Universally Subsidized Day Care and its Effects on Youth Crime Rates: Evidence from Quebec[1]

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ABSTRACT

Research from intensive, targeted early childhood intervention programs suggests they can have large, long-run private and public benefits, much of which come from reductions in the propensity to engage in criminal activity. That research is being used to advocate for increased government expenditures universal early childhood programs. However, it is not clear that interventions would have the same effects on the general population as they do on disadvantaged children. The introduction of Quebec's universally subsidized day care program in 1997 provides an opportunity to take a first glimpse at the long run effects of a non-targeted early childhood program. Studies of the short-run effects of the program show no evidence of improvements in child development in the short run, but the long run effects have not been studied. We use a difference-in-differences strategy to examine the policy's effects on youth crime rates, using the rest of Canada as the counterfactual. Overall, we find no evidence of large reductions in youth crime rates among the cohort of Quebec youth following the introduction of subsidized day care relative to youth in the rest of Canada – indeed, if anything, they appear to have increased. We conclude that caution is necessary in using findings of large social benefits of early childhood education from small, intensive, targeted interventions to draw conclusions that larger-scale universal programs implemented in a different context.

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1. INTRODUCTION

There is an accumulating body of evidence that early childhood interventions may have higher economic and social returns than educational investments later in life. Policy makers and advocates of early childhood interventions have used evidence of high social returns to a group of intensive early childhood interventions targeted to disadvantaged children to make the case for increasing government funding to more broadly available programs (Baker, 2011). The research on these intensive and targeted early intervention programs finds that there are large returns in investing in at-risk children. But it is not clear that policy interventions will have the same effects on the general population as they do on disadvantaged children, and there is little research available on the long-run effects of universal early childhood interventions.

In this paper, we examine the long run effects of a large expansion of subsidized day care provided to pre-school aged children in Quebec, starting in 1997. At the centre of these new policies was a voluntary, low-cost childcare program for children age zero to four years old. This program allowed Quebec families, regardless of their income, to enroll their children in day care at a cost of only five dollars (later 7 dollars) a day (Lefebvre, Merrigan and Roy-Desrosiers, 2010). This Family Policy had three objectives: to increase mothers' labour force participation, help parents maintain a manageable work-life balance, and enhance child development and equality of opportunity for children. By 2005, approximately 50 percent of children age zero to four years old were registered in subsidized day care spaces (Lefebvre and Merrigan, 2008). Questions about the effectiveness of the program are of particular interest given that an expansion of Quebec's subsidized daycare model to the rest of Canada is currently being touted as a policy to be taken in to the next federal election (Barton, 2014).

Baker, Gruber and Milligan (2008), Lefebvre and Merrigan (2008), Lefebvre, Merrigan and Roy-Desrosiers (2010) and Haeck, Lefebvre and Merrigan (2013) have studied how Quebec's universal child care policy has affected women's labour force participation and school readiness of children in elementary school through their math, reading and social skills, and children's behaviour. They find

similar results: the program was associated with an increase in labour force participation of mothers with young children, but it did not enhance – and may well have slightly harmed – child development in the short run, with an increase children's aggressive behaviour and poorer math and reading scores. Kottelenberg and Lehrer (2013) show that these negative effects were still evident a decade after the start of the program, but that there is considerable heterogeneity in treatment effects – for the average child in care, there may be some positive effects, while those children who would not have attended child care without the subsidy experienced quite strong negative effects. Kottelenberg and Lehrer (2014) also find there is heterogeneity in treatment effects by age of child at first registration in child care, with negative effects being larger for those enrolled at a younger age.

However, the long-run effects on child development have not been studied as yet. Seventeen years after its implementation, the first cohorts of children affected by this program are now between the ages of 17 and 21, allowing us a first glance at the longer run outcomes for the affected cohort.

As with previous research, we use a difference-in-differences estimation strategy, examining whether youth crime rates for the affected cohort in Quebec fell relative to the rest of Canada. We focus on crime for three reasons. First, this is an area where data on longer-run outcomes are currently available for the affected cohort. Second, in the highest profile study of targeted early childhood interventions, the Perry Pre-School program, reductions in crime rates are estimated to account for as much two thirds of the total benefits of investing in at-risk children (Heckman, 2000). And third, youth crime rates are also associated with other negative long run life outcomes such as lower education attainment, income and health status, as well as with longer-run criminal activity.

We find no statistically significant or economically large decrease in youth crime rates in Quebec relative to the rest of Canada. Indeed, if anything, there is some evidence that crime rates increased. This paper therefore adds to the cautions issued by researchers studying only the short-run effects of the program, that using evidence from "a limited set of experimental preschool interventions"

(Baker et al., 2008: 740) with very specific target groups to develop broader programs available to the entire population may be unwise.

2. PRIVATE AND PUBLIC RETURNS ON HUMAN CAPITAL

The human capital approach to education is that education is an investment that can increase an individual's cognitive and non-cognitive skills. The private return on this investment comes in the form of higher incomes, a lower probability of unemployment, and better health. The public return mainly comes from reductions in crime, and on public spending on social welfare programs.

2.1 Human Capital Returns by Timing of Intervention

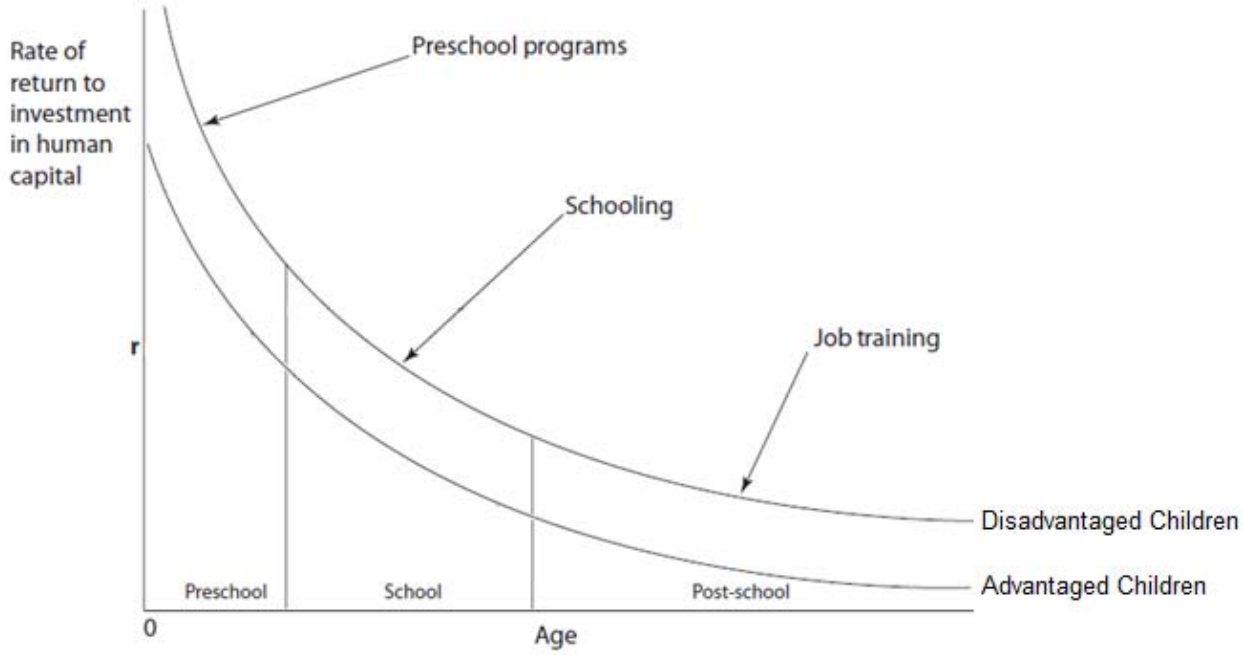
Carneiro and Heckman (2003), Kilburn and Karoly (2008) and many other researchers argue that both social and private returns in human capital investment are higher for early than for later education programs. Figure 1, taken from Carneiro and Heckman (2003), displays this general profile across individuals of high and low initial ability. This figure, however, is not evidence of differences in returns – it is rather a description of a specific model of human capital accumulation. Assuming such a time profile of returns to education interventions is justified in two ways: first, by a comparison of some studies of the economic returns to some early childhood interventions with some interventions in later adolescence or adulthood; and second, by reference to the neuroscience literature on brain development and plasticity.

The first point is made by pointing to the evidence of extremely high returns to programs such as the Perry Pre-School Program. Heckman (2006) points to evidence that tuition subsidies, criminal rehabilitation and public job training programs for disadvantaged young adults have not typically shown much evidence of positive outcomes.

The second justification is with reference to findings from neuroscience, which point to the possibility that young children's brains are more malleable than those of older children or adults, so that educational interventions should be more effective for younger than older people. However,

Howard-Jones, Washbrook and Meadows (2012) point out that the scientific findings are somewhat more nuanced than suggested by the figure. They note that there are clearly critical periods for brain development, and that some of these come very early in life. In particular, deprivation in the first year of life appears to impede long-run motor and sensory development, the evidence on sensitive periods for higher order and cognitive functions is less clear cut. They point to evidence that development in the pre-frontal cortex remains quite plastic until adolescence or even early adulthood, noting "while most other regions of the brain are influenced by atypical adversity in early in life [sic], the prefrontal cortex appears more vulnerable to such experiences when they occur in adolescence" (p. 21-22). Since the pre-frontal cortex has been found to be important in reasoning and decision making, this suggests that it is far from the case that later interventions cannot matter. Indeed, some of the explanations given for the weaker estimated effects of Head Start on cognitive scores of black children are that relative to other Head Start graduates, these children may have weaker educational inputs from the school system in general when they are somewhat older. The possibility that experiences in adolescence matter independently of other childhood experiences is also suggested by Bell, Bindler and Machin (2015) who find that youth who complete their education during a recession are substantially more likely to engage in crime in both the short- and the long-run than those completing their education when labour markets are stronger.

Figure 1. Posited return to investment in human capital over time



Source: Carniero and Heckman (2003)

2.2 Human Capital Returns by Intensity of Intervention

The level of intensity of early intervention programs is also likely to affect their social and private returns. High intensity targeted programs, such as the Perry Preschool Program and Abecedarian, had highly qualified teachers, weekly home visits with parents, lower child-to-teacher ratios, individually designed curriculum for each child, as well as medical and nutritional services. Not surprisingly, the evidence suggests that these high-intensive, high cost-per-child programs are associated with higher public and private returns on human capital investments, particularly through reductions in crime and increases in income and educational attainment. Modestly funded programs like Head Start and the Chicago Child-Parent-Centre are typically found to have more modest private and social benefits.

