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ABSTRACT

Past research has demonstrated that positive increments to the non-cognitive development of children can have long-run benefits. We test the symmetry of this contention by studying the effects of a sizeable negative shock to non-cognitive skills due to the introduction of universal child care in Quebec. We first confirm earlier findings showing reduced contemporaneous non-cognitive development following the program introduction in Quebec, with little impact on cognitive test scores. We then show these non-cognitive deficits 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 non-cognitive skills for long-run success.

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Recent advances in the study of early childhood development have emphasized the role of non-cognitive skills in fostering later-life success (e.g., Heckman and Mosso 2014). Traits such as perseverance and industriousness are viewed as equally important to cognitive skills for better adult outcomes. In contrast, non-cognitive attributes such as impulsiveness and emotional instability are associated with poorer outcomes at older ages. For example, Bertrand and Pan (2013) examine how childhood non-cognitive deficits account for the gender difference in teenage disruptive behavior.

Particularly striking evidence on this point comes from experimental or quasi-experimental studies finding interventions improving non-cognitive skills—while having little persistent effect on cognitive ability—lead to improved long run outcomes. Experimental pre-school interventions such as the Perry Preschool program provide a useful example. As reviewed by Heckman et al. (2013), the Perry Preschool program had no lasting measurable cognitive benefit, with any improvement in test performance fading out during the school years. Yet there were enormous long run benefits of the program in terms of improved economic outcomes and a lower incidence of criminal behavior, such that the annualized measured rate of return to this investment is 6-10%. Heckman et al. (2013) document an association of the Perry program with dramatic and lasting improvements in non-cognitive skills.

This evidence is also consistent with evaluations of the Head Start program in the United States. A number of studies, including a recent experimental evaluation, have found that cognitive gains from this program fade out during the school years (e.g. Bitler et al., 2014). Yet quasi-experimental studies have found sizeable long run benefits from Head Start program

participation. Carneiro and Ginja (2014) use a regression discontinuity design around program eligibility rules to show that Head Start participation reduces behavior problems and obesity at ages 12-13, and reduces depression, obesity, and criminality for those ages 16-17.

These findings raise an important question of symmetry: are there equally persistent and important negative long-run impacts of interventions that foster a *deterioration* in non-cognitive skills? In this paper, we develop a causal estimate of the relationship between negative shocks to young children's non-cognitive skills and their later life outcomes. To do so we study the longer-run impacts of 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 relative to the rest of Canada, where child care services remained unchanged, Quebec saw large increases in maternal labor supply and in the placement of children in child care (see also Lefebvre and Merrigan 2008 and Lefebvre et al. 2009). However, at the same time, there was a large, significant, negative shock to the preschool, non-cognitive development of children exposed to the new program (with little measured impact on cognitive skills). Subsequent research (Kottelenberg and Lehrer 2013a) has confirmed that this negative impact of the program on young children's non-cognitive development has persisted as the program has matured.

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 provide 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. 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 no effect on English or science scores. We take this as further evidence that any impacts at older ages are operating through the non-cognitive channel.

We do, however, find a significant worsening 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.

Our results reinforce previous research emphasizing the importance of non-cognitive 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. Most recently, the Obama Administration unveiled an ambitious child care agenda, while the Mayor of New York has proposed universal pre-kindergarten availability.[1] The

[1] See https://www.whitehouse.gov/the-press-office/2013/02/13/fact-sheet-president-obama-s-plan-early-education-all-americans and http://www1.nyc.gov/assets/home/downloads/pdf/reports/2014/Ready-to-Launch-NYCs-Implementation-Plan-for-Free-High-Quality-Full-Day-Universal-Pre-Kindergarten.pdf

evidence presented here suggests that measurement of the near-term non-cognitive impact of these policy efforts can serve as a key indicator of the likely long-run success of failure of the program.

Our paper also extends the record of North America's best known experiment in universal preschool care and education. Universal programs like the one in Quebec, are more common in Europe. While the evaluation of their impacts is mixed (Dustmann et al. 2013, Felfe et al. 2015, Datta Gupta and Simonsen 2010, Havnes and Mogstad 2011), the external validity of the European evidence to other jurisdictions is not clear. European programs are run under different funding levels, which reflect the public's greater acceptance of an active state and government's assumption of a larger proportion of economic activity. The Quebec experience is important for understanding a universal initiative within the context of North American tax structures and labor market norms.

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 presents our results, and Part V 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 in the interpretation of the evidence. First is whether the child care intervention being studied was targeted at children in

more disadvantaged families or was universal and targeted all families. Second, is any impact of the intervention on, considered separately, cognitive and 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 plague the large existing literature in economics on maternal work and child outcomes.

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. Importantly for our

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

work, Heckman et al. (2013) 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, reporting that while neither child care utilization or parental labor supply is sensitive to price, they observe a positive impact on children's junior high school outcomes, presumably from 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

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

deviations, driven by the impacts for girls and children from disadvantaged families. Finally, Dustmann et al. (2013) 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 positive impact on language and motor skill outcomes of children of immigrant ancestry but not on children of native ancestry. 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 (2013a), that the negative impacts on child outcomes are larger the younger the age the child entered the program (2014) and that the impacts vary by the sex of the child (2013b). Haeck et al. (2013) present evidence that the program had negative effects on children's cognitive development at age 5. Finally, Brodeur and Connolly (2013) report that the Quebec program led to a small decrease in parent's life satisfaction, although this was a result of large positive effects for low education parents being offset by negative effects for highly educated parents.

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. But broader child care expansions do not appear to provide 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.

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. (2013) report that the number of regulated child care places 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.

The introduction of the program was accompanied by some important reforms of the structure of child care provision. Formal qualifications for caregivers were raised and operational regulations were modified. 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

[4] See BGM for more detail on the program.

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 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

Our first dataset is the National Longitudinal Study of Children and Youth (NLSCY), which was the primary dataset in BGM. 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.

