	Number of siblings	Log of Household Equivalent Income	PMK Age	PMK Has University Degree	Atlantic Canada	Western Canada	Live in Rural Area	Unemployment Rate	year 1998	year 2000	year 2004	year 2006	R^2
Committed At Least 2 Types of Crime		0.057*	-0.011	-0.019	-0.005***	-0.046**	0.033	0.037	0.002	-0.003	0.639***	0.596***	0.583***	0.605***	0.165
Committed At Least 3 Types of Crime		0.040	-0.009	-0.015	-0.002*	-0.027*	-0.040	-0.006	0.014	0.004	0.351**	0.327***	0.295*	0.339**	0.094
Full Sample (N=4,560)															
Property Crime	0.024***	0.014	-0.003	-0.004	-0.000	-0.005	0.002	-0.007	-0.011	-0.001	0.080	0.078	0.092	0.092	0.039
Mischief	0.024***	0.014	-0.003	-0.004	-0.000	-0.005	0.002	-0.007	-0.011	-0.001	0.080	0.078	0.092	0.092	0.039
Violent Crime	0.022***	0.010	-0.000	-0.004	-0.001***	-0.004	-0.002	0.003	0.008	-0.002	0.108*	0.117***	0.110*	0.099*	0.033
Assault - Fight	0.015***	0.003	-0.001	0.003	-0.001***	-0.005	0.005	-0.001	-0.001	-0.002**	0.058	0.062	0.056	0.050	0.025
Assault - Sexual	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Drugs	0.014	0.063***	-0.009	0.026*	-0.001	0.003	-0.006	-0.011	0.014	0.001	-0.089	-0.107	-0.098	-0.122	0.132
Drug Trafficking	0.009	0.009	-0.004	0.007	-0.001	-0.012	-0.023	0.009	0.001	0.005*	-0.045	-0.042	-0.035	-0.044	0.031
Tried Marijuana	0.015	0.061***	-0.008	0.025*	-0.001	0.010	-0.008	-0.008	0.022	0.001	-0.128	-0.137	-0.129	-0.159	0.119
Tried Other Drugs	-0.018***	0.025**	-0.001	0.003	-0.002**	-0.012	0.006	-0.001	0.004	-0.000	0.091	0.075	0.070	0.079	0.043
Committed Any Crime	0.033**	0.076***	-0.009	0.020	-0.001	-0.003	-0.015	-0.014	0.019	0.001	-0.016	-0.026	-0.015	-0.031	0.150
Committed Repeatedly	0.097***	0.071***	-0.003	0.006	-0.004***	-0.013	0.017	0.037*	0.001	-0.002	0.271	0.263	0.244	0.236	0.208
Committed At Least 2 Types Crime	0.053***	0.056***	-0.005	0.011	-0.002*	-0.020	-0.014	0.013	0.009	0.002	0.048	0.031	0.040	0.029	0.114
Committed At Least 3 Types of Crime															

Data Source: NLSCY Cycles 3, 4, 6 and 7.
Note: 1. – means that this output is suppressed by Statistics Canada's Research Data Centre due to confidentiality reasons.
2. *, ** and *** mean 10%, 5% and 1% level significance, respectively.
3. Inferences are made with standard errors generated using bootstrap weights to account for the complex survey design.

Table C.8: Linear Probability Regressions of the Probability of Being a Young Repeat Offender, 16-17 Year Old, Non-Quebec, 2000-2006

