# The Long-Run Impacts of a Universal Child Care Program

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Past research has investigated the persistence of positive impacts of early-life interventions on child development as children reach older ages, with the strongest evidence for the importance of non-cognitive skills. We test the symmetry of these findings by studying the persistence of a sizeable *negative* shock to child development due to the introduction of universal child care in Quebec. We first confirm earlier findings showing reduced contemporaneous outcomes following the program introduction in Quebec. We then examine the persistence of these impacts into older ages in the spheres of non-cognitive skills, cognitive skills, health, and criminal activity. We find that the negative non-cognitive effects persisted to school ages, and also that cohorts with increased child care access subsequently had worse health, lower life satisfaction, and higher crime rates later in life. The impacts on criminal activity are concentrated in boys. Our results reinforce previous evidence on the central role of the early childhood environment for long-run success.

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An enduring question about early childhood development is the persistence of the impact of interventions as children age. The debate on Head Start in the United States, for example, has focused in part on whether positive effects found at younger ages fade through time. For example, Gibbs et al. (2013), Bitler et al. (2014), and Kline and Walters (2016) use data from a randomized experimental study of Head Start and generally find that the initial cognitive impact fades by first grade. Kline and Walters (2016) argue, however, that even that initial impact can have long-run impact on earnings. Using a regression discontinuity approach, Carneiro and Ginja (2014) found sizeable and persistent long-run benefits from Head Start program participation. With a similar focus on persistence, the re-examination of evidence on the Perry Preschool Project by Heckman et al. (2013) distinguished between positive cognitive effects which faded and positive non-cognitive effects which persisted. These long-run impacts led to improved economic outcomes and a lower incidence of criminal behavior, such that Heckman et al. (2010) find the measured annualized rate of return to the Perry Preschool investment is 6-10%.

These findings leave untouched an important question of symmetry: are there equally persistent and important negative long-run impacts of interventions that had an initial *negative* impact? This question is important because an affirmative answer would buttress the general case for the importance of the early childhood environment. When a supportive developmental environment is present, children may benefit in the long run. This case is made stronger with evidence that a deficient early environment has a long-run detrimental impact. Bertrand and Pan (2013) provide an example of such a finding, with evidence that childhood non-cognitive deficits account for the gender difference in teenage disruptive behavior.

In this paper, we develop a causal estimate of the long-run impact of an early childhood intervention on long-run later-life outcomes. To do so we study the largest experiment with universal child care in North America in recent years: an introduction of very low cost child care for children aged 0-4 in Quebec beginning in 1997. In an earlier paper (Baker, Gruber & Milligan 2008, henceforth BGM) we documented that Quebec saw large increases in maternal labor supply and in the placement of children in child care relative to the rest of Canada, where child care services remained unchanged. (See also Lefebvre and Merrigan 2008 and Lefebvre et al. 2009.) At the same time, there was a large, significant, negative shock to the preschool, non-cognitive development and health of children exposed to the new program, with little measured impact on cognitive skills. Subsequent research (Kottelenberg and Lehrer 2013) has confirmed that this negative contemporaneous impact of the program on young children's non-cognitive development has persisted as the program has matured.

Our analysis extends the study of the impact of a large universal childcare program to children at older ages, looking for persistence of effects in four main spheres: non-cognitive development, cognitive development, health, and crime. We begin our investigation by replicating earlier results showing that exposure to the Quebec child care program increased use of child care among children age 0-4, and led to lower non-cognitive outcomes at those ages as well.

We then proceed to our examination of persistence by providing new evidence for those aged 5-9 showing the negative effects on non-cognitive skills do not appear to have faded by those ages—and in some cases are even stronger. In this way, our results are a mirror-image of the Perry Preschool and Head Start evidence. We next explore the longer-run impacts of this

child care intervention in the preteen and teenage years on measures of cognitive development. Using two large national data sets on test score performance, we find no consistent evidence of any impact on test scores; the surveys give opposing answers for math scores, and show little effect on English or science scores. We do, however, find a significant decline in self-reported health and in life satisfaction among teens. Most strikingly, we find a sharp and contemporaneous increase in criminal behavior among the cohorts exposed to the Quebec program, relative to their peers in other provinces. We illustrate graphically a monotonic increase in crime rates among cohorts with their exposure to the child care program, and we show in regression analysis that exposure led to a significant rise in overall crime rates. We also find that these effects are concentrated in boys, who also see the largest deterioration in non-cognitive skills.

By showing that early shocks to childhood development can have persistent effects, our results reinforce previous research emphasizing the importance of early development for later-life outcomes, and also provide an important input for the current debate over child care policy. The rapid growth in female labor force participation has led policy makers around the world to consider increased public entitlement to child care for two-worker families. The Trump administration has maintained a policy focus on childcare for the US government. New York City is implementing a universal pre-kindergarten in 2017.[1] The evidence presented in this paper suggests that measurement of the near-term impact of these policy efforts can serve as a key indicator of the likely long-run success or failure of similar programs.

[1] See https://www.whitehouse.gov/the-press-office/2017/08/25/president-donald-j-trump-proclaims-august-26-2017-womens-equality-day and http://www1.nyc.gov/office-of-the-mayor/news/258-17/mayor-de-blasio-3-k-all#/0.

Our paper proceeds as follows. Part I provides a summary of the extant literature on child care and child outcomes. Part II discusses the Quebec reform. Part III then introduces the wide variety of data sources that we will use for the analysis, and discusses our empirical strategy. Part IV updates the results on the contemporaneous impact of the program, and Part V presents our results on the persistence of the impact. Part VI concludes.

## Part I: Background

There is now an enormous literature on the impacts of child care and preschool on the outcomes of young children, and a smaller literature that examines any longer-run impacts as the children age. Two important distinctions have emerged interpreting the evidence. First is whether the child care intervention being studied was targeted at children in more disadvantaged families or was universal and targeted at all families. Second, is any impact of the intervention on either cognitive or non-cognitive outcomes, both in the short and long run. We review this literature to place our results in context, with an emphasis on recent research.[2]

A recent view of effects of previous child care exposure on outcomes in adolescence suggest that more hours in child care in general does not affect test scores, but has a negative effect on non-cognitive outcomes, such as impulsivity and risk-taking (Vandell et al., 2010). That study, typical of many in the literature, relies on parental choice of child care mode, raising the question of whether any estimated impacts of child care mode are causal or due to selection by parent type. Similar problems affect the interpretation of the large existing literature in economics on maternal work and child outcomes.

[2] See a review of the literature up to 2008 in BGM, and in Baker (2011) and Cascio (2015).

A growing body of evidence comes from the use of experimental and quasi-experimental methods to examine the impacts of child care. Perhaps best known are programs targeted toward at-risk children; for example the experimental variation embedded in the evaluations of the Abecedarian and Perry Preschool interventions. These randomized trials from the 1960s have shown that high quality pre-school targeted to low-income children has substantial positive effects. For example, Heckman et al. (2010) estimate a statistically significant annual return of between 7 and 10 percent for the Perry Preschool intervention. Carneiro and Heckman (2003) summarize the evidence from these programs as improving motivation and social skills, while reducing crime and related behavior. Heckman et al. (2013) also argue that the non-cognitive improvements were pivotal to the long-run impact on participant outcomes.

Unlike the experimental evaluations of model programs, our paper focuses on a universal program that services a more economically and socially diverse group of children. In contrast to the literature on programs targeting at-risk children, the evidence on broader programs is mixed (see Baker 2011 and Cascio 2015 for recent overviews). In addition to the previous studies of the Quebec program, which are documented below, there have been evaluations of programs in Denmark, Norway, Spain and Germany.

Exploiting variation in access to center-based preschool (versus a family-based alternative) in Denmark, Datta Gupta and Simonsen (2010) report little effect on non-cognitive outcomes at age 7, and a negative impact of family child care[3] for boys of parents with low education. Black et al. (2014) utilize a discontinuity in the price of child care in Norway,

[3] Family child care is in private homes, but the caregivers are employed by the local municipality. The municipality approves the facilities and the qualifications of the caregivers.

reporting that while neither child care utilization nor parental labor supply is sensitive to price, they observe a positive impact on children's junior high school outcomes, presumably through a disposable income effect. Havnes and Mogstad (2011) explore an expansion of the Norwegian system, reporting positive impacts. The public system led to higher educational attainment (primarily for children of low education mothers) and earnings (mostly for girls) at ages 30–40. In a related paper Havnes and Mogstad (2014) provide more detail, finding that the earnings gains are primarily for children of low income parents and that children of upper class parents experience an earnings loss. Felfe et al. (2015) exploit variation across states in the expansion of the Spanish child care system, finding improvements in reading skills at age 15 of 0.15 standard deviations, driven by the impacts for girls and children from disadvantaged families. Finally, Cornelissen et al. (forthcoming) explore a policy reform of the German child care system which entitles every child to a place on their third birthday. They find child care attendance has a more positive effect for children from more disadvantaged backgrounds. While there are clearly studies here that report positive impacts of universal children programs, in many cases these impacts are primarily enjoyed by less advantaged children. There is a little clear evidence that these programs provide significant benefits more broadly.

Universal preschool has also been a focus of recent research in the United States. Many of these studies exploit age cutoffs for preschool enrollment comparing the youngest children in a preschool cohort to the children just a little bit younger who had to wait an additional year before enrolling. Perhaps the best known program is in Oklahoma. Gormley and Gayer (2005) document positive impacts for Hispanics and blacks, but not for whites, which is correlated with eligibility for free school lunch. Using a different cognitive measure Gormley et al. (2005) report

more broadly-based gains. A study of New Mexico's program (Hustedt et al. 2008) finds positive effects on math achievement and literacy in a sample that over represents Hispanics and Native Americans. Taking a wider view, Wong et al. (2007) examine preschool programs in five states (a mix of targeted and universal programs) on a variety of outcomes. They record positive impacts on a little more than half of the outcomes investigated. Finally, Fitzpatrick (2008) studies the introduction of pre-K program in Georgia, finding positive impacts for disadvantaged children in small towns and rural areas. As with the European studies, the recent American evidence mostly fits the pattern that the positive impact of universal programs is concentrated in more at-risk children.

Most relevant to the current paper is research on the introduction of universal child care in Quebec. The initial evaluation of this policy in BGM found striking negative impacts of the program on child non-cognitive and family outcomes. In a series of papers Kottelenberg and Lehrer show that the most of these negative effects of the program on young children and family outcomes measured shortly after it was introduced have persisted as the program has matured (2013), that the negative impacts on child outcomes are larger the younger the age the child entered the program (2014), that the impacts vary by the sex of the child (forthcoming). They also find in (2017) evidence of heterogeneous impact, with more positive outcomes for children in single-parent families. Haeck et al. (2015) present evidence that the program had negative effects on children's cognitive development at age 5. Finally, Brodeur and Connolly (2013) and Molnar (2017) focus on heterogeneity by education, with the former paper looking at life satisfaction and the latter time allocation.

To summarize, the literature on child care and preschool seems to indicate that high-quality interventions for low-income populations deliver both short and long-run benefits, particularly through non-cognitive channels. But universal child care expansions do not appear to provide broadly-based short-term benefits, with mixed evidence on long-term effects.

