

Non-Cognitive Deficits and Young Adult Outcomes: The Long-Run Impacts of a Universal Child Care Program

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Motivation

Big question: how much does early-life environment affect long-run life outcomes?

Related policy question: is there an economic payoff to universal childcare from improved child outcomes?

Setting the stage: the story so far

Long-run impact of ‘model programs’



RCTs of small model programs have shown big long-run impact.

Belfield et al. (2006) on Perry-HighScope:

- Higher education (girls); less crime (boys)
- Higher earnings; lower welfare take-up
- Return to society: \$12.90 per dollar invested.
- 88% of this is through crime reduction.

Heckman et al. (2010; 2013)

- Revises return down to 7%-10%.
- Emphasizes non-cognitive channel.

Setting the stage: the story so far

Baker Gruber Milligan (2008)

- Analyze impact of Quebec's Centre de la petite enfance (CPE) program.
- Find positive impact on maternal labour-supply.
- But, negative impact on non-cognitive / behavioural measures.
- Baker (2011) reconciles: heterogeneous impact. Compare to alternative care environment.

Follow-up studies

- Quebec: Kottelenberg and Lehrer (2013ab), Lefebvre and Merrigan et al. (2008, 2009, 2013), Brodeur and Connolly (2013).
- Elsewhere: Carneiro and Ginja (2014), Havnes and Mogstad (2011, 2014), Datta Gupta and Simonsen (2010), Dustmann, Rauta, and Schoenberg (2013), Cascio (2015) Lipsey, Farran, and Hofer (2015).

Our questions:

1. Did the documented Quebec contemporaneous negative non-cognitive shocks persist to older ages?
2. Did longer-run outcomes respond symmetrically to the Heckman et al. (2013) case?

Notable questions we do not attempt to answer:

- Why did Quebec's program seemingly deliver a negative non-cognitive shock?
- Normative questions about whether universal daycare policies should be adopted.
 - Labour supply, gender equity, heterogeneous impact all make this a bigger question than we can handle.

Our contributions:

1. Document evidence that negative non-cognitive shocks have long-run implications symmetric to positive shocks.
2. Suggests a way to evaluate efficacy of early-life environments in ‘real time’.

Roadmap:

- I. Institutional background
- II. Empirical Strategy
- III. Data
- IV. Persistence of non-cognitive deficits
- V. Relating to long-run outcomes
- VI. Shortcomings, caveats, and to-do list

Quebec's CPE program

- \$5 out-of-pocket; the rest subsidized by provincial government.
- Universal access—no means-testing or entrance requirements.
- Increased standards: e.g. moved to 2/3rds ECE diploma requirement; higher pay.
- Rolled out by cohort:

Sept 1997	4 year olds
Sept 1998	3-4 year olds
Sept 1999	2-4 year olds
Sept 2000	0-4 year olds

- Queuing: wait lists prevalent.