2.3 Human Capital Returns by Socioeconomic Status

The family is a major producer of cognitive and non-cognitive skills needed for successful students in schools and workers in the labour force (Heckman and Masterov, 2007). Given that children are born into different socioeconomic situations, the return on early childhood investments is likely to differ by child. There are some theoretical and empirical reasons to believe that the return to public investments on children from disadvantaged households – including those with parents who have low incomes or education, and those in single parent households – is higher than the return to public investments in advantaged children. Children with able and engaged parents have the resources at home to acquire the skills, self-control and motivation needed to be successful in life (Heckman and Masterov, 2007), and it appears that those children initially at a cognitive disadvantage were more likely to catch up to their peers if their families were better off. Furstenberg, Brooks-Gunn and Morgan (1987) found that, on average, children who started school from disadvantaged families had worse performance than other children, and Heckman and Masterov (2007) have argued that just as advantages accumulate over time, so do disadvantages, leading to a widening of these early gaps over time.

3. EMPIRICAL RESEARCH ON EARLY CHILDHOOD INTERVENTIONS

We begin with a review of the evidence on the long-run effects of three high-quality, high-cost intervention programs run in the US, and Head Start, a lower cost-per-child, federally funded preschool program. Table 1 summarizes their findings. We then turn to a discussion of research on non-targeted programs.

3.1. Long Run Effects of Targeted Early Childhood Interventions

3.1.1. Perry Preschool Program

One of the most studied and cited experiments for early childhood interventions is the Perry Preschool Program run in the 1960s in Ypsilanti, Michigan. Participation in the program was limited to low income African-American families in inner cities, based on child characteristics where a child

scored between 75 and 85 on the standard Stanford-Binet IQ test (Heckman, 2000). The experiment involved 123 children, where 58 were randomly assigned to a high-quality preschool program at ages three and four. The other 65 students received no program. The Perry Preschool intervention involved a half-day preschool every weekday and a weekly 90 minute family visit for eight months of the year. The program was for 2 years. Student-teacher ratios were 6:1, and all teachers had masters degrees and training in child development (Currie, 2001). The program participants were surveyed periodically about their lives, with the most recent data from participants at the age of 40 (Baker, 2011).

The estimated effect of the program on participants' cognitive and non-cognitive outcomes was substantial. Baker (2011) summarized some of the findings:

> "[R]elative to the control group, the proportion of program participants that had an IQ of 90 or higher at age 5 was 139% higher, that graduated high school was 44% higher, that earned at least $20,000 at age 40 was 50% higher, and [the probability of being] arrested five or more times by age 40 was 35% lower. The treatment group bettered the controls on a variety of outcomes throughout their lives, including achievement tests at primary and secondary school ages, employment rates, and home ownership at ages 27 and 40"

One cost-benefit analysis of the Perry Preschool Program is shown in Figure 2. A substantial fraction, 65 percent, of the total benefits to the program was attributed to reductions in youth and subsequent adult crime. Private benefits for the children enrolled in program came mainly through the increase in future income of the children (this study did not consider long-run effects on mothers' earnings).

Figure 2. Cost-Benefit Analysis per Perry Preschool Program Participant

Present Value in 1992 Dollars Discounted at 3%			
Benefits*	**For Participant**	**For Public**	**Total**
Child care provided	738	0	738
More efficent K-12 education, such as less grade retention and higher achievement	0	6,872	6,872
Decrease in public adult education costs	0	283	283
Increase in participants' earnings and employee benefits	21,485	8,846	30,331
Decrease in crime	0	70,381	70,381
Increase in publicly funded higher education costs	0	-868	-868
Decrease in welfare payments	-2,653	2,918	265
Total Benefits	19,570	88,433	108,002
Cost of Program	0	-12,356	-12,356
Estimated return on $1 invested in program:			
For Participant and Public:	$8.74 ($108,002 in Benefits/$12,356 for Cost of Program)		
For Public:	$7.16 ($88,433 in Benefits/$12,356 for Cost of Program)		

* Benefits and costs were measured from ages 3 through 27 and projected for ages 28 through 65.

Source: Rolnick and Grunewald (2003)

3.1.2. The Carolina Abecedarian Project

The Carolina Abecedarian Project was also a high-intensity program that targeted disadvantaged children, but participants were as young as four months old. Program participants were in families that scored high on the High Risk Index (Masse and Barnett, 2002).[2] Almost all children enrolled in the program were African-American and had parents with low levels of education, income and

[2] Factors considered for this high risk index included weighted measures of maternal and paternal education levels, family income, absence of the father at home, poor social or family support for the mother, indication of older siblings having academic problems, use of welfare, unskilled employment, low parent IQ, and family members who sought counseling.

cognitive ability. The average age of children's mothers was less than 20 years old (Heckman and Masterov, 2007).

The experiment consisted of 112 children born between 1972 and 1977. By the time the children were approximately four months old, they were randomly assigned to a preschool intervention or control group. When the children reached the age of five and were old enough to enter kindergarten, each child was reassigned to either a school age intervention until the age of eight or to a control group, so that there were four groups: 1) children who had no intervention; 2) children who had an intervention when they were zero to five years old; 3) children who had an intervention at five to eight years old and 4) children who had a high-quality intervention from zero to eight years old. The children were followed until the age of 21 (Heckman and Masterov, 2007).

The Abecedarian Project began earlier in children's lives than the Perry program, and involved intensive teacher time (the infant-to-teacher ratio was 3:1 and grew to 6:1 as the children progressed through the program) and parental interventions. The children also received medical and nutritional services (Masse and Barnett, 2002). When children reached the age for full-time kindergarten, they were given a home-school teacher who met with parents to provide supplemental educational activities at home, and helped parents deal with other issues affecting their ability to take care of their children (Heckman and Masterov, 2007).

In general, the result from all of the assessments showed that exposure to the Abecedarian preschool intervention was associated with improvements in measurements of intelligence and education attainment both in the short- and long-run (Masse and Barnett, 2002). The evidence shows the Abecedarian Project had some effect on IQ, concentrated primarily among girls, with the overall IQ score approximately 5 points higher for those in the preschool group than for those who were not, with the effects apparent from age 6.5 to 21 years old (Heckman and Masterov, 2007). There were comparable effects on children's math and reading scores, and children in the program were less

likely to enroll in special education program, less likely to repeat a grade, more likely to graduate high school and less likely to smoke (Heckman and Masterov, 2007). Lastly, children who attended Abecedarian preschool were more likely to attend a four-year college or have had a skilled job at the age of 21, relative to those in the control group.

The evidence from the Perry Program and Abecedarian yield similar results: program participants attained higher levels of education and were less likely to commit crimes in later years. However, there is a large gap between these high-cost, high-intensity programs and most large-scale, public interventions. Although these enriched programs suggest that early intervention programs can have long-term effects on children, it may not necessarily hold true in a larger setting with less intensity and lower cost-per-child (Currie, 2001). The Chicago Child-Parent Centre and Head Start program provide an opportunity to address some these concerns.

3.1.3. The Chicago Child-Parent Centre

The Chicago Child-Parent Centre (CPC) Program had a similar premise to the Perry and Abecedarian program but was much larger in scope. Using federal funds, the program provided health, social, academic and school support services from preschool to grade three (Reynolds, 1994). The preschool component was a half-day program for three- and four-year-olds and was designed to promote reading readiness and effective development through smaller class sizes, staff training and structured learning activities (Reynolds, 1994). From kindergarten to grade three, the program was full-day and shared similar services. The program also encouraged parents to participate in their children's school activities through field trips and volunteering in the classroom, while improving their own lives through helping them complete high school and take part in educational workshops (Heckman and Masterov, 2004). Data was collected until the children were 21-years old.

Reynolds et al. (2001) estimated the long run effects of the CPC program on educational achievement and juvenile arrest. By the time of this study, there were 24 CPC schools, located in Chicago's poorest

neighbourhoods. Unlike the Perry and Abecedarian, the children in CPC schools are not randomly assigned – enrollment was determined by catchment area. Outcomes for these children were compared with children who participated in alternative early full-day kindergarten programs at other public schools, or went to CPC schools but did not participate in kindergarten there. All of the treatment and control group were born in 1980, and the two groups had similar socioeconomic characteristics when they were children. The control group would have been eligible for the program had they lived in a CPC neighbourhood.

There were some children who were in the CPC program for preschool and kindergarten only, but not enrolled when they reached school-age at six-years old. There were also some children who were not in the CPC program for preschool and kindergarten but enrolled when they reached school age. This resulted in four groups: 1) children who had no intervention; 2) children in the CPC program from preschool to grade three; 3) children in the CPC preschool and kindergarten program only; 3) children in the CPC program for grades one to three only. Again, the neighbourhoods of the schools were low income and low employment, and the children were almost all African-American or Hispanic (Heckman and Masterov, 2007)

The authors found CPC preschool participants were 8.2 percentage points less likely to be arrested by age 20. CPC preschool participants also had a lower rate of multiple arrests (17% vs 25%) and violent arrests (9% vs 15%). Reynolds et al. (2001) also found significant gains in education attainment – CPC preschool participants were 11.2 percentage points more likely to complete high school and 8.3 percentage points less likely to drop out of high school by age 20 by 11.2 and 8.3 percentage points, respectively. Outcomes for children in the CPC program from preschool to grade three did not have significantly different outcomes than those enrolled only in preschool and kindergarten, however, suggesting that the earlier years are more important for child development than grades 1 through 3.

3.1.4. Head Start

In 1965, the U.S. federal government introduced Head Start, a summer preschool program for children in low-income families and children with developmental delays or disabilities. By the early 1970s, Head Start became a full year program. The key goal of this federal initiative was to enhance the level of school-readiness for economically disadvantaged children before they entered kindergarten at the age of five (Magnuson et al., 2004). In 2010, over 900,000 children were enrolled with a cost to the federal government of $7 billion USD or $7,600 per child (Baker, 2011). Enrollment represents approximately a third of eligible three- and four-year old children in the U.S. (Currie, 2001).

Head Start is run at the local level but is subject to federal quality guidelines. The guidelines specify that, in addition to providing a nurturing learning environment, Head Start is to provide a wide range of services. This includes facilitating and monitoring the use of preventive medical care by participants, as well as providing nutritious meals and snacks (Currie, 2001).