## Part II: The Quebec Universal Child Care Policy

Introduced in September 1997, the goal of the Quebec child care policy was to provide regulated child care places to all children aged 0-4 in the province at a price of $5 per day, with the rest of the cost covered by government subsidy. This program raised child care subsidies to almost 80 percent on average in the province, which can be compared to subsidies of roughly one-third in the other provinces.[4] Children were eligible for the program whether or not their parents worked. There was a phase-in period of 4 years starting with places for 4 year olds in 1997/98 and ending with places for 0 and 1 year olds in 2000/01.[5]

Child care under the program was provided in two venues. The first were child care centers (centres de la petite enfance--CPE) created out of existing nonprofit child care centers. The second was home-based care staffed by regulated providers and organized into networks affiliated with a local CPE. Typically older children enrolled in the CPE-based care and younger children were enrolled in family home-based care. The daily fee was raised to $7 a day in 2004 and to $7.30 in 2014. Haeck et al. (2015) report that the number of regulated child care places

[4] BGM report that the program raised subsidies for two parent households from 50% to 80%, while subsidies for single parent households rose from just under 70% to 80%. In the pre-policy period part of these subsidies were tax credits rather than direct subsidization of the price. A fuller description of child care subsidization in Canada in these years is presented in Baker et al. (2005).

[5] For older aged children the policy introduced (voluntary) full-time kindergarten and subsidized after-school care for children aged 5–12.

in the province rose from 78,864 in 1997 to 245,107 in 2012, while provincial subsidies to child care rose from 288 million dollars in 1996/97 before the program to 2.2 billion dollars in 2011/12.[6]

The introduction of the program was accompanied by some important reforms of the structure of child care provision. Formal qualifications for caregivers were raised[7] and operational regulations were modified.[8] The government also introduced new wage policies in the sector to make employment more attractive. Child care providers in both CPEs and family home facilities are unionized and have successfully used strikes to win better terms of employment and wages. In our analysis, we cannot distinguish the impacts of these supply side interventions on the quality of care from the reduction in fees which happened at the same time.

The program was first introduced to four year olds in September, 1997. So, children born before 1993 were not eligible. In 1998, three year olds were included, followed in 1999 by two year olds. Finally, in 2000, both zero and one year old children were included. So, birth cohorts from 1999 onward were eligible at all ages from zero to four, while those born between 1993 and 1998 were eligible for part of their early lives. This pattern of birth cohort eligibility means that outcomes for 15 year olds are available in 2014 for one fully-eligible cohort (1999

[6] There appears to have been queues for subsidized places at the start of the program. The magnitude of excess demand is hard to estimate, however, because waiting lists included children not yet eligible, children in subsidized care but wanting to change providers and children on multiple wait lists.

[7] The proportion of staff required to have a college diploma or university degree in early childhood education; rose from one-third to two-thirds. To facilitate this goal the government provided financial aid for staff enrolled in college-level early childhood education. Home-based providers faced increased training (24–45 hours) and annual professional development (6 hours) requirements.

[8] While maximum center size increased from 60 to 80 places, staff/child ratios remained unchanged, except the ratios for 4- and 5-year-olds rose from 1 : 8 to 1 : 10. There was also increase in parental participation in governance as their representation on the board of directors rose from 51% to two-thirds of members.

birth year), six partially eligible cohorts (born in 1993 to 1998; observed at age 15 between 2008 and 2013), and also completely ineligible cohorts (born in 1992 or earlier; observed at age 15 at or before 2007). We depict this cohort eligibility pattern in Appendix Figure 1.

## Part III: Data and Empirical Strategy

We make use of four types of data (consisting of six data sets) for our analysis to trace the long-run impact of the Quebec program from the period of treatment through to young adulthood, covering a variety of relevant outcomes. For all the data sources, our sample selection decisions are guided by how each source covered the cohorts exposed to program treatment. Below we describe each of the four data sources in turn.

### Child Care Enrollment and Child Outcomes: NLSCY and SYC

Our first datasets are the National Longitudinal Study of Children and Youth (NLSCY), which was the primary dataset in BGM and the Survey of Young Canadians (SYC). The NLSCY is a nationally representative survey of children, conducted biannually between 1994-95 (cycle 1) and 2008-09 (cycle 8). A cohort of about 2000 children for each age between 0 and 11 was selected in the initial cycle and followed throughout the entire survey. In subsequent waves new cohorts of 0-1 year olds were added but generally only followed until age 5. Therefore, in each wave the survey offers data on the first wave cohort, as well as children aged 0-5 and selected ages in the interval 5-9. The SYC was conducted in 2010/11 as a cross section survey of children aged 1-9. It included many of the questions on child development from the NLSCY and

therefore allows us to take a longer view of the developmental impacts of the Quebec Family Plan.

We use the NLSCY/SYC for two purposes, each with a different sample. First, we re-examine the contemporaneous impact of the Quebec Family Plan on some child outcomes. We benchmark our estimates to BGM taking the sample of children aged 0 to 4 from cycles 1 through 5 (excluding the transitional cycle 3, as in BGM). Next we extend this evidence by adding the data from the NLSCY cycles 6-8 and the SYC. Second, we want to see if the estimated contemporaneous impacts of the program persist into grade school. To do this, we take a sample of 5 to 9 year olds in cycles 1 and 2 (the 'pre' period) and compare them to 5 to 9 year olds in cycle 7 and the SYC. We restrict the post sample from the NLSCY to cycle 7 to ensure we have the same set of ages for the treatment and control groups.[9]

We focus on a number of outcome measures. First is a binary indicator for the child being in any type of non-parental care while the parent works or is at school. Next is a set of parent reported non-cognitive scores. These scores are built up from a menu of questions that parents answer about the behavior and development of their children. They are based on best practices in the relevant fields. An overview of the questions that make up each measure is provided in the Appendix.[10]

[9] Cycle 7 is the only one of the post treatment cycles with children at each age between 5 and 9 who are treated. The other cycles have holes at some ages. We have also run our results using all cycle 4 to cycle 8 observations within the age 5 to 9 range and the results are similar. We view the restricted sample we use for our main results as the more conservative approach.

[10] A more detailed discussion of the non cognitive measures in the NLSCY is available in the online appendix to BGM or from the authors on request.

At ages 2 and 3 we observe indices of Hyperactivity, Anxiety, Separation Anxiety, and Aggression.[11] For the 5-9 year olds we have indices of Hyperactivity, Anxiety, Aggression, Indirect Aggression and Prosocial Behaviour. While some of the indices for the older age group have the same names as corresponding indices for the younger children, they are based on a different set of age appropriate questions. We also investigate a parent report of how the child gets along at school with his/her teacher. Finally, we examine the Peabody Picture Vocabulary Test (PPVT) score as a measure of cognitive development.

Test Scores: SAIP/PCAP and PISA

To measure the impact of the Quebec program on test scores of older children, we turn to two different data sets. The first data set combines data from the School Achievement Indicators Program (SAIP) and subsequent Pan Canadian Assessment Program (PCAP), which are initiatives of the Council of Ministers of Education. The SAIP initiated in 1993 is a set of tests to assess the performance of 13 and 16 year old students across the country, in the core subjects of math, reading and science. The tests were conducted 9 times between 1993 and 2004, each time focusing on one of the core subjects. The PCAP succeeded the SAIP, and has been conducted triennially starting in 2007. Each PCAP focuses on one of math, reading or science; just like SAIP. Unlike SAIP, a smaller sample of students writes tests in the other non-focal subjects. This means that scores for each subject are available in each PCAP wave. We pool data from SAIP and PCAP to construct analysis samples for each subject area. Each subject

[11] For the non-cognitive outcomes we focus on 2-3 year olds (as in BGM) within the 0-4 age group, because the measures do not exist for children ages 0-1 and as noted, the non-cognitive indices for 4 year olds are based on different questions.

sample contains data from the 2007, 2010, and 2013 PCAPs, while the math sample adds SAIP data from 1997 and 2001, the reading sample adds SAIP data from 1998 and the science sample adds SAIP data from 1996.

The second data set comes from the Programme for International Student Assessment (PISA), which is a triennial test of 15 year olds conducted by the OECD in countries around the world. This testing program was initiated in 2000, and covers the core subject areas of math, reading and science. The international nature of the PISA means it is not tailored to the curriculum of a particular school system. Our analysis sample includes the Canadian test scores from 2000, 2003, 2006, 2009, 2012 and 2015.

Health and Well-Being: CCHS

To assess the impact of the child care intervention on the health of older children, we use the Canadian Community Health Survey (CCHS). The CCHS offers biannual data for 2001, 2003, and 2005 of approximately 130,000 observations; followed by annual surveys of around 65,000 observations starting in 2007. We use all available surveys—the latest data is for 2015. The sampling coverage of the survey is national, with a range of questions on individual health behaviors and outcomes. We use questions on self-assessed health, life satisfaction, and mental health. We examine a sample of 12 through 20 year olds, which in the chosen years contains both individuals who were and were not exposed to the child care program at younger ages.

Criminal Behavior: UCRS

We combine special tabulations of crime accusations[12] and convictions from Statistics Canada's Uniform Crime Reporting Survey (UCRS) with single age population counts to construct crime rates by age, sex, province, year cells. The UCRS is a survey of police reported crime.[13] This means that the crime incident has been substantiated by the police and therefore the survey misses crimes that are never detected and/or not reported to the police.

We examine rates (separately) for crimes against persons, crimes against property, "other criminal code violations", and drug violations; as well as an aggregate crime rate based on these four categories.[14] For our age groups most "other criminal code violations" involve failures to appear in court and breaches of probation.[15]

Our data is for the years 2006 through 2014. We start the analysis in 2006 to stay clear of any impact of the introduction of the Youth Criminal Justice Act in 2003. We discuss this choice in depth below. As in our analysis of the CCHS, we construct our sample for 12 through 20 year olds. We exclude the data from 2010 because of missing data for that year from Montreal, the largest city in Quebec.

[12] The accused includes those charged plus those dealt with through the use of extrajudicial measures.
[13] Responding to the coverage is mandatory and survey compliance is reported as "virtually 100 percent" (http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=3302).
[14] We omit the traffic crime category as in most provinces the legal driving age is 16, and there are graduated licensing schemes that impose significant restrictions on older teenaged drivers. We also omit a residual 'other federal statute violations' that includes violations under legislation such as the Bankruptcy Act and the Competition Act.
[15] Other prevalent youth crimes are theft under $5000, assault, mischief, breaking and entering, cannabis possession, uttering threats and possession of stolen property. See Zhang (2014) for a recent comparison of youth and adult crime rates by offence.

Empirical Strategy

For all but the crime analysis, the empirical strategy is a straightforward difference-in-difference analysis that follows BGM. This empirical framework compares the pre and post program outcomes of children/teenagers in Quebec, to the corresponding outcomes of child/teenagers in the rest of Canada. We estimate models of the form:

(1) $Y_{ipt} = \alpha + \beta EXPOSURE_{pt} + \pi PROV_p + \delta YEAR_t + \lambda X_{ipt} + \varepsilon_{ipt}$

where *i* indexes individual children, *p* indexes province, and *t* indexes year in the survey. We control for a set of province dummies ($PROV_p$) and year dummies ($YEAR_t$ ), as well as control variables that vary (according to availability) by data set but can include gender, child's age, mother's age and education, the number of older and younger siblings, and mother's /father's/family's immigrant status and ethnicity. The full set of explanatory variables by data set is reported in a table in the Appendix. We focus on the estimation of β, the coefficient on exposure to the Quebec child care program. We standardize the measures of non cognitive and cognitive outcomes. Standard errors are clustered by province and birth-year cohort.

For the crime analysis, we have data that covers a larger number of cohorts over a larger number of years. This allows us to estimate a more flexible version of equation (1) in which we introduce a full set of province/child age/gender interactions as well as province-specific time effects.