We use the NLSCY for two purposes, each with a different sample. First, we re-examine the contemporaneous impact of the Quebec Family Plan on some child outcomes. For this, we take a sample of children aged 0 to 4 from cycles 1 through 5 (excluding the transitional cycle 3, as in BGM). Second, we want to see if the estimated contemporaneous impacts 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. We restrict the sample to cycle 7 to ensure we have the same set of ages for the treatment and control groups.[5]

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. At ages 2 and 3 we observe indices of Hyperactivity, Anxiety, Separation Anxiety, and Aggression, which are described in detail in BGM.[6] For the 5-9 year olds we have indices of Hyperactivity, Anxiety, Aggression, Indirect Aggression and Prosocial Behaviour. While some of indices for the older age group have the same names as

[5] Cycle 7 is the only one 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.

[6] 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.

corresponding indices for the younger children, they are based on a different set of age appropriate questions.[7] 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 standardized 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. Like SAIP, one of math, reading or science is the focus of each PCAP. 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 sample contains data from the 2007 and 2010 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.

[7] The age range for the scores for younger children is 2-3, while a different set of questions is used to form the scores for children from age 4 up.

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 is conducted in the core subject areas of math, reading and science. Because the test is conducted in many countries 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 and 2012.

Health and Well-Being: CCHS and CHMS

To assess the impact of the child care intervention on the health of older children, we use two further data sets. The first is 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 2013. 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.

The second is the Canadian Health Measures Survey (CHMS), which started in 2007, with data from 3 cycles—2007-2009, 2009-2011, 2012-2013—now available. This survey combines information on health behaviors with a set of direct physical measurements. It is stratified—collected only in 16 sites—but with weights, the sample of around 5,700 can recover nationally-representative estimates. We select a sample of youth ages 15-20, which again contains both

individuals who were and were not exposed to the child care program at younger ages.[8] We examine self-reported measures of health, ranging from general health to stress to mental health and life satisfaction.

Criminal Behavior: UCRS

We combine special tabulations of crime accusations[9] 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.[10] 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 and property (separately), "other criminal code violations" and drug violations, as well as an aggregate crime rate based on these four categories.[11] For our age groups most "other criminal code violations" involve failures to appear in court and breaches of probation.[12]

[8] The CHMS surveys individuals aged 3-79, but all Quebec children younger than 15 were exposed to the child care program in the survey years available.
[9] The accused includes those charged plus those dealt with through the use of extrajudicial measures.
[10] 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).
[11] 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.
[12] Other prevalent youth crimes are theft under $5000, assault, mischief, breaking and entering, cannabis possession, uttering threats and possession of stolen property. There is also a residual category for 'other federal statute violations', that includes violations under legislation such as the Bankruptcy Act and the Competition Act. See Zhang (2014) for a recent comparison of youth and adult crime rates by offence.

Our data is for the years 2006 through the latest available, 2013. Our choice to start the analysis in 2006 is, as explained below, made to stay clear of any impact of the introduction of the Youth Criminal Justice Act in 2003. As in our analysis of the CCHS, we construct our sample for 12 through 20 year olds.

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, urban status 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. Standard errors are clustered by province by 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/(own) 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. (2013) 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 who 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 was to minimize 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 extend this point below in our re-examination of the contemporaneous impacts of the program on the outcomes of young children from all families. Milligan and Stabile (2011) report evidence that indicates 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.[13]

[13] 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.

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. This 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 instead of the courts for less severe crimes.[14] 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 by 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.

Part IV: Impacts on Non-Cognitive Skills

In this section we model the impact of exposure to the Quebec Family Plan on non-cognitive skills of youths. We begin by replicating earlier analysis showing the negative effects on non-cognitive skills of young children. We then extend the results to show that the estimated deficits persist once these children enter school.

[14] 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.

The Impact of the Quebec Child Care program on the Outcomes of Young Children

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

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 over 15 percentage points, this result is marginally larger than the estimate in our previous paper (0.146). However, it leads to the same conclusion that the effect of the program is to increase child care use by a little more than one-third 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 a higher score indicates a poorer outcome. The estimates 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 larger in magnitude than the estimates in our previous paper, although not enough to qualitatively change our inference. At 10 percent and 13 percent of a standard deviation respectively, the inference for Anxiety and Aggression match well with the conclusions in BGM.[15]

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 almost 1.7 points, or 11 percent of a standard deviation and is statistically significant at conventional levels. This result, while consistent with Haeck et al. (2013), is not consistent with the estimate in BGM. The estimate in BGM was for

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

the sample of 4 year olds, and the addition of five years olds here explains the difference. 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.

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. 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.

The Impact of the Quebec Child Care program on the Outcomes of Children aged 5-9 Years Old

We next extend the analysis in table 1 to children of older ages. 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 different set of age-appropriate questions. The index of Prosocial behavior is coded so that a higher score indicates a poorer outcome.

The results presented in the first 5 rows of table 2 show that the Quebec program's negative effects on non-cognitive skills appear to strongly persist into school years, and in many instances 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 it is now just under one fifth of a standard deviation, or roughly 50 percent higher

than at younger ages. New here is a statistically significant impact on Hyperactivity of almost 10 percent of a standard deviation. For the two new indices we see a statistically significant impact on Indirect Aggression of 16 percent of a standard deviation, and while the result for Prosocial behavior indicates a poorer outcome in sign, it is not statistically significant.

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 grow as they reach school ages. Unfortunately, there is no parallel cognitive measure available in the NLSCY at older ages to follow up on the PPVT result in table 1.[16] Instead we examine cognitive test scores at older ages available from SAIP/PCAP and PISA.

[16] 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 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.

Part V: Impacts on Teen Outcomes

Having established that the Quebec program negatively affected non-cognitive outcomes, and that this effect persisted into the school years, we next examine teen outcomes along several dimensions. We look first at cognitive outcomes using standardized test scores. This is followed by estimates for self reports of health and life satisfaction. Finally, we look for any impact of the Quebec child care program on youth crime.

