Cash Transfers and Child Outcomes

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Abstract

This paper focuses on the treatment effects of various existing programs around the English-speaking world that transfer money to families with children, either through work-based or unconditional transfers. Work-based programs are those that require labour force participation in order to qualify. Unconditional transfers simply require that children be present in the household. In Canada, the larger benefit programs targeted at families with children have been unconditional in nature. This paper shows that income support programs are an effective tool to promote child well-being. Further, while there are potentially positive gains for most families from this income support, the largest benefits are likely to be found among lower-income families. Even modest child benefits contribute to closing test score gap between the least disadvantaged and most disadvantaged children. The paper concludes that some questions about the efficacy of income supports remain. These include whether more targeted benefits had disproportionately larger effects on test scores, and whether the method benefit delivery within the context of income support programs is an important element of policy design.

Introduction

Income transfers to families with children are a primary tool for addressing child poverty and increasing the chances for children to succeed in school and, subsequently, the labour market. Almost all developed countries either have direct child benefits or target welfare/social assistance benefits toward families with children. These benefits are meant to help achieve several goals. First, by investing in children from low-income families, society can provide opportunities for improved educational and labour market outcomes, thereby generating a substantial return on investment (Hendren & Sprung-Keyser, 2020). Second, benefit programs help society achieve distributional and equity goals, regardless of the future returns of these transfer programs. In many contexts, including the federal Canadian context, these programs act as near-universal basic income (UBI) programs for families with children. The proposed UBI for British Columbia would therefore expand on or replace existing transfer programs in Canada. This brief explores what effect such a policy change would have on children.

This briefing has two components. The first outlines what we know about the effects of benefit programs aimed at children and their families on the educational and health outcomes of children. There are a wide range of studies evaluating the effects of different types of income transfer programs on children. Outcomes explored in the literature include a variety of health outcomes, from birth to early childhood health; cognitive development (reading, writing, and numeracy); educational achievement in public schools and post-secondary settings; and social, emotional, and behavioural development, as well as intermediate outcomes that are important for child outcomes, such as maternal health, parenting behaviours, and the home learning environment.

The review will focus mainly on the treatment effects of various existing programs around the English-speaking world that transfer money to families with children, either through work-based or unconditional transfers. We organize our review of the literature around program structure, classifying program alternatives into three categories:

1. Work-based programs, such as the Earned Income Tax Credit (EITC) in the United States and the Working Income Tax Benefit in Canada.
2. Unconditional but means-tested cash transfers, such as the Canada Child Benefit (CCB) in Canada.
3. Unconditional and universal cash transfers, such as the Universal Child Care Benefit (UCCB) in Canada and the Child Benefit in the U.K.

Work-based programs are those that require labour force participation in order to qualify. The EITC program in the United States is the quintessential work-based program and has been studied extensively. Figure 1 shows the classic EITC tax schedule for work-based cash transfers: recipients must earn some income to qualify, and the benefit increases as earnings increase for very-low-wage earners (work subsidy), before phasing out for higher earners. In Canada, by contrast, the larger benefit programs targeted at families with children have been unconditional in nature. Figure 2 shows the current means-tested CCB, as well as the former means-tested National Child Benefit (NCB) and Canada Child Tax Benefit (CCTB) programs in Canada. These programs do not include a phase-in range and are most generous for non-earners and the lowest earners. Finally, Figure 2 also shows

Canada's former universal program—the UCCB—which was replaced by the means-tested CCB in 2016. The UCCB is the component of Canada's safety net for children that most closely resembled a UBI. The program provided income to all families with small children, regardless of income, although UCCB income was taxable. We also present some evidence on the exact mechanisms by which these programs achieve their effects.

The second component describes results of analyses that look specifically at the effects of the UCCB income on educational outcomes among children in British Columbia. Our analysis uses administrative educational data on all children enrolled in British Columbia schools born between 1998 and 2007. We explore how the 2006 implementation of the UCCB—a universal cash transfer program for all Canadian children less than six years old—affected test scores in Grades 4 and 7. Using the results of this analysis, we benchmark what we believe variants of a basic income could achieve in terms of improving educational outcomes for children in British Columbia.

The Work-Based Program Literature

The U.S. EITC is a large and highly studied in-work benefit, although other countries—including Canada and the U.K.—offer similar credits. Nine studies included in the Cooper and Stewart (2013, 2017) reviews exploit changes in the EITC to estimate the effect of income on a multitude of child outcomes. Dahl and Lochner (2012) use an instrumental variables strategy on non-linear changes to the EITC in the late 1980s and 1990s. The authors compare unaffected higher-income families to lower-income families likely to be eligible for the EITC to estimate the causal effect of income on numeracy and reading scores. They estimate that a $1,000 increase in income improves numeracy and reading scores by 6% of a standard deviation (SD) in the short run, with larger effects for younger children, boys, and those with less-educated mothers. Hamad and Rehkopf's (2016) results indicate significant positive effects on both child behaviour and the home environment. The Behavior Problems Index improved by 3% of a SD for every $1,000, and the Home Observation for Measurement of the Environment (HOME) score improved by 4%. Additionally, Bastian and Michelmore (2018) find evidence that $1,000 of EITC income received during adolescence is associated with a 1.3% increase in high-school completion rates and a 4.2% increase in college completion rates.

There is less evidence of the extent to which EITC income affects child health outcomes, although several studies use the EITC to look at child weight. Hoynes et al. (2015), Strully et al. (2015), and Markowtiz et al. (2017) find significantly positive effects on birth weight. In terms of later-life weight outcomes, Jo (2018) finds evidence of increased obesity rates among children, while Chia (2013) does not find any association between EITC income and childhood obesity. Cooper and Stewart (2017) highlight that this may be because birth weight is perhaps more responsive to changes in income than childhood weight. Indeed, existing work has found evidence that mothers respond to EITC income by improving prenatal maternal health behaviours (Cowan & Teft, 2012; Hoynes et al., 2015; Markowtiz et al., 2017).

The Unconditional but Means-Tested Cash Transfers Literature

The largest national benefit programs for children in Canada are unconditional, but means-tested—namely, the former CCTB and NCB, as well as the more recent CCB. These programs are most generous for non-working families, and benefit amounts decrease as earning increase. Research on these programs have shown that means-tested transfer programs have positive effects on child outcomes. Milligan and Stabile (2011) analyzed the effect of the CCTB on educational outcomes using provincial variation in the program structure related to the generosity of CCTB. The authors use a simulated-benefits approach, making use of the policy variation in benefit-eligibility rules that is unrelated to individual-level characteristics. They find that a $1,000 increase in CCTB income led to a 6.9% of a SD improvement in numeracy scores, and a reduction in the likelihood of diagnosis of leading disability, with both effects concentrated among boys. Among girls, the authors estimate that a $1,000 increase in CCTB benefit income leads to about a 20% of a SD reduction in an aggression index score. Child health measures did not improve but there were strong positive effects on maternal depression.

Several additional studies explore the effects of means-tested benefit programs internationally. Two studies make use of the Minnesota Family Investment Program (MFIP) and its design. Specifically, lone-mother families were randomly assigned into three research groups: the control group, which continued to receive aid that falls steeply as earnings rise; the second group, which received financial incentives that meant families could keep a larger share of the welfare payments as earnings increased; and the third group, which received the same incentives but was also required to participate in work and training. The third group allows the studies to disentangle income effects from employment effects because the welfare payments in the third group were offset by any additional income from work. Gennetian and Miller (2002) find that the financial incentives had significant effects on positive child behaviour and on children's engagement in school and reduced maternal depression and domestic abuse. Adding the third group, where employment was mandatory, made no difference to most outcomes though it appeared to decrease children's social competence and autonomy. Using an instrumental variable approach, Morris and Gennetian (2003) find positive and significant effects of the incentives on positive social behaviour and school engagement, with effect for school achievement and problem behaviour not significant.

The Unconditional and Universal Cash Transfers Literature

Unconditional, universal cash transfer programs targeted at families with children are in essence basic income programs, since they transfer income to all families with children, regardless of income. Existing literature on such programs is limited. In the Canadian context, Lebihan and Mao Takongmo (2018) find mixed and inconclusive evidence of the effects of the UCCB on children's health outcomes. Using a difference-in-difference analysis, they find that the rollout of the UCCB is associated with a reduction of 16% of a SD in a hyperactive behaviour score among girls from low-education families. However, they also find evidence that the UCCB income is associated with worse aggression scores among boys. In the U.S., Chung et al. (2015) explore whether birth weight is affected by income received from the Alaska Permanent Fund (APF) dividend—a universal income transfer to all residents of Alaska, funded by oil revenue. They estimate that $1,000 in APF income is associated with a 14% reduction in low-birth-weight babies, an effect that is especially strong among mothers with lower levels of education.

