# Learning Violence Young

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**Abstract**

Two geographically and culturally connected nations, the United States and Canada, 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 and that this cross-country violence gap exists even among children as young as 4-5 years old. Conventional arguments believed to account for this sharp contrast in violence rates prove to have limited explanatory power. The US violence premium remains a puzzle. Using rich information provided by large-scale individual level longitudinal survey data, this study performs a Canada-US comparative analysis with a special focus on the role of maternal work after birth in determining children's violent anti-social behaviour. 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.

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# 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 (1998), 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.

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

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

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 (2008); 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 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

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

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 2. Section 3 describes the data. Section 4 shows that the US-Canada violence gap opens up in early childhood and persists into teenage years. In Section 5, I show that previously proposed hypotheses in the literature are limited in explaining the observed US-Canada violence disparity among children. In Section 6, I investigate the role of full time early maternal employment in accounting for the US-Canada difference in children's violent behaviour. Section 7 concludes.

## 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 (2008a) and Baker and Milligan (2008b) 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' labor 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 labor 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 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 et al. (2008); Soares (2004)).

"Bullying" and "fighting" are available in both countries' data sets at a biennial frequency

[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?"

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 US-Canada Violence Gap: A First Look

Figure 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 Table A1 and A2 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 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 2 tracks the US-Canada bullying ratio by age group and

[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.

gender. As shown in Figure 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 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 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 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 1 explain this gap away? I examine these hypotheses by simple descriptives in the next section.

## 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 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 suggests that race, poverty status and family structure cannot explain away the US-Canada violence gap.

- "Southern" bias or large city effect. Figure 4 and Figure 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 areas of the West region and 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 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 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 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 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?

[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 Labor Income and Dynamics 2003.

[7] See Appendix Table A3 for US-Canada comparisons of actual violence rates among these subgroups.

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.

# 6 Post-birth Maternal Employment and Children's Violent behaviour

## 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)[8]. 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 up to a ceiling, meaning that the effective replacement rate is higher for low-income women and lower for high-income women.[9].

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 (2008b); 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.

### 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 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

[8]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.

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

children born to immigrant mothers, the analysis henceforth will focus on the White population. Figure 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 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:

$$Y = F(X\beta) \tag{1}$$

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 $\Gamma$ 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 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 A4 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 $\Gamma$, 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 $\Gamma$. 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 $\Gamma$. 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 neighbor matching and kernel density matching with three different bandwidths - 0.01, 0.06 and 0.1.

Table 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[10]. 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

[10]Results are available upon request.

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 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 (2008a) and Baker and Milligan (2008b) 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 (2008a) and Baker and Milligan (2008b) 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 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 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 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.

$$Y^{CA} = F(X^{CA}\beta^{CA}) \tag{2}$$

$$Y^{US} = F(X^{US}\beta^{US}) \tag{3}$$

$$
\begin{aligned}
&\bar{Y}^{US} - \bar{Y}^{CA} = \\
&[\sum_{i=1}^{N^{US}} \frac{F(X_i^{US}\hat{\beta}^*)}{N^{US}} - \sum_{i=1}^{N^{CA}} \frac{F(X_i^{CA}\hat{\beta}^*)}{N^{CA}}] \\
&+[\sum_{i=1}^{N^{US}} \frac{F(X_i^{US}\hat{\beta}^{US})}{N^{US}} - \sum_{i=1}^{N^{US}} \frac{F(X_i^{US}\hat{\beta}^*)}{N^{US}} \\
&+ \sum_{i=1}^{N^{CA}} \frac{F(X_i^{CA}\hat{\beta}^*)}{N^{CA}} - \sum_{i=1}^{N^{CA}} \frac{F(X_i^{CA}\hat{\beta}^{CA})}{N^{CA}}]
\end{aligned} \tag{4}
$$

Let Equation 2 and Equation 3 represent the empirical model for Canada and US, respectively. A general formulation of the Blinder-Oaxaca decomposition can be expressed as in Equation 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 2 and equation 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 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 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 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 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.