Cognitive Outcomes

As noted above we are unable to follow any impact of the Quebec program on cognitive outcomes at older ages in the NLSCY due to issues with the standardized math tests in the first waves. Instead we use data from periodic standardized testing of Canadian teens through 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 a marginally significant, negative impact of exposure to the Quebec program on math scores of over 20 percent of a standard deviation, and statistically insignificant, small, negative impacts on 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 marginally significant positive impact of exposure in math of almost 12 percent of a standard deviation and an almost equal marginally significant negative impact in science. The impact on reading is positive, statistically insignificant and very small. If instead we view the 2009 scores as post program, the impact on math is still positive but larger and significant at the 1 percent level and one quarter of a standard deviation, while the impact for reading and science are both statistically insignificant and very small.

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 program leading to over a 20 percent standard deviation increase or decrease in scores. The inference for science and reading scores is 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 and CMHS surveys. The results of this analysis are shown in Table 4. For the CCHS, we show the results for ages 12-20, while in the CHMS we use a sample of 15-20 year olds. All health measures are coded so a higher score indicates a worse outcome.

The point estimates from each survey mostly indicate that exposure to the Quebec program is associated with some worsening of self-reported health. For youths exposed to the program, the health indicator rises in both surveys. The increase in the CCHS is 7.2 percent of a standard deviation. The rise is a much larger in the CMHS but the standard error is larger as well so that the estimate is not significant.

The estimate for life satisfaction is small and statistically insignificant in the CCHS, but indicates a statistically significant poorer outcome in the CMHS; the effect is large, amounting to more than one-third of a standard deviation. There are no significant effects on mental health or stress, but quality of life measure also worsens significantly in the CHMS, once again by more than a third of a standard deviation. Overall, these results give strong indications 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 program, the long-run impact on crime was a vital component of the analysis.[17] 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.

[17] 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."

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 1 and 2 show cohort-specific age profiles of *differences* in the aggregate crime rates per 100,000 people between Quebec and the rest of Canada, in which the cohorts vary by their exposure to the Quebec program. For example, the top black line in each graph shows the difference between the 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 black long dashed line shows the same differences for those born in 1993, who had one year of exposure (at age 4). The black short-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 light grey lines shows the results for cohorts born from 1998 to 2000, 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 decrease in 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 the argument that this is just an aging effect: more exposed cohorts have higher differential crime rates at every age. It also allows us to rule out the idea that this is just a time series effect – at any year, crime rates are higher for more exposed children (this can be seen by following the points diagonally – e.g. in 2010 those

born in 1993 are 17 and have a much lower differential than those born in 1997, who are 13 at that year). 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 1 and 2-- a positive effect of exposure to the child 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 trend 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, we estimate a rise of 300 crimes per 100,000 children, compared to a mean of 7,970 crimes. This is a rise of 3.7 percent. The result is slightly higher in percentage terms for convictions per 100,000 (4.6 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 other criminal code convictions; the estimates from the richest specification show an increase in accusations of these crimes of 321 per 100,000 children, or nearly 19 percent of the mean, and for convictions for these crimes of 310 per 100,000, or about 28 percent of the mean. The estimated impacts on property crimes are almost as large. Consistently smaller are the estimated impacts on crimes against persons, at 11 percent of the mean for both accusations and convictions. Finally, the impact for drug crimes is 7.5 percent of the mean for accusations but over 17 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,[18] as well as growing interest in gender differences in childhood

[18] In addition to the evidence in table 6 see, for example, Datta Gupta and Simonsen (2010), Felfe et al. (2015) and Kottelenberg and Lehrer (2013b).

and adult success.[19] 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.

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 on hyperactivity and aggression for boys, even relative to their higher standard deviations. For example, the negative impact on Aggression is primarily for boys, and the estimate in this case is one third of a standard deviation. For girls the strongest effect is on prosocial behavior, which worsens by 22 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.[20] 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.

[19] See for example, Baker and Milligan (2013), Bertrand and Pan (2013), Cornwell et al. (2013), Fortin et al. (2013) and Jacob (2002).

[20] 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.

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 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. This is a striking finding that allows us to assess whether the growing consensus that *increases* in non-cognitive skills foster later life success is symmetric to *decreases* in non-cognitive skills.

Indeed, our evidence is consistent with such symmetry. We find that the Quebec policy had a lasting negative impact on the non-cognitive skills of exposed children, but no consistent impact on their cognitive skills. 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.

The implications of these findings for early child care policy are profound. They provide strong support for the argument that non-cognitive development is a crucial determinant of the long-term success of child care programs. This suggests that measuring the impact of child care programs on the non-cognitive development is important. When a child care program fails to improve non-cognitive development, it may have no long-standing positive effects on children.

As non-cognitive skills can be evaluated relatively easily in the short-run, this suggests non-cognitive skill development can act as an important guide for policy in this area.

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 universally provided child care can have widespread positive impacts on non-cognitive development, which our results together with evidence such as Heckman et al. (2013) suggest should lead to long run positive outcomes.