Comparing the Programs and Policies

By and large, the included studies show that benefit income improves cognitive, social, behavioural, and physical outcomes for children and infants. However, magnitudes of these estimates vary considerably across studies. Two recent review articles by Cooper and Stewart (2013, 2017) summarize much of the causal literature. In order to facilitate comparison of estimated treatment effects across studies, the authors convert results to SD changes after a $1,000 increase, measured in 2000 constant USD. In some cases, a distinction is also made between estimates for different genders and income levels, as many studies find significant heterogeneity between these subsamples.

In terms of cognitive results, estimates of a $1,000 increase in income (in 2000 USD) has been shown to improve numeracy scores by about 0.23SD in Canada (Milligan & Stabile, 2011), but only by about 0.06SD in the U.S. (Dahl & Lochner, 2012). Duncan et al. (2011) find improvements in GPA as low as 0.06SD studying 10 welfare programs in the U.S. and Canada. Gennetian and Miller (2002) estimate an effect on GPA twice as large (0.12SD), with the estimate as high as 0.23SD for boys.

Studies on physical and behavioural outcomes exhibit similar variation in the magnitude of estimated effects. The variation in the magnitude of estimates depends on the context and structure of the program (work-based vs. universal or means-tested) and the population. In particular, there appears to be some evidence that boys benefit more from infusions of money in terms of academic achievement, while girls benefit more in terms of behavioural issues. For instance, Gennetian and Miller (2002) estimate a 0.12SD improvement for boys in the Behavior Problems Index and a 0.22SD improvement for girls. Similarly, Milligan and Stabile (2011) find higher estimates for aggression-related outcomes for girls.

Comparing the results above across work- and non-work-based programs, we see similar effects on numeracy scores, 0.07SD in the CCB case and 0.06SD for the EITC (Milligan & Stabile, 2011; Dahl & Lochner, 2012). This is true for maternal depression as well, with a −0.15SD effect in the MFIP study, a −0.10SD effect in the CCB study, and a −0.14SD effect in the EITC case (Gennetian & Miller, 2002; Milligan & Stabile, 2011; Boyd-Swan et al., 2016). However, the MFIP has a considerably larger positive effect on the Behavior Problems Index than the EITC: 0.12SD and 0.03SD for a US$1,000 change, respectively (Gennetian & Miller, 2002; Hamad & Rehkopf, 2015). This comparison is limited, however, as outcomes differ between the work- and non-work-based programs mentioned. For example, Dahl and Lochner (2012) also study the effect on reading, whereas Milligan and Stabile (2011) look at the Peabody Picture Vocabulary Test. Surprisingly, no EITC study included in the two reviews analyzes the effect in performance at school (GPA). There are also cases in which the sample is restricted in one study but not in others, such as by gender.

Mechanisms

There are several potential mechanisms through which transfer programs may improve outcomes for children. On the one hand, as transfers expand the budget set, families may simply use the income to purchase more goods and services, including goods that are valuable in maintaining basic child welfare and enhancing child development (food, clothing, books, etc.). On the other hand, income transfers may have indirect effects, such as reducing stress and improving household relations or changing the incentives for household labour supply. Such changes may benefit children indirectly, and therefore change their ability to function, and learn. These channels are explored by Mayer (1997), Yeung et al. (2002), and Hoynes et al. (2015), among others, and we borrow terminology from the previous literature here. Direct purchases of resources useful for child development are called the "resources" channel. Improved family relations and emotional well-being are called the "family process" channel. Finally, labour force mechanisms are called the "labour supply" channel.

There is evidence to support the resource channel hypothesis—that families spend benefit income on direct inputs like food, housing, and education (Barrow & McGranahan, 2000; Gennetian & Miller, 2002; Gregg et al., 2006; Kaushal et al., 2007; Goodman-Bacon & McGranahan, 2008; Riccio et al., 2010; Milligan & Stabile, 2011; McGranahan & Schanzenbach, 2013; Michelmore & Pilkauskas, 2019; Jones et al., 2019; Lenhart, 2019). There are also a significant number of studies that explore the family process channel hypothesis—that income improves intermediary outcomes such as parenting behaviours or stressors. Several studies have confirmed that increases in benefit income are associated with lower levels of maternal depression (Evans & Garthwaite, 2010; Boyd-Swan et al., 2016); better parenting outcomes (Cancian et al., 2013); lower levels of financial strain (Shaefer et al., 2013; Jones & Michelmore, 2018; Jones & Michelmore, 2019); and improved maternal health behaviours, such as lower rates of smoking and drinking (Cowan & Tefft, 2012; Averett & Wang, 2013; Hoynes et al., 2015; Hamad & Rehkopf, 2015; Jones et al., 2019). However, a handful of studies have found evidence that parents increase smoking or alcohol consumption when benefits are made more generous (Blow et al., 2010; Kenkel et al., 2014).

In terms of the labour supply channel, there is significant evidence exploring the link between benefit programs and maternal labour supply both in Canada and in the U.S. EITC. The evidence on work-based programs generally suggests that work-based benefit programs have led to increases in labour supply, especially among single mothers (Eissa & Liebman, 1996; Hotz et al., 2006; Hoynes & Patel, 2018, among many others). The evidence on unconditional programs in Canada is more mixed, with studies showing that benefit programs can either increase (Milligan & Stabile, 2007) or decrease (Schirle, 2015) labour supply among mothers. An important consideration is that to the extent that the program structure affects labour supply incentives, it will also affect the propensity to use childcare—a decision that can have far-reaching effects on childhood outcomes but is beyond the scope of this review.

One final consideration in terms of mechanisms is the extent to which the name of a benefit program matters. Kooreman (2000) shows that families are more likely to spend money earmarked as a "child benefit" on children. One explanation for this, which has been important in other contexts, is that child benefits are often claimed by mothers. Existing evidence has demonstrated that women tend to spend cash transfers on family goods at higher rates than men (Schady & Rosero, 2008).

General Conclusions From Literature as They Pertain to a Basic Income

We can draw several general conclusions from the literature to date. The first is that it is clear that benefit income can have a positive effect on child outcomes across several domains. The second is that it is likely the case that this matters more for low-income children than for high-income children (we propose to test the magnitude of this directly with the B.C. school data). The third is that, on the margin, it isn't clear that one can conclude that one type of benefit income delivery system has a much larger impact on child outcomes than another. The range of estimates is broad enough that one can generally say that all of these different delivery mechanisms produce improvements. This is an area that would likely benefit from further investigation, but given the evidence to date, it is likely that the biggest difference across benefit income regimes is to be found in the impact on other important domains, such as female labour supply, progressivity of the tax system, household bargaining, and poverty.

While there is every reason to believe that findings in the literature should be generalizable to B.C. children, we now turn to directly estimating the effect of benefit income on the educational outcomes of children in British Columbia, as well as testing to see whether there are differential impacts by socioeconomic status and duration of treatment. We also hope to provide some further evidence on the contrast between in-work benefits and universal cash transfers on educational outcomes.

Original Analysis Using British Columbia Educational Data Policy Details: The UCCB

We begin by evaluating the effect of a universal cash transfer program on educational outcomes among students enrolled in B.C. schools. The universal cash transfer program we evaluate is the UCCB. The UCCB was a cash transfer program available to all Canadian children aged five and younger. Implemented in July 2006, the program provided $100 per month, per child, to all families with eligible children. The benefit was fully taxable and thus decreased in real value as household income increased. The CCTB young child supplement was also eliminated with the rollout of the UCCB, further reducing the real value of the UCCB by $249 in 2006 dollars. However, the UCCB benefit was transferred in a separate cheque, such that families may have viewed the benefit at its $100 value. In 2015, the value of the UCCB was increased to $160 per month for children under six, and a new benefit of $60 per month was added for children aged six through 17. In 2016, the UCCB was bundled together with other existing child benefit programs upon the implementation of the CCB. Our analysis explores how the initial rollout of the UCCB in 2006 affected educational outcomes for children living in lower-income neighbourhoods of British Columbia.

British Columbia had previously provided support for low-income families through a number of programs. Perhaps most importantly for our analysis, the 1996 B.C. Family Bonus provided an income-tested benefit for families with children, replacing previous income assistance programs (British Columbia Ministry of Finance and Corporate Relations, 1997). It also served as a model for the NCB that would emerge in 1998. Both programs were more targeted at lower-income families than the UCCB. The existence of these programs makes inference on the effects of the UCCB more complicated, and we discuss the potential effects of these programs on our estimates below.