Scaling Reduced Form Results

As discussed in BGM, our modeling of outcomes is a reduced form of an underlying process through which the Quebec policy impacts maternal labor supply and child care

utilization. To interpret the results structurally, in that paper we either scaled the estimated effects by the impact of the Quebec policy on maternal labor supply (a 7% rise) or by its impact on use of child care (a 14% rise). But we also noted that the effects could be even broader as the program led to a large shift in the locus of child care as well. Haeck et al. (2015) show that between the mid-1990s and 2008 the proportion of children, aged 1-4, who were in center-based care as their primary arrangement rose in Quebec from under 10 percent to close to 60 percent, while in the rest of Canada it rose from about 10 percent to just under 20 percent. The proportion in parental care fell from around 55 percent to roughly 25 percent in Quebec over this same period, while the similar proportion in the rest of the country fell from just under 60 percent to about 50 percent, where it has stabilized since 1998. By this metric the proportion of treated children in Quebec is much higher than the proportion that moved into non parental care with the advent of the program.

There are therefore a wide variety of "first stage" estimates one could apply to the longer run reduced form impacts we estimate here. As a result, we are reticent here to interpret any of our longer run results in a structural way, and focus instead on the sign and significance of our reduced form findings.

Additional Factors

In our previous study of the Quebec program we limited our analysis sample to children in two-parent families. This choice minimized any possible confounding effects of concurrent changes to Canada's National Child Benefit on our sample of 0-4 year olds. Due to income testing, this program benefits single-parent households disproportionately. As noted in Baker

and Milligan (2010) roughly 90 percent of children are born into two-parent families in Canada, so this restriction is not as limiting as it might be in other countries.

As we turn our focus to children at older ages, the restriction to children in two-parent families makes less sense. Due to family dynamics, at older ages children currently living in single-parent families may have lived in two-parent families when they were young. Likewise, children currently in two-parent families may have been born into single-parent households. We therefore sample children in all family types.

BGM report a limited set of results demonstrating that the main findings of the study extend to the children of single-parent households. We develop this point further in our re-examination of the contemporaneous impacts of the program on the outcomes of young children from all families. Milligan and Stabile (2011) provide evidence indicating the changes to child benefits had positive impacts on child development. Therefore, any bias from including children from single-parent families in our sample will attenuate many of the impacts of the Quebec Family Plan we report.[16]

Another factor relevant to our analysis of teenage criminal activity is that the Youth Criminal Justice Act (YCJA) came into effect on April 1, 2003. The YCIA is a federal act governing the prosecution of youth crimes across the country. Quebec has a history of taking a more rehabilitative approach to youth criminal activity. One of the impacts of the YCJA was to make the rest of Canada more like Quebec, in that it encouraged the use of extrajudicial remedies

[16] The impact of child benefits is much more important for single-parent families, as the benefits examined in Milligan and Stabile (2011) are narrowly targeted on a fairly modest range of family incomes.

instead of the courts for less severe crimes.[17] Correspondingly there appears to be a sharp drop in the proportion of youth offenders charged in most provinces in 2003 and corresponding uptick in the proportion chargeable but not charged (Carrington and Scholenberg 2005). An exception is Quebec, no doubt reflecting the province's pre-existing proclivity for extrajudicial measures for youth crime. As evidenced in Bala et al. (2009), this impact appears mostly discrete to the year the Act was implemented, and the rates of charged and otherwise cleared youth crimes "settled" into new post YCJA levels by about 2005. As a result we use crime data starting in 2006 to stay clear of this impact of the YCJA. We also note that by examining both accusations and convictions we provide evidence of criminal activity both prior and post to the application of any extrajudicial remedies.

## Part IV: Contemporaneous Impacts

In this section we model the contemporaneous impact of exposure to the Quebec Family Plan on childcare use and non-cognitive skills. We begin by replicating earlier analysis showing a substantial increase in the use of non-parental care. We then reproduce our earlier results on the negative effects on non-cognitive skills of young children. Note that we normalize the non-cognitive scores and PPVT to have zero mean and unit standard deviation, but the patterns of statistical significance and sign are similar if we specify them as the ordinal scores.

[17] As argued by Trepanier (2004) the YCJA also put some limits on Quebec's rehabilitative approach (for example, no rehabilitation while accused is remanded in custody) and was perceived as a triumph of the principle of proportionality over rehabilitation and reintegration.

In Table 1 we report the impact of the Quebec program on selected outcomes of young children. This table is different from the original analysis in BGM because we now include children of both single-parent and two-parent families, as discussed above.

In the first row is the estimate of the effect of the Quebec program on the probability of the child being enrolled in child care at ages zero through four. At just under 15 percentage points, this result almost exactly matches the estimate in our previous paper (0.146). Extending the sample by the additional waves of the NLSCY and the SYC leads to a larger estimate, which might be expected as the supply of subsidized child care spaces expanded as the program matured. This latter estimate represents an increase in child care use of just over 40 percent of the baseline rate.

In the next four rows are the estimates of the impact of the program on non-cognitive outcomes at ages 2 and 3. Note that in each case we have created the variable so that a higher score indicates a poorer outcome. The components of each score are listed in the Appendix. The estimates using waves 1, 2, 4, and 5 echo the results in BGM in terms of statistical significance—statistically significant estimates for Anxiety and Aggression but not for Hyperactivity and Separation Anxiety. They are marginally smaller in magnitude than the estimates in our previous paper, although not enough to qualitatively change our inference.[18] Adding the additional waves of data leads to a statistically significant estimate for Hyperactivity, and maintains the inference for Anxiety and Aggression. Also, the estimates are generally stable in magnitude across the two samples, with the exception of the result for Aggression, which is just under 50 percent larger.

[18] In BGM the estimates for Anxiety and Aggression are 9 percent and 12 percent of a standard deviation, respectively.

To investigate further, in figure 1 we graph the Quebec-ROC mean difference in the dependent variable for the Aggression score for ages 2-3 by cycle. We can see the emergent difference in the Quebec-ROC outcome starting in cycle 4, in which we see the first treated cohorts. The difference grows over the cycles, then drops sharply in cycle 8 and then "recovers" in cycle 9 (the SYC). We are not aware of any issues with the final cycle (8) of the NLSCY that would lead to this apparent sampling anomaly.[19]

In the last row is the estimated impact of the program on a measure of cognitive development—PPVT—at ages 4 and 5. It is a decline of 11 to 14 percent of a standard deviation depending on sample, and is statistically significant at conventional levels. This result, while consistent with Haeck et al. (2015), is not consistent with the estimate in BGM. However, the estimate in BGM was for the sample of 4 year olds, and the addition of five years olds here explains the difference.[20]

The results in table 1 demonstrate that the main conclusions of BGM for young children of two-parent families extend to the full sample of young children from all family types, and persist as the program has matured. The Quebec program led to a substantial increase in the use of child care and increases in children's levels of anxiety and aggression. One difference between the results here and in BGM is the small negative impact on children's cognitive development as measured by the PPVT, although that distinction is driven by the age group used for the sample.

[19] A similar drop and recovery in cycles 8 and 9 are observed in the corresponding graphs for Separation Anxiety and Hyperactivity, but not for Anxiety.

[20] When we restrict the sample to 4 year olds we obtain an insignificant estimate of -0.250 (0.843), consistent with the insignificant result (0.36 with standard error of 0.75) in BGM.

## Part V: Persistence of Impacts at Older Ages

We now turn to the examination of the persistence of the impacts at older ages. The analysis begins with the use of several behavioral non-cognitive scores at ages 5-9, and then moves on to cognitive test scores at early teen ages. Following that we examine health outcomes, and finally criminal behavior.

### Non-cognitive outcomes

As noted above, the questions about behavior in the NLSCY are different for ages 4-11 than for ages 2-3. This means that for older children, we have two new indices for Prosocial behavior and Indirect Aggression, and that the indices for Hyperactivity, Anxiety, and Aggression, while similar in name to the indices in table 1, are based on a changed set of age-appropriate questions (see the Appendix for details). The index of Prosocial behavior is coded so that a higher score indicates a poorer outcome in order to be consistent with the other results. We again normalize the non-cognitive scores to have zero mean and unit standard deviation.

The results are presented in table 2. The results for the non cognitive outcomes (the first 5 rows) show that the Quebec program's negative effects on non-cognitive skills appear to strongly persist into school years, and in some cases are larger than at younger ages. For Anxiety the impact is now just over one quarter of a standard deviation, which is more than twice as large as for 2-3 year olds, while for Aggression the estimate is very similar to the result for the younger age group. New here is a statistically significant impact on Hyperactivity of 13

percent of a standard deviation. For the two new indices we see a statistically significant impact on Indirect Aggression of 19 percent of a standard deviation, while the result for Prosocial behavior is very close to zero.

For the older children we also have an alternative measure of behavior, a parent-reported indication of how the child gets along with his/her teacher at school. The variable is coded 0/1, where one indicates the child gets along very well with his/her teacher (there are no problems). The estimate for this variable is in the last row of table 2. It is consistent with the results for the non-cognitive indices, in that it indicates exposure to the Quebec program leads to a statistically significant worse outcome.

Taken together, the negative impact of the Quebec program on the non-cognitive outcomes of young children appears to persist and in some cases grow as they reach school ages.

Cognitive Outcomes

We now turn to the study of cognitive outcomes. Unfortunately, there is no parallel verbal cognitive measure available in the NLSCY at older ages to follow up on the PPVT result in table 1. Moreover, we are unable to follow any impact of the Quebec program on quantitative aptitude at older ages in the NLSCY due to issues with the standardized math tests in the first waves.[21] Instead we use data from periodic standardized testing of Canadian teens through

[21] While school aged children in the NLSCY did complete a standardized test in math, there were problems with its delivery in waves 1-3. First, in the initial wave of the survey, a ceiling effect—a disproportionate number of perfect scores—was detected. This ceiling effect was particularly pronounced for the province of Quebec, and it persisted in the second wave of data (see documentation of these problems with the math test in the NLSCY microdata user guides for Cycle 1, Cycle 2, and Cycle 3). Second, the response rate to the math test was low and variable in the first waves of the survey. For example, just over 50 percent in wave 1 completed the math test. This response rate

SAIP/PCAP and PISA. Note that the 2009 PISA scores are likely to capture both teenagers in Quebec who were and were not exposed to the child care program. We consider different coding of the EXPOSURE dummy for the 2009 scores to discover how the estimates vary on this margin.

The estimates are presented in table 3. The standard deviations of the scores are approximately one so the point estimates can be read directly as proportions of a standard deviation. In the first row are the results for the PCAP/SAIP tests. The estimates indicate negative but statistically insignificant impacts of exposure to the Quebec program on math scores, reading, and science scores.

In the next two rows are the results for the PISA tests alternatively viewing the 2009 scores as capturing Quebec children who are not or who are exposed to the child care program. If we view the 2009 scores as pre-program, we obtain a statistically significant positive impact of exposure in math of just over 30 percent of a standard deviation, a marginally significant increase for reading of 10 percent of a standard deviation and result for science which is statistically insignificant and close to 0. If instead we view the 2009 scores as post-program, the impact on math is still positive but smaller at 20 percent while the impacts on reading and science are both close to zero and statistically insignificant.

