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# Canadian Evidence on Ten Years of Universal Preschool Policies: the Good and the Bad

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The analysis is based on Statistics Canada's National Longitudinal Survey of Children and Youth (NLSCY) and Survey on Labour and Income Dynamics (SLID) restricted-access Micro Data Files, which contain anonymous data. All computations on these micro-data were prepared by the authors who assume responsibility for the use and interpretation of these data. This research was funded by the Fonds québécois de la recherche sur la société et la culture.

**Abstract:**
More than ten years ago, to increase mothers' participation in the labour market and to enhance child development, the province of Québec implemented a $5 per day universal childcare policy. This paper provides a comprehensive review of the costs and benefits of the program over that period. A non-experimental evaluation framework based on multiple pre- and post-treatment periods is used to estimate the policy effects. We find that the reform had important and lasting effects on the number of children aged 1 to 4 attending childcare and the numbers of hours they spend in daycare. For children aged 5, we uncovered strong evidence that implementing full-day kindergarten alone was not enough to increase maternal labour force participation and weeks worked, but when combined with the low-fee daycare program it was, and these effects were also long lasting. Our results on cognitive development suggest that the school setting is more successful in raising children's cognitive ability than the daycare setting. Finally, we show that the fiscal costs were most likely larger than the benefits.

**Keywords:** Childcare policy, mother's labour supply, preschool children and school readiness, treatment effects, natural experiment

**JEL Classification:** H42, J21, J22

# 1 Introduction

In the mid 1990's, in order to promote work-life balance and improve early childhood human capital development, the province of Québec (the second most populated province in Canada) developed and implemented an ambitious universal early childhood education and care (ECEC) program. Starting in September $1^{st}$ 1997, accredited and regulated childcare facilities offered publicly subsidized daycare at the very low fee of $5 per child per full-day for children aged 4 on September $30^{th}$ 1997. Over time, the age requirement for subsidized spaces progressively decreased and the number of subsidized $5 per day spaces increased. By September 2000, the low-fee policy applied to all children aged 0 to 5.

Since September 1997, the number of regulated daycare spaces increased from 78,864 to 245,107 by the end of March 2012 (see Figure 1). Overall, 18% of all children aged 0 to 4 in Québec attended regulated childcare in late 1997 compared to 75% by 2012. Over this period, families' childcare arrangements changed dramatically. At the same time growing public funds were dedicated to the program: direct public subsidies increased from $288 million in fiscal year 1996-1997 to $2.2 billion for fiscal year 2011-2012, while the average subsidy per space increased from $3,832 to $10,210 over the same period (see Figure 2). No policy close to this magnitude impacting preschool children (including kindergarten) was enacted in the other Canadian provinces between 1997 and 2009 (see Table A.1).

Previous studies on Québec's childcare reform show that it had a large positive impact on the labour supply of mothers measured by participation, annual weeks worked, annual hours worked, and annual earnings, for both mothers with children aged 1 to 5 (Lefebvre and Merrigan, 2008) and mothers with children aged 6 to 11 (but no children less than 6) (Lefebvre et al., 2009). Baker et al. (2008), using a different data set than Lefebvre and Merrigan, also find substantial positive effects on the labour force participation of mothers. Furthermore, they find that for the first year after the introduction of the childcare reform, some health and behavioural outcomes of children and parents in Québec have worsened relative to the Rest of Canada (RofC, for the other nine provinces). Parent-reported behavioural measures of child aggressiveness and anxiety show significant worsening, as do measures of parenting skills, maternal depression and parental relationship-satisfaction indices. The period covered by their study ends in 2002, just one year after the full implementation of the program. At the time, no data was available on children who had been eligible for the daycare program since birth. As such, as pointed out by the authors, their findings may reflect short-run effects.