Analysis: Data and Methods

We use administrative data on testing outcomes for all children enrolled in the B.C. public school system. We explore reading, writing, and numeracy test scores collected from the Foundation Skills Assessment (FSA) tests, which all B.C. students are required to take in Grades 4 and 7.[1] Test scores are scaled and standardized and range from 0 to 100, with a mean of 50.[2] Our main analytical sample includes children born between 1998 and 2007, who were in Grade 4 between the years of 2007 and 2017—about 432,000 students—and children born between 1998 and 2004, who were in Grade 7 between 2010 and 2017—about 306,000 students.[3] There are a significant number of test scores recorded as 0 in the data (15%–20% per test—see Tables 1a and 1b for details). We assume that many of these 0 scores are in fact missing tests.[4] Accordingly, we also conduct our analyses on the sample of children with test scores greater than 0.

Our main analysis compares FSA scores among children with more years of exposure to the UCCB to scores of children with fewer years of exposure. The main source of this variation is birth timing: children born on or after the July 2006 UCCB implementation date had access to the full six years of UCCB benefit income, while children born between July 2000 and June 2006 received between one and six years of UCCB benefit income before their sixth birthday. Children born before July 2000 received no UCCB funding before their sixth birthday.

Under this definition, exposure to the UCCB is completely determined by birth timing, since children born later received more UCCB income than children born earlier. This means that simply comparing the test scores of children with more UCCB income to those with less

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[1] The test is administered through both a written component and an online component. Online components have multiple-choice questions. The written component provides for open-ended questions (British Columbia Ministry of Education, 2019). Questions types vary by test. For example, the Grade 4 numeracy test asks: "Sam collects hockey cards. He has 395 hockey cards in his collection. He buys some more cards at a garage sale. Now he has 422 cards. How many cards did he buy?" Another asks about which shapes should be added to a diagram to complete a pattern, and another about interpreting a histogram. The reading test asks students to read two excerpts, write a written response about one, and answer a series of multiple-choice comprehension questions about the other. The writing tests ask students to complete one writing task over 45 minutes.

[2] The online multiple-choice questions are self-scoring. All written responses are scored at the school or district level by independent scorers who have completed training. A random sample of tests are rescored for validation (British Columbia Ministry of Education, 2019).

[3] Sample sizes are rounded to accord with data disclosure rules.

[4] There has been ongoing debate between British Columbia school boards and the British Columbia Teachers' Federation (BCTF) regarding the suitability of the FSA tests for evaluating learning. The BCTF has repeatedly urged parents to boycott the tests, resulting in some students and schools refusing to complete the FSA (CBC News, 2015; Boynton, 2019). Furthermore, there is no consequence to missing a test. Thus, if a student misses the test and scheduled make-up session due to absences, they will not be required to take it.

will not reveal the effect of the UCCB: any relationship between UCCB income and test scores could simply reflect changing test results over cohorts. To overcome this issue, we use children for whom the UCCB benefit was less valuable—namely, children from higher-income households—as a control group. By using higher-income children as a control group, we can isolate the change in test scores over cohorts that is unique to lower-income children. Any test score change unique to lower-income children is more likely due to the UCCB income than to cohort trends in test scores.

While the B.C. administrative data do not include information about household income for individual children, they do include information about the characteristics of each child's neighbourhood. Thus, we identify children who live in relatively more disadvantaged neighbourhoods and use this as a proxy for low-income households. We use the following neighbourhood characteristics to identify children who live in more disadvantaged neighbourhoods: the percentage of families receiving government transfer income, the average neighbourhood income, the homeownership rate, the proportion of families with income below the low-income cut-off, and the proportion of families in the bottom 10% of the overall income distribution. We identify neighbourhoods below the median for each measure, using a 0/1 indicator; we then add these indicators together to create a measure of the degree of relative disadvantage in a child's neighbourhood. This neighbourhood disadvantage index (DI) has a value ranging from 0 to 5, with 0 indicating less disadvantaged neighbourhoods and 5 indicating more disadvantaged neighbourhoods. As we have multiple years of data for each child, we take the average DI for each child across all sampled years.

The regression model we estimate is a cohort difference-in-difference model:

$$FSA_{icn} = \beta UCCBExp_c * DI_n + \alpha UCCBExp_c + \delta DI_n + \boldsymbol{X}_i^{\%}\boldsymbol{\gamma} + \theta_y + \eta_s + \epsilon_i \qquad (1)$$

Equation (1) models FSA test score for student *i*, born in year *c*, with a neighbourhood DI score of *n*. The main explanatory variables in the model include the $UCCBExp_c$, which captures the total years of UCCB exposure for the student born in year *c* (ranging from 0 to 6); DI_n, which is the DI score for students in neighbourhood *n* (ranging from 0 to 5); and their interaction. The coefficient on the interaction term, β, tells us how the Grade 4 or Grade 7 FSA scores change with an additional year of UCCB exposure for students who come from relatively disadvantaged neighbourhoods, relative to how they change among students from less disadvantaged neighbourhoods. The model also controls for $\boldsymbol{X}_i$, a set of student-specific covariates including sex, age, Indigenous status, whether English is spoken in the home, birth year,[5] and birth month fixed effects. Finally, we include fixed effects to control for the school year (θ_y) and school (η_s) when and where the child took the Grade 4 or Grade 7 tests. We estimate model (1) on the FSA reading, writing, and numeracy scores in both Grades 4 and 7. We also estimate model (1) on an indicator for 0 scores for each test in each grade

[5] While the *UCCBExp* variable is highly determinant by birth year, it is not perfectly collinear with birth year. All students born in 2000 and earlier have zero exposure years, and all students born after July 2006 have six exposure years. Accordingly, the birth year fixed effects allow us to distinguish between these cohorts. Furthermore, while *UCCBExp* captures linear variation in outcomes across cohorts, the birth year fixed effects allow for non-linear cohort effects.

level. The results of these analyses identify whether the propensity to miss tests is related to the UCCB policy. We cluster all standard errors at the school-year level.

In addition to traditional regression estimates, we also show event study–type figures that illustrate the results. We estimate models similar to (1) above, except we replace the *UCCBExp* with cohort fixed effects (with birth year 2000 as the omitted category). We interact the cohort fixed effects with an indicator that equals 0 for students with a DI score of 2.5 or less, and 1 for students with DI scores greater than 2.5—our treatment group. We estimate these regression models after including the same set of covariates as above. We then plot the estimated cohort-by-DI interaction coefficients. The event study figures show the marginal trends in FSA scores for cohorts more and less exposed to the UCCB, for students in the most disadvantaged neighbourhoods relative to students in the least disadvantaged neighbourhoods.

Main Results

Tables 1a and 1b show average test scores for the students in our sample. In panel A of Table 1a, we show the average Grade 4 test scores overall, as well as by DI group. Because scores are standardized to a mean of 50, the overall average scores are all close to 50. However, there are significant difference in average score between children who score high and low on the DI. There are 5- to 6-point test score gaps for reading, writing, and numeracy tests, with children living in more disadvantaged neighbourhoods scoring worse than those in less disadvantaged neighbourhoods. For all three tests, these gaps represent about 10% differences in average scores by DI. In panel B of Table 1a, we show the average proportion of test scores recorded as 0 (which we assume represent missed tests). About 16%–17% of test scores are recorded as 0; about 18% of students have a recorded score of zero for at least one test. We also identify a test-taking gap by DI group. About 16% of students from less disadvantaged neighbourhoods have a recorded 0 for at least one test, while about 21% of students from more disadvantaged neighbourhoods have a recorded 0 on at least one test. A test-taking gap of five percentage points represents a large difference between the proportion of students who miss tests in high- versus low-DI neighbourhoods. Table 1b shows similar results for the Grade 7 tests. We find similar gaps in test scores across DI groups, and similar rates of missed tests as well.

Tables 2 and 3 show the results of estimating model (1) on the Grade 4 and Grade 7 test scores, respectively. For each test score, we report two sets of regression coefficients: one set derived from estimating model (1) after including school-year fixed effects (column 1), and a second after including both school-year and school fixed effects (column 2). Comparing the two estimates for each outcome gives an indication of the extent to which unobserved school-level factors may be correlated with exposure to the UCCB and may therefore bias our estimates.

Table 2 shows the results for the Grade 4 tests. The results show a significant direct effect of exposure years, ranging from about 1.5 to 2.5 points across tests and specifications. This suggests that there is a general trend of increasing scores across cohorts who are born later and are therefore more exposed to the UCCB. The direct effect of exposure years is large: comparing students born in 2006 and 2007 with those born in 1998, 1999, and 2000, we estimate that the children born later scored at least 10 points better on the three tests than the children born earlier. This difference captures any effect of the UCCB, along with unrelated cohort differences in test scores. The direct effect of the DI is also significant across all test scores and specifications: in general, a 1-point increase in DI score is associated with a 1- to 2-point reduction in test scores, such that students from the most disadvantaged neighbourhoods scored 5 to 10 points worse on all tests.