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Figure 1

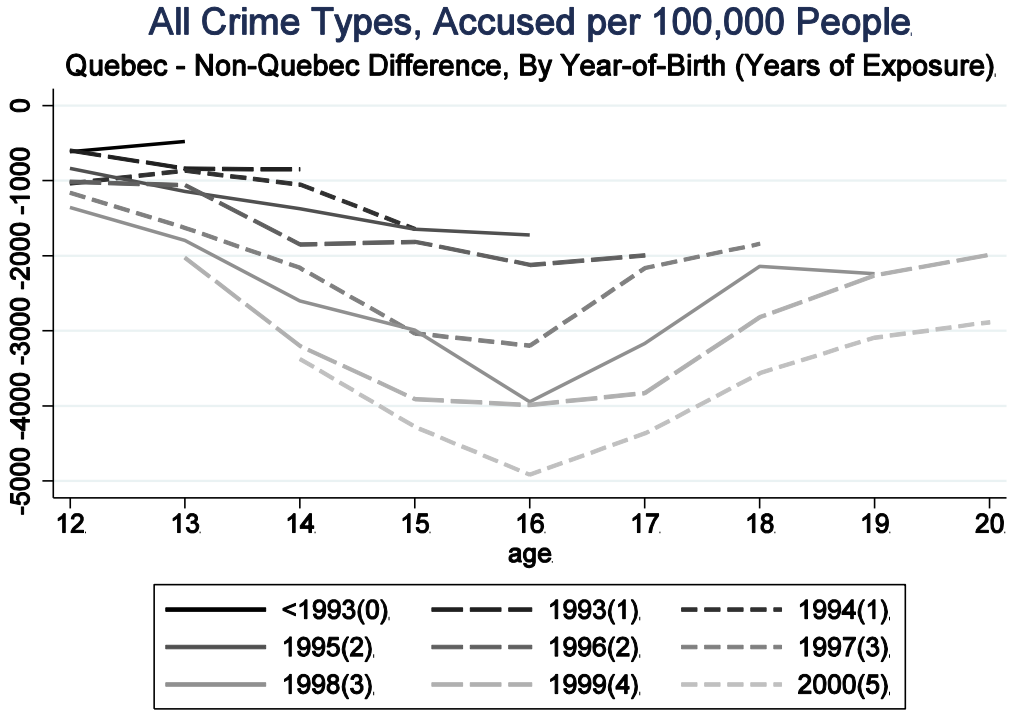


Figure 2

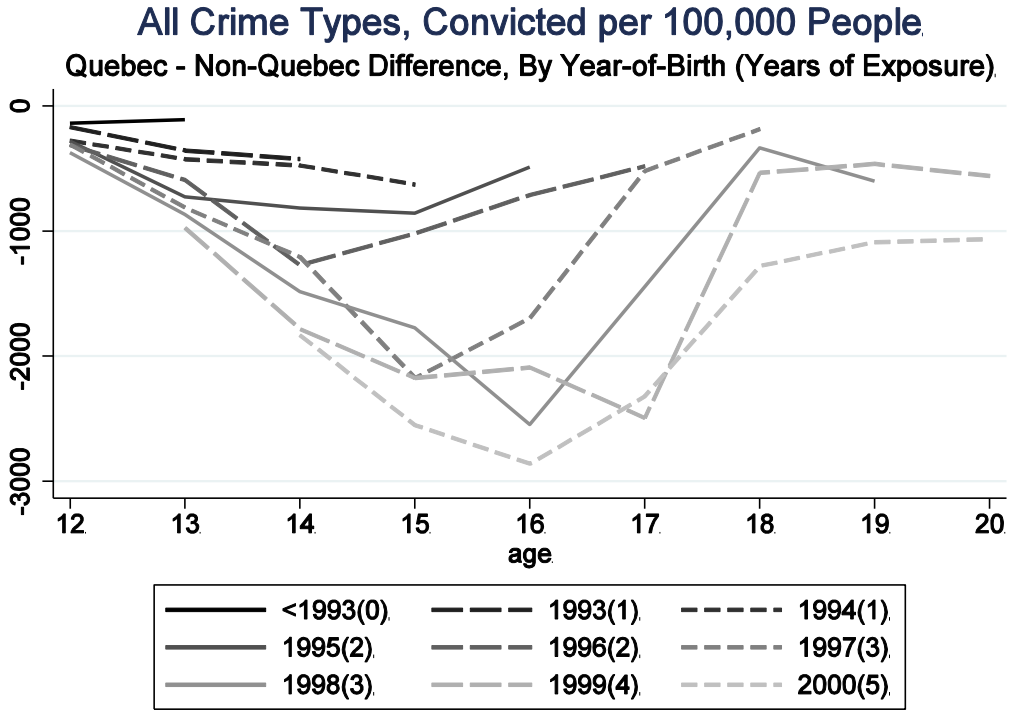


Table 1: Impact of Exposure to the Quebec Family Plan on Non-cognitive and Cognitive Outcomes at Young Ages

Outcome	Mean	EXPOSURE
In Care	0.45	0.153***
	(0.50)	(0.032)
Hyperactivity	2.86	0.131
	(2.12)	(0.100)
Anxiety	1.23	0.154***
	(1.50)	(0.044)
Separation Anxiety	2.77	0.137
	(2.03)	(0.108)
Aggression	5.00	0.398***
	(2.93)	(0.105)
PPVT	100.02	-1.686***
	(15.28)	(0.569)

Notes: Authors' calculations from NLSCY data. Sample—all families. The sample ages are 0-4 years for In Care, 2-3 years for Hyperactivity, Anxiety, Separation Anxiety and Aggression, and ages 4-5 for 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 Non-cognitive Outcomes at ages 5-9

Outcome	Mean	EXPOSURE
Hyperactivity	4.02	0.290**
	(3.12)	(0.145)
Anxiety	2.41	0.638***
	(2.29)	(0.157)
Aggression	1.38	0.326***
	(1.83)	(0.100)
Indirect Aggression	1.09	0.260***
	(1.63)	(0.090)
Prosocial	13.11	0.185
	(3.90)	(0.183)
Child gets along with Teacher (parent report)	0.80	-0.061**
	(0.40)	(0.025)

Notes: Authors' calculations from NLSCY data (waves 1, 2 and 7). Sample—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	-0.229*	0.107	-0.074	0.060	-0.042
	(0.986)	(0.117)	(1.000)	(0.180)	(0.990)	(0.087)
PISA (2009 control)	0.119	0.114	0.144	-0.008	0.122	-0.120***
	(0.998)	(0.071)	(0.973)	(0.034)	(0.991)	(0.039)
PISA (2009 treated)	0.119	0.257***	0.144	0.072	0.122	-0.032
	(0.998)	(0.038)	(0.973)	(0.048)	(0.991)	(0.073)