This study documents the enduring/persevering effects of this unique large scale "natural" policy experiment now well established, up to 2009, on the labour supply of mothers with young children and observe whether the effects found in Lefebvre and Merrigan (2008) hold up for the later years of the policy. This is however not the value added of the paper. We also estimate the impact of the policy on outcomes that were neglected in former studies, in particular, the time children spend in formal childcare (conditionnally or not, on attending

daycare), paternal labour force participation and weeks worked, family income and earnings, poverty and welfare receipt, and cognitive development of children at ages 4 and 5 as measured by three tests scores. The estimates of the policy effects on these outcomes are important to fully grasp the impact of the reform and to form expectations about the effects of a universal low-fee extensive childcare policy.

Furthermore, this is the first study to document the impacts by age of the child interacting with maternal education and family status. There are several reasons to study the impact of the policy by age, however, two stand out. First, two major parental leave policy reforms, making them more generous, were implemented in December $31^{st}$ 2000 and January $1^{st}$ 2006. The first was nationwide while the second occured only in Québec. Therefore, analysing the labour supply of mothers with children less than 1 who are affected by the childcare and parental leave policy is of importance for policy makers. Second, the year following childcare reform in Québec, half-day publicly provided school-based kindergarten was replaced with full-day kindergarten affecting five year-olds and their mother.

Curiously, impacts of the Québec childcare policy on the labour supply of single mothers were also neglected in past studies. The results we find in this regard are among the most interesting of the paper. Although the sample sizes are rather small for children with single mothers by education level, we find that the policy did produce much different impacts, in line with different policies, depending on the age of the child, family structure and the mother's level of education. Breaking down the effect by level of education allows us to assess the impacts of the reform from an equity standpoint. Although the price is the same for all,[1] more educated mothers may benefit more from the policy as their higher skills increase the chances they return to work early to a job that is better paid than less qualified mothers.

Finally, taking into account the estimated impact on labour force participation, this study provides a careful evaluation of the fiscal impacts of the policy at both levels of government, federal and provincial.

We use Statistics Canada's National Longitudinal Survey of Children and Youth (NLSCY) for the estimation of the impacts of the policy and rely on a non-experimental framework where the evolution of outcomes for Québec children and their parents are compared with those of comparable children and parents in the RofC. To estimate the fiscal impacts of the policy we use Statistics Canada's 2004 Longitudinal Survey of Income Dynamics (SLID).

The outline of the paper is as follows. Section 2 describes Québec's ECEC program. Section 3 reviews evidence from prior research. Section 4 identifies the conceptual issues and lays the framework for the analysis. Section 5 briefly describes the data set. It also presents the evolution of childcare use and arrangements over the implementation of the program and traces the unique evolution of Québec among Canadian provinces in this regard. Section 6 presents econometric results on the impact of the daycare policy on hours of formal childcare

[1] More precisely, all parents whose children attend subsidized daycare, pay the same price except for welfare mothers returning to the labour market who pay a reduced fee.

and parental labour supply. Section 7 offers some evidence of the impact of the policy on family income and earnings, welfare participation and the incidence of low-income status. Section 8 presents the estimated impacts of the policy on the changes in families income taxes and transfers for both levels of government. Section 9 discusses the results for the policy impacts on cognitive test scores for children aged 4 and 5. Section 10 provides a summary of the benefits and costs of Québec's childcare program.

# 2 Québec's preschool policies

On September $1^{st}$ 1997, childcare facilities licensed and regulated[2] by Québec's Ministry of the Family and Elders (MFA) started offering spaces at the low fee of $5 per day per child. At the time, only children aged 4 as of September $30^{th}$ 1997 were eligible. The 3-year-olds (on September $30^{th}$) became eligible on September $1^{st}$ 1998 and 2-year-olds on September $1^{st}$ 1999. By September $1^{st}$ 2000, all children aged less than 59 months were eligible. The exception is children aged 5 (60 months) as of September $30^{th}$ who enter public school kindergarten.[3] The Québec ECEC program pursued two explicit objectives: (1) increase mothers' labour force participation (while balancing the needs of workplace and home) and (2) enhance child development and school readiness. We first discuss the reform as it applied to pre-kindergarten children and then discuss the kindergarten reform.