Garces, Thomas and Currie (2002) estimate the effect of Head Start on four indicators of economic and social success in adulthood: completion of high school, attendance at college, earnings, and whether the respondent ever reported being convicted of a crime, using micro data on the cohort born between 1966 and 1977. The adults observed at the time of this study were in their late twenties and early thirties. Given the richness of the data, the authors were able to compare children who attended Head Start to their siblings who were not in the program, by including a family-specific fixed effect.

In general, the authors found that on average, children in Head Start did worse than children not in the program. Head Start attendees were nine percent less likely to complete high school, relative to stay-at-home children. Those who attended other preschools were nine percent more likely to complete high school, relative to stay-at-home children. Those who attended Head Start were less

likely to go to college, had lower earnings and were more likely to report involvement in criminal activity, relative to those who went to other preschools and those who did not attend preschool. However, this was mostly a result of Head Start children being from less advantaged backgrounds than those who did not attend Head Start. When family fixed effects were included, Head Start children were four and ten percent more likely to complete high school and attend college, respectively, relative to siblings who were not enrolled in Head Start. They were also six percentage points less likely to be charged or convicted of a crime. The authors also found that respondents who had an older sibling attend Head Start were also themselves significantly less likely to have been charged with a crime (Garces et al., 2002).

The results, then, suggest that Head Start has substantial benefits, and a lower cost than the more intensive program. Indeed, in a recent evaluation, Deming (2009) finds overall long-run effects of Head Start to be around 80% of the benefits of the Perry Preschool program, but at only 60% of the costs. However, unlike Garces et al. (2002), he finds no statistical differences in criminal activity between children who participated in Head Start and their siblings who did not.

These studies demonstrate that high-quality interventions at the early stages of a child's life can have significant private and social benefits. The most celebrated study – the Perry Preschool Program – finds extremely large net private and social benefits, with approximately two thirds of the estimated total benefits coming from reductions in crime. That said, studies of other programs, including the CPC, Abecedarian and Head Start programs, find modest to no long run effects on youth and subsequent adult crime.

Table 1. Summary of Targeted Early Childhood Interventions and Long Run Effects

	Perry Preschool Program	Carolina Abecedarian Project	Chicago Child-Parent Centre (Reynolds et al.)	Head Start (evaluation by Garces et al.)
Cost (US$2012)	$17,500/child/year	$20,400/child/year	$6,200/child/year	$8,330/child/year
Observed Group	• 123 , low IQ, low income, African American, inner city children • 3- and 4-year-olds	• 112 children in high risk families • 0- to 8-year-olds	• 900 low income, inner city children in treatment; 500 matched in control • 3- to 8-year-olds	• 1,792 low income children • 3- and 4-year olds
Treatment	• Random assignment to high-quality preschool • Family visits, parenting advice	• Most intensive • Random assignment to high-quality preschool and/or school-age program • Family visits, parenting advice	• Enrollment determined by catchment area • High-quality preschool and/or school-age program • Parent participation/advice	• Federally funded preschool program • Program administered at local level • Also provides nutritious meals and snacks
Control	• Random assignment	• Random assignment	• Children with similar socioeconomic characteristics, but not in CPC	• Siblings of participants but not in the program
Treatment Effect on Crime	• Probability of being arrested five or more times by age 40 was 35% lower	N/A	• 8.2 % pts (33%) lower juvenile arrest rate	• 6% less likely to charged or convicted of a crime
Other Outcomes for Treatment Group	• Higher IQ, graduation rates, income • Lower use of welfare	• Higher math and reading scores • Less likely to enroll in special education • More likely to finish high school	• More likely to complete high school and have higher levels of education	• More likely to complete high school and go to college

http://eclkc.ohs.acf.hhs.gov/hslc/data/factsheets/docs/hs-program-fact-sheet-2012.pdf

3.2. Universal programs

The Perry, CPC, Abecedarian and Head Start programs were or are all available primarily to economically and sometimes cognitively disadvantaged children. While these studies do suggest strong overall economic benefits from targeted and intensive early childhood interventions, it is not clear that we can extrapolate these results to more universally-available programs. There is little evidence on the effects of more broadly available early childhood programs, of the types being

proposed or implemented in response to the encouraging findings of the targeted programs described above.

There are a number of reasons to be skeptical of the idea that a universal program will have similar effects to those found for targeted programs, as has been well recognized in the academic literature. Welsh, Sullivan and Olds (2010), for instance, point to several factors that might lead universal programs to have smaller effects on crime rates, including: universal programs do not focus on those at the highest risk of committing crimes, diluting the effects; a more heterogeneous population meaning the initial program simply has different effects; a lack of availability of high quality workers; and other difficulties in maintaining the initial program quality. Donohue and Seigelmen (1998: 36) note that "It is unrealistic to think that the small Perry Preschool program results could be replicated in such a massive social program, but our working hypothesis will be that the massive preschool intervention could reduce crime for its participants by half the amount found in the Perry program." Despite these concerns, policy makers have routinely made strong claims about programs like subsidized child care and full-day kindergarten, in part because we simply do not have sufficient research on the long-run effects of comparable universal programs.

One relatively well studied universal intervention has been Quebec's subsidized childcare policy. The details of this program are described in Section 4. The most extensive studies on this topic are by Baker, Gruber and Milligan (2008), Lefebvre and Merrigan (2008), Lefebvre, Merrigan and Roy-Desrosiers (2010), Haeck, Lefebvre and Merrigan (2013), and Kottelenberg and Lehrer (2013, 2014).

To examine outcomes for children, the papers primarily use data from National Longitudinal Study of Children and Youth (NLSCY), a biennial nationally representative panel survey of Canadian children, with the first cohort comprising of 0-11 year olds in 1994 (Baker et al., 2008). The studies mostly use a difference-in-differences strategy to evaluate the intent-to-treat effects of policy changes (although some examine local average treatment effects). Changes in outcomes in Quebec

after the policy was introduced are compare with changes in outcomes for children in the rest of Canada. Baker et al. (2008) use the standard model:

$$Outcome_{ipt} = \beta_0 + \beta_1 Policy_{pt} + \beta_2 Prov_p + \beta_3 Year_t + X_{ipt} + \varepsilon_{ipt} \quad (1)$$

where $Outcome_{ipt}$ is the outcome of interest for child *i* in province *p* at year *t*; $Policy_{pt}$ is a dummy if the child resided in Quebec and was eligible for subsidized day care[3]; $Prov_p$ and $Year_t$ are province and year fixed effects; X_{ipt} is a set of control variables including parents' characteristics, size of urban area, number of siblings, gender and age of the child and ε_{ipt} is the error term. Lefebvre et al. (2010) used a similar approach, but included separate dummy variables for each NLSCY cycle, to account for different rates of access to child care as more than 110,000 new day care spaces were created between the beginning and end of the sample period.

3.2.1 Parental Labour Force Participation

Baker et al. (2008) and Lefebvre and Merrigan (2008) found similar effects of Quebec's policy change on maternal labour supply. Baker et al. (2008) focus only on mothers of 0-4 year old children in two-parent households. The authors found that since the program's introduction, the rise in labour force participation of married women in Quebec was 7.7 percentage points, or 14.5 percent of baseline participation, relative to the rest of Canada. Lefebvre and Merrigan (2008) found similar results for married women, with sample sizes too small to estimate for single mothers, and with a larger effect for more educated mothers compared with less educated mothers. There is also evidence that these effects have gotten larger over time, perhaps as the available child care spaces have also increased over time since the policy change.

In a subsequent paper, Lefebvre et al. (2009) found long-run increases in labour force participation for relatively less educated women, and Haeck et al. (2013) find very large effects on labour force

[3] An alternative for the policy variable was average subsidy rate for childcare expenses in a given province and year. This was used to estimate price elasticities of child care.

participation rates of single mothers. Thus, while the child care policy seems to have gotten relatively educated women back into the workforce earlier than otherwise, while their employment rates once their children were older did not change much, it appears it may have led to a boost in participation rates of less educated women with older children. Families with higher incomes saw a substantial decrease in the direct cost of child care while families with lower incomes did not (Baker et al. 2008).[4] This is because single parent and/or low income families in Quebec had direct subsidies for childcare and refundable tax credits prior to 1997. This suggests that the 1997 family policy had a more dramatic effect on the costs of day care for higher income families than lower income families.

This finding is important in the context of the long-run effects of the policy – given the different take-up rates, we are likely to be mostly be capturing the effects of the policy on outcomes for children who were not from the provinces poorest families, unlike the targeted program. If heterogeneous treatment effects are important, then, we should not be surprised if research on universal programs uncovers different average treatment effects than does research on targeted programs.

3.2.2. Hours of Non-Parental Child Care Use

Baker et al. (2008) and Lefebvre and Merrigan (2008) find the use of non-parental child care in Quebec increased significantly for children ages one to four. Baker et al. (2008) found that Quebec's policy change was associated with a 14.7 percentage point increase in the use day care, relative to the rest of Canada. Lefebvre et al. (2010) found the use of care increased over time. Lastly, Baker et al. (2008) found a very large rise in institutional child care and a shift from at-home, non-licensed care to licensed care. This suggests that there was crowd out of informal child care in Quebec.

Lefebvre et al. (2010) found that the use of day care rose mostly for women in higher education groups, both in single- and two-parent households. The estimated increase of weekly hours in

[4] For a more extensive overview of Quebec's Family Policy change effects on the price of childcare for different types of families, refer to Baker et al. (2008)

daycare for one to four year olds was 14.1 and 6.1 hours for children of single mothers with a higher and lower education, respectively.[5] This aligns with Lefebvre et al.'s (2010) findings on maternal labour force participation, where participation effects were stronger for university educated mothers.

3.2.3. Child Development

Baker et al. (2008) and Haeck et al. (2013) found somewhat negative effects of Quebec's policy change on child development. Both papers use data on children's performance on the Peabody Picture Vocabulary Test (PPVT) as a measure of early literacy skills. Baker et al. (2008) also consider several summary scores to measure children's development such as hyper-activity-inattention, anxiety, separation anxiety, physical aggressiveness, motor and social development, as well as five measures of health: an indicator for excellent health, nose/throat or ear infections, an indicator for having an asthma attack in the last 12 months, and an indicator for injury in the last 12 months.