The estimated coefficients on the interaction between *UCCBExp* and *DI score* tell us the marginal change in the test scores of children from more disadvantaged neighbourhoods who receive more years of UCCB income, relative to children from less disadvantaged neighbourhoods. For the numeracy test, we estimate that for children from marginally more disadvantaged neighbourhoods, one additional year of UCCB income is associated with a 0.1 point test score improvement. The estimate decreases in magnitude to 0.06 after we include school fixed effects. To put this estimate in context, among students with no UCCB income, we expect a student from the most disadvantaged neighbourhoods to score about 5.6 points lower on the Grade 4 numeracy test than a student from the least disadvantaged neighbourhoods. However, if we compare students from the least and most disadvantaged neighbourhoods who received UCCB income in all six years before starting school, we expect the test score gap to narrow to 3.7 points—a 34% reduction. Among students from the most disadvantaged neighbourhoods, each additional year of UCCB income is associated with a 0.3 point improvement in Grade 4 numeracy scores—a 0.7% improvement from the average numeracy score of 46.68. Results are similar for the Grade 4 reading and writing scores. Reading scores for the most disadvantaged students improve by 0.4 points with each additional year of UCCB income; writing scores improve by 0.2 points with each additional year of UCCB. Compared with students from the most advantaged neighbourhoods, Grade 4 students from disadvantaged neighbourhoods with no UCCB income score about 6 points lower on both the reading and writing tests. For students with six years of UCCB income, test score gaps narrow by 2.1 points for the reading test and by 1.4 points for the writing test—39% and 30% reductions, respectively. Our estimates for these outcomes are relatively stable to the inclusion of school fixed effects.

Table 3 shows the results for the Grade 7 test scores. Just as we did for the Grade 4 tests, we find evidence of test score gaps between children from more and less disadvantaged neighbourhoods. However, unlike the Grade 4 results, we find evidence of negative associations between UCCB exposure years and test scores among more advantaged children. We estimate that the direct effect of exposure to the UCCB is between −3.5 and −1.5 points per year, depending on the test and model specifications we consider. Despite the negative association between exposure years and test scores among the general population, we estimate positive, significant marginal effects of exposure among children from more disadvantaged neighbourhoods for the Grade 7 numeracy and reading test scores. We find that each year of UCCB exposure among children from the most disadvantaged neighbourhoods is associated with a 0.4 point improvement in their Grade 7 numeracy test score. Six years of UCCB exposure is associated with a 2.4 point reduction in the test score disadvantaged gap—from 4.8 points to 2.4 points, or a 50% reduction. For the Grade 7 reading test, the marginal effect of an additional year of UCCB exposure among children from the most disadvantaged neighbourhoods is 0.4 points, although the estimated effect is only significant with control for school-level differences in scores. Similar to the numeracy test, the cumulative effect of six years of UCCB exposure is associated with a 2.2 point reduction in the test score gap—from 4.6 points to 2.4 points. We do not estimate statistically significant marginal effects among children from disadvantaged neighbourhoods for the Grade 7 writing test.

Event Studies

In addition to our regression results, we also estimate cohort event studies and plot the relevant coefficients in Figures 3 through 8. These figures show the estimated coefficient on the interaction between birth year fixed effects and the indicator for high-DI-score children. The graphs show the differences between the average test scores among children from more disadvantaged neighbourhoods relative to those from less disadvantaged neighbourhoods, and how the differences change across birth cohorts. The average scores are computed in a regression framework and are therefore conditional of the set of child- and test-specific covariates described above. If our regression estimates reflect the causal effect of the UCCB, then we should expect to see minimal trends in test score differences for children with no UCCB exposure (those born before 2000), and changing test score differences across cohorts who are progressively more exposed to the UCCB (born in 2000 and later). In all six figures, we plot the cohort-specific coefficients and their 95% confidence intervals (dashed lines).

Figure 3 shows the results of the event study analysis for the Grade 4 numeracy test. The graph shows that relative to the cohort trend among children from less disadvantaged neighbourhoods, test scores among children from more disadvantaged neighbourhoods are increasing across more exposed cohorts—those born after 2000. Similar to the regression results, we find that for children born in later cohorts, there is a 1- to 2-point marginal difference between test scores of more versus less disadvantaged children. We also see some indication that the effect increases with more years of exposure: children from disadvantaged neighbourhoods who were born in 2001 and 2002—and who received only one or two years of UCCB income—do not enjoy improved test scores relative to children from less disadvantaged neighbourhoods. It is only among children with three or more years of UCCB exposure—those born in 2003 and later—that we see positive marginal effects of exposure. However, we also find evidence of positive, significant marginal effects among the 1998 and 1999 cohorts, both of whom did not receive any UCCB income. It is possible that these early cohorts reflect some "contamination" from other programs available to low-income families in B.C. As noted above, the B.C. Family Bonus program began two years prior, in 1996. As the earlier benefit was more targeted than the UCCB, it may contribute to the positive effects we observe in the 1998 and 1999 cohorts. This may also produce downward bias in the effects post-2000. Further examination of the separate contributions of these programs on educational outcomes will benefit from detailed tax data on which families received income support.

Figure 4 shows the same graph for the Grade 4 reading test. We again estimate positive, marginal effects of birth year among children from more disadvantaged neighbourhoods relative to children from less disadvantaged neighbourhoods. The positive trend in test scores emerges for the birth cohorts born in 2003 and later, and we find evidence of a 1- to 2-point marginal effect that increases with exposure years. We again find some evidence of positive marginal effects among the high-DI-score children who were born in 1998 and 1999, although the estimated coefficients for these birth cohorts are only marginally significant. Figure 5 shows the event study graph for the Grade 4 writing test. While none of the estimated coefficients for this test are significant, the estimates suggest a trend that is similar to the numeracy and reading tests.

Figures 6 through 8 show similar event studies for Grade 7 test scores. Note that for Grade 7 scores, we do not have scores for children born in 2005 or later, who had not yet completed the tests by 2017. Figure 6 shows the results for the Grade 7 numeracy test. The event study confirms that, relative to the low-DI-score children, there is a positive cohort trend among children born after 2000 with high DI scores. The event study estimates confirm the regression results that there is a positive, significant marginal effect of cohort of about 1 point. We do not find evidence of significantly different scores between high- and low-DI-score children who are unexposed to the UCCB—those born in 1998 and 1999. Figure 7 shows the results for the Grade 7 reading test. The graph reveals a positive trend in the difference in reading test scores between low- and high-DI students for the 2001 through 2004 birth cohorts. However, for the reading test, we again find evidence of positive marginal effects for the unexposed 1998 and 1999 cohorts. Finally, Figure 8 plots the event study coefficients for the Grade 7 writing test. In general, the figure does not suggest any significant differences in test scores between low- and high-DI-score students.

Robustness Checks

We conduct two sets of robustness checks to help validate our findings. First, we address the fact that 15%–20% of test scores are recorded as 0 for all tests. Although we cannot confirm this, we assume the 0 scores reflect missed tests rather than an actual 0. We therefore conduct an analysis of the 0 scores and re-estimate our models after dropping the children with 0 scores from our analysis. We report the results of this exercise in Table 4, with results in the top panel for the Grade 4 outcomes and results in the bottom panel for Grade 7 outcomes. In the first column, we report the results of estimating model (1) on an indicator that equals 1 for children for whom at least one Grade 4 (or Grade 7) test score is recorded as 0—which we interpret as test skipping. In both Grade 4 and Grade 7, we estimate small, precise 0 coefficients on the interaction between *UCCBExp* and *DI score.* This suggests that, relative to children from less disadvantaged neighbourhoods, children from more disadvantaged neighbourhoods are not more or less likely to skip a test with additional years of UCCB exposure.

In the remaining columns of the table, we estimate model (1) on the test scores after excluding any student with a score of 0 on that test. In general, the results of this exercise confirm our main results, although the estimates decrease in magnitude for the Grade 4 tests. We estimate that among test takers, the marginal effect of an additional year of UCCB exposure among children from the most disadvantaged neighbourhoods is 0.2 points for Grade 4 numeracy and reading and 0.1 points for Grade 7 writing. This suggests that for students from the most disadvantaged to least disadvantaged neighbourhoods, the UCCB may have closed the Grade 4 test score gaps by 23% for numeracy (from 4.4 to 3.3 points), by 36% for reading (from 4.1 to 2.7 points), and by 22% for writing (from 3.09 points to 2.4 points). For Grade 7, the marginal effect estimates are similar in magnitude among the test taker sample relative to the full sample.

The second robustness check we conduct is to re-estimate our models after excluding students born in 1998 and 1999.[6] Our event study analyses revealed differential test scores between high- and low-DI-score students born in these cohorts. However, because these cohorts are part of the control group, they should not differ in test scores. Accordingly, we eliminate these cohorts from the control group—leaving just the children born in year 2000. We re-estimate our model and report results in Table 5. The results of this exercise are very similar to our baseline results. For all test scores, we find positive, significant estimates of the coefficient on the interaction term, suggesting that the associations between UCCB exposure and test score differences between low- and high-DI-score students are not driven by underlying cohort trends in test scores. Further, after we remove the 1998 and 1999 birth cohorts, several of the estimates of the direct effect of UCCB exposure years become insignificant.