On balance the results in table 3 do not provide strong evidence of a persistent negative impact of the Quebec program on cognitive ability, as first evidenced on table 1 in PPVT scores. The least precise inference is for math scores. The estimates show exposure to the Quebec

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increased to 74 percent in wave 2, and then fell back down to 54 percent in wave 3. Since these waves wholly constitute the pre-program data available in the NLSCY, we do not include the math scores in the analysis.

program leading to a decrease in the SAIP/PCAP but an increase in PISA scores.[22] The results for reading and especially science provide a more consistent story of no impact of the Quebec program. Overall there is no strong evidence in these estimates that the Quebec Family Plan had a lasting impact on children's cognitive development.

Health and Life Satisfaction

We next study the impact of exposure to the Quebec program on health status and on life satisfaction using the CCHS survey. The results of this analysis are shown in Table 4. We use a sample with ages 12-20 for this analysis. The dependent variables are based on continuous scores between 1 and 5, running from better to worse. These scores are normalized by the standard deviation for our regressions. We have a measure of self-perceived health, another for satisfaction with life in general, and finally self-perceived mental health.

The estimate indicates that exposure to the Quebec program is associated with some worsening of self-reported health. For youths exposed to the program, the poor health indicator rises by 7.3 percent of a standard deviation. The estimate for life satisfaction is smaller, but still statistically significant, and again indicates a poorer outcome from exposure to

[22] The relatively stronger performance of Quebec students on PISA measured math testing is a matter of some public debate in Canada, and has been attributed by some in the popular press to higher levels of teaching training. In Quebec a teaching certificate requires a 4 year degree in education while in most other provinces a certificate can be obtained after an undergraduate degree with 1 to 2 years of additional study. Quebec students make the transition to high school instruction (courses taught by subject specialists) in grade 7 while in most other provinces it is in grade 9. See for example, https://beta.theglobeandmail.com/news/national/education/quebec-students-place-sixth-in-international-math-rankings/article15815420/?ref=http://www.theglobeandmail.com& accessed September 1 2017) or http://www.ottawacitizen.com/life/adds+reason+students+math+scores+higher+quebec+than+rest/14561639/story.html (accessed September 7 2017).

the program. Finally the estimate for metal health is negative but very small and statistically insignificant.

Overall, these results give some indication of a worsening of both health and life satisfaction among those older youths exposed to the Quebec child care program.

Youth Crime

Our final measure of longer-run outcomes is youth criminal activity. In evaluations of the Perry Preschool Project, the long-run impact on crime was a vital component of the analysis.[23] Our aim here is to investigate whether the link between non-cognitive development and crime holds up in a symmetric case where there is a *decrease* in measured non-cognitive development. As noted above, we have two measures of criminality—rates of accused and convictions. We focus on four crimes (personal, property, other criminal code convictions and drugs), as well as an aggregate measure of the incidence of all of these crimes.

To lay the foundation for this analysis, Figures 2 and 3 show cohort-specific age profiles of *differences* in crime rates between Quebec and the rest of Canada. Figure 2 has the number of accused per 100,000 and figure 3 has the number of convictions per 100,000. The mostly-negative values indicate that the crime rate in Quebec for these cohorts was lower than the rest of Canada at these ages.

The cohorts displayed in these figures vary by their exposure to the Quebec program. For example, the bottom light solid line in each graph shows the difference between the crime

[23] Belfield et al. (2006) find that crime reduction by males provides most of the long-run financial benefit of the Perry Preschool program. Heckman et al. (2013, p. 2070) find in their study of Perry that "…the evidence from this paper suggests that reducing early externalizing behavior reduces crime."

rate in Quebec and the crime rate in the rest of Canada, at each age, for those born before 1993. These children were not exposed to the child care program in Quebec. The light grey short-dashed line shows the same differences for those born in 1993, who had one year of exposure (at age 4). The light grey long-dashed line shows the differences for those born in 1994, who also had one year of exposure. The dark grey lines show the results for cohorts born between 1995 and 1997, who had two to three years of exposure. The final set of black lines at the top shows the results for cohorts born from 1998 to 2001, who had three to five years of exposure.

The differences in the age profiles by cohort in these graphs are quite striking: there is a mostly monotonic shrinking of the difference between the crime rates in Quebec and the rest of Canada with years of exposure to the Quebec program. That is, as cohorts in Quebec were more exposed to the program, their crime rates rose relative to the rest of Canada.

This visual representation allows us to rule out results driven by an aging effect in the composition of our sample: more exposed cohorts show higher crime rates at every age compared to those in the rest of Canada. The graphs also allow us to examine the possibility that our results are driven only by a time series effect. Comparing data points for a given year, more-exposed children have higher crime rates than less-exposed children.[24] This is striking evidence that exposure to this program is associated with higher levels of crime.

In the appendix we show similar figures for the four specific crime types that we study. The story is similar to that told by figures 2 and 3—a positive effect of exposure to the child

[24] For example, consider 2010. Those born in 1993 are age 17 in 2010, those born in 1995 are 15 in 2010, and those born in 1997 are 13 in 2010. The line formed by these data points slopes up to the left, indicating that the more exposed cohorts had more crime relative to the rest of Canada. The same pattern generally holds at other years as well.

care program on crime rates for each type of crime. For drug accusations, the profiles are more compressed, but still show the same pattern.

In table 5 we formalize this inference with regression estimates. In column (1) we present the simple difference-in-differences results, where we control for fixed effects for province, year, age, and gender. In addition, we also include a set of dummies for crime type in the pooled regression for all crime types. In column (2) is a richer specification that includes the full set of second order interactions between province, age and gender (and crime type in the regressions for the aggregate rates). Finally, in column (3) we add controls for province*year trends to allow for province-specific trends in crime rates (as well as crime type*province*year in the aggregate rate regressions).

The estimates are generally consistent with the graphical evidence: exposure to the Quebec program leads to higher rates of crime. Looking first at all crime counts, the estimates from the simple difference-in-differences specification indicate increases in both the rates of accused and convictions that is statistically significant. This estimate for rates of accused does not change much when we add the second order province/age/gender interactions in the second column, but there is an increase in the estimates for convictions. In column (3) the estimate for accused falls but remains sizable and highly significant, while the estimate for convictions returns to the level seen in column (1).

The estimates from the richest specifications indicate sizeable effects on crime rates. For accused across all categories, we estimate a rise of 353 crimes per 100,000 children, compared to a mean of 1872 crimes. This is a rise of 19 percent. The result is slightly higher in percentage terms for convictions per 100,000 (22 percent).

The remaining rows of the table show the results for each type of crime. The impact of exposure to the Quebec program is largest for property crime; the estimates from the richest specification show an increase in accusations of these crimes of 602 per 100,000 children, or 19 percent of the mean, and for convictions for these crimes of 342 per 100,000, or about 25 percent of the mean. The estimated impacts on other criminal code violations are almost as large. Slightly smaller are the estimated impacts on crimes against persons, at 16 percent of the mean for both accusations and convictions. Finally, the impact for drug crimes is 14 percent of the mean for accusations but over 23 percent of the mean for convictions.

Heterogeneity in the Impact of the Quebec Child Care program on the Outcomes of Children at Older Ages

We next present estimates of the effect of the Quebec program by gender. Gender differences are of potential importance as there is recent evidence that the impacts of non-parental care vary by gender,[25] as well as growing interest in gender differences in childhood and adult success.[26] Gender differences in life outcomes have also captured the popular imagination, with some arguing that male attributes are at odds with changes in social and economic norms (e.g., Rosin 2012). Certainly the increasing prevalence of the non-parental care of children in developed countries, make it an obvious candidate to explain any emerging differences in the outcomes of men and women.

[25] In addition to the evidence in table 6 see, for example, Datta Gupta and Simonsen (2010), Felfe et al. (2015) and Kottelenberg and Lehrer (forthcoming).
[26] See for example, Baker and Milligan (2016), Bertrand and Pan (2013), Cornwell et al. (2013), Fortin et al. (2015) and Jacob (2002).

In Table 6 are estimates of the impact of the Quebec program on non-cognitive skills at ages 5-9, by gender. We see much stronger impacts for most measures for boys. For example, the negative impacts on Hyperactivity and Aggression are primarily for boys, and the estimates are one-fifth and almost one third of a standard deviation, respectively. For girls the strongest effect is on prosocial behavior, which worsens by almost 20 percent of a standard deviation. The larger impacts for boys on aggression in particular suggest that there may be gender differences in the impact of the program on criminal activity later in life.

Indeed, that is what we see in the gender splits in crime rates in Table 7. The estimates indicate larger absolute impacts on the crime rates for boys, particularly for other criminal code violations and drugs.[27] In fact in our richest specification some of the estimates for girls are substantively smaller and lose some statistical significance. Therefore, the gender differences in the impacts of the Quebec program on crime rates line up with the gender differences in the impact of the program on non-cognitive development.

## Part VI: Conclusions

The rapid growth in the labor force participation of mothers of young children has led to a strong policy interest in expanding access to non-parental child care. In particular, there has been much interest expressed in "universal" child care availability. Although that term has come to take many meanings, the best example in North America is clearly the program introduced in Quebec in the late 1990s. This program made child care much cheaper for all residents and led to an enormous expansion in use of child care by the population. Previous

[27] Baseline crime rates are also higher for boys, but what matters here is not the share of crimes committed by boys but whether there is more criminal activity when there is a reduction in population non-cognitive skills.

work has shown that this policy change led to a large decline in measured non-cognitive skills among young children exposed to the subsidized child care. We use this initial negative shock to assess whether there is persistence of the negative impact on longer-run outcomes that mirrors findings in the literature that link positive early-life interventions to positive longer-run outcomes.

Indeed, our evidence is generally consistent with such symmetry. We find that the Quebec policy had a lasting negative impact on the non-cognitive skills of exposed children. At older ages, program exposure is associated with worsened health and life satisfaction, and increased rates of criminal activity. Increases in aggression and hyperactivity are concentrated in boys, as is the rise in the crime rates. In contrast, we find no consistent impact on their cognitive skills.

The implications of these findings for early child care policy are potentially profound. Our findings provide strong support for the argument that the early childhood development environment is a crucial determinant of the long-term success of children. This suggests that measuring the contemporaneous impact of child care programs on development indicators is important because it is predictive of later-life success.

In evaluating the implications of our results for the universal option, the key question for policy makers is whether the evidence of negative impacts are particular to the Quebec program, or whether the lessons apply more broadly to other such expansions in child care. Our findings for young children clearly contrast with those of the Perry, Abecedarian, and Head Start studies. These latter programs both provide higher quality care and are targeted at less advantaged children. An important outstanding question is whether a universally-provided child

care program can have widespread positive impacts on child development. If so, our results together with evidence such as Heckman et al. (2013) suggest such a program could lead to long-run positive outcomes.