For almost every measure, Baker et al. (2008) find that the increased use of child care was associated with a decrease in child wellbeing, relative to other children. Reported fighting and other measures of aggressive behaviour increased significantly. The authors also found substantial negative effects on children's health: the probability of being in excellent health decreased by 5.3 percentage points for children in Quebec. Lefebvre et al. (2013) found Quebec's policy change was negatively associated with five-year-old PPVT scores, with a more negative effect for children with low-educated mothers, while expanding kindergarten to full-day may have improved cognitive skills somewhat.

Kottelenberg and Lehrer (2013) update the analysis, which allows them to say that the negative effects seem to have persisted, and so are not plausibly a result of short-term transitional difficulties of the program. They also point out that there appears to be considerable treatment heterogeneity, with children who would have been in day care without the subsidies appearing to benefit from that

[5] For children in Cycle 3 of the NLSCY

care, while those who were enrolled in day care because of the subsidies appear to have had negative effects. That is, the effect of treatment on the treated at the margin appears to be significantly negative.

These papers suggest that Quebec's policy change did not enhance child development, which was a stated goal of the policy. It is natural to ask whether these short-term issues translate to longer-run consequences. For example, Baker et al. (2008) found that fighting and other measures of aggressive behaviour increased significantly for children affected by this policy change. Is it possible that this aggressive behaviour in children could lead to worse subsequent behaviour in youth? The findings from some of the targeted interventions that early positive effects on measures of cognitive skills fade out, but that there are nonetheless long-term positive effects on outcomes in adulthood should provide some caution in assuming that knowing short-term outcomes is sufficient to be able to identify long-run outcomes.

4. DETAILS OF QUEBEC'S FAMILY POLICY

In September 1997, licensed and regulated childcare facilities, under agreement with Quebec's Ministère de la Famille et de l'Enfance, began to offer childcare spaces for Quebec families for five dollars (later increased to seven dollars) a day (Lefebvre et al., 2010). The program was rolled out starting with four-year-olds in September 1997. In September 1998 and 1999, respectively, the program was made available to three- and two-year olds. By September 2000, all Quebec children from age zero to four years old were eligible for subsidized child care spaces. In addition to subsidized day care for children under the age of five, Quebec's new Family Policy also included changes in child care for children who were five years old and over, who as of September 1997 were eligible for free full-day (rather than half-day) kindergarten, and subsidized after-school childcare at the subsidized rate (Baker et al., 2008). As a result, children born after September 1 1992 (who were aged 5 in September 1997 when the program began) were eligible to receive at least one year – and

for those born after September 2000, six years – of heavily subsidised day care, as well as one year of full-day rather than half-day kindergarten, compared to previous cohorts of Quebec children.

Because of the timing of eligibility for school, children born in the same year were eligible for different amounts of child care. Children born between October 1 1991 and September 30 1992 were therefore eligible for 1 year of full-day kindergarten plus one year of subsidised after-school care when they turned 5 in 1997. Children born between October 1 1992 and December 30 1992 – who were 4 when the policy started to roll out – were eligible for an additional year of subsidized child care compared with those born earlier in the year.

Following the introduction of this policy, childcare usage rates increased dramatically, as did government spending on childcare (Table 2). Spending per child in care has almost doubled since the beginning of the program, and is currently similar to spending per pupil as Head Start.

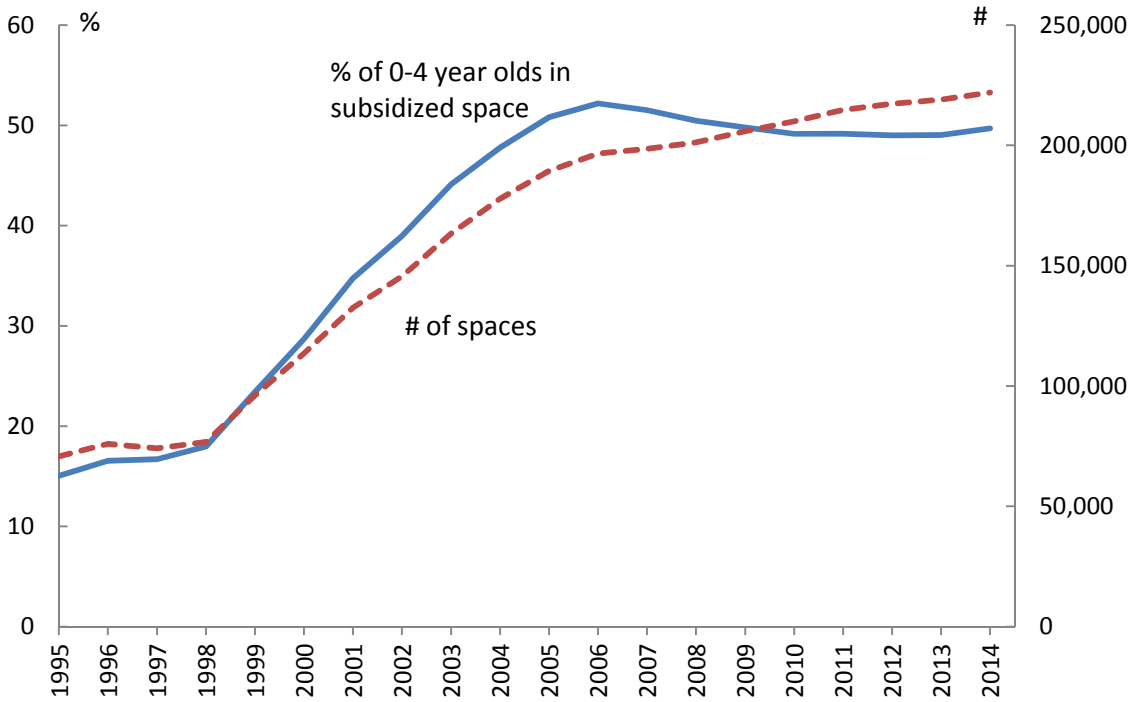
Not all children in Quebec could be enrolled in subsidized day care. Although the introduction of the program was staggered by age, the demand for childcare spaces exceeded the supply. Figure 3 shows the total number of subsidized childcare spaces available in Quebec and the total number of children age 0-4 in Quebec from 1997 to 2007. The Quebec government responded quickly to the demand, almost doubling the number of subsidized child care spaces from 1997/98 to 2000/01, when the program became available to all children aged zero to four. Rapid growth continued thereafter, until around 2005 when the growth in subsidized spaces began to slow down. This increase in subsidized spots led to a large increase in the percentage of children aged 0-4 able to access those spots, from 17% in 1997 to just over 50% by 2005, where it has roughly remained since. Overall use of institutional daycare among children in this age group has been somewhat higher. As Haeck et. al (2013) note, there was no other change in any other province's educational or family policy affecting children around the same time of anything like the same magnitude.

Table 2. Number of subsidizes spaces, percentage of children in subsidizes spaces, and subsidy per space (constant 2012$), 1995-2014

	# of subsidized spaces	% of children aged 0-4 in subsidized space	Subsidy per space (constant 2012$)
1995	70,782	15.03	
1996	76,029	16.56	
1997	74,058	16.69	5,174
1998	76,715	17.97	5,027
1999	96,113	23.42	6,318
2000	113,545	28.69	7,130
2001	132,545	34.74	7,849
2002	145,625	38.97	8,461
2003	163,434	44.12	8,697
2004	177,848	47.80	8,515
2005	189,380	50.82	8,270
2006	196,618	52.19	8,439
2007	198,606	51.50	8,881
2008	201,166	50.45	9,015
2009	205,823	49.78	9,295
2010	210,019	49.15	9,535
2011	214,804	49.17	9,541
2012	217,334	49.01	10,192
2013	219,084	49.03	10,375
2014	221,983	49.69	10,253

Source*:* Lefebvre and Merrigan (2008); Haeck, Lefebvre and Merrigan (2013); www.mfa.gouv.qc.ca/fr/services-de-garde/portrait/places/Pages/index.aspx; Government of Quebec (various years) Expenditure Budget Vol II Estimates of Departments and Agencies.

Figure 3. Number of subsidized spaces for preschool children on March 31 of each year



Source: Lefebvre et al. (2009), http://www.mfa.gouv.qc.ca/fr/services-de-garde/portrait/places/Pages/index.aspx , and CANSIM Table 51-0001. Figures are for the number of subsidized spaces – there has been substantial growth in unsubsidised spaces since around 2009, and these now account for 17% of all spaces, up from 1% in 2003.

5. EMPIRICAL STRATEGY AND DATA

5.1 Empirical Strategy

Crime rates are notoriously difficult to model. It is, for instance, well known that beginning in the 1970s, crime rates rose in a number of countries, only to begin to decline again in the 1990s. But there is no consensus on the causes of this decline. Factors suggested range from increased incarceration, more or more vigilant policing, economic and social factors like unemployment or inequality, better alternatives for spending time, declining alcohol consumption, the crack cocaine effect, population ageing, increased abortion rates, and the use of leaded (and then later unleaded) gasoline (Levitt, 2004; Nevin, 2000).

Consequently, we take a relatively agnostic approach to the socio-economic determinants of crime rates, and use a difference-in-differences identification strategy in this paper, similar to Baker et al. (2008) and Lefebvre et al. (2010), adding data on economic conditions (the unemployment rate for 15-19 year olds) and on numbers of police, both of which vary by province and year.

We have data on youth crime rates – that is, crime rates for those aged between 12 and 17 years of age – for the years 1998 through 2013. Because of the way that Quebec's Family Policy was rolled out, we have in effect three different cohort/time combinations over this period. The first is those aged 12-17 between 1998 and 2004, who were not young enough to have received any benefits from the Family Policy (having been older than 5 years of age when the program was rolled out). We use this group as our Quebec control group. The second is the group aged 12-17 after 2009, all of whom were eligible for full-day (rather than half-day) kindergarten and at least one year of subsidised day care (even if only after-school), and up to four years (for those who were 12 in 2009). This includes those aged 5 at the time of the policy roll-out. In between, for the years 2005 through 2008, the group of 12-17 year olds is a mixed group, which includes some youths who were too old to be affected by the introduction of the Family Policy in 1997, and some who had one to three years of subsidized childcare available. This is shown in Figure 4. By 2005, the cohort first eligible for full-day kindergarten plus after-school care were turning 12. The crime data for that year, then, includes the earliest cohorts affected by the roll out of the family policy.