Quebec's CPE program

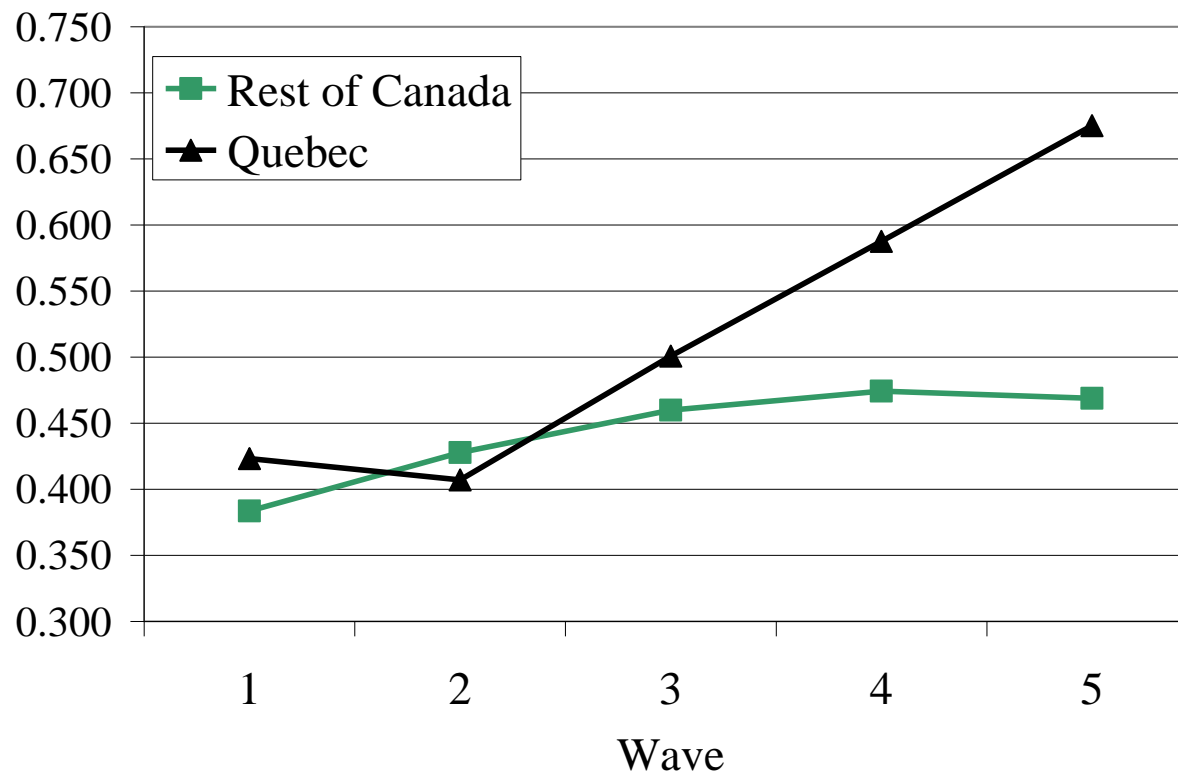
Cohort map: how many years of eligibility, given age/year.

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

Quebec's CPE program

Impact: Use of childcare increased markedly

Proportion of kids age 0-4 in any non-parental care arrangement:

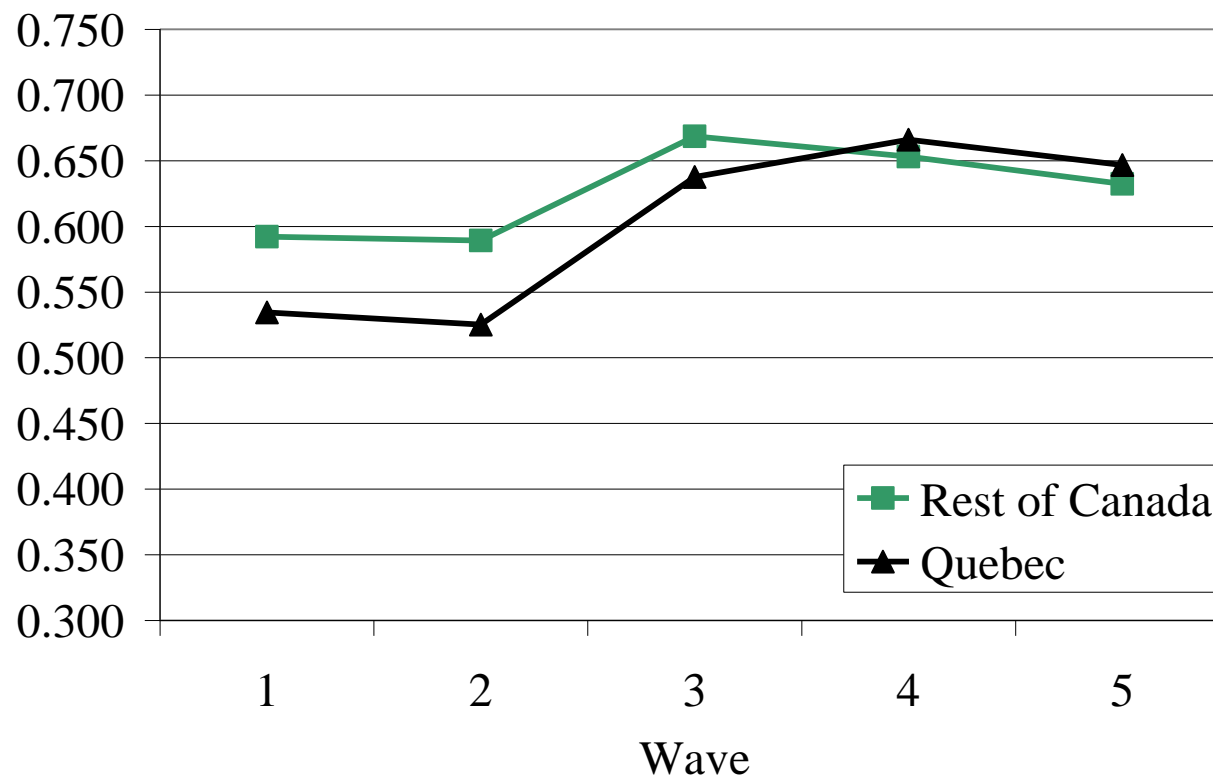


Source: NLSCY wave 1 (1994-5) to wave 5 (2002-03)

Quebec's CPE program

Impact: Maternal labour supply increased

Proportion of two-parent mothers of kid age 0-4 employed:



Source: NLSCY wave 1 (1994-5) to wave 5 (2002-03)

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VI. Shortcomings, caveats, and to-do list

Empirical strategy:

Nothing particularly fancy here: differencing strategy.

- Compare Quebec to rest of Canada, before and after.
- Intent to treat effects: Assignment to treatment based on plausibly exogenous factors rather than choice.

$$(1) \quad Y_{ipt} = \alpha + \beta \text{EXPOSURE}_{pt} + \pi \text{PROV}_p + \delta \text{YEAR}_t + \lambda X_{ipt} + \varepsilon_{ipt}$$

Refinements:

- Dose-response: some cohorts received 1 year; some 5 years of care.
- Compare boy results to girl results.
- In some cases, can use Prov/Year/Age variation in a DD with year trends.

Causal inferences:

- In absence of differential trends in the counterfactual of no policy, we identify the desired effect.
- I can show you the numbers and build the case for that assumption; you get to decide if credible.

Empirical strategy:

What can go wrong here?

1. Cyclical or volatile data; sensitivity to starting and ending points
 - The social measures we use are fairly stable; not like employment or biz-cycle sensitive outcomes.
-
2. Confounding policy factors.

We have considered three:

- School curriculum reform.
- Changes to Youth Criminal Justice Act.
- Changes in child benefit system

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Data sources:

National Longitudinal Study of Children and Youth (NLSCY)

- Contemporaneous and persistent non-cognitive impact.
- About 2000 kids per age per wave; include married/single.
- Covers 1994-5 (wave 1) to 2008-9 (wave 8).

Cohort map for the NLSCY: how many years in treatment.

ages	0	1	2	3	4	5	6	7	8	9
Cycle1	T	T	C	C	C	C	C	C	C	C
Cycle2	T	T	T	T	C	C	C	C	C	C
Cycle3	T	T	T	T	T	1	C	C	C	C
Cycle4	T	T	T	T	T	2	1	1	C	C
Cycle5	T	T	T	T	T	3			1	1
Cycle6	T	T	T	T	T	4				
Cycle7	T	T	T	T	T	5	5	4	3	3
Cycle8	T	T	T	T	T	5	5	5		

- Contemporaneous: use waves 1,2,4,5; ages 0-4.
- Long-run: use waves 1-2 and 7; ages 5-9.

Data sources:

Programme for International Student Assessment (PISA) and Pan-Canadian Assessment Program (PCAP) and School Achievement Indicators Program (SAIP)

- School test scores: reading, math, science.
- SAIP 1993 to 1994; PCAP 2007+; Ages 13 and 16.
- PISA 2000-2012 triennially; age 15.