	Gender - Male	Lone Parent	Number of siblings	Log of Household Equivalent Income	PMK Age	PMK Has University Degree	Atlantic Canada	Western Canada	Live in Rural Area	Unemployment Rate	year 2000	year 2004	year 2006	R^2
Boys (N=1,332)														
Property Crime		0.030	-0.009	0.031	-0.005**	-0.028	-0.009	0.026	0.000	-0.001	0.027	0.035	0.013	0.128
Mischief		0.020	-0.008	0.010	-0.004***	-0.028	-0.016	-0.002	-0.013	-0.003	0.205	0.240	0.218	0.091
Theft		-0.007	-0.003	0.012	-0.002	-0.004	0.019	0.023	0.007	-0.002	0.046	0.029	0.044	0.078
Violent Crime		0.004	-0.004	0.021	-0.003**	-0.024*	0.011	-0.007	0.018	-0.007	-0.001	0.014	-0.007	0.058
Assault - Fight		0.006	-0.003	0.013	-0.003**	-0.029**	0.010	-0.004	0.007	-0.006	0.055	0.064	0.060	0.047
Assault - Attack		-0.002	-0.004	0.009	-0.002**	-0.025***	0.001	0.001	-0.003	-0.003	0.024	0.047	0.044	0.038
Assault - Sexual														
Drugs		0.062	0.006	0.109***	0.001	0.009	-0.111*	0.006	-0.011	0.018	-0.997**	-1.035**	-1.078**	0.287
Drug Trafficking		0.025	-0.006	0.022	0.002	-0.011	0.003	-0.015	0.002	-0.004	-0.203	-0.198	-0.212	0.070
Tried Marijuana		0.046	0.003	0.112***	0.001	0.005	-0.104	0.020	-0.022	0.018	-1.080**	-1.095***	-1.148***	0.274
Tried Other		0.040	-0.009	0.011	-0.002	-0.013	-0.000	0.012	0.036	0.005	-0.004	-0.026	-0.027	0.070
Drugs Impaired Driving		0.043*	-0.002	0.034*	0.001	-0.014	0.051	0.042**	0.038**	-0.005	-0.353	-0.374	-0.375	0.075
Committed Any Crime Repeatedly		0.075	0.003	0.127***	-0.000	0.003	-0.089	0.052	0.008	0.014	-1.091**	-1.130**	-1.152**	0.346
Committed At Least 2 Types of Crime		0.074	0.000	0.083*	-0.000	-0.041	-0.137*	0.006	-0.020	0.016	-0.520	-0.509	-0.483	0.433
Committed At Least 3 Types of Crime		0.075	-0.020	0.093**	-0.008***	-0.017	-0.064	0.006	0.044	0.003	-0.330	-0.312	-0.359	0.302
Girls (N=1,445)														
Property Crime		-0.015	0.002	-0.029*	-0.002	-0.013	0.003	0.011	-0.027	-0.003	0.483**	0.496**	0.470**	0.074
Mischief		0.005	0.001	-0.023**	-0.000	0.001	0.009	0.006	0.004	-0.004	0.297*	0.322*	0.303*	0.043
Theft		-0.017	-0.007	-0.021	-0.003***	-0.006	-0.008	0.006	-0.027*	-0.000	0.417**	0.409**	0.411**	0.057
Violent Crime		—	—	—	—	—	—	—	—	—	—	—	—	—
Assault - Fight		—	—	—	—	—	—	—	—	—	—	—	—	—
Assault - Attack		—	—	—	—	—	—	—	—	—	—	—	—	—
Assault - Sexual		—	—	—	—	—	—	—	—	—	—	—	—	—
Drugs														
Drug Trafficking		0.071*	-0.015	0.016	-0.005*	-0.045	0.038	-0.068*	-0.035	-0.012	0.373	0.412	0.348	0.213
Tried Marijuana		0.078**	-0.009	0.022	-0.005***	-0.037	0.016	-0.065*	-0.021	-0.010	0.286	0.318	0.263	0.195
Tried Other		0.014	-0.017*	-0.039**	-0.000	-0.016	0.056	0.009	-0.014	-0.009	0.552***	0.566***	0.555***	0.081
Drugs Impaired Driving		-0.001	-0.010**	-0.008	-0.000	-0.011	0.007	0.013	0.014	0.001	0.126	0.123	0.114	0.037
Committed Any Crime Repeatedly		0.055	-0.016	0.017	-0.003	-0.070**	0.002	-0.043	-0.024	-0.004	0.302	0.324	0.244	0.246
Committed At Least 2 Types of Crime		0.042	-0.024	0.014	0.005	-0.021	-0.027	-0.006	0.008	-0.003	-0.030	-0.003	-0.062	0.300
Committed At Least 3 Types of Crime		0.036	-0.005	0.016	0.002	-0.063*	-0.006	-0.039	0.017	-0.006	-0.036	0.008	-0.067	0.184