Notes: Authors' calculations from SAIP/PCAP and PISA test score data. Sample—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

	CCHS		CHMS	
Age	12-20		15-20	
	Mean	EXPOSURE	Mean	EXPOSURE
Health	2.10	0.072***	2.40	0.337
	(0.85)	(0.021)	(0.85)	(0.212)
Life Satisfaction	1.63	0.022	1.65	0.228***
	(0.63)	(0.018)	(0.62)	(0.068)
Mental Health	1.88	-0.011	1.92	-0.094
	(0.87)	(0.017)	(0.87)	(0.074)
Stress			2.80	0.075
			(0.80)	(0.139)
Quality of Life			1.98	0.294**
			(0.82)	(0.131)

Notes: Authors' calculations from CCHS and CHMS data. Sample—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	8112	464***	548***	301***
		(76)	(71)	(74)
Person	1962	455***	536***	224***
		(80)	(73)	(74)
Property	3447	413**	1016***	580***
		(102)	(171)	(196)
Other CC	1712	650***	509***	321***
		(129)	(65)	(75)
Drugs	990	338***	129***	75***
		(66)	(24)	(25)
Convictions				
All	4120	188***	312***	188***
		(43)	(51)	(55)
Person	1059	274***	258***	119*
		(55)	(51)	(62)
Property	1492	51	527***	340***
		(68)	(100)	(112)
Other CC	1119	297***	309***	310***
		(64)	(55)	(56)
Drugs	450	133***	154***	78***
		(25)	(24)	(26)

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	0.105	0.478**	0.140	0.286***	0.819***	-0.041
	(0.187)	(0.187)	(0.123)	(0.109)	(0.185)	(0.029)
Boys	0.463*	0.796***	0.525***	0.245**	-0.458*	-0.081***
	(0.261)	(0.215)	(0.155)	(0.119)	(0.248)	(0.029)

Notes: Authors' calculations from NLSCY data (waves 1, 2 and 7). Sample—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)	357***	692***	313***	686***	522***	527***	392***	1064***	198***	493***
	(59)	(80)	(52)	(93)	(103)	(133)	(74)	(172)	(38)	(73)
(2)	343***	742***	377***	688***	792***	1229***	173***	829***	32***	221***
	(58)	(88)	(65)	(92)	(154)	(214)	(46)	(100)	(12)	(57)
(3)	170**	428***	154**	292***	367*	781***	131*	513***	24*	124***
	(72)	(82)	(66)	(94)	(202)	(217)	(68)	(109)	(14)	(43)
Convictions										
(1)	160***	294***	161***	451***	200***	41	203***	469***	76***	214***
	(30)	(45)	(31)	(66)	(48)	(97)	(40)	(82)	(16)	(32)
(2)	162***	455***	168***	345***	338***	706***	98***	511***	43***	261***
	(27)	(77)	(32)	(77)	(56)	(159)	(37)	(88)	(8)	(46)
(3)	92**	289***	85*	164*	180**	496***	90*	350***	15	143***
	(37)	(79)	(45)	(97)	(73)	(166)	(54)	(99)	(11)	(41)

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.

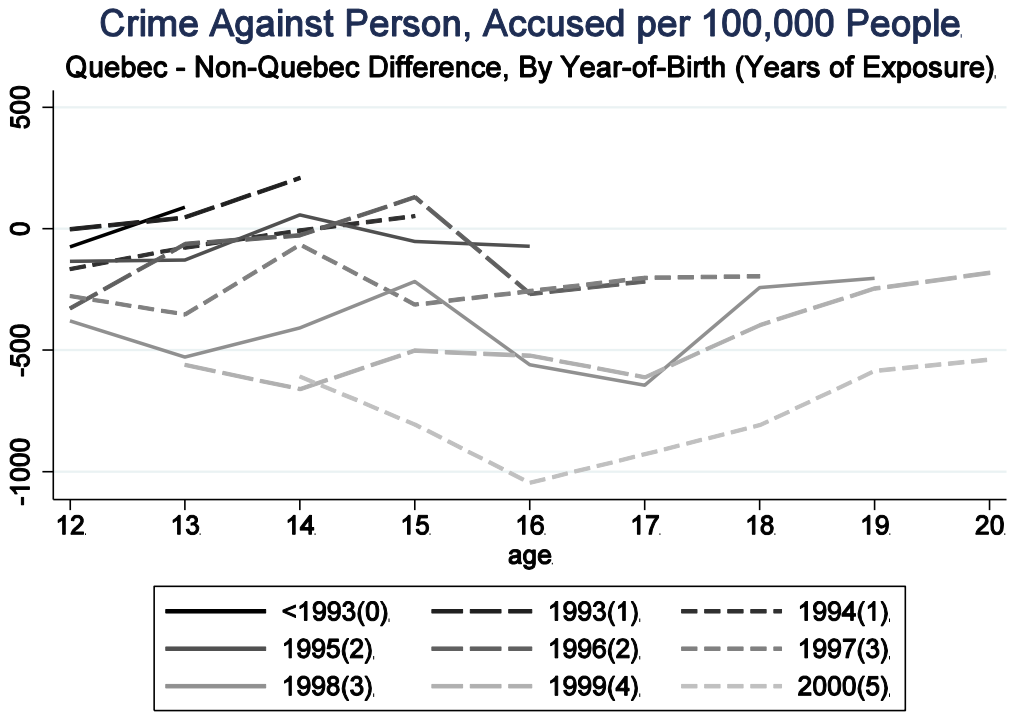
	NLSCY	CCHS	CHMS	SAIP/PCAP	PISA	UCRS
Male	Dummy	Dummy	Dummy	Dummy	Dummy	Dummy
Province	Dummies	Dummies	Dummies	Dummies	Dummies	Dummies
Year	Dummies	Dummies	Dummies	Dummies	Dummies	Dummies
Own Age	Dummies	Dummies	Dummies			Dummies
Month of Birth					Dummies	
Mother's Education	Dummies				Dummies	
Mother's Age	Dummies					
Father's Education	Dummies					
Father's Age	Dummies					
Highest Education in Family		Dummies	Dummies			
Two Parent Family	Dummy	Dummy	Dummy			
Urban Size	Dummies					
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				Dummy	
Child born in Canada		Dummy	Dummy			
Family is not "white"		Dummy	Dummy			

Appendix Figure 1: Cohort Map for Program Eligibility.