Canadian Community Health Survey and Canadian Health Measures Survey

- Health, stress, life satisfaction.
- CCHS 2001-2005; CHMS 2007-2013.
- Focus on age 15-20

Uniform Crime Reporting Survey

- Universe data of accused and convicted by age/year/sex/province.
- Disaggregated into categories of crime (persons, property, drug, other).

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Non-cognitive deficits

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 (0.50)	0.153*** (0.032)
Hyperactivity	2.86 (2.12)	0.131 (0.100)
Anxiety	1.23 (1.50)	0.154*** (0.044)
Separation Anxiety	2.77 (2.03)	0.137 (0.108)
Aggression	5.00 (2.93)	0.398*** (0.105)
PPVT	100.02 (15.28)	-1.686*** (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.

Non-cognitive deficits

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

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

Non-cognitive deficits

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

Non-cognitive deficits

Discussion:

Q: What is driving this?

A: Can only list speculative possibilities

1. Is it quality shortfall?

- Quality audit (Japel Tremblay Côté 2005).
- Measurable quality attributes up.

2. Is it curriculum?

- Care based on detailed, research-based program.
- Focus on childhood development.

3. Stresses of two-parent working?

- Evidence from GSS that subjective well-being decreased: driven by middle income households; women; married not single.

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Long-run outcomes: test scores

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 (0.986)	-0.229* (0.117)	0.107 (1.000)	-0.074 (0.180)	0.060 (0.990)	-0.042 (0.087)
PISA (2009 control)	0.119 (0.998)	0.114 (0.071)	0.144 (0.973)	-0.008 (0.034)	0.122 (0.991)	-0.120*** (0.039)
PISA (2009 treated)	0.119 (0.998)	0.257*** (0.038)	0.144 (0.973)	0.072 (0.048)	0.122 (0.991)	-0.032 (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.

Long-run outcomes: health / life satisfaction

(Higher scores are worse)

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

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

Long-run outcomes: crime

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

	Mean	(1)	(2)	(3)
Accused				
All	8112	464*** (76)	548*** (71)	301*** (74)
Person	1962	455*** (80)	536*** (73)	224*** (74)
Property	3447	413** (102)	1016*** (171)	580*** (196)
Other CC	1712	650*** (129)	509*** (65)	321*** (75)
Drugs	990	338*** (66)	129*** (24)	75*** (25)

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.