# 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 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.

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Figure 1: Canada and US Violence Rate Comparison by Gender

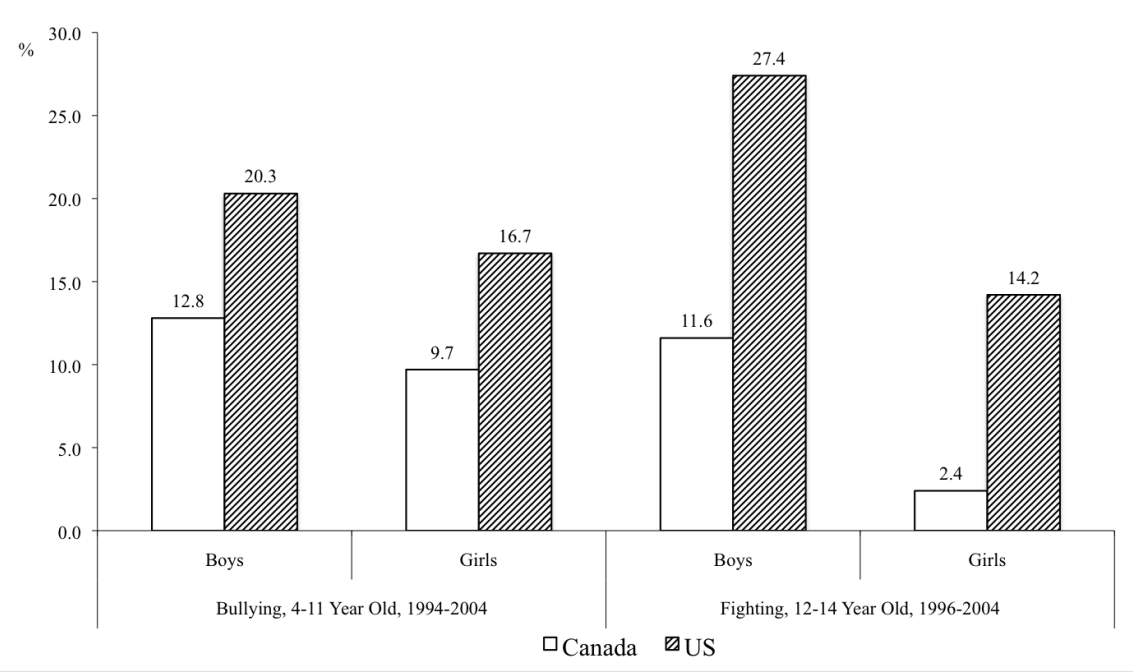



Figure 2: US/Canada Relative Bullying Ratio by Age and Gender