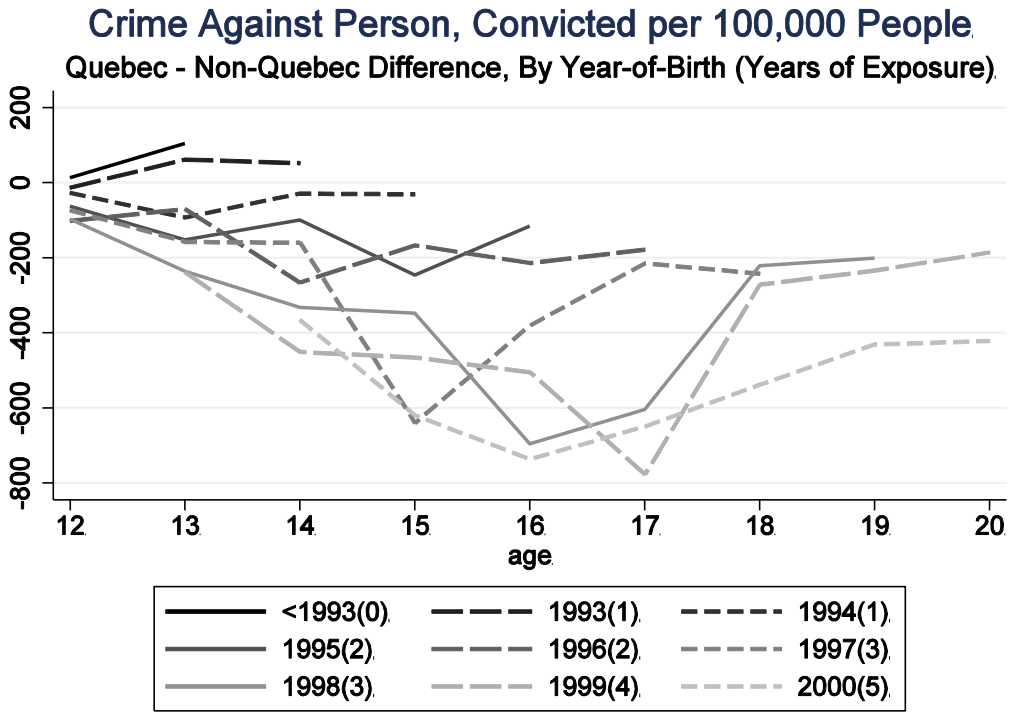
Year Of Observation	Age 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1997	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	1	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	1	1	1	2	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	1	2	2	2	3	2	2	1	1	0	0	0	0	0	0	0	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.