There are two other key advantages of excluding the data from these intermediate years. The first is that, as noted in Baker et. al (2008) and shown in Figure 3, there was still relatively small percentage of the population of 0-4 year olds who were in subsidized child care in the program's early years. They exclude data from an intermediate wave of the NLSCY to allow for this delayed supply side response. In addition, as discussed in more detail below, the Youth Criminal Justice Act (YCJA) was introduced in 2003, in an effort to divert young offenders from the formal criminal justice system.

Although this legislation affected all of Canada, it is possible that it was implemented differently by the provincial policing and criminal justice systems. The following section gives more detail on this change.

Figure 4 shows the years in which the data on 12-17 year olds includes youth who were in the cohort of Quebec children who were eligible for reduced fee day care. Children born October 1991 to December 1991 would have been eligible for one year of full-day kindergarten and one year of subsidized after-school care. These children turned 12 late in the year 2003, so that some of Quebec's 12 year olds in 2003 would have been children eligible for the treatment. Only a relatively small number of Quebec children aged 12-17 in 2003 would have been eligible for subsidized day care, then, and even fewer would in fact have participated. Nonetheless, we also drop 2003 from our sample, since that also means we exclude the immediate aftermath of the introduction of the YCJA from our sample – thus, any adaptations to the YCJA should not affect our estimates. This gives us a total of 5 years of data pre-treatment (1998 through 2002) and 5 years of data post-treatment (2009 through 2013).

Figure 4. Treated, untreated and mixed cohorts by birth year and calendar year

	Children born in the year to September:																Calendar year data type
	1985	1986	1987	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	
Age in Sept:																	
1991	5	4	3	2	1	<1											
1992	6	5	4	3	2	1	<1										
1993	7	6	5	4	3	2	1	<1									
1994	8	7	6	5	4	3	2	1	<1								
1995	9	8	7	6	5	4	3	2	1	<1							
1996	10	9	8	7	6	5	4	3	2	1	<1						
1997	11	10	9	8	7	6	5	4	3	2	1	<1					
1998	12	11	10	9	8	7	6	5	4	3	2	1	<1				Not treated
1999	13	12	11	10	9	8	7	6	5	4	3	2	1	<1			Not treated
2000	14	13	12	11	10	9	8	7	6	5	4	3	2	1	<1		Not treated
2001	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	<1	Not treated
2002	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Not treated
2003	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	Not treated*
2004	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	Mixed
2005	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	Mixed
2006	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	Mixed
2007	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	Mixed
2008	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	Mixed
2009	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	Treated
2010	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	Treated
2011	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	Treated
2012	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	Treated
2013	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	Treated
Years treated	0	0	0	0	0	0	1	2	2	3	3	4	4	5	6	6	

Notes: The shaded area shows cohorts that were eligible for full-day rather than (half-day) kindergarten and subsidized childcare, by birth cohort and year of eligibility. The dotted area shows the cohorts that are aged 12-17 in September of the calendar year at left, and so are included in the data on youth crime rates for that calendar year. The final column shows the treatment status used for the empirical analysis in this paper of the cohort aged 12-17 in the calendar year at left.
* Note that although 2003 is identified as 'not treated' we exclude it from the analysis along with the rest of the mixed group, both to exclude the effects of the YCJA (2003) and because children born in October to December of 1991 were in the first treated cohort and turned 12 in 2003. This makes very little difference to our estimates of the treatment effect, however.

For this analysis, we compare Quebec to the rest of Canada (ROC). Baker et al. (2008) found no significant changes in the effective subsidy of childcare prices for other provinces around the same time Quebec introduced its Family Policy in 1997. Thus, there is no reason to suppose that other provinces do not act as a reasonable control for Quebec, at least insofar as we focus on child care policy.

The econometric model used to estimate the effect of universal childcare on youth crime rates is:

$$crime_{pt} = \alpha + \beta PQ_p * Aff_t + \gamma X_{pt} + Prov_p + Year_t + \varepsilon_{pt} \quad (2)$$

where $crime_{pt}$ is the youth crime rate in province p at time t, PQ is a dummy variable equal to 1 for the province of Quebec, and Aff is a dummy variable equal to 1 for the affected cohort. The interaction of these two is therefore our intent-to-treat variable. X_{pt} includes the unemployment rate for 15-19 year olds and the number of police in the province as additional controls. $Prov_p$ and $Year_t$ are province and year fixed effects, respectively, and ε_{pt} is the error term. In our main specification we use total youth violations excluding criminal code traffic violations. We cluster the standard errors at the province level to deal with issues of common time-specific shocks within provinces. In addition, different population sizes by province can mean that errors are heteroskedastic across provinces, so we also show results from models that use youth population weights for each province-year observation.

As with most other studies of Quebec's Family Policy (Baker et al. 2008; Lefebvre et al. 2010), this approach gives us reduced form intent-to-treat estimates of the effect of the policy change on crime rates for all children in the affected cohorts in Quebec relative to those in the rest of Canada. Assuming there are no externalities or other feedback effects, the intent-to-treat estimates would be smaller than the effects of being in a subsidized space (the effect of treatment on the treated). This is because the policy increased use of daycare among 0-4 year olds by only around a third.

Since we do not have a fully specified model of crime rates, we are in effect assuming that any other factors that affect crime rates operated similarly in each year across every province. Given the results of the previous literature, a key issue here would be changes in policing behaviour in Quebec relative to other provinces. We do include a control for the number of police employed in the province, but there could be changes in policing policies that we do not observe. To allow for this possibility, we also estimate a triple differences model, using adult crime rates as a control for youth crime rates.

Adult crime rates in Quebec should not (yet) be directly affected by Quebec's child care policy. And if there were, for instance, some general trend towards stronger enforcement that affected arrest rates in Quebec, then so long as this affected both adult and youth population similarly, this will be accounted for in the triple differences approach. The econometric model for this strategy is:

$$Crime_{gpt} = \alpha_2 + \beta_2 PQ_p * Aff_t * Youth_g + Youth_g + Prov_p + Year_t + (Prov_p * Youth_g) + (Year_t * Youth_g) + \gamma_2 X_{pt} + \mu_{ptg} \quad (3)$$

where $crime_{ptg}$ is the crime rate in province *p* at year *t* for group *g* and $Youth_g$ is a dummy variable equal to one for the 12-17 year age group and zero for adults. The interaction term PQ*Aff*Youth takes a value of one for youth crime rates in Quebec after and including 2009 and zero for other observations in the sample, with β_2 being the estimated intent-to-treat effect of Quebec's universal day care.

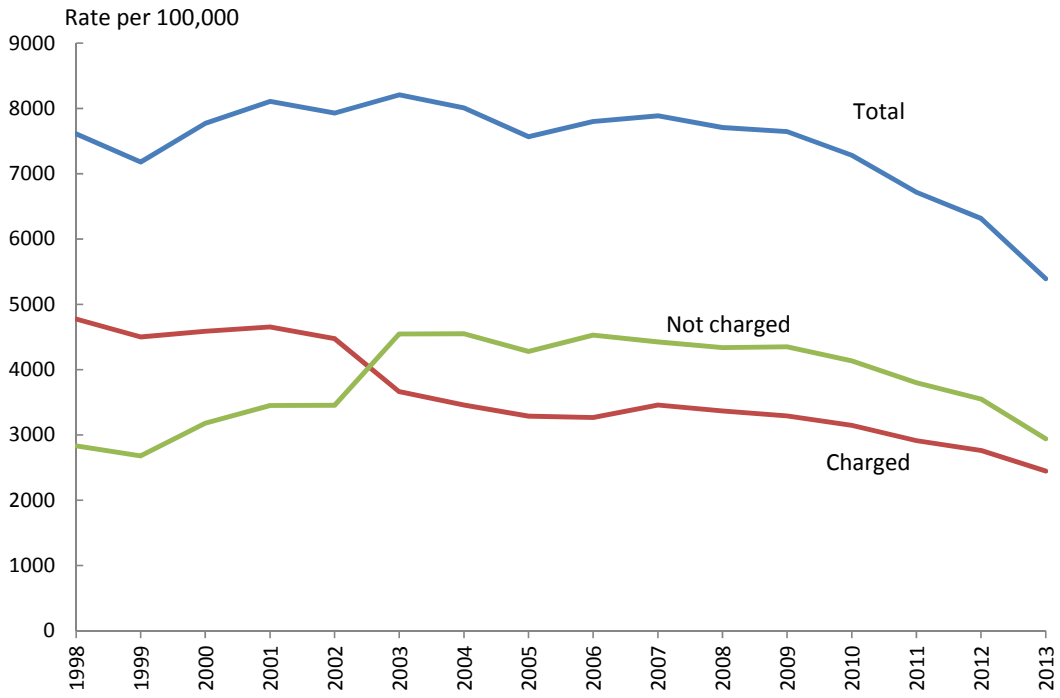
5.2 Data

We use data from Statistics Canada's key socioeconomic database, CANSIM. CANSIM Table 252-0051 contains aggregated data from incident-based crime statistics, with information by Canadian province/territory on crime rates for youth (aged 12 to 17) and adults from 1998 to 2013. We use CANSIM Tables 051-0001 and 282-004 for youth population statistics and youth unemployment rates, respectively.

After a youth is accused of a crime, there are two possible outcomes: 1) the accused is charged for the crime and is taken to trial in a court of law or 2) the accused is not charged and is diverted from the formal criminal justice system through the use of warnings, cautions and/or referrals to community programs (Perrault, 2013). We use the total number of youth charged and not charged, which we call youth accused of committing a crime.

There were around 129,000 youths in Canada aged 12 to 17 years accused of committing a crime in 2013, or roughly 5400 accused per 100,000 youths. This compares with 187,000 or 7600 per 100,000 youths in 1998. The rate of youth accused of any violation in Canada has fallen gradually since 2007, with some acceleration in the drop since 2010. Figure 5 shows the data on youth accused, charged and not charged in Canada from 1998 to 2013. Clearly, there was a switch in process between 2002 and 2003, when there was a large increase in youth not charged with a crime, and a corresponding drop in youth charged.

Figure 5. Total youth aged 12-17 accused, charged and not charged, Canada, 1998 to 2012



Source: CANSIM Table 252-0051, series v44361582 and v53080891.