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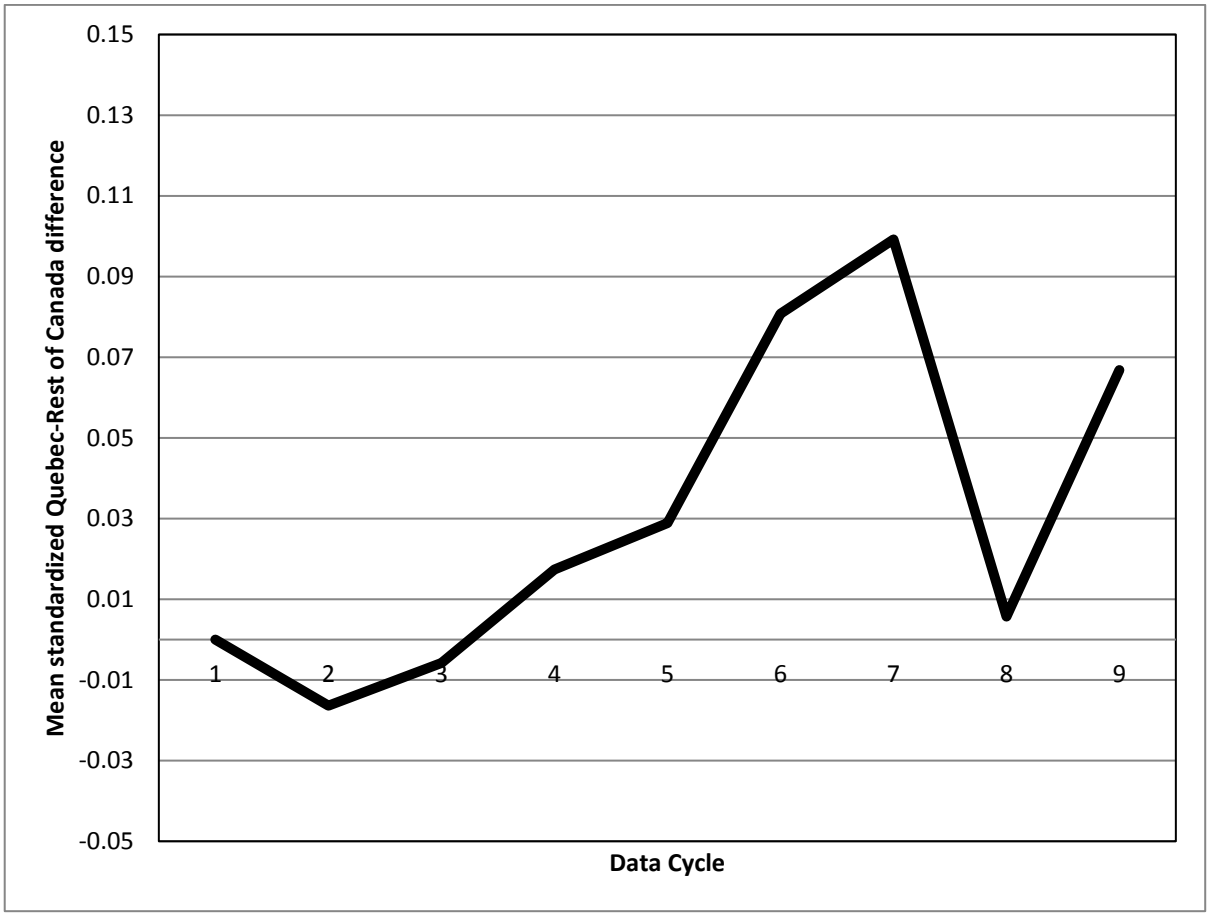
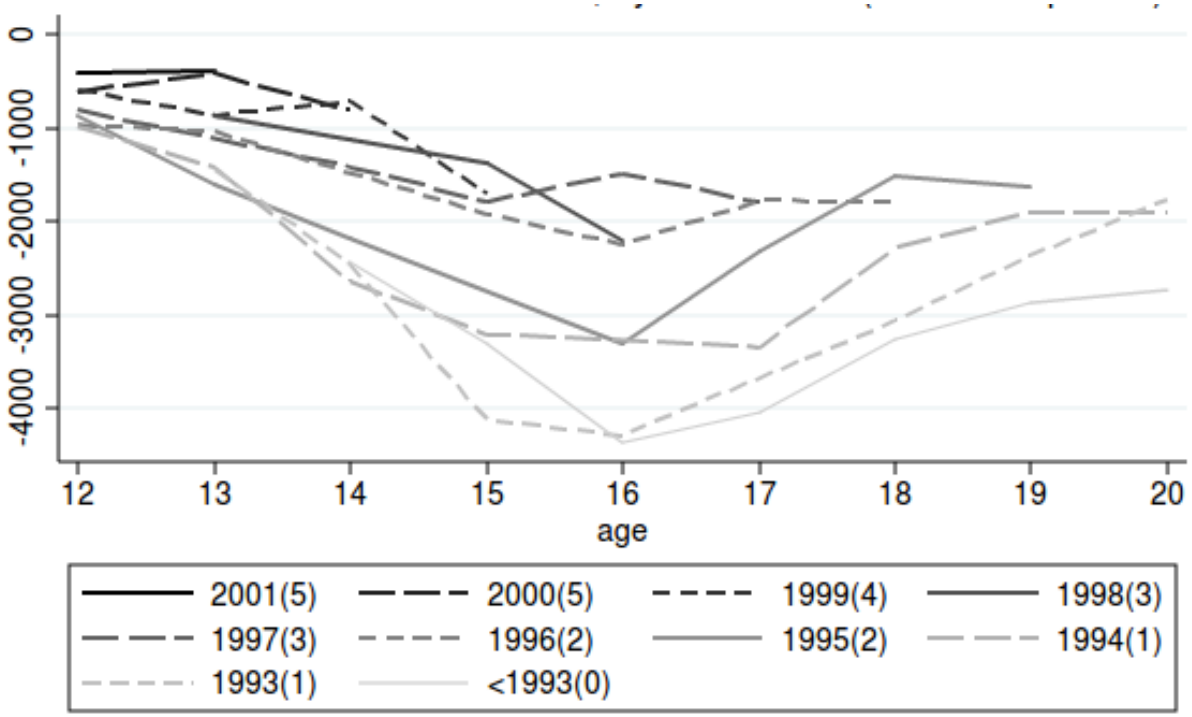
**Figure 1: Standardized Aggression Score, Ages 2-3**



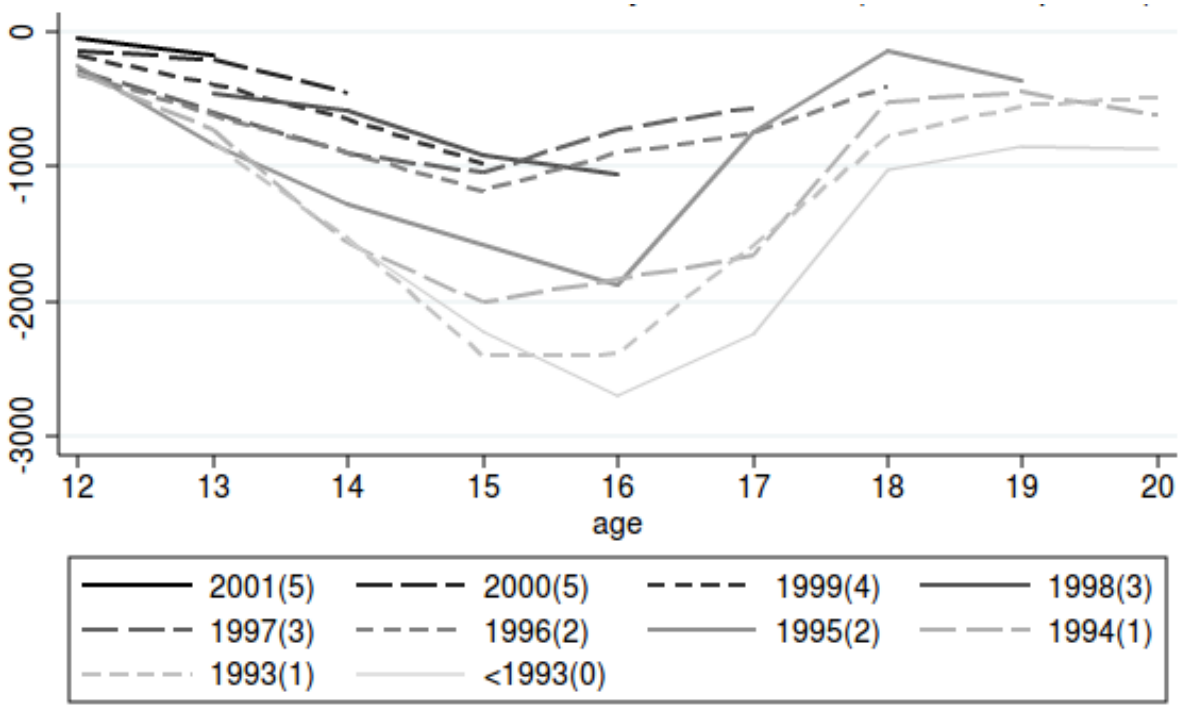

Notes**:** source is the NLSCY (cycle 1-8) and the SYC (here labeled as cycle 9). The graph shows the mean standardized difference between Quebec and the rest of Canada across cycles.

**Figure 2: All Crime Types, Accused per 100,000 People**




Notes: Source is the Universal Crime Reporting Survey. Graph shows Quebec-Rest of Canada difference by year of birth. The legend shows the year of birth with the number of years of exposure to the childcare program in parentheses.

**Figure 3: All Crime Types, Convictions per 100,000 People**




Notes: Source is the Universal Crime Reporting Survey. Graph shows Quebec-Rest of Canada difference by year of birth. The legend shows the year of birth with the number of years of exposure to the childcare program in parentheses.

**Table 1: Impact of Exposure to the Quebec Family Plan on Child Care and Measures of Non-cognitive and Cognitive Outcomes at Young Ages**

| Outcome | Mean | EXPOSURE | |
|---|---|---|---|
| "Cycles" | 1,2,4,5 | 1,2,4,5 | 1,2,4-9 |
| In Care | 0.46 | 0.143*** | 0.197*** |
| | (0.50) | (0.031) | (0.026) |
| Hyperactivity | 2.86 | 0.065 | 0.070** |
| | (2.12) | (0.048) | (0.035) |
| Anxiety | 1.25 | 0.115*** | 0.119*** |
| | (1.50) | (0.027) | (0.033) |
| Separation Anxiety | 2.76 | 0.073 | 0.063 |
| | (2.03) | (0.047) | (0.042) |
| Aggression | 4.98 | 0.117*** | 0.156*** |
| | (2.95) | (0.040) | (0.043) |
| PPVT | 99.98 | -0.109** | -0.116*** |
| | (15.29) | (0.045) | (0.041) |

Notes: Authors' calculations from NLSCY/SYC data. "Cycle" 9 is the SYC. Sample includes all families. The sample ages are 0-4 years for In Care; 2-3 years for (standardized) Hyperactivity, Anxiety, Separation Anxiety and Aggression; and ages 4-5 for (standardized) PPVT. Reported is the coefficient on a dummy indicating exposure. Significance at the 10, 5, and 1 percent levels is indicated with 1, 2, and 3 asterisks respectively.

**Table 2: Impact of Exposure to the Quebec Family Plan on Measures of Non-cognitive Outcomes at ages 5-9**

| Outcome | Mean | EXPOSURE |
|---|---|---|
| Hyperactivity | 4.09 | 0.130** |
| | (3.14) | (0.050) |
| Anxiety | 2.49 | 0.278*** |
| | (2.30) | (0.041) |
| Aggression | 1.36 | 0.169*** |
| | (1.82) | (0.039) |
| Indirect Aggression | 1.00 | 0.190*** |
| | (1.55) | (0.017) |
| Prosocial | 13.48 | 0.006 |
| | (3.90) | (0.048) |
| Child gets along with Teacher (parent report) | 0.80 | -0.084*** |
| | (0.40) | (0.023) |

Notes: Authors' calculations from NLSCY (waves 1, 2 and 7) and the SYC. Sample includes all families. Reported is the coefficient on a dummy indicating exposure. Significance at the 10, 5, and 1 percent levels is indicated with 1, 2, and 3 asterisks respectively.