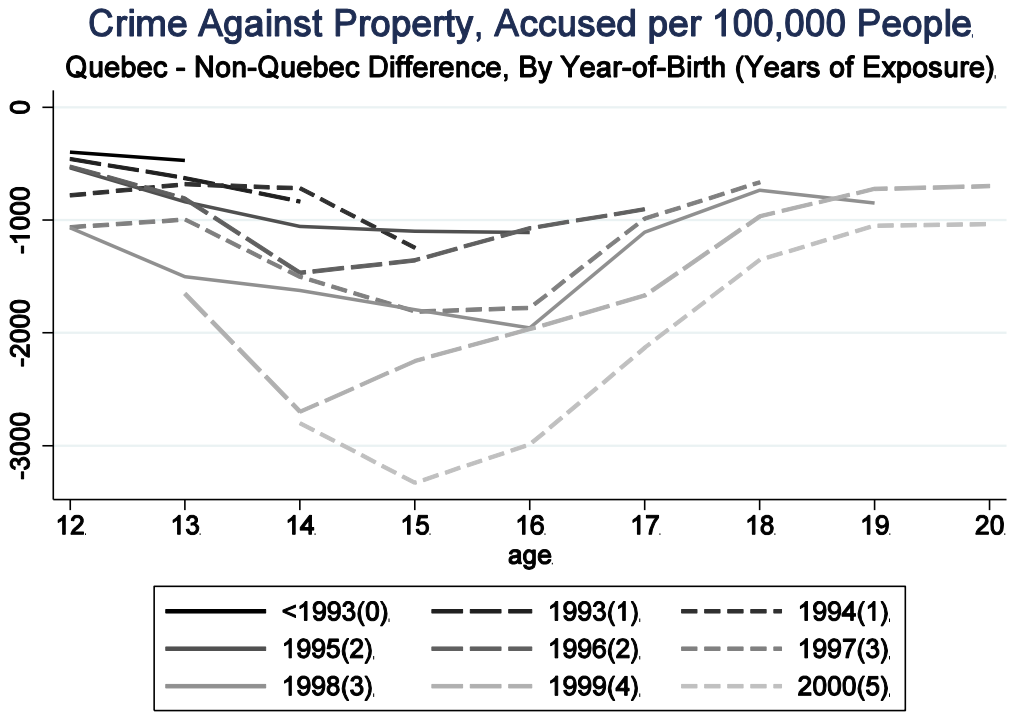
Appendix Figure 2



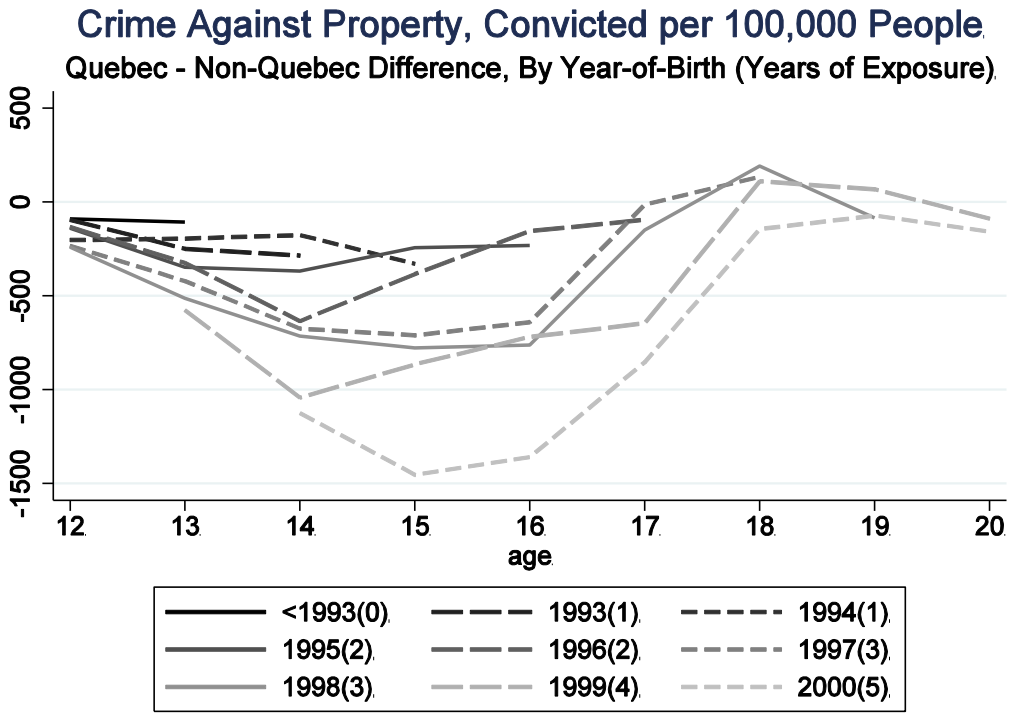
Appendix Figure 3



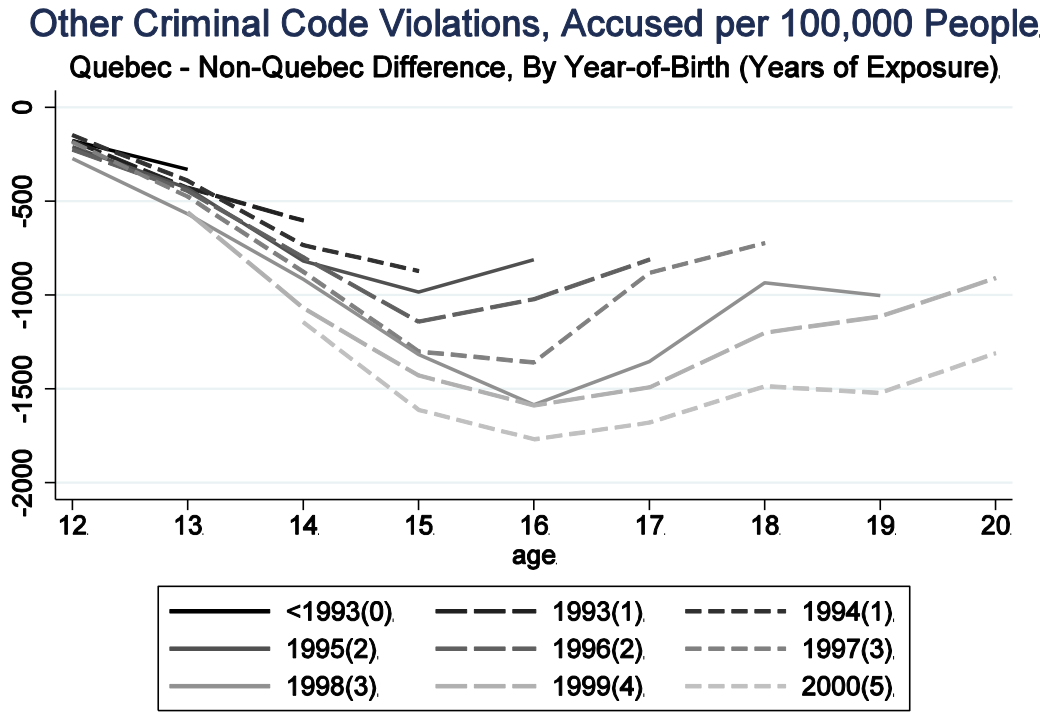
Appendix Figure 4