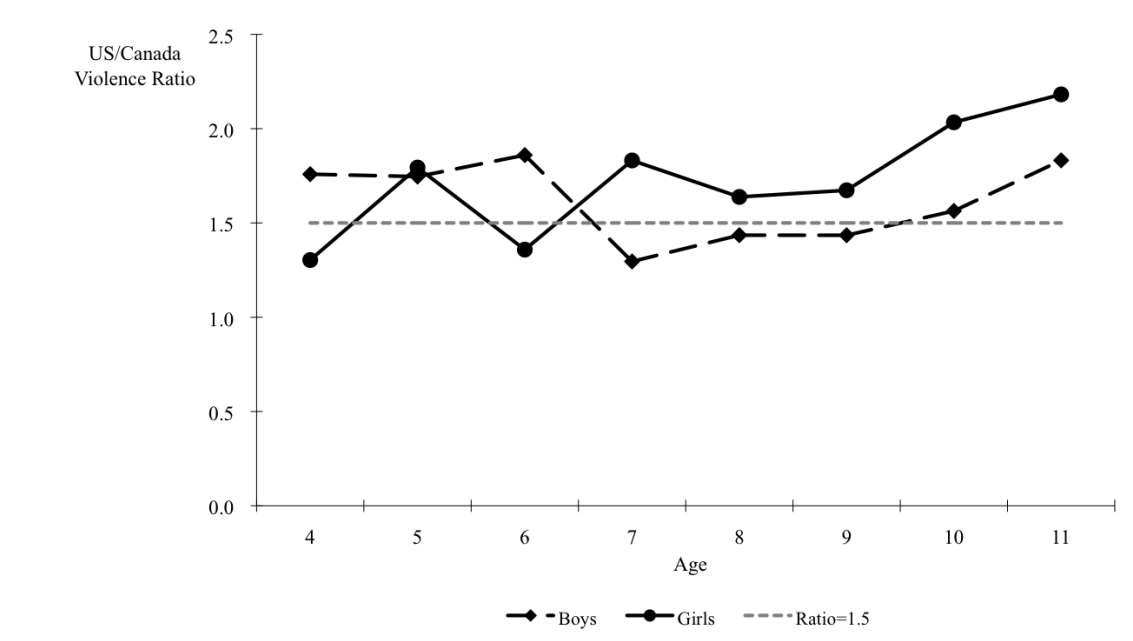
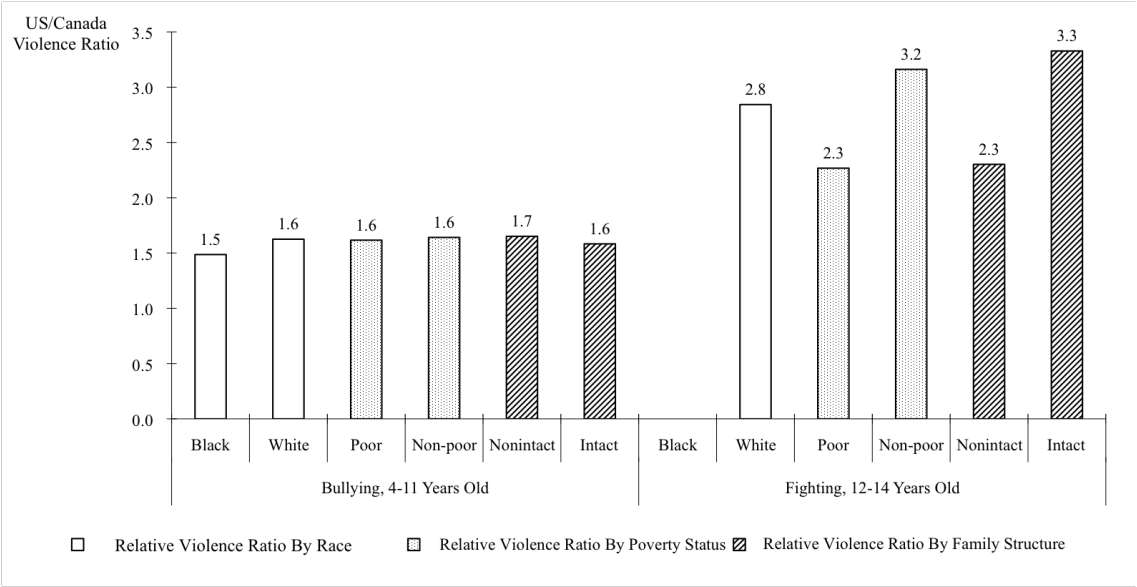


Figure 3: US/Canada Relative Violence Ratio by Race, Poverty Status and Family Structure




Note: The US/Canada fighting ratio for Blacks is suppressed by the Atlantic Research Data Centre to protect respondents' confidentiality.