**Table 3: Impact of Exposure to the Quebec Family Plan on Standardized test Scores**

| | Math | | Reading | | Science | |
|---|---|---|---|---|---|---|
| | Mean | EXPOSURE | Mean | EXPOSURE | Mean | EXPOSURE |
| SAIP/PCAP | 0.125 | -0.181 | 0.107 | -0.237 | 0.060 | -0.062 |
| | (0.986) | (0.118) | (1.000) | (0.181) | (0.990) | (0.059) |
| PISA (2009 control) | 0.119 | 0.308*** | 0.144 | 0.100* | 0.122 | 0.036 |
| | (0.998) | (0.050) | (0.973) | (0.050) | (0.991) | (0.081) |
| PISA (2009 treated) | 0.119 | 0.200** | 0.144 | 0.053 | 0.122 | 0.020 |
| | (0.998) | (0.084) | (0.973) | (0.048) | (0.991) | (0.087) |

Notes: Authors' calculations from SAIP/PCAP and PISA test score data. Sample includes all families. Reported is the coefficient on a dummy indicating exposure. Significance at the 10, 5, and 1 percent levels is indicated with 1, 2, and 3 asterisks respectively.

**Table 4: Impact of Exposure to the Quebec Family Plan on Self-Reported Health Outcomes**

| Age | 12-20 | |
|---|---|---|
| | Mean | EXPOSURE |
| Health | 2.09 | 0.073*** |
| | (0.85) | (0.019) |
| Life Satisfaction | 1.61 | 0.043*** |
| | (0.62) | (0.017) |
| Mental Health | 1.90 | -0.011 |
| | (0.88) | (0.020) |

Notes: Authors' calculations from CCHS and CHMS data. Sample includes all families. Reported is the coefficient on a dummy indicating exposure. Significance at the 10, 5, and 1 percent levels is indicated with 1, 2, and 3 asterisks respectively.

**Table 5: Impact of Exposure to the Quebec Family Plan on Crime Rates, Ages 12-20**

| | Mean | (1) | (2) | (3) |
|---|---|---|---|---|
| Accused | | | | |
| All | 1872 | 514*** | 590*** | 353*** |
| | | (77) | (60) | (69) |
| Person | 1839 | 530*** | 649*** | 299*** |
| | | (84) | (68) | (81) |
| Property | 3100 | 566** | 932*** | 602*** |
| | | (100) | (132) | (172) |
| Other CC | 1604 | 639*** | 563*** | 379*** |
| | | (121) | (64) | (68) |
| Drugs | 945 | 322*** | 217*** | 130*** |
| | | (73) | (27) | (28) |
| Convictions | | | | |
| All | 963 | 208*** | 323*** | 212*** |
| | | (37) | (39) | (44) |
| Person | 1002 | 292*** | 323*** | 167*** |
| | | (51) | (43) | (59) |
| Property | 1363 | 112* | 455*** | 342*** |
| | | (61) | (70) | (93) |
| Other CC | 1059 | 289*** | 311*** | 239*** |
| | | (57) | (50) | (54) |
| Drugs | 429 | 140*** | 203*** | 99*** |
| | | (27) | (26) | (29) |

Notes: Authors' calculation from the Uniform Crime Reporting data. In column (1) are estimates from the difference in differences specification. In column (2) are estimates that add all second order province, age, gender interactions. In column (3) are estimates that add province, year trend interactions. Reported is the coefficient on a dummy indicating exposure. Significance at the 10, 5, and 1 percent levels is indicated with 1, 2, and 3 asterisks respectively.

**Table 6: Gender Differences in the Impacts of the Quebec child care program on Non cognitive skills**

| | Hyperactivity | Anxiety | Aggression | Indirect Aggression | Prosocial | Get Along with Teacher |
|---|---|---|---|---|---|---|
| Girls | 0.060 | 0.177*** | 0.060 | 0.161*** | 0.199*** | -0.068*** |
| | (0.061) | (0.019) | (0.040) | (0.041) | (0.059) | (0.019) |
| Boys | 0.201*** | 0.387*** | 0.295*** | 0.241*** | -0.217*** | -0.106*** |
| | (0.063) | (0.074) | (0.054) | (0.047) | (0.058) | (0.031) |

Notes: Authors' calculations from NLSCY (waves 1, 2 and 7) and the SYC. Sample includes all families. Reported is the coefficient on a dummy indicating exposure. Significance at the 10, 5, and 1 percent levels is indicated with 1, 2, and 3 asterisks respectively.

**Table 7: Impact of Exposure to the Quebec Family Plan on Crime Rates by Gender, Ages 12-20**

| | All | | Person | | Property | | Other CC | | Drugs | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Girls | Boys | Girls | Boys | Girls | Boys | Girls | Boys | Girls | Boys |
| Accused | | | | | | | | | | |
| (1) | 378*** | 638*** | 376*** | 673*** | 581*** | 542*** | 378*** | 880*** | 176*** | 458*** |
| | (52) | (106) | (50) | (122) | (87) | (136) | (65) | (179) | (41) | (109) |
| (2) | 326*** | 844*** | 427*** | 862*** | 639*** | 1213*** | 194*** | 917*** | 46*** | 382*** |
| | (51) | (75) | (59) | (89) | (121) | (164) | (45) | (102) | (14) | (51) |
| (3) | 158** | 539*** | 200*** | 396*** | 282 | 906*** | 126* | 622*** | 26** | 233*** |
| | (74) | (76) | (71) | (116) | (194) | (191) | (68) | (112) | (12) | (55) |
| Convictions | | | | | | | | | | |
| (1) | 162*** | 247*** | 176*** | 399*** | 206*** | 15 | 196*** | 371*** | 70*** | 204*** |
| | (25) | (52) | (27) | (78) | (36) | (101) | (34) | (82) | (18) | (39) |
| (2) | 148*** | 490*** | 174*** | 465*** | 278*** | 625*** | 93*** | 519*** | 47*** | 353*** |
| | (26) | (56) | (32) | (61) | (49) | (104) | (36) | (79) | (10) | (47) |
| (3) | 81** | 337*** | 97** | 235*** | 133** | 541*** | 78 | 393*** | 15 | 181*** |
| | (35) | (62) | (44) | (89) | (66) | (140) | (52) | (90) | (10) | (53) |

Notes: Authors' calculation from Uniform Crime Reporting data. In rows titled (1) are estimates from the difference in differences specification. In rows titled (2) are estimates that add all second order province, age, gender interactions. In rows titled (3) are estimates that add province, year trend interactions. Reported is the coefficient on a dummy indicating exposure. Significance at the 10, 5, and 1 percent levels is indicated with 1, 2, and 3 asterisks respectively.

**APPENDIX**

**Appendix Table: Control Variables Available in the Various Analysis Samples.**

| | NLSCY/SYC | CCHS | CHMS | SAIP/PCAP | PISA | UCRS |
|---|---|---|---|---|---|---|
| Male | Dummy | Dummy | Dummy | Dummy | Dummy | Dummy |
| Province | Dummies | Dummies | Dummies | Dummies | Dummies | Dummies |
| Year | Dummies | Dummies | Dummies | Dummies | Dummies | Dummies |
| Own Age | Dummies | Dummies | Dummies | | | Dummies |
| Month of Birth | | | | | Dummies | |
| Mother's Education | Dummies | | | | Dummies | |
| Mother's Age | Dummies | | | | | |
| Father's Age | Dummies | | | | | |
| Highest Education in Family | | Dummies | Dummies | | | |
| Two Parent Family | Dummy | Dummy | Dummy | | | |
| Number of Younger Siblings | Dummies | | | | | |
| Number of Older Siblings | Dummies | | | | | |
| Number of Children in Household <12 | | Dummies | Dummies | | | |
| Mother is Immigrant | Dummy | | | | Dummy | |
| Father is Immigrant | | | | | Dummy | |
| Child born in Canada | | Dummy | Dummy | | | |
| Family is not "white" | | Dummy | Dummy | | | |

## Behavioral Scores

The behavioral scores in the NLSCY and SYC are built up from individual questions with three categorical responses, typically “never/rarely”, “sometimes” “often/always”. Each response is assigned 0, 1, or 2 points corresponding to the three categories, and then added up across the questions to form the behavioral score. There are some differences in questions across the age 2-3 and age 5-9 samples. The underlying questions for the SYC were identical to the NLSCY. More detail on these scores is available in the online appendix to Baker et al. (2008).

The list below indicates what questions are used to form each behavioral score we use in this paper.

| **Behavioral Scores** | **Ages 2-3** | **Ages 5-9** |
|---|---|---|
| **Hyperactivity** | | |
| Can’t sit still, is restless or hyperactive? | X | X |
| Is distractible, has trouble sticking to any activity? | X | X |
| Can't concentrate, can't pay attention for long? | X | X |
| Has difficulty awaiting turn in games or groups? | X | X |
| Is inattentive? | X | X |
| Cannot settle to anything for more than a few moments? | X | X |
| Is impulsive, acts without thinking? | | X |
| **Anxiety** | | |
| Seems to be unhappy, sad or depressed? | X | X |
| Is not as happy as other children? | X | X |
| Is too fearful or anxious? | X | X |
| Is worried? | X | X |
| Cries a lot? | | X |
| Is nervous, highstrung or tense? | X | X |
| Has trouble enjoying him/herself? | X | X |
| **Separation Anxiety** | | |
| Cries a lot? | X | |
| Clings to adults or is too dependent | X | |
| Constantly seeks help | X | |
| Gets upset when separated from parents? | X | |
| Doesn’t want to sleep alone | X | |