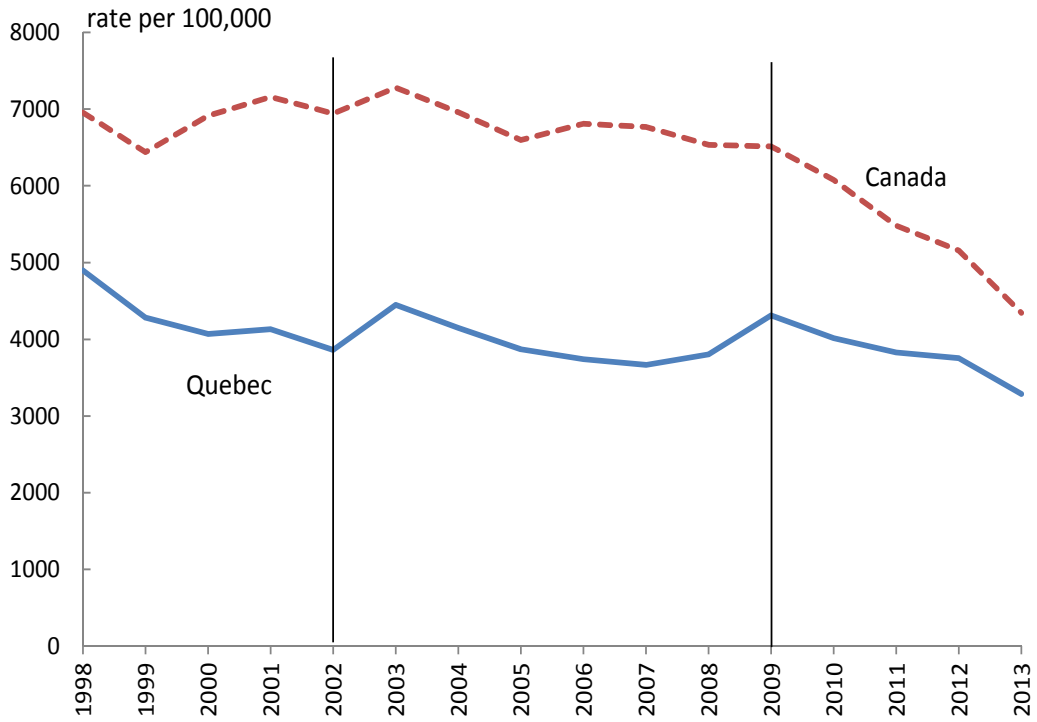
This is mostly a result of the implementation of the Youth Criminal Justice Act (YCJA).[6] The purpose of the YCJA was to increase the use of non-court responses to less serious offences by youth, allowing youth courts to focus on more serious cases of youth crime, as well as to reduce youth custody rates

[6] Refer to Appendix for a more extensive review of the YCJA and youth crime in Canada

for less serious offences. Since criminal law is under federal jurisdiction, this change took place throughout Canada, so it should not significantly affect our estimates of the effect of Quebec's family policy. We nonetheless choose to use aggregated data on total youth charged and not charged for this paper.

Figure 6 shows the rate at which youth are accused of all crimes except for criminal code traffic violations, for Canada and Quebec from 1998 to 2013.[7] In essence, this is a graphical representation of the estimating strategy in equation (2). Two key facts are clear: 1) Quebec's average youth crime rates are lower than in Canada as a whole; and 2) after 2009, youth crime rates in Canada as a whole fell somewhat faster than in Quebec.

Figure 6. Youth violation rate excluding criminal code traffic violations, 1998-2013



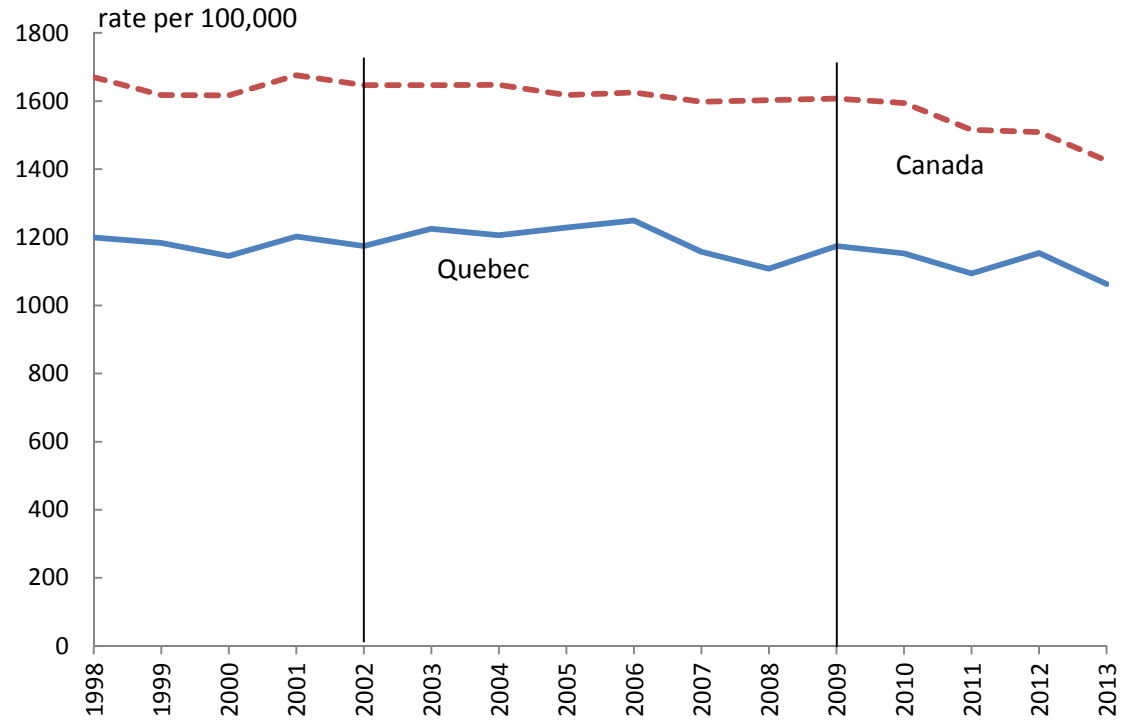
Source: CANSIM series v53080895, v53085996, v44383069 and v44349658. Violation rate includes youth charged and youth not charged.

[7] We exclude traffic violations because data youth charged and not charged for impaired driving was only available after 2007. It is relatively minor for most teenagers.

Figure 7 shows adult crime rates in Quebec and Canada as a whole. In both places, crime rates have drifted down slightly over time, but more slowly than for youth crime. There is also relatively little difference in the trends experienced in Quebec and Canada as a whole, suggesting that there are unlikely to be any province-wide factors that have led to different trends in overall crime rates in Quebec compared with the rest of Canada.

Although we have data on crime rates for Canada's ten provinces and three territories, we do not use the territories' data in our analysis. Crime rates in the territories are much higher than in other areas of Canada, and much more variable over time. Economic and social issues are also very different in those areas than in the more urban parts of southern Canada. As a result, we do not believe the territories constitute a useful comparison group for Quebec crime rates. That said, the results are basically similar when we include them in the analysis.

Figure 7. Adult violation rate excluding criminal code traffic violations, 1998 to 2013



Source: CANSIM series v44341438 and v44367252.

6. RESULTS

Table 3 shows our estimates of equation (2), the difference-in-differences specification, using both the number of crimes per 100,000 youth and its log as dependent variables, and showing results using unweighted and population-weighted regressions to account for possible heteroscedasticity. Standard errors are adjusted for clustering at the province level. The results are probably unsurprising given the trends shown in Figure 6. There is no evidence of a statistically significant decline in youth crime rates in Quebec relative to the rest of Canada. Indeed, all the point estimates are positive, with all estimates including control variables close to statistically significant at the 5% level.

The estimates are larger in magnitude when we use the population aged 12-17 as a weight in the regressions. This is, mathematically, because youth crime rates fell particularly dramatically in the two largest 'control' provinces – Ontario and British Columbia. It makes sense to rely on the population-weighted estimates if we think that, for instance, Ontario youth are a more suitable comparison group for Quebec youth than are youth from Prince Edward Island, and that therefore the trends in Ontario area better guide to what would have happened in Quebec in the absence of the Family Policy.

It is interesting that when we include socio-economic controls, the estimated effects of the policy get larger. Equally, however, it is possible that we are not including in our specifications some factors that affect youth crime rates and that vary across provinces and over time, such that our estimates of the treatment effect are biased. Again, we note that there is in the literature no agreement on what would constitute a fully-specified model of aggregate crime rates, and in any case we probably could not get data on all the possible factors that may affect crime. To address the possibility of an omitted variables problem, we posit that (1) there is no reason to believe that the Family Policy should have affected aggregate adult crime rates in Quebec as yet; and (2) that trends in adult crime rates by

province should give us a reasonable guide to a variety of other factors that may influence youth crime rates.

If (1) is true, then if we estimate equation (2) using adult crime rates, and the same treatment variable (that is, a dummy variable equal to 1 for all Quebec crime rates after 2009), then we should find a coefficient on treatment close to zero. The results of this 'placebo' regression are in Table 4. They show precisely that – small and statistically insignificant estimated effects of the treatment on adult crime rates. It does not, then, appear that there is any evidence that changes in the overall policing system or other provincial-level factors can easily explain the results in Table 3.

Table 3. Regression results for differences-in-differences specification (equation 2)

Dependent variable:	Crimes per 100,000 youth				ln(Crimes per 100,000 youth)			
	Unweighted		12-17 yo pop weighted		Unweighted		12-17 yo pop weighted	
Treatment effect (per 100,000 youth)	233	1150	1171	1706	0.01	0.143	0.178	0.22
	(0.39)	(1.88)	(2.39)*	(2.60)*	(0.11)	(1.53)	(2.57)*	(2.02)
15-19 yo unemployment rate (%)		170		292		0.02		0.034
		(1.84)		(3.51)**		(1.68)		(2.64)*
Number of police in province ('000)		-809		-562		-0.127		-0.085
		(0.81)		(2.87)*		(2.64)*		(3.48)**
Year Fe	y	y	y	y	y	y	y	y
Prov FE	y	y	y	y	y	y	y	y
Observations	100	100	100	100	100	100	100	100
R-squared	0.92	0.95	0.92	0.95	0.90	0.94	0.93	0.95

Notes: All specifications include province and year fixed effects. t-statistics in parentheses are clustered at the province level. * significant at 5% level; ** significant at 1% level.