Figure 4: Canada and US Bullying Rate by Region

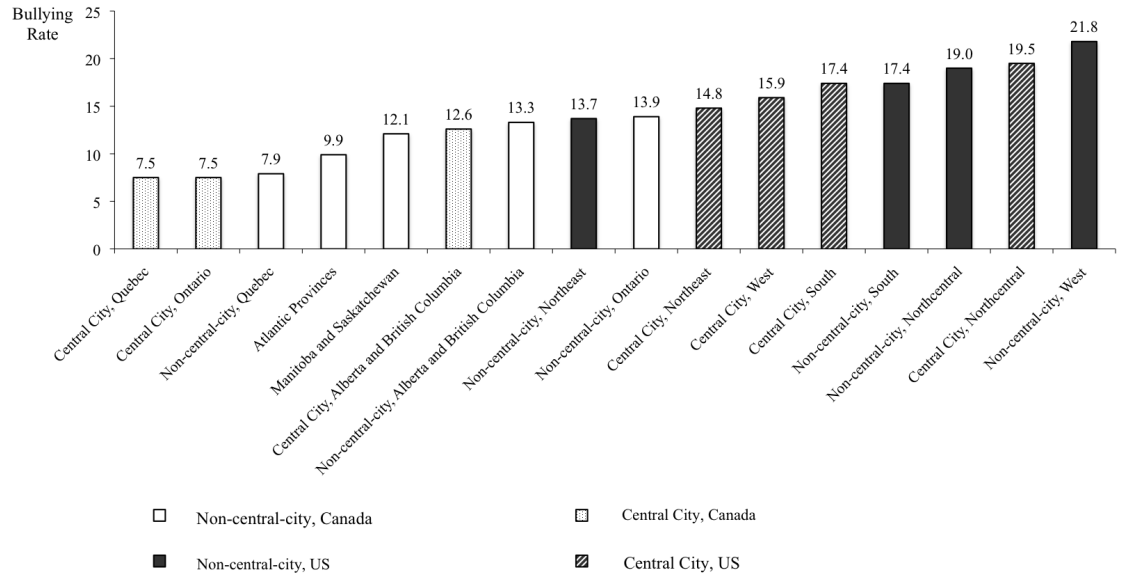


Figure 5: Canada and US Fighting Rate by Region

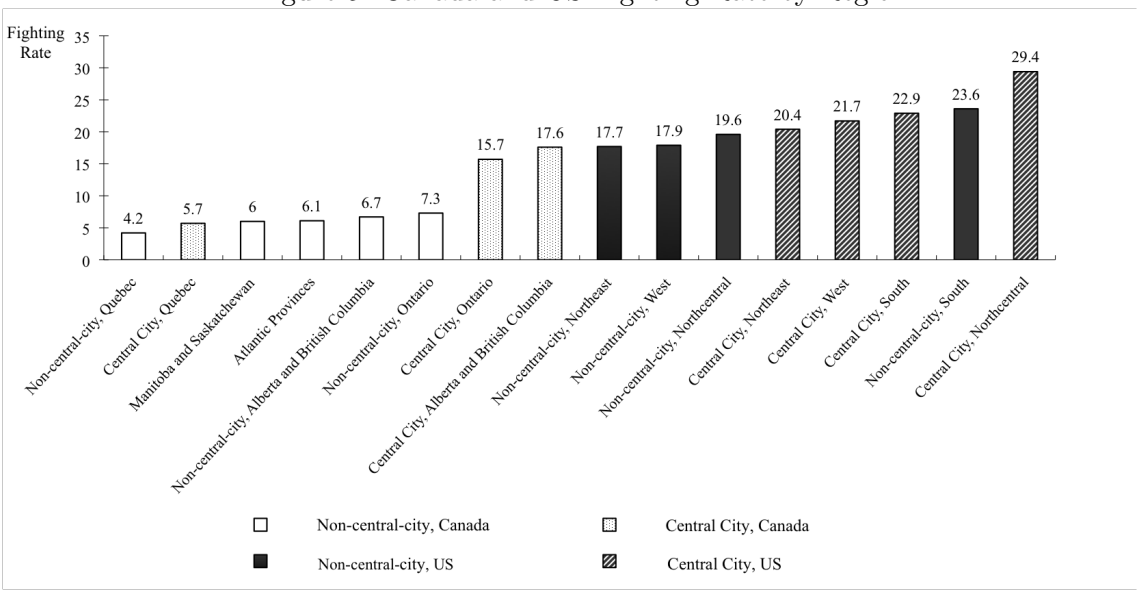



Figure 6: Percentage of Mothers Starting to Work After Birth

**Table 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<br>0.08 | 0.72<br>0.92 | 0.10 | 0.47<br>0.08 | 0.53<br>0.92 | 0.13 | 1.3 |
| 6/7 to 8/9 | 0.44<br>0.09 | 0.56<br>0.91 | 0.14 | 0.53<br>0.11 | 0.47<br>0.89 | 0.19 | 1.4 |
| 8/9 to 10/11 | 0.45<br>0.07 | 0.55<br>0.93 | 0.11 | 0.53<br>0.05 | 0.47<br>0.95 | 0.10 | 0.9 |
| Mean Transition Probabilities | 0.39<br>0.08 | 0.61<br>0.92 | 0.12 | 0.51<br>0.08 | 0.49<br>0.92 | 0.14 | 1.2 |

| | 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<br>0.09 | 0.70<br>0.91 | 0.11 | 0.34<br>0.11 | 0.66<br>0.89 | 0.14 | 1.3 |
| 6/7 to 8/9 | 0.46<br>0.07 | 0.54<br>0.93 | 0.11 | 0.52<br>0.08 | 0.48<br>0.92 | 0.14 | 1.3 |
| 8/9 to 10/11 | 0.38<br>0.05 | 0.62<br>0.95 | 0.07 | 0.31<br>0.05 | 0.69<br>0.95 | 0.07 | 1.0 |
| Mean Transition Probabilities | 0.38<br>0.07 | 0.62<br>0.93 | 0.10 | 0.39<br>0.08 | 0.61<br>0.92 | 0.12 | 1.2 |

**Table 2: The Effect of Working Full Time During the First 3 Months After Birth[1]**

| | | | Propensity Score Matching | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Linear Probability** | **Probit** | 1-to-1 matching without replacement | 1-to-1 matching with replacement | 5 nearest-neighbor | kernel matching, $b^2$=0.01 | kernel matching, b=0.06 | kernel matching, b=0.1 | **No. of Observations** |
| **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[3]** | | | | | | | | | |
| 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: Probit Estimates of Bullying and Fighting Behaviour[1,2]

| | Bullying, 6-11 Year Old | | | | Fighting,12-14 Year Old | | | |
|---|---|---|---|---|---|---|---|---|
| | Boys | | Girls | | Boys | | Girls | |