Conclusions

A review of the evidence on the effects of cash transfers on child outcomes, coupled with new evidence from educational data in British Columbia, all suggests that income support programs are an effective tool to promote child well-being. Further, while there are potentially positive gains for most families from this income support, the largest benefits are likely to be found among lower-income families. New evidence from British Columbia tests scores presented here suggests that even a modest benefit such as the UCCB contributed to closing the test score gap between the least disadvantaged and most disadvantaged children, as measured at the neighbourhood level.

Using variation in the exposure to the UCCB in Canada coupled with differences in neighbourhood-level disadvantage, we examine the effect of the UCCB on test scores in B.C. for children in Grades 4 and 7. We find that UCCB exposure helped reduce the gap in test scores between more and less disadvantaged families. Further, we find this effect across different academic domains, including reading, writing, and numeracy. The effect is stronger at the Grade 4 level than the Grade 7 level when examining cohorts born between 1998 and 2006, but stronger for the Grade 7 cohort if we restrict our analysis to more recent cohorts (from 2000 onward).

Some questions about the efficacy of income supports remain. These include whether more targeted benefits had disproportionately larger effects on test scores, and whether the method benefit delivery within the context of income support programs is an important element of policy design. These questions are best pursued through a more detailed linkage between tax data and administrative data on child outcomes—a project that is currently under way.

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[6] We also exclude students with 0 scores in this analysis. Our results are not sensitive to this decision.

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Table 1a

Mean Test Score (Grade 4) and Test Taking Overall and by DI Index Grouping

	Panel A: Grade 4 Test Scores							
	Overall Score		Low DI Index		High DI Index		Test Gap	(s.e.)
	Mean	SD	Mean	SD	Mean	SD		
Numeracy	49.69	29.39	52.60	28.72	46.68	29.77	−5.923***	(0.089)
Reading	51.05	28.92	54.19	28.23	47.80	29.26	−6.386***	(0.087)
Writing	47.69	26.60	50.40	26.05	44.89	26.86	−5.514***	(0.080)
	Panel B: Grade 4 Proportion who Skipped a Test (recorded as 0)							
	Overall		Low DI Index		High DI Index		Test Skipping Gap	(s.e.)
	Proportion	SD	Proportion	SD	Proportion	SD		
Numeracy	0.16	0.37	0.14	0.35	0.18	0.39	0.045***	(0.001)
Reading	0.16	0.37	0.14	0.34	0.18	0.39	0.046***	(0.001)
Writing	0.17	0.38	0.15	0.36	0.20	0.40	0.049***	(0.001)
Any Test	0.18	0.38	0.16	0.36	0.21	0.40	0.051***	(0.001)
N (Rounded)	434,000		221,000		213,000			

Note. Table 1a presents average test scores overall, and by DI score, as well as the test score gap. High-DI-score children are those with DI score above 2.5, the midpoint on the index. These children are from relatively more disadvantaged neighbourhoods.

Table 1b

Mean Test Score (Grade 7) and Test Skipping Overall and by DI Index Grouping

	Overall Score		Low DI Index		High DI Index		Test Gap	(s.e.)
Panel A: Grade 7 Test Scores								
	Mean	SD	Mean	SD	Mean	SD	Gap	
Numeracy	46.25	29.26	48.47	28.85	43.94	29.51	−4.529***	(0.106)
Reading	51.78	30.05	54.50	29.65	48.93	30.20	−5.573***	(0.108)
Writing	47.59	27.95	50.00	27.67	45.07	28.02	−4.934***	(0.101)
Panel B: Grade 7 Proportion who Skipped a Test (recorded as 0)								
	Overall		Low DI Index		High DI Index		Test Skipping Gap	(s.e.)
	Proportion	SD	Proportion	SD	Proportion	SD		
Numeracy	0.18	0.39	0.17	0.37	0.20	0.40	0.035***	(0.001)
Reading	0.18	0.38	0.16	0.37	0.20	0.40	0.036***	(0.001)
Writing	0.19	0.40	0.17	0.38	0.22	0.41	0.041***	(0.001)
Any Test	0.20	0.40	0.18	0.39	0.23	0.42	0.043***	(0.001)
N (Rounded)	306,000		156,000		150,000			

Note. Table 1b presents average test scores overall, and by DI score, as well as the test score gap. High-DI-score children are those with DI score above 2.5, the midpoint on the index. These children are from relatively more disadvantaged neighbourhoods.

Table 2

The Effect of UCCB Exposure on Grade 4 Test Scores, by Neighbourhood Disadvantage Index

	Numeracy		Reading		Writing	
	(1)	(2)	(1)	(2)	(1)	(2)
UCCBExp	1.648	1.219*	2.500**	2.389***	2.032**	1.895***
	(1.149)	(0.571)	(0.810)	(0.506)	(0.731)	(0.539)
DI Score	−1.915***	−1.124***	−1.830***	−1.085***	−1.653***	−0.911***
	(0.086)	(0.064)	(0.075)	(0.062)	(0.079)	(0.060)
UCCBExp × DI Score	**0.095****	**0.064*****	**0.096*****	**0.071*****	**0.076****	**0.046****
	(0.029)	**(0.018)**	**(0.026)**	**(0.018)**	**(0.026)**	**(0.017)**
Year Fixed Effects	x	x	x	x	x	x
School Fixed Effects		x		x		x
N Rounded	432,000	432,000	432,000	434,000	432,000	432,000
Adj. R-square	0.112	0.259	0.206	0.224	0.114	0.251

Note. Table 2 presents estimates of the effect of UCCB exposure on Grade 4 test scores. UCCB exposure is calculated based on year of birth, with children receiving zero to six years of UCCB, depending on their year of birth relative to the UCCB implementation in 2006. The DI score is an index of neighbourhood socioeconomic conditions, calculated based on the child's neighbourhood of residence. Baseline covariates include student age, Indigenous status, and whether English is spoken in the home. Robust standard errors clustered at the school-year level in parentheses, with significance marked as follows: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 3

The Effect of UCCB Exposure on Grade 7 Test Scores, by Low-Income Index

	Numeracy		Reading		Writing	
	(1)	(2)	(1)	(2)	(1)	(2)
UCCBExp	−3.362***	−2.435***	−2.785**	−2.144**	−2.078**	−1.564**
	(0.917)	(0.508)	(0.958)	(0.661)	(0.741)	(0.497)
DI Score	−1.636***	−0.951***	−1.544***	−0.920***	−1.449***	−0.712***
	(0.108)	(0.064)	(0.103)	(0.067)	(0.103)	(0.061)
UCCBExp × DI Score	**0.134***	**0.079***	**0.118**	**0.073***	**0.063**	**0.006**
	(0.063)	**(0.032)**	**(0.062)**	**(0.034)**	**(0.063)**	**(0.032)**
Year Fixed Effects	x	x	x	x	x	x
School Fixed Effects		x		x		x
N Rounded	36000	306000	306000	306000	306000	306000
Adj. R-square	0.126	0.314	0.111	0.265	0.115	0.302

Note. Table 3 presents estimates of the effect of UCCB exposure on Grade 7 test scores. UCCB exposure is calculated based on year of birth, with children receiving zero to six years of UCCB, depending on their year of birth relative to the UCCB implementation in 2006. The DI score is an index of neighbourhood socioeconomic conditions, calculated based on the child's neighbourhood of residence. Baseline covariates include student age, Indigenous status, and whether English is spoken in the home. Note that Grade 7 writing test scores were recorded not as continuous scores, but into rounded groups for every 8% (i.e., 0%, 8%, 17%, 25%, etc.). Robust standard errors clustered at the school-year level in parentheses, with significance marked as follows: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.00$.