Table 4. "Placebo" treatment effect, using adult crime rates rather than youth crime rates

Dependent variable:	Crimes per 100,000 adults				ln(Crimes per 100,000 adults)			
	Unweighted		Weighted		Unweighted		12-17 yo pop weighted	
"Placebo" effect	-59.2	-4.1	87.8	60.0	-0.032	0.001	0.057	0.037
	(0.54)	(0.04)	(1.32)	(0.54)	(0.72)	(0.03)	(1.68)	(0.70)
15-19 yo unemployment rate (%)		-4.2		11.2		-0.002		0.004
		-0.35		(1.01)		(0.35)		(0.78)
Number of police in province ('000)		-82		-65		-0.047		-0.034
		(1.78)		(1.64)		(2.38)*		(2.85)*
Year Fe	y	y	y	y	y	y	y	y
Prov FE	y	y	y	y	y	y	y	y
Observations	100	100	100	100	100	100	100	100
R-squared	0.97	0.97	0.97	0.97	0.97	0.98	0.97	0.98

Notes: All specifications include province and year fixed effects. t-statistics in parentheses are clustered at the province level. * significant at 5% level; ** significant at 1% level.

Table 5. Triple differences estimates of treatment effect (equation 3)

	Crimes per 100,000 individuals		ln(Crimes per 100,000 individuals)	
	Unweighted	Weighted	Unweighted	Weighted
Treatment effect	293	1,083	0.042	0.121
	(0.38)	(1.68)	(0.46)	(1.67)
R-squared	0.9872	0.9874	0.9962	0.9976
Observations	200	200	200	200

Notes: All specifications include province and year fixed effects, and both interacted with a youth dummy. t-statistics in parentheses are clustered at the province level. * significant at 5% level; ** significant at 1% level. No socio-economic controls are included.

Finally, the estimates from the triple differences model in Table 5 show results that are similar to those from the difference-in-differences model – that Quebec's youth crime rates were no lower than expected given trends in youth and overall crime rates in Canada's other provinces, although the coefficient estimates for the population-weighted regressions are somewhat smaller in magnitude and are no longer statistically significant at the 5% level. This is not surprising that the results are similar given that the 'placebo' regressions show at most a slight (but not statistically significant) rise in adult crime rates in Quebec relative to the rest of Canada after 2009. If youth crime rates reflect roughly similar socio-economic effects as adult crime rates, then these estimates should be preferable to the difference-in-differences estimates. That they are not in fact very different from each other suggests that there is not likely to be some other factor such as changes in policing practices that affected our measures of youth crime rates in Quebec after 2009 differently than in the rest of Canada.

The biggest differences in our estimates occurs when we use population weights in our regressions. We are somewhat concerned that using population weights might overemphasize the largest provinces in the analysis – in this case Ontario and British Columbia. While that might be justifiable

on the grounds that in many ways those two provinces are the most comparable with Quebec (particularly since both also have very large cities), we do not want to rely heavily on the findings of a positive effect of the policy change on youth crime rates in only the weighted regressions. Nonetheless, in the unweighted regressions our point estimates are typically positive but small in magnitude, which certainly does not suggest there is any strong evidence that the policy change led to a reduction in crime rates in Quebec.

7. DISCUSSION

Overall, we find no consistent evidence in the data that youth crime rates fell in Quebec relative to the rest of Canada after the introduction of the Family Policy – if anything, crime rates appear to have risen somewhat. This is different from the findings of previous studies of intensive, targeted early childhood interventions. There are two possible reasons why we might find no statistically significant negative effect of the policy. One is that there is nothing to find – that the policy truly did not reduce crime rates. The other is that the policy did reduce criminal activity in the treated cohorts, but the data and methods used here are not able to identify the effect.

Hemenway (2009) discusses some of the difficulties of finding 'nothing', particularly in time series analyses. Here, we have a policy change to help identify the policy effects, which mitigates these concerns. Nonetheless, we are attempting to identify an effect from a policy change that occurred one time, in one province. In essence, we have relatively little information, as is clear in the small sample size in general. Using data on individual-level crime data (as in Lefebvre et al. (2010), and Baker et al. (2008), for instance) may seem as though it would help better identify any effect of the policy, yielding apparently larger sample sizes – however, this is somewhat illusory, since any sample of the population will actually include fewer individuals and criminal acts than the data we use, which contains information on all youth accused of a crime in a province-year combination.

Having access to micro data would, perhaps, allow us to better estimate a treatment on the treated effect, and of course to consider effect heterogeneity, neither of which is possible using aggregated data. The first point is important given that not all children in Quebec were enrolled in the subsidized day care program. As a result, our estimates cannot be interpreted as the effect of being in a subsidized day care place on subsequent criminal activity. Rather, they show the effects on criminal activity of the cohort who were of an age to be eligible for subsidized day care. Suppose that only those who were actually enrolled in subsidized daycare were affected by the policy (ie there were no spillovers), then if the policy only affected a relatively small percentage of the population, then even a quite large effect on those individuals might not be observable in the aggregate data. This does seem somewhat unlikely, however. Day care use rates increased rapidly by around 30 percentage points between 1999 and 2004. If we had seen reductions in crime rates of the order of magnitude found in the Perry program, for instance, this should have been visible in the raw data. Furthermore, the data are informative on the question of the impacts on crime of an actually implemented, large-scale low-cost daycare program.

A related concern is that most youth crimes are committed by 16- and 17-year olds (see Appendix A, Figure A.2). As shown in Figure 3, youth aged 16- and 17-years old in the sample were children enrolled early in the program, from 1997 to 1999. This was still early in the roll out of the program, when supply of subsidized day care spots was still relatively low compared with even three years later. It is therefore possible that we are not observing the full effect of subsidized day care on the youth crime rates since my affected youth cohort includes 16- and 17- year olds who were in subsidized day care during Quebec's transition period.

That said, we believe there is good reason to think that in fact there may simply be nothing to find here. First, Quebec's family policy appears to have primarily increased the use of day care among children in relatively advantaged households. Lefebvre et al. (2010) found no significant change in

labour force participation of Quebec single mothers of young children while Baker et al. (2008) found a 7.7 percentage point increase in labour force participation of married women. Lefebvre et al. (2010) found that the increase in the use of day care was substantially larger for women in higher education groups, both in single- and two-parent households. This suggests that advantaged children in two-parent, high-educated and/or high-income households are the affected youth cohort in this paper. If it were the case that these children were in any case at low risk of committing crimes in the future, then it would not be surprising that the policy change had little effect on subsequent youth crime rates. Second, Baker et al. (2008) and Lefebvre et al. (2010) both found somewhat negative short-term effects of Quebec's policy change on child development. Lefebvre et al. (2010) found the use of child care was negatively associated with PPVT scores, a measure of children's early literacy skills. Baker et al. (2008) considered several measures for child development such as hyper-activity-inattention, anxiety, separation anxiety, physical aggressiveness, motor and social development. For almost every measure, the use of child care was associated with a decrease in child development. It may not be surprising, then, that we find no evidence of positive long-run effects, and some of negative effects. Third, while the Perry Pre-School program evaluations have found large drops in crime rates, that program was substantially different in character from Quebec's subsidized daycare program. Garces et al. (2002) found modest long-run effects for disadvantaged children of Head Start compared with more intensive programs such as Perry and Abecedarian. The Family Policy's different intensity and focus may well explain why we find little evidence of any reduction in crime rates in the affected group. Finally, if the policy had effects of an order of magnitude of the Perry Pre-school project, for instance, we would expect to see a 10-15% reduction in crime rates (a one third drop in crime rates for one third of the population). This is within the range of effects that would likely be statistically detectable given the data we use, particularly in the triple differences specifications – indeed, rather than finding a drop in crime rates of 10-15%, we find an increase in crime rates of roughly that order of magnitude in some cases.

8. CONCLUSION

The government of Quebec currently spends upwards of $1.6 billion every year for its subsidized day care program. The introduction of this program in 1997 pursued three objectives: to increase mothers' labour force participation, help parents maintain a manageable work-life balance, and enhance child development and bridge the gap between advantaged and disadvantaged children (Lefebvre et al., 2010). Looking at the research on the short-run effects of Quebec's day care program, it seems that the third objective, arguably the most important of the three, was not met. Our research has taken a first glimpse of the long run effects of Quebec's non-targeted, subsidized day care program. Overall, we found no evidence of any reduction in youth crime rates among the affected cohort.

Although there are limitations to our empirical strategy and data availability, there is some economic significance to take away from this paper. What is clear from the data is that youth crime rates in comparable provinces like Ontario and B.C. have fallen much faster than in Quebec after 2009. This is why we observed a positive estimated policy effect on youth crime rates. It is possible that Quebec's five percent average youth crime rate is the baseline and Ontario and B.C. are converging to this baseline. At the rate that Ontario and B.C.'s youth crime rates are currently falling, it is also possible that their youth crime rates will fall below five percent in the next few years while Quebec remains unchanged. If this were to happen, then one could be more confident in drawing the inference that youth crime rates really did increase in Quebec relative to the rest of Canada.

It would be useful to observe more years of the affected youth cohort for another reason. The current youth cohort we are observing was affected by the policy change while Quebec was slowly rolling out the program. The oldest youth in the early years of the sample had less access to subsidized childcare places than did subsequent cohorts. Indeed, enrolment seemed to stabilize at around half of 0-4 year olds only by around 2005. By that time, spending per space was also similar to that in Head Start, and the program was relatively established. The oldest of those children were 12 to 13 years old in

2013, and that group has relatively low crime rates. Including subsequent years of data may help to clarify the robustness of the results. It would be useful to revisit this analysis when that cohort reaches the age of 18.

Most importantly, because we only have aggregate crime data, this research does not address the differential effects of youth crime rates for disadvantaged and advantaged children. It would be interesting to attempt to use data on individual crimes to attempt to examine whether there were any differential effects of Quebec's subsidized day care program on youth crime rates for advantaged versus disadvantaged children. Estimating these effects by children's socioeconomic characteristics would help to reconcile the results of little effect of this universally available program, compared with the results from the Perry program, for instance. That said, previous research has found that the biggest effect on children in care of the Quebec Family Program was among children from relatively advantaged families. The policy had relatively little effect on the net price or on day care arrangements for children from less advantaged families. The results, then, are consistent with the possibility of heterogeneous treatment effects, with smaller to negligible effects of childcare on children from advantaged families and potentially large effects on children from relatively disadvantaged families. We cannot draw a clear conclusion on this issue, but can say that the results do not support the notion that a universal day care program is likely to lead to big reductions in subsequent youth crime rates.