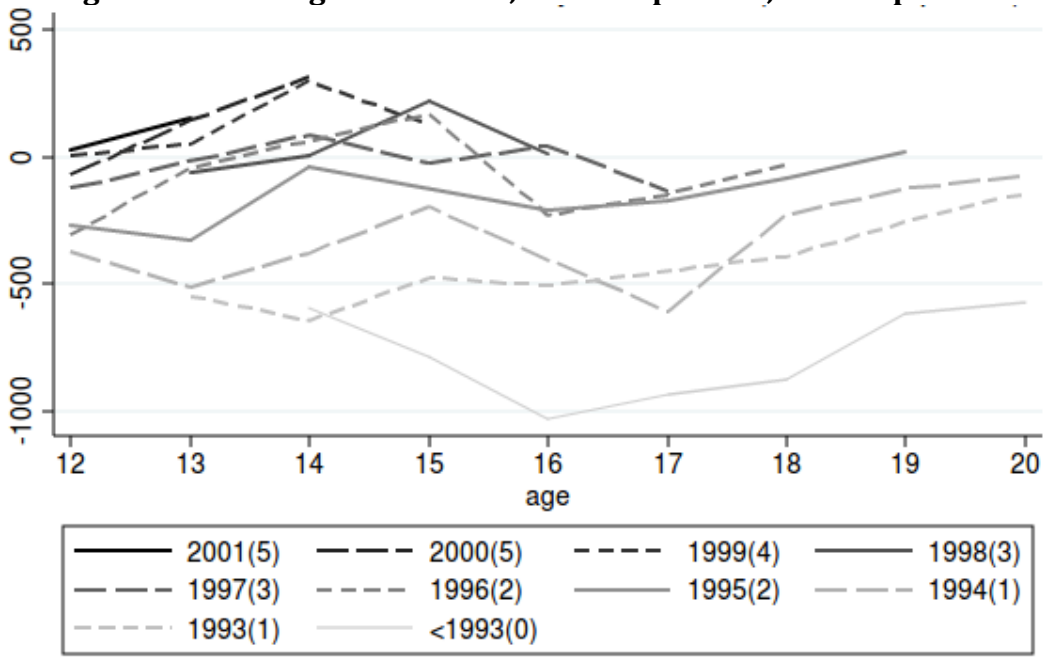
| Behavioral Scores | Ages 2-3 | Ages 5-9 |
|---|---|---|
| **Aggression** | | |
| Gets into many fights? | X | X |
| When another child accidentally hurts him/her (such as by bumping into him/her), assumes that the other child meant to do it, and then reacts with anger and fighting? | X | X |
| Physically attacks people? | | X |
| Threatens people? | | X |
| Is cruel, bullies or is mean to others? | | X |
| Kicks, bites, hits other children? | X | X |
| Is defiant? | X | |
| Doesn't seem to feel guilty after misbehaving? | X | |
| Punishment doesn't change his behaviour? | X | |
| Has temper tantrums or hot temper? | X | |
| Has angry moods? | X | |
| **Indirect Aggression** | | |
| When mad at someone, tries to get others to dislike that person? | | X |
| When mad at someone, becomes friends with another as revenge? | | X |
| When mad at someone, says bad things behind the other's back? | | X |
| When mad at someone, says to others: let's not be with him/her? | | X |
| When mad at someone, tells the other one's secrets to a third person? | | X |
| **Prosocial** | | |
| Shows sympathy to someone who has made a mistake? | | X |
| Will try to help someone who has been hurt? | | X |
| Volunteers to help clear up a mess someone else has made? | | X |
| If there is a quarrel or dispute, will try to stop it? | | X |
| Offers to help other children (friend, brother or sister) who are having difficulty with a task? | | X |
| Comforts a child (friend, brother, or sister) who is crying or upset? | | X |
| Spontaneously helps to pick up objects which another child has dropped (e.g. pencils, books, etc.)? | | X |
| Will invite bystanders to join in a game? | | X |
| Helps other children (friends, brother or sister) who are feeling sick? | | X |
| Takes the opportunity to praise the work of less able children? | | X |

**Appendix Figure 1: Cohort Map for Program Eligibility.**

| Year Of Observation | Age 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1997 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1998 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1999 | 0 | 0 | 1 | 1 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2000 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2001 | 1 | 2 | 2 | 2 | 3 | 2 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2002 | 1 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2003 | 1 | 2 | 3 | 4 | 4 | 3 | 3 | 2 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2004 | 1 | 2 | 3 | 4 | 5 | 4 | 3 | 3 | 2 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2005 | 1 | 2 | 3 | 4 | 5 | 5 | 4 | 3 | 3 | 2 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2006 | 1 | 2 | 3 | 4 | 5 | 5 | 5 | 4 | 3 | 3 | 2 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2007 | 1 | 2 | 3 | 4 | 5 | 5 | 5 | 5 | 4 | 3 | 3 | 2 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2008 | 1 | 2 | 3 | 4 | 5 | 5 | 5 | 5 | 5 | 4 | 3 | 3 | 2 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| 2009 | 1 | 2 | 3 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 3 | 3 | 2 | 2 | 1 | 1 | 0 | 0 | 0 | 0 |
| 2010 | 1 | 2 | 3 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 3 | 3 | 2 | 2 | 1 | 1 | 0 | 0 | 0 |
| 2011 | 1 | 2 | 3 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 3 | 3 | 2 | 2 | 1 | 1 | 0 | 0 |
| 2012 | 1 | 2 | 3 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 3 | 3 | 2 | 2 | 1 | 1 | 0 |
| 2013 | 1 | 2 | 3 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 3 | 3 | 2 | 2 | 1 | 1 |
| 2014 | 1 | 2 | 3 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 3 | 3 | 2 | 2 | 1 |
| 2015 | 1 | 2 | 3 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 3 | 3 | 2 | 2 |

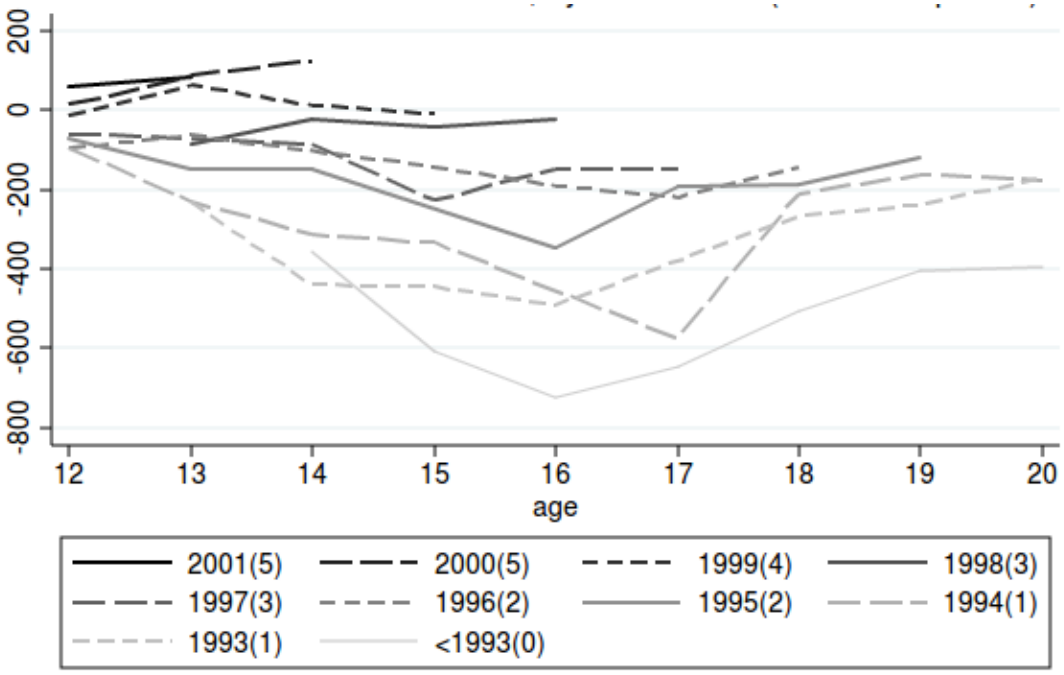
Notes: The figure shows eligibility for the Quebec childcare program for a child reaching the given age in the given year. The eligibility reported is the number of years of lifetime exposure, so a child age 9 who was eligible from ages 0 to 4 has 5 years of lifetime eligibility. The eligibility ranges from zero for those born before the program was introduced to 5 for those who were eligible from ages 0 to 4.

**Appendix Figure 2: Crime Against Person, Accused per 100,000 People**



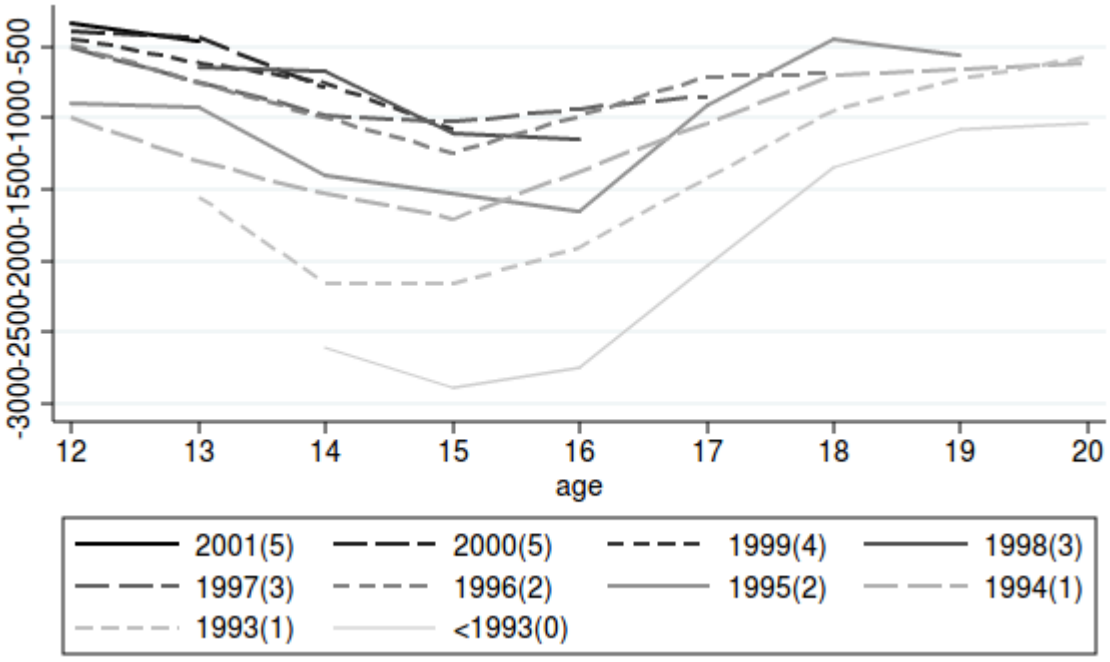

Notes: Source is the Universal Crime Reporting Survey. Graph shows Quebec-Rest of Canada difference by year of birth. The legend shows the year of birth with the number of years of exposure to the childcare program in parentheses.

**Appendix Figure 3: Crime Against Person, Convicted per 100,000 People**



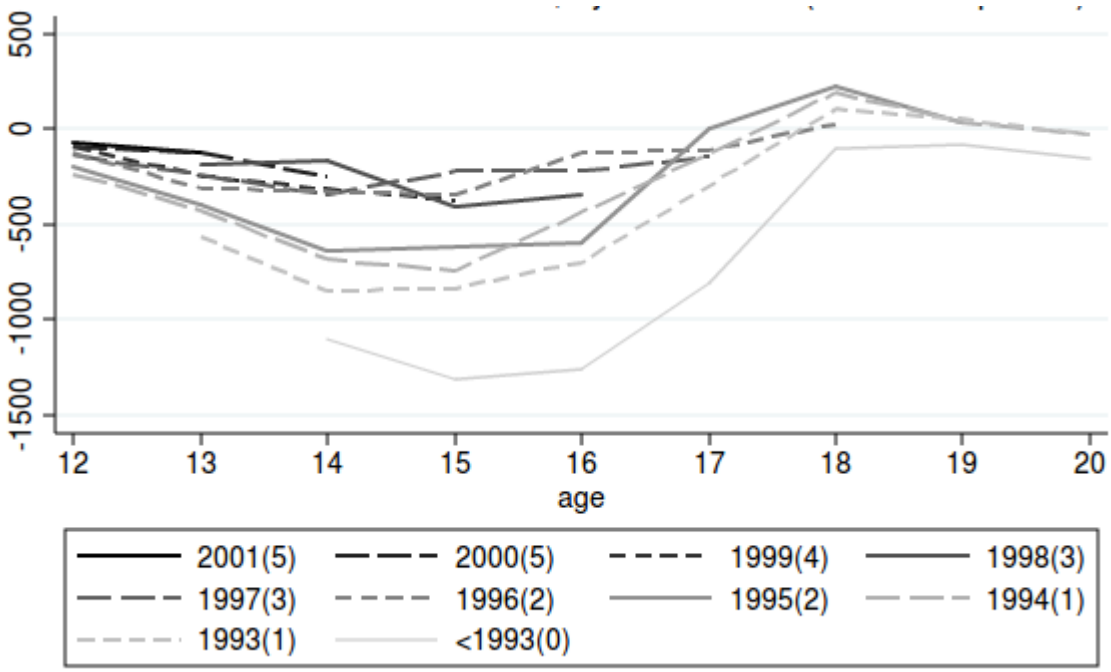

Notes: Source is the Universal Crime Reporting Survey. Graph shows Quebec-Rest of Canada difference by year of birth. The legend shows the year of birth with the number of years of exposure to the childcare program in parentheses.