Figure 1[4] shows the evolution of the number of regulated spaces from 1994 to 2012. The total number of spaces in the network increased from 78,864 in 1997 to 133,250 in 2001, when all children became eligible. In 1997, none of the spaces were at the low fee of $5 per day, while most regulated spaces (99.5%) were "low-fee" in 2001.[5] By March 2012, the number of regulated spaces reached 245,107 (with 89% "low-fee"). This represents a 211 percent increase over the 1997-2012 period. Figure 1 further shows the breakdown of spaces by mode of care. It is clear that early in the reform non-profit providers (centre and family-based) were the main beneficiaries of the policy.

The increasing number of spaces was paralleled by an increasing subsidy cost to the government. Before September 1997, the government provided grants to all regulated childcare facilities to cover part of their fixed costs and also to low-income families (in the form of a fee-subsidy) according to certain eligibility criteria. In 1996-1997, these subsidies amounted to 288 million dollars. Under the childcare reform, these subsidies were gradually abolished. Instead, the regulated and subsidized childcare providers receive a fixed amount per child per day, depending on the age and type of childcare setting, complemented with the low-fee

[2] Regulated childcare may take a variety of forms: not-for-profit daycare centres, for-profit daycare centres, and family-based daycare (caring for no more than 6 children).

[3] This is the first year of pre-primary school for most children in Canada. Age eligibility is different in the other provinces (5 on December $31^{th}$). Kindergarten is not compulsory, but most children are enrolled.

[4] See Appendix for more details on this figure.

[5] Information on the number of low-fee spaces is only available as of 2001. As such, it is not possible to present the evolution of the number of low-fee spaces between 1998 and 2001.

contribution of the family. By 2011-2012, the total government subsidy reached 2.2 billion dollars. Figure 2 shows the provincial government's total direct cost[6] and average cost per space for the childcare program between 1996 and 2012. While the fee per day has been fixed at \$7 per day (instead of \$5) since January $1^{st}$ 2004, the subsidy per space continues to soar out. Two main reasons explain this increase. First, the program, because it makes childcare so inexpensive, has a 100% take-up rate for low-fee spaces, so that almost all children in daycare are by now in \$7 per day settings. Second, once unionized, childcare educators were able to negotiate much better working conditions.[7] In the first year of the policy (covering only the 4-year-olds and continuing parent fee-subsidies for the other children in daycare), the mean subsidy per space was \$3,888. For fiscal year 2011-2012, the subsidy amounted to \$10,210 per space (parents no longer receive direct subsidies). The mean masks important differences by setting and age of children: not-for-profit centres receive the highest average subsidy per space (\$13,235), followed by for-profit centres (\$10,840), and family-based spaces (\$8,514). Furthermore, the subsidy is higher for children aged less than 18 months as the children/educator ratio is lower.

Using administrative data, we cannot trace any such elaborate picture of the evolution of childcare services in the other provinces in Canada. However, Table A.1 provides the number of regulated spaces by province for 2001 and 2006 as well as the number of children receiving subsidies. In 2006, 38% of regulated daycare spaces across Canada are in Québec (200,005 versus 325,753 spaces in the other provinces) where 196,813 children are in a totally subsidized space compared to 155,886 children receiving a total or partial subsidy in the RofC. Table A.1 also stresses that Québec has a unique childcare regime compared to those existing in the other provinces in terms of provincial funding,[8] monthly (daily) fees and eligibility.

Concerning kindergarten children, although there are differences in kindergarten programs across Canada, the only major change in kindergarten policy over the period of our study occurred in Québec.[9] Prior to 1997, children aged 5 on September $30^{th}$ were eligible to start part-time kindergarten (2 hours and 30 minutes). As of September 1998, full-day kindergarten was implemented in all public schools. Kindergarten is not compulsory,[10] but if a child is enrolled in a public school, he or she must attend class for the full school day and school week. Furthermore, schools were required to offer before- and after-school childcare for children aged 5 years or more for \$5 per day (\$7 since 2004).

Other reforms possibly interacting with the daycare reform were implemented during the

[6] The direct costs abstract from the childcare refundable fiscal credit for unsubsidized daycare.

[7] After the raises, roughly 85% of total costs were covered by the government subsidy. Since, the percentage has increased because operating costs of subsidized spaces has increased steeply, while the \$7 daily fee has remained unchanged **to** this date since 2004.