Table 4

The Effect of UCCB Exposure on Test Scores, Test Skipping Analysis

	Test Skipping	Numeracy	Reading	Writing
Panel A: Grade 4 Outcomes				
UCCBExp	−0.019*	−0.563	1.393**	0.713*
	(0.009)	(0.499)	(0.425)	(0.280)
DI Score	0.007***	−0.871***	−0.827***	−0.618***
	(0.001)	(0.047)	(0.042)	(0.037)
UCCBExp × DI Score	−0.000	0.034**	0.049***	0.023*
	(0.000)	(0.013)	(0.011)	(0.011)
N Rounded	432000	363,000	364,000	358,000
Adj. R-sq	0.206	0.256	0.173	0.216
Panel B: Grade 7 Outcomes				
	Test Skipping	Numeracy	Reading	Writing
UCCBExp	0.024**	−0.946*	−0.576	−0.151
	(0.008)	(0.381)	(0.554)	(0.321)
DI Score	0.003**	−1.008***	−0.951***	−0.686***
	(0.001)	(0.048)	(0.045)	(0.039)
UCCBExp × DI Score	0.001	0.094***	0.086***	0.036
	(0.001)	(0.023)	(0.020)	(0.020)
N Rounded	306000	250,000	251,000	250,000
Adj. R-square	0.247	0.293	0.186	0.264

Note. Table 4 presents estimates of the effect of UCCB exposure on the likelihood of having a zero score for at least one Grade 4 or Grade 7 test (called “test skipping”). Subsequent columns show results for test scores, estimated only among children with a test score greater than 0 for the given test. UCCB exposure is calculated based on year of birth, with children receiving zero to six years of UCCB, depending on their year of birth relative to the UCCB implementation in 2006. The DI score is an index of neighbourhood socioeconomic conditions, calculated based on the child’s neighbourhood of residence. Baseline covariates include student age, Indigenous status, and whether English is spoken in the home. Note that Grade 7 writing test scores were recorded not as continuous scores, but into rounded groups for every 8% (i.e., 0%, 8%, 17%, 25%, etc.). Robust standard errors clustered at the school-year level in parentheses, with significance marked as follows: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 5

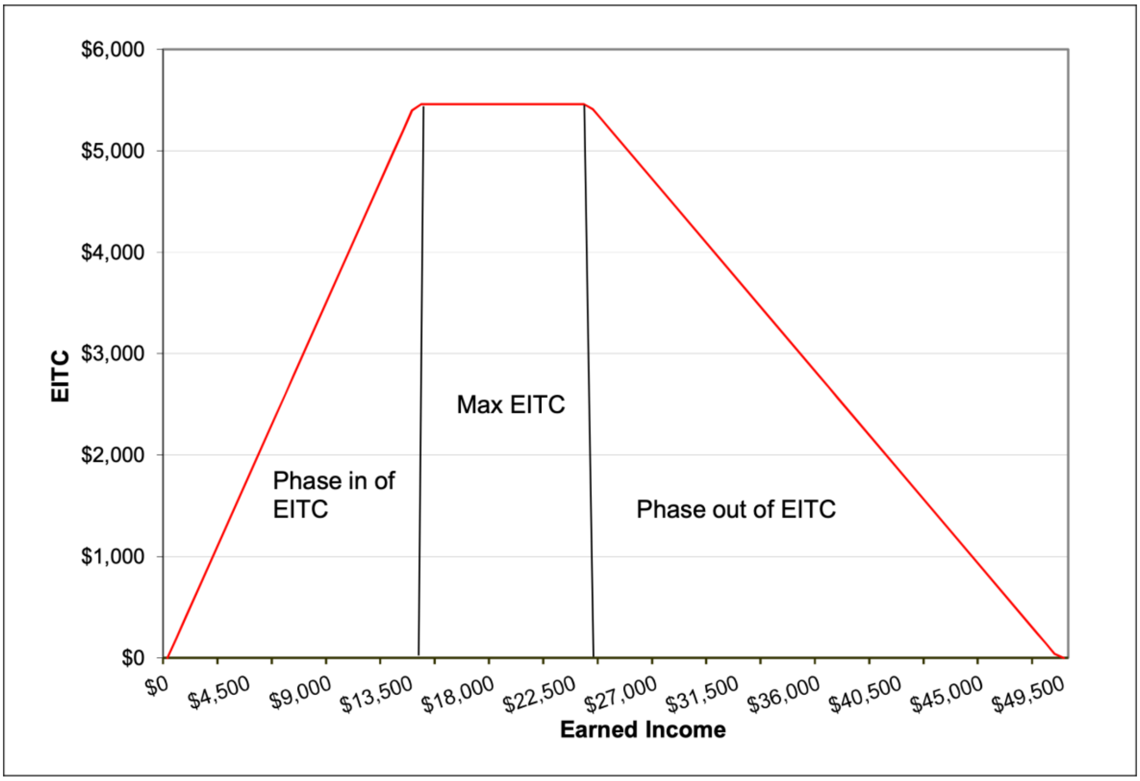
The Effect of UCCB Exposure on Test Scores, Ignoring 1998 and 1999 Cohorts

Panel A: Grade 4 Outcomes			
	Numerac y	Reading	Writing
UCCBExp	−0.601	1.707**	0.927*
	(0.828)	(0.524)	(0.403)
DI Score	−0.991***	−0.904***	−0.685***
	(0.065)	(0.056)	(0.050)
UCCBExp × DI Score	**0.059*** **	**0.068*** **	**0.035** **
	(0.016)	**(0.013)**	**(0.012)**
N Rounded	286,000	287,000	282000
Adj. R-square	0.256	0.179	0.229
Panel B: Grade 7 Outcomes			
	Numerac y	Reading	Writing
UCCBExp	4.501*	−2.029	0.670
	(1.887)	(1.894)	(1.618)
DI Score	−1.039***	−1.099***	−0.742***
	(0.068)	(0.064)	(0.057)
UCCBExp × DI Score	**0.095*** **	**0.138*** **	**0.054* **
	(0.028)	**(0.024)**	**(0.024)**
N Rounded	175,000	176,000	175,000
Adj. R-square	0.300	0.187	0.277

Note. Table 5 presents estimates of the effect of UCCB on test scores, estimated among the sample of children with greater than 0 scores and born in 2000 and later. UCCB exposure is calculated based on year of birth, with children receiving zero to six years of UCCB, depending on their year of birth relative to the UCCB implementation in 2006. The DI score is an index of neighbourhood socioeconomic conditions, calculated based on the child's neighbourhood of residence. Baseline covariates include student age, Indigenous status, and whether English is spoken in the home. Note that Grade 7 writing test scores were recorded not as continuous scores, but into rounded groups for every 8% (i.e., 0%, 8%, 17%, 25%, etc.). Robust standard errors clustered at the school-year level in parentheses, with significance marked as follows: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 1

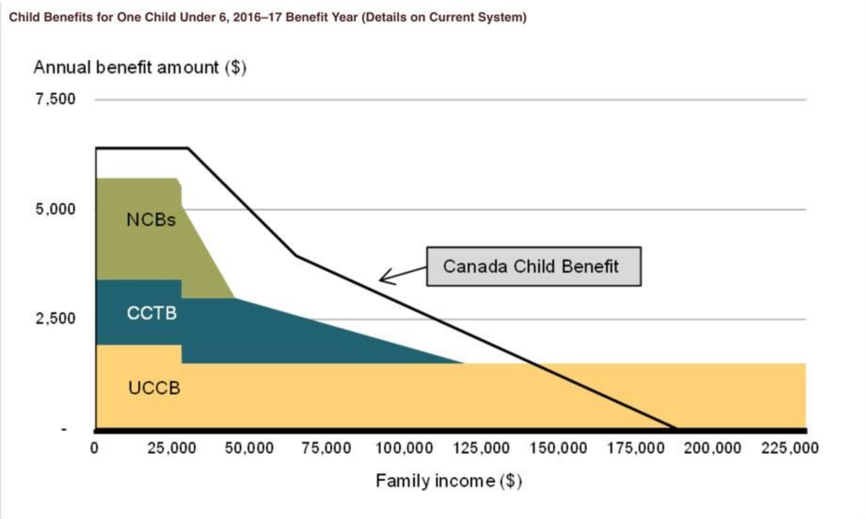
U.S. EITC Benefit Schedule, Married Couple with Two Children, Tax Year 2014



Note. Reprinted from *The Earned Income Tax Credit (EITC): An overview*, by Gene Falk, retrieved from https://fas.org/sgp/crs/misc/RL31768.pdf Copyright 2014 by Congressional Research Service.