Long-run outcomes: crime

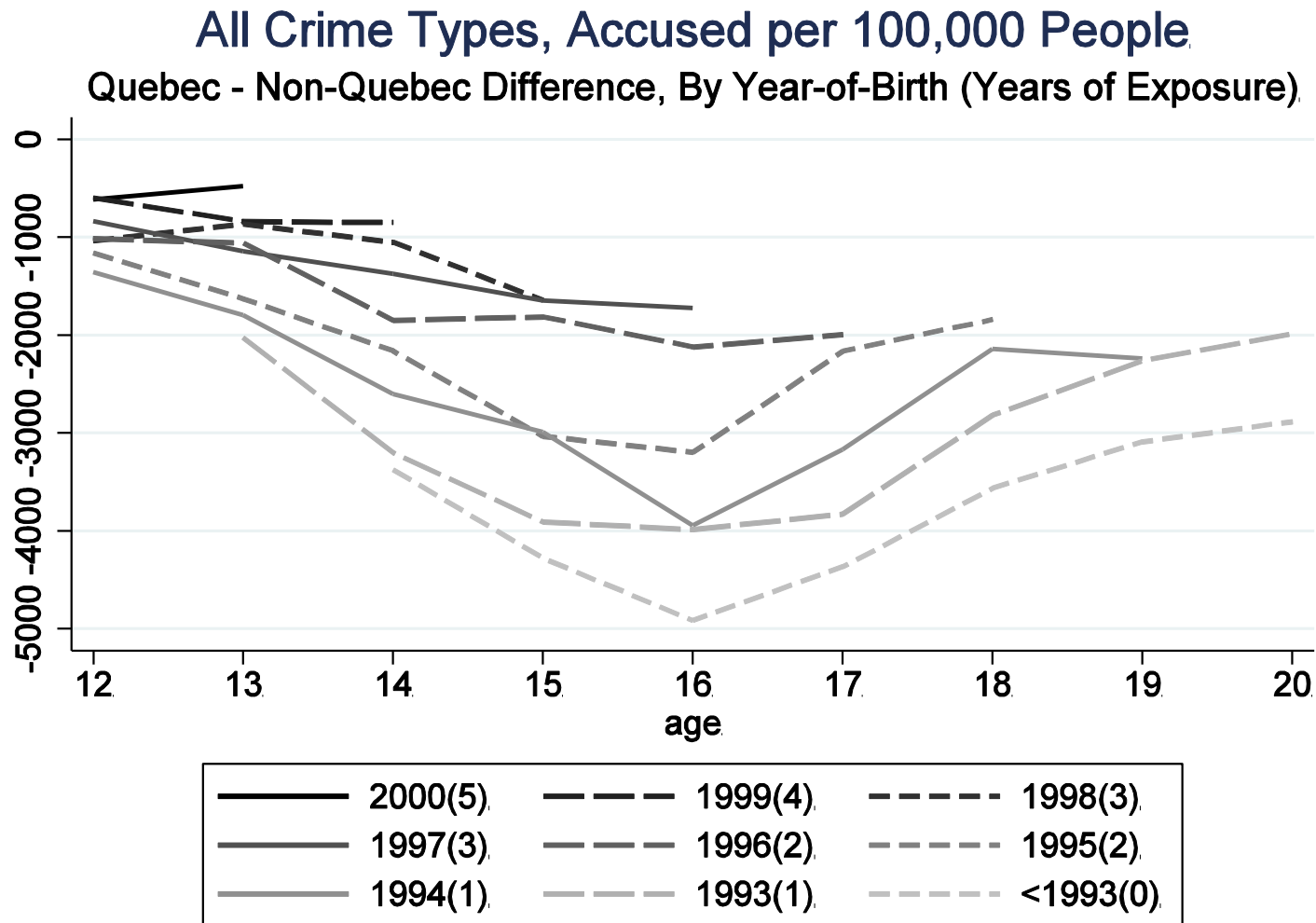
Table 5: Impact of Exposure to the Quebec Family Plan on Crime Rates, Ages 12-20

	Mean	(1)	(2)	(3)
Convictions				
All	4120	188*** (43)	312*** (51)	188*** (55)
Person	1059	274*** (55)	258*** (51)	119* (62)
Property	1492	51 (68)	527*** (100)	340*** (112)
Other CC	1119	297*** (64)	309*** (55)	310*** (56)
Drugs	450	133*** (25)	154*** (24)	78*** (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.

Long-run outcomes: crime

Dose-response relationship?



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Conclusions: shortcomings, caveats, and to-do list

We show:

- Negative non-cognitive effects documented in BGM 2008 persisted.
- Mixed evidence on persistent cognitive effects.
- Health and wellbeing worsens.
- Evidence of teenage criminal behaviour worsens.

Why this matters:

- Symmetric evidence on impact of non-cognitive reinforces idea that early-life developmental environment is crucial.
- If non-cognitive are important: we can experiment and assess interventions ‘quickly’ rather than wait 50 years for long-run Perry-style evaluations.

Conclusions: shortcomings, caveats, and to-do list

Policy confounders:

- Child benefit reforms: impact on married families; DDD estimates.
- School curriculum reforms: can't rule out—cohort mapping almost overlaps.
- YCJA: we have DDD with year-trends. Rules out a prov-year or prov-age response.

What we're still working on:

- Adjust standard errors to account for multiple inferences.
- Make stronger case to rule out YCJA: better than prov*age effects + prov*trend?
- Make stronger case for non-cognitive channel. How to rule out other potential channels?

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			