| | Canada | US | Canada | US | Canada | US | Canada[3] | 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-squared | 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 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 Early Maternal Employment | Absolute Difference (%) | 1.3 | 1.2 | 0.4 | 1.2 | 1.1 |
| | 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 Mother's Education | Absolute Difference (%) | 0.2 | 0.2 | 0.1 | 0.2 | 0.3 |
| | 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 Lone Parenthood | Absolute Difference (%) | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 |
| | 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 Early Maternal Employment | Absolute Difference (%) | 1.3 | 1.3 | 0.9 | 1.2 | 1.2 |
| | 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 Mother's Education | Absolute Difference (%) | 0.2 | 0.0 | 0.1 | 0.2 | 0.2 |
| | 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 Lone Parenthood | Absolute Difference (%) | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| | 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 Early Maternal Employment | Absolute Difference (%) | 0.9 | 0.9 | 0.0 | 1.0 | 0.9 |
| | 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 Mother's Education | Absolute Difference (%) | 0.3 | 0.3 | 0.2 | 0.2 | 0.4 |
| | 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 Parenthood | Absolute Difference (%) | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| | 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 |

**Appendix Table A1: 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 |

**Appendix Table A2: 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 |

**Appendix Table A3: 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.

## Appendix Table A4: Means of Independent Variables[1]

| 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: 1. 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.