Figure 2

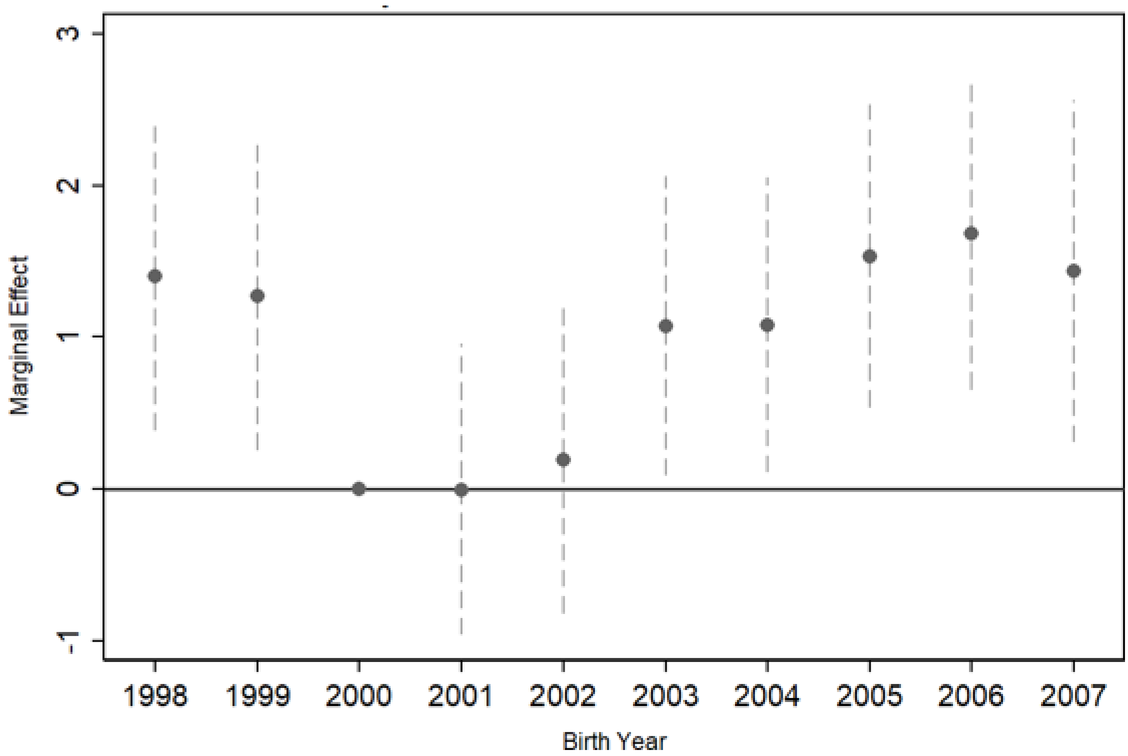
Canada Child Benefit Compared to Previous Programs (NCB, CCTB, and UCCB)



Note: Reprinted from *Budget 2016*, by Department of Finance, Canada, retrieved from https://www.budget.gc.ca/2016/docs/plan/ch1-en.html Copyright 2016 by Department of Finance, Canada.

Figure 3

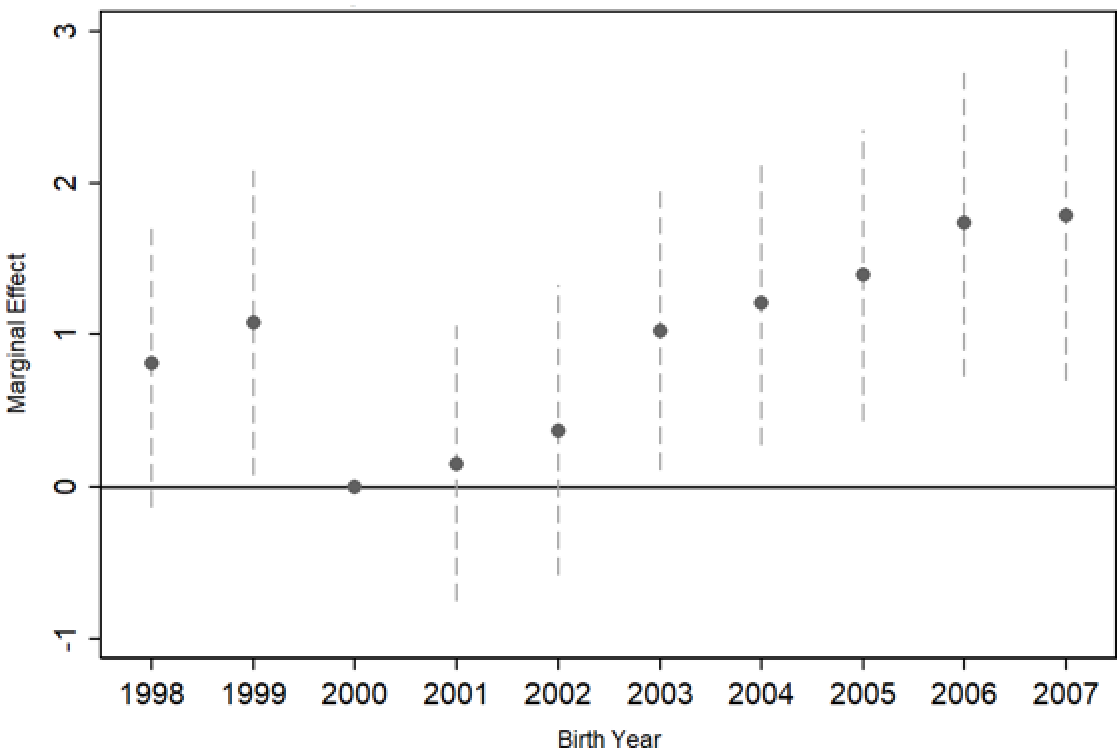
Grade 4 Numeracy



Note. Figure 3 plots the regression coefficients from the interaction of cohort fixed effects and an indicator of disadvantage for children born between 1998 and 2007. Covariates include sex, age, Indigenous status, whether English is spoken in the home, birth year and birth month fixed effects, and fixed effects for the school year and school where the test was taken.

Figure 4

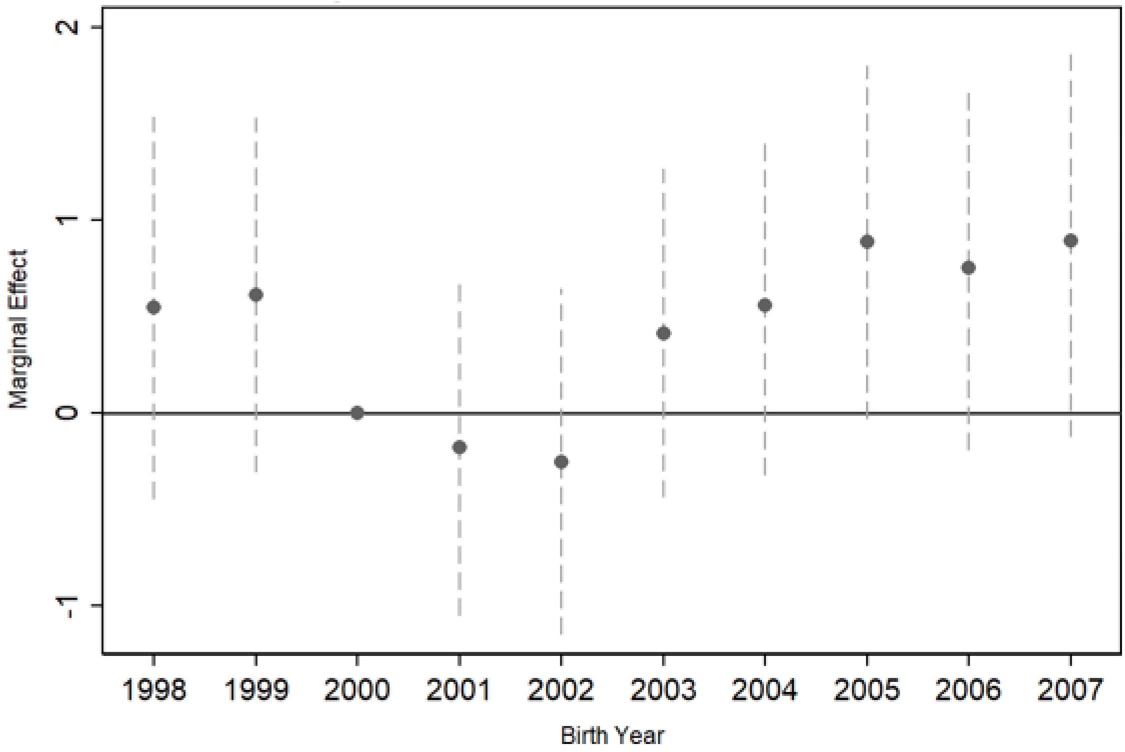
Grade 4 Reading



Note. Figure 4 plots the regression coefficients from the interaction of cohort fixed effects and an indicator of disadvantage for children born between 1998 and 2007. Covariates include sex, age, Indigenous status, whether English is spoken in the home, birth year and birth month fixed effects, and fixed effects for the school year and school where the test was taken.