[8] In the other provinces, licensed childcare providers may receive one-time funding (for the expansion of spaces) or recurrent funding (for equipment, infrastructure, administration, salaries).

[9] Two provinces (Nova Scotia and New-Brunswick) have full-time kindergarten. In the other provinces it is half-day. The Province of Ontario offers half-day junior-kindergarten for four-year-olds.

[10] In Québec, as of September 1998, almost all 5-year-olds attended full-day kindergarten (98% compared to 85% before the policy change).

time period we use to evaluate the Québec policy. First, on December $31^{st}$ 2000, the federal government passed an amendment to the Employment Insurance Act which increased the Parental Benefit Program from 10 weeks to 35 weeks of paid parental leave. Since mothers, meeting certain eligibility criteria, were already eligible to 15 weeks of paid maternity leave, this extension effectively increased parental paid leave from 25 to 50 weeks. The percentage of mothers eligible to paid maternity and parental leave was approximately 60% at the time. This policy obviously influenced the number of hours in care for children aged 0 to 12 months and the labour force participation of their mother during that first year. We look at this age group separately in our empirical analysis.

The second reform, taking place in 1998, is the introduction of the federal National Child Benefit Supplement (in place of a small Working Income Supplement) for low-income families as part of the Canadian Child Tax Benefit (CCTB) introduced in 1993. The National Child Benefit Supplement effectively increased the benefits per child paid to low-income families. At the same time, many provinces, including the province of Québec, introduced their own child tax benefit to promote attachment to the the labour market.

Milligan and Stabile (2007) find that this reform had a significant positive effect on the labour supply of low-income families in Canada for five provinces (excluding Québec) and their overall income. Impacts were strong for single-parent families, but extremely modest for two-parent families. We estimate the effect of the Québec policy on single-parent and two-parent families separately, and interpret our findings on single parents in light of the NCBP reform. Both of these reforms were enacted across Canada, with some minor variations in the case of the NCBP. However, our empirical strategy accounts for changes that are common to Québec and the RofC.

Québec specific reforms were also implemented during the period that may have interacted with the daycare reform: a January 2005 fiscal reform for families with children that included a new working income supplement to low-income households (mostly favouring single-parent families working at near the minimum wage) and the enhancement of the parental leave program in Québec implemented in January 2006. The new parental leave policy (including 5 weeks specifically for fathers) mainly increases the amount paid to a parent on leave and relaxes the eligibility criteria in the federal program by including self-employed parents. Both the parental leave and the work income supplement lead to an increase in disposable income for treated families. In addition, the parental leave enhancement allows more children to stay at home with their parents in the first year of life. We carefully interpret our results in light of these other policies and explicitly identify some limitations of our analysis.

# 3 Prior research evidence on ECEC

Research on early childhood education and care has grown exponentially over the past decade. In this section, we review some of the important contributions on the links between maternal labour force participation, ECEC, and cognitive development. For a comprehensive review of research on early childhood development we refer the readers to Almond and Currie (2011).

**On mothers' labour supply and use of childcare** Earlier studies find that the Québec experiment produced an important increase in the labour supply of mothers of eligible children. Lefebvre and Merrigan (2008) use Statistics Canada's Survey of Labour and Income Dynamics (SLID) annual data from 1993 to 2002. Using the sample of all Canadian mothers with at least one child aged 1 to 5, they find that the policy had substantial effects on a diversity of labour supply indicators (participation, labour earnings, annual weeks and hours worked).[11] Baker et al. (2008), using the first two waves (1994-1995 and 1996-1997) and the last two waves (2000-2001 and 2002-2003) of the NLSCY available at the time, analyze the impact of Québec's childcare policy on formal childcare use and maternal work (mothers in two-parent families only). Restricting their attention to preschool children aged 0 to 4, they also show that the policy had substantial positive effects on mother's employment and non-parental childcare use.