Since we do not have information on the characteristics of the individuals who committed crimes, it is not possible to delve deeper into the effects of the policy, to ask whether there may have been a reduction in crime rates among particular subgroups of the population. A number of researchers find that the policy reforms had a larger effect on the child care decisions of middle and higher income families than of lower income families, in part because subsidies for child care were already available for lower income families. If it were the case that crimes were disproportionately committed by

children who grew up in lower income families, then, we might expect that this policy change would have little effect on crime rates. This illustrates the importance of considering how a particular policy is targeted when considering its likely long run socio-economic effects. In particular, it suggests that drawing inferences about programs designed to be universally accessible from studies on tightly targeted programs is not appropriate. As with the research on the short-run effects of Quebec's day care program, there is little evidence as yet to support the notion that Quebec's subsidized daycare program has led to significant improvements in outcomes of the children affected.

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APPENDIX A

YOUTH CRIME IN CANADA

Between 2011 and 2012, Canadian youth courts completed approximately 48,000 cases[8] involving 12- to 17-year olds. This represents a 10 percent decline from the previous year and the third consecutive annual decline (Dauvergne, 2013). This also reflects the lowest number of completed youth court cases since data was collected for 1991-1992 by Statistics Canada. Figure A.1 presents the number of cases completed in youth court over the past two decades.

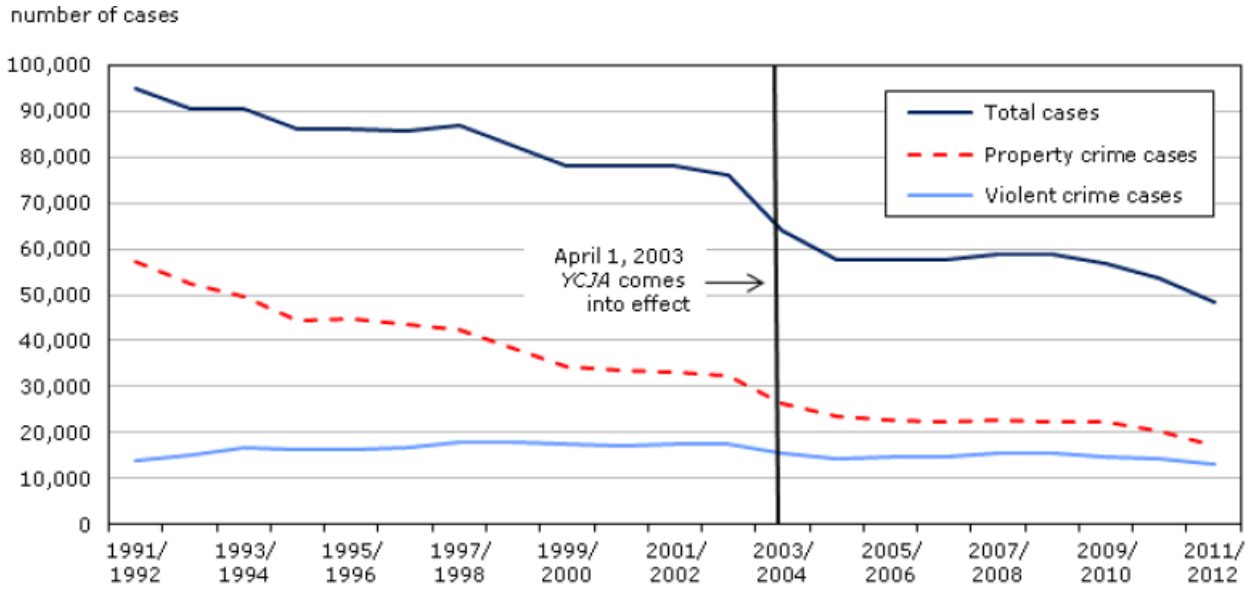

Figure A1. Cases completed in youth courts in Canada from 1991/1992 to 2011/2012
Source: Dauvergne, 2013

The Youth Criminal Justice Act

Criminal law is under federal jurisdiction. The Youth Criminal Justice Act (YCJA) is the law that governs Canada's youth justice system. This applies to youth between 12- and 17-years-old who are alleged to have committed criminal offences (Department of Justice, 2013). The YCJA was implemented in April 2003, completely replacing the Young Offenders Act (YOA).

[8] A case is one or more charges against an accused person that were processed by the courts at the same times and received a final decision. Age represents the age of the accused at the time of the offence.

Prior to the YCJA, the Department of Justice (2013) claimed that youth courts were dealing with a large number of relatively minor offences that did not require a court proceeding in order to hold the young offender accountable. One of the key objectives of the YCJA is to increase the use of "effective and timely" non-court responses to less serious offences by youth. Increasing the use of non-court responses enabled youth courts to focus on more serious cases of youth crime (Department of Justice, 2013). As presented in Figure A.1, it is not surprising that the number of youth court cases declined after the YCJA was implemented. Although the drop in youth court cases after 2003 was substantial, many cases continue to be processed through the courts (Dauvergne, 2013).

Most Common Youth Court Cases

Data consistently shows that crime rates peak during late adolescence and early adulthood (Dauvergne, 2013). Between 2011 and 2012, the majority (61 percent) of youth court cases were toward 16- and 17-year-olds, while 39 percent of cases were toward 12- to 15-year olds. Along with this, the majority of youth court cases involve men. Between 2011 and 2012, approximately 77 percent of youth accused were males. Figure A.2 presents cases completed in youth court, by gender and age between 2011 and 2012. The larger proportion of older youth was consistent for both males and females across most types of cases (Dauvergne, 2013).

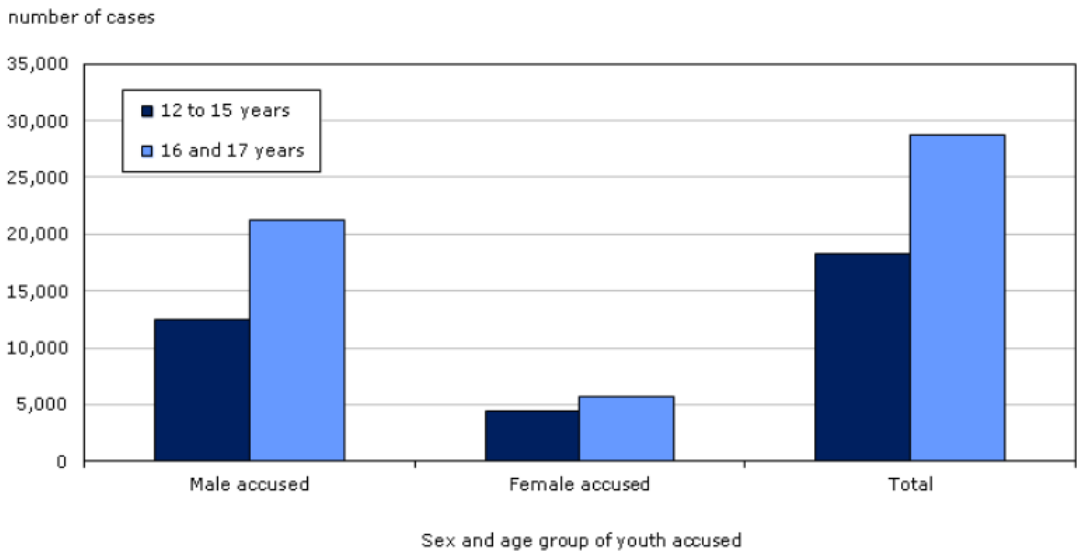

Figure A.2. Cases completed in youth court, by gender and age group of accused between 2011 and 2012.

Source: Dauvergne, 2013

The most common youth court cases involve property crime violations. This includes theft, breaking and entering, mischief and possession of stolen property. The most common type of violent youth court case was assault. Figure A.3 presents the ten most common cases in youth court. Similar to previous years, these ten types of cases accounted for 70 percent of total youth court cases (Dauvergne, 2013).

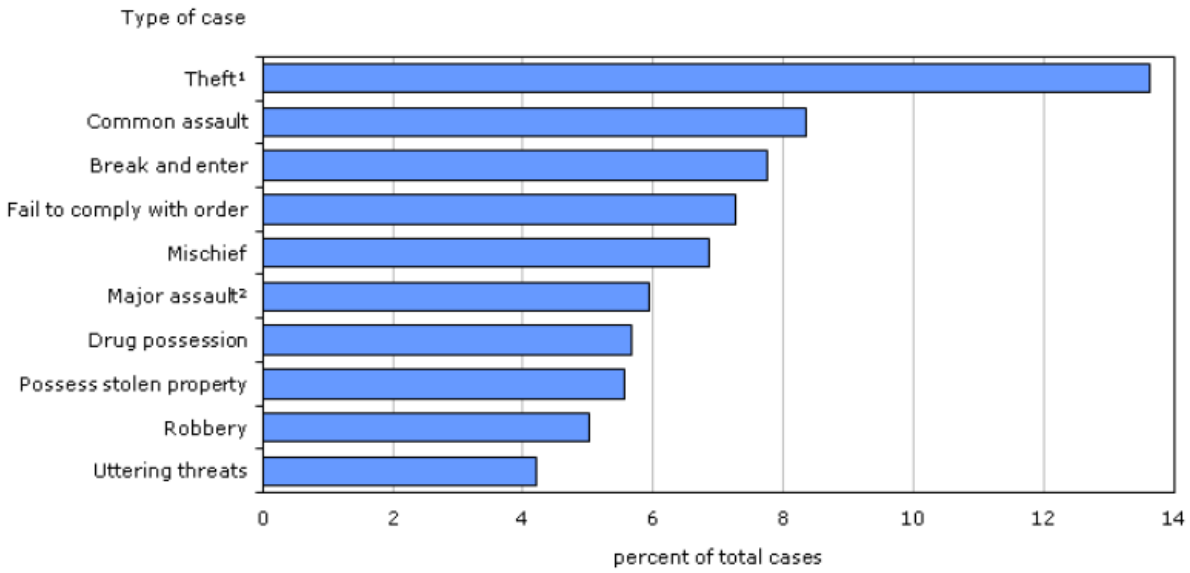

Figure A.3. Ten most common youth court cases in Canada between 2011 and 2012
Source: Dauvergne, 2013

Between 2010/2011 and 2011/2012, the decrease in the total number of completed youth cases was driven by fewer cases in almost every type of offence (Dauvergne, 2013). The most common property crime cases, theft and breaking and entering decreased by 17 and 15 percent respectively. Among violent youth crime cases, assault and criminal harassment decreased by 15 and 14 percent respectively. Cases that involved the possession of drugs and other drug crimes were among the few cases to increase (Dauvergne, 2013).