Figure 5

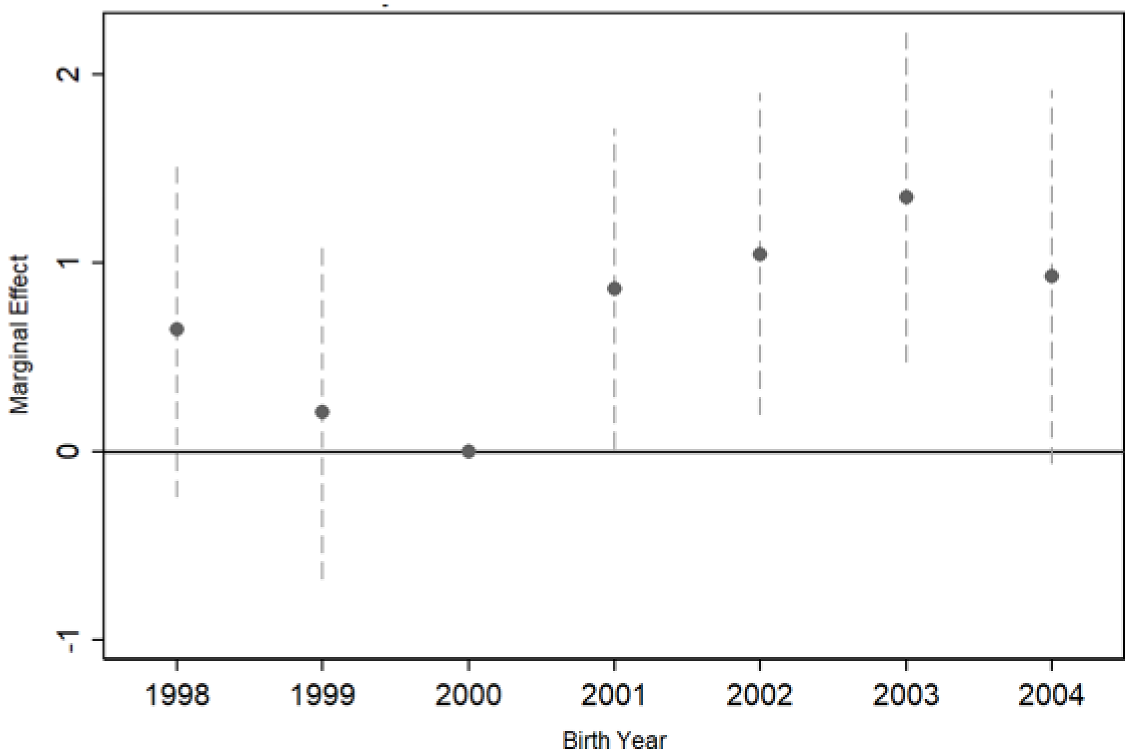
Grade 4 Writing



Note. Figure 5 plots the regression coefficients from the interaction of cohort fixed effects and an indicator of disadvantage for children born between 1998 and 2007. Covariates include sex, age, Indigenous status, whether English is spoken in the home, birth year and birth month fixed effects, and fixed effects for the school year and school where the test was taken.

Figure 6

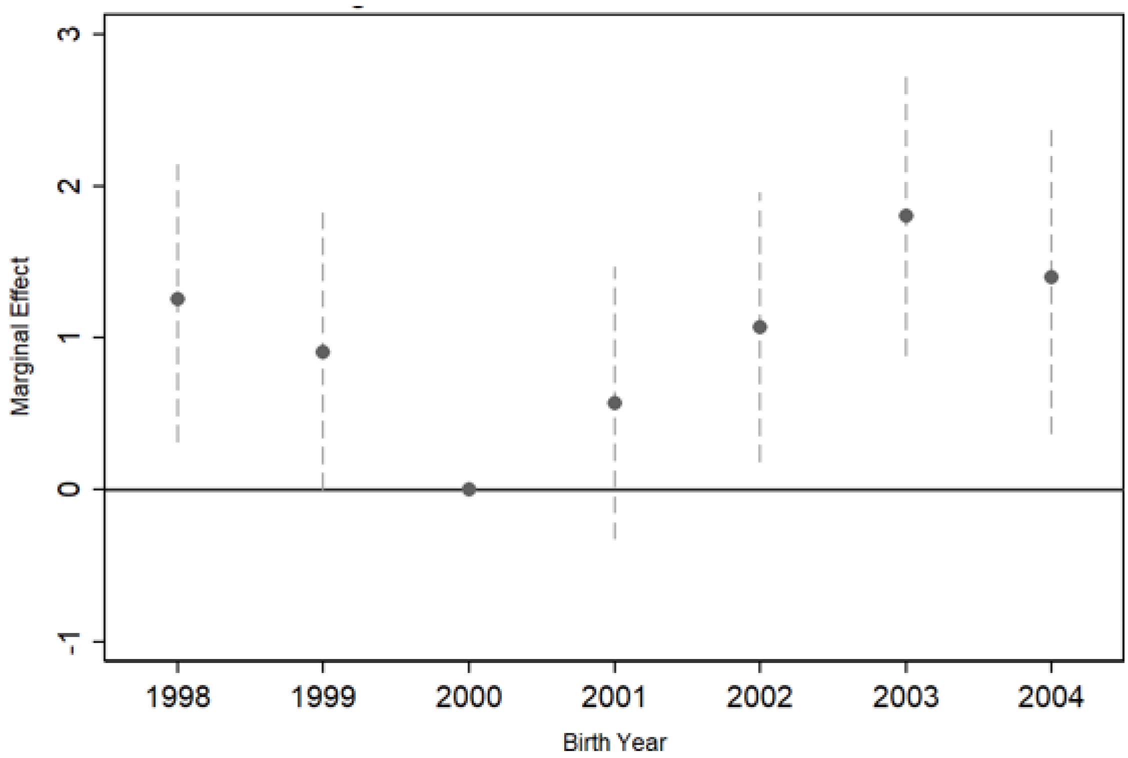
Grade 7 Numeracy



Note. Figure 6 plots the regression coefficients from the interaction of cohort fixed effects and an indicator of disadvantage for children born between 1998 and 2007. Covariates include sex, age, Indigenous status, whether English is spoken in the home, birth year and birth month fixed effects, and fixed effects for the school year and school where the test was taken.

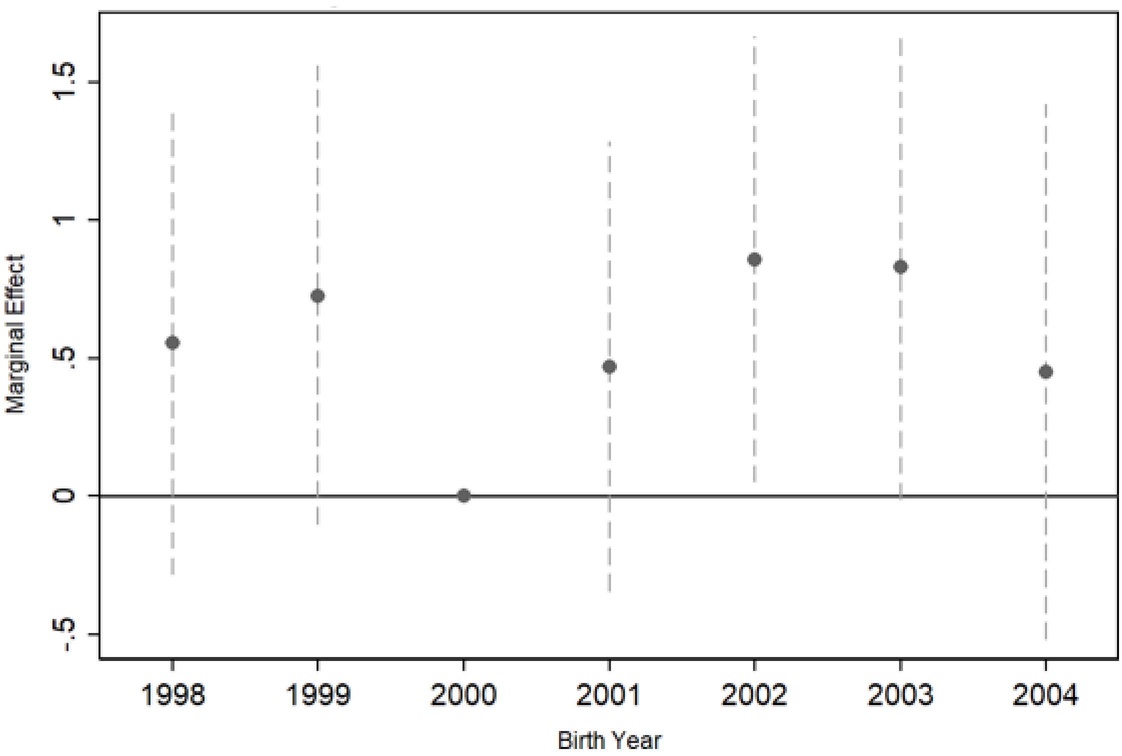
Figure 7

Grade 7 Reading



Note. Figure 7 plots the regression coefficients from the interaction of cohort fixed effects and an indicator of disadvantage for children born between 1998 and 2007. Covariates include sex, age, Indigenous status, whether English is spoken in the home, birth year and birth month fixed effects, and fixed effects for the school year and school where the test was taken.

Figure 8
Grade 7 Writing



Note. Figure 8 plots the regression coefficients from the interaction of cohort fixed effects and an indicator of disadvantage for children born between 1998 and 2007. Covariates include sex, age, Indigenous status, whether English is spoken in the home, birth year and birth month fixed effects, and fixed effects for the school year and school where the test was taken.