Full Sample (N=2,777)

Table C.8: Linear Probability Regressions of the Probability of Being a Young Repeat Offender, 16-17 Year Old, Non-Quebec, 2000-2006

	Gender - Male	Lone Parent	Number of siblings	Log of Household Equivalent Income	PMK Age	PMK Has University Degree	Atlantic Canada	Western Canada	Live in Rural Area	Unemployment Rate	year 2000	year 2004	year 2006	R^2
Property Crime	0.058***	0.007	-0.003	0.003	-0.003***	-0.023	-0.005	0.018	-0.012	-0.002	0.204	0.215	0.191	0.105
Mischief	0.053***	0.010	-0.003	-0.005	-0.002**	-0.014	-0.001	0.002	-0.002	-0.004	0.209	0.239	0.217	0.073
Theft	0.030**	-0.010	-0.004	-0.003	-0.002**	-0.007	0.003	0.014	-0.010	-0.001	0.203	0.191	0.200	0.067
Violent Crime	0.032***	0.012	-0.005	0.007	-0.001	-0.017**	0.007	-0.003	0.006	-0.004	0.023	0.032	0.022	0.043
Assault - Fight	0.023***	0.009	-0.003	0.004	-0.002**	-0.018***	0.004	0.000	0.001	-0.003	0.078	0.080	0.083	0.037
Assault - Attack	0.016**	0.008	-0.004*	0.003	-0.001	-0.016**	0.004	0.000	-0.002	-0.002	0.021	0.034	0.031	0.028
Assault - Sexual	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Drugs	0.071***	0.071**	-0.002	0.067**	-0.002	-0.021	-0.044	-0.031	-0.026	0.004	-0.392	-0.390	-0.444	0.246
Drug Trafficking	0.040***	0.010	-0.001	0.016	0.001	-0.008	-0.005	-0.015	0.005	-0.001	-0.173	-0.152	-0.179	0.059
Tried Marijuana	0.075***	0.067**	-0.000	0.071***	-0.002	-0.019	-0.052	-0.024	-0.023	0.005	-0.470	-0.461	-0.515	0.232
Tried Other	-0.004	0.026	-0.012**	-0.011	-0.001	-0.017	0.027	0.010	0.010	-0.002	0.251*	0.248*	0.241*	0.069
Drugs														
Impaired Driving	0.025***	0.023	-0.005	0.015	0.001	-0.014	0.024	0.028**	0.026**	-0.001	-0.146	-0.157	-0.161	0.055
Committed Any Crime Repeatedly	0.098***	0.071**	-0.004	0.076***	-0.002	-0.038	-0.052	0.004	-0.009	0.006	-0.493	-0.500	-0.552*	0.296
Committed At Least 2 Types of Crime	0.132***	0.058	-0.011	0.054*	0.003	-0.035	-0.077	0.001	-0.005	0.006	-0.410	-0.393	-0.411	0.376
Committed At Least 3 Types of Crime	0.114***	0.049	-0.012	0.056**	-0.003	-0.043	-0.034	-0.017	0.031	-0.003	-0.253	-0.221	-0.287	0.250

Data Source: NLSCY Cycles 4, 6 and 7.
Note: 1. — means that this output is suppressed by Statistics Canada's Research Data Centre due to confidentiality reasons.
2. *, ** and *** mean 10%, 5% and 1% level significance, respectively.
3. Inferences are made with standard errors generated using bootstrap weights to account for the complex survey design.