**Appendix Figure 4: Crime Against Property, Accused per 100,000 People**



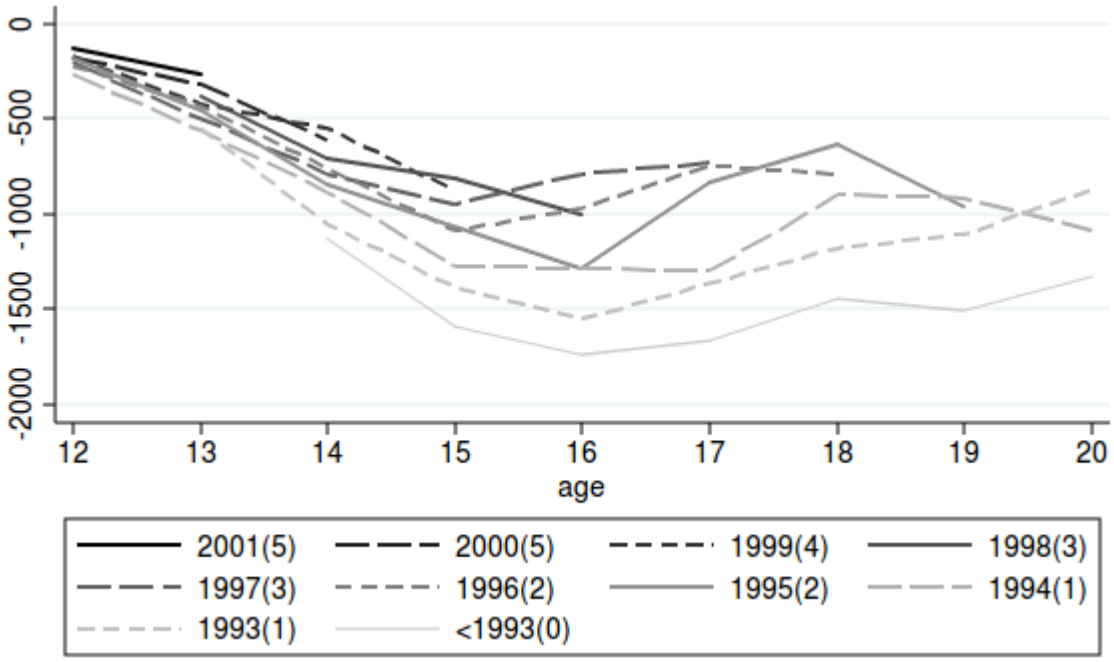

Notes: Source is the Universal Crime Reporting Survey. Graph shows Quebec-Rest of Canada difference by year of birth. The legend shows the year of birth with the number of years of exposure to the childcare program in parentheses.

**Appendix Figure 5: Crime Against Property, Convicted per 100,000 People**



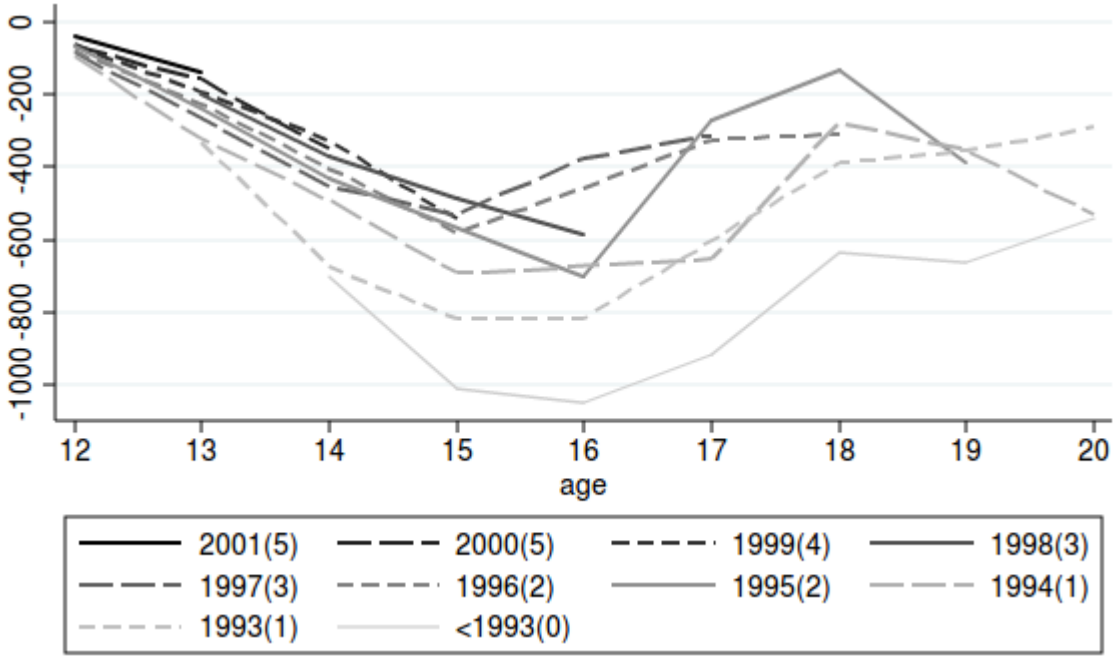

Notes: Source is the Universal Crime Reporting Survey. Graph shows Quebec-Rest of Canada difference by year of birth. The legend shows the year of birth with the number of years of exposure to the childcare program in parentheses.

**Appendix Figure 6: Other Criminal Code Violations, Accused per 100,000 People**



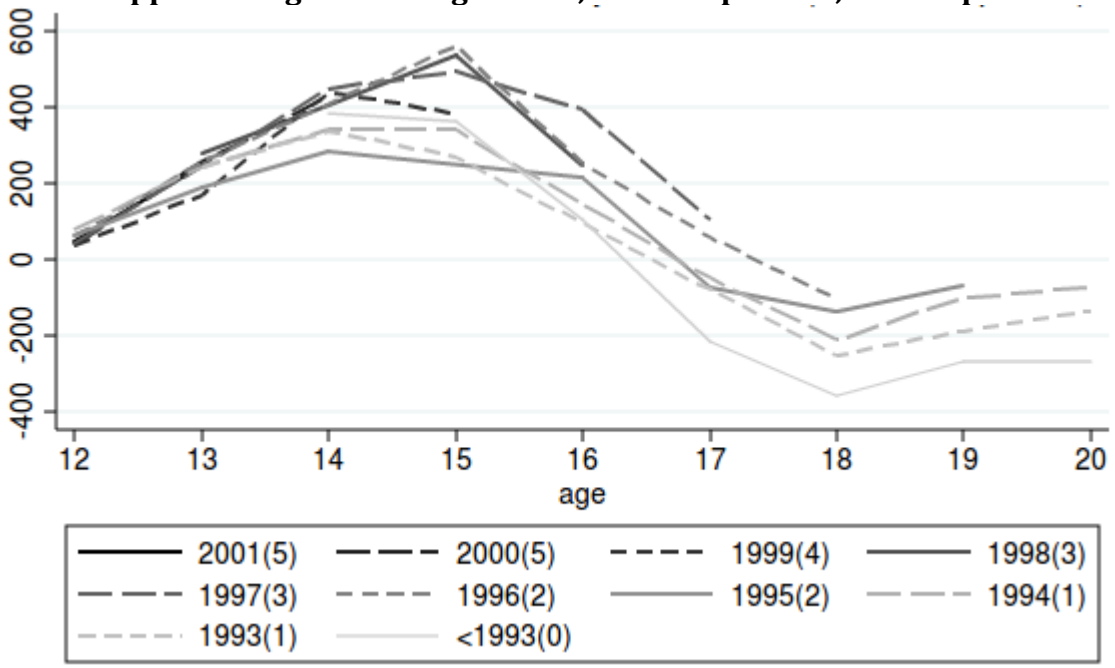

Notes: Source is the Universal Crime Reporting Survey. Graph shows Quebec-Rest of Canada difference by year of birth. The legend shows the year of birth with the number of years of exposure to the childcare program in parentheses.

**Appendix Figure 7: Other Criminal Code Violations, Convicted per 100,000 People**



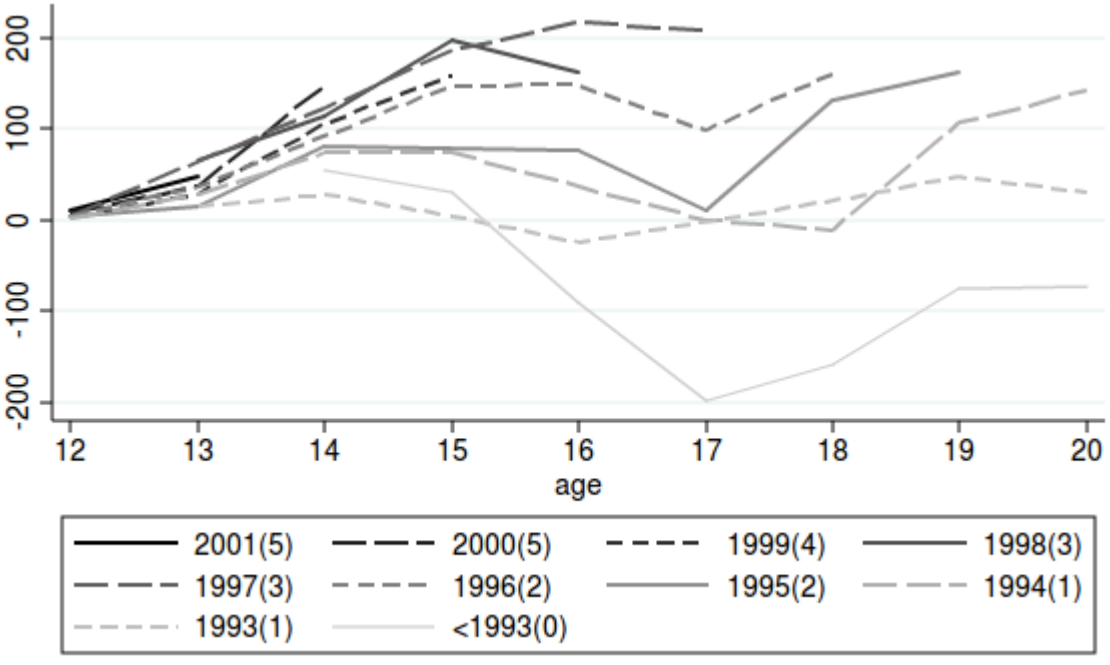

Notes: Source is the Universal Crime Reporting Survey. Graph shows Quebec-Rest of Canada difference by year of birth. The legend shows the year of birth with the number of years of exposure to the childcare program in parentheses.

**Appendix Figure 8: Drug Crimes, Accused per 100,000 People**




Notes: Source is the Universal Crime Reporting Survey. Graph shows Quebec-Rest of Canada difference by year of birth. The legend shows the year of birth with the number of years of exposure to the childcare program in parentheses.

**Appendix Figure 9: Drug Crimes, Convicted per 100,000 People**




Notes: Source is the Universal Crime Reporting Survey. Graph shows Quebec-Rest of Canada difference by year of birth. The legend shows the year of birth with the number of years of exposure to the childcare program in parentheses.