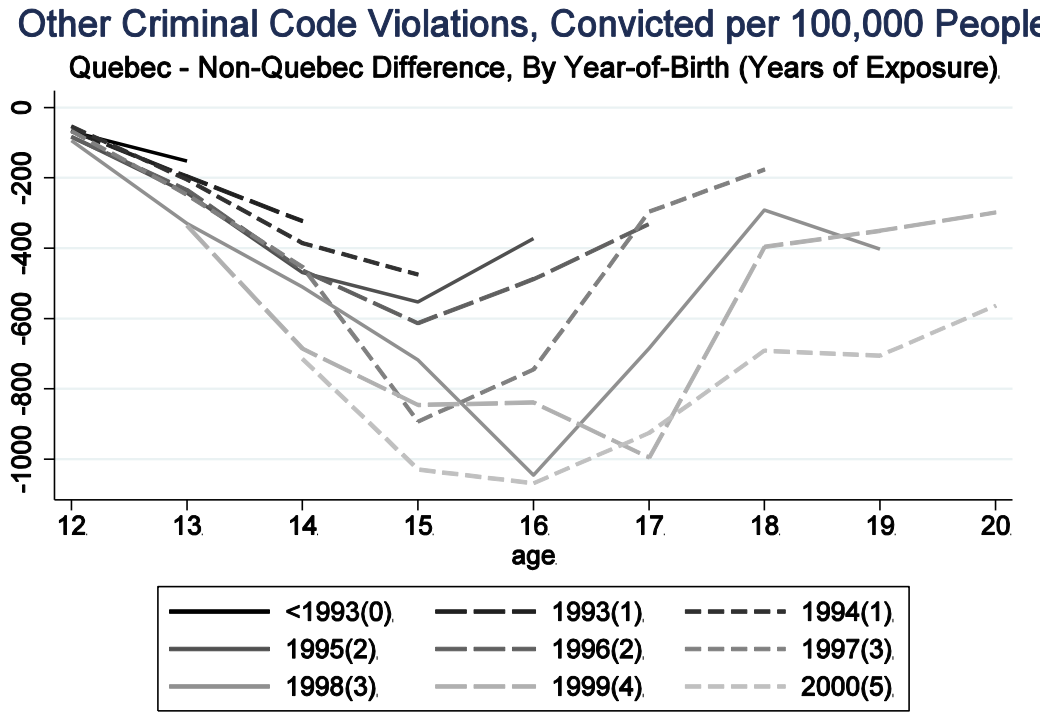
Appendix Figure 5



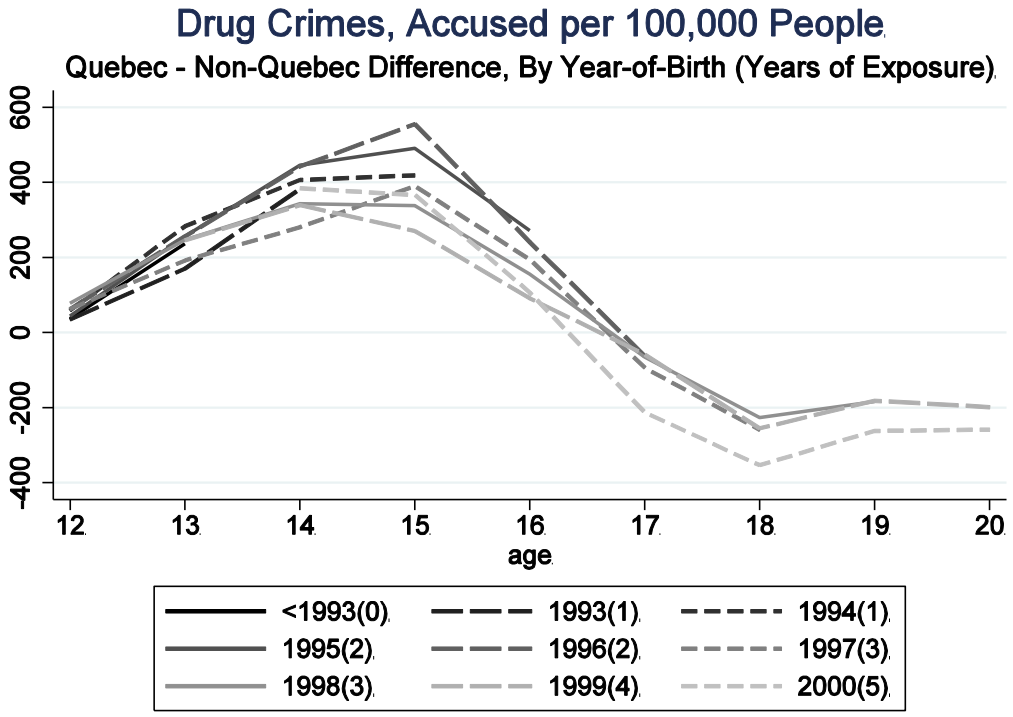
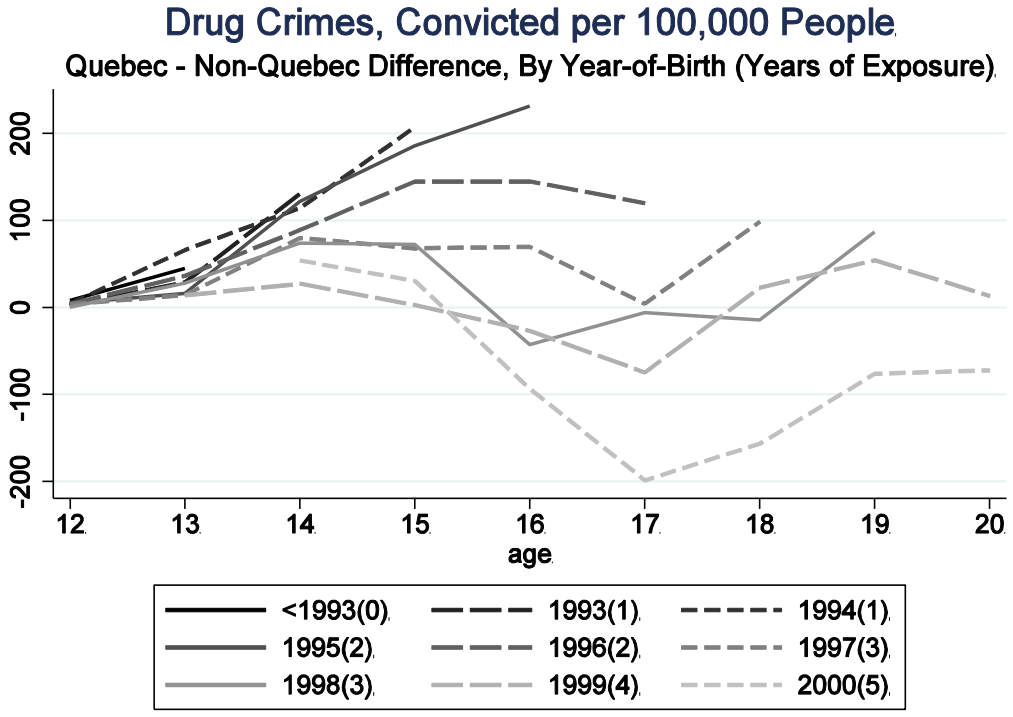
Appendix Figure 6



Appendix Figure 7



Appendix Figure 8



Appendix Figure 9