Lefebvre et al. (2009) using data from the SLID (1996 to 2004) evaluate the potential long-term labour supply effects of Québec's universal childcare policy. They find that the program had substantial dynamic labour supply effects on mothers in Québec, especially for mothers who had a high probability of having a child in low-fee daycare from the child's birth to his or her fifth birthday. For example, the results show that the policy increased annual hours worked in 2004 for mothers with at least one child aged 6 to 11 (and no child less than 6, therefore not "directly" affected by the policy) in Québec by 217 hours.[12] Their results suggest that the effects were persistent over the life of a child. Clavet and Duclos (2012) estimate a structural model of labour supply strictly with mothers from Québec and for a single year (2004). They find a small effect of the daycare policy for mothers in two-parent families, and a larger effect for single mothers. The Baker et al. (2008) study has been extended by Lefebvre, Merrigan and Roy-Desrosiers (2011) using waves 1 to 7 of the NLSCY. Results show that labour supply increases with each post-reform year and age of children for both type of families. Kottelenberg and Lehrer (2013), using the same DD approach as Baker et al. (2008) while also adding waves 6 and 7 of the NLSCY, obtain a similar average effect over the post-policy period (11 versus 7 percentage points) for the participation rate

[11] In 2002, the effects on participation, earnings, annual hours and weeks worked of the childcare policy are respectively between 8.1 and 12 percentage points, $5,000 to $6,000 (2001 dollars), 231 to 270 annual hours at work, and 5 to 6 annual weeks of work.

[12] Lefebvre and Merrigan (2008) find the impact of the policy on all mothers with at least one child aged 1 to 5 to be 231 hours in 2002.

of mothers with at least one child aged 0-4 years in two-parent families.

Surprisingly, other childcare reforms in some European countries, which led to a sizeable expansion of publicly subsidized full-time childcare, had a modest effect on maternal employment. In Norway, the replacement of informal (e.g. relatives, grand-parents, neighours) with formal childcare in the mid 1970s had surprisingly no effects on childcare use or maternal labour supply (Haynes and Mogstad, 2011a). An early 1990s reform in Spain expanded publicly subsidized childcare for 3 year-old children and were conducive to large increases of enrollment in the following years. The reform had a modest effect on maternal employment (Nollenberger and Rodríguez-Planas, 2013), albeit in a period of depressed economic activity (which is not the case in Québec). The results suggest that crowding out of informal care was unlikely as most 3 year-olds whose mothers worked prior to the reform were already enrolled in either public or private childcare. The authors interpret the effects mainly as the effects of substituting maternal care by public high-quality care. Over the years 2005-2009, the Dutch government increased childcare subsidies substantially, reducing the average effective parental fee by 50%, and extended subsidies to so-called childminder (**"guestparent")** care. Moreover a substantial increase in the earned income tax credit for the same treatment group over the same period was implemented at the same time. Bettendorf, Jongen and Muller (2012) estimate the labour supply effect of the joint reform with a DD strategy, using parents with older children as a control group. They find small sized impacts on maternal labour supply (participation and hours). Fitzpatrick (2010), analyses data for three American states who recently introduced universal 4 year-old prekindergarten programs offering free preschool to all age-eligible children. Using restricted-access data from the Census, together with birthday-based eligibility cutoffs, and a regression discontinuity framework, she finds that universal pre-K availability increases statewide preschool enrollment by about 14% but has little effect on the labour supply of most mothers.

In sum, Canadian studies find substantial positive labour supply effects of the Québec childcare policy for mothers of eligible children. All of these studies measure the short to medium term effects, up to 2006, four years after the full implementation of the program, while this paper estimates the persistent labor supply effects, up to 2009 for specific post-reform years and sub-groups (by age of children, family type, mother's education and for fathers). The impact of the Québec reform on mother's labour force participation stands in stark contrast compared to impacts of similar policies implemented in other countries. These policies are however typically narrower in terms of age coverage and size of the subsidy, which may explain the differences in impact.

**On ECEC and child development** Improving the cognitive skills of young children has been suggested as a possible strategy for equalizing opportunities across socioeconomic status – levelling the playing field – and improving children's long-run outcomes. Almond and Currie (2011) argue that formal childcare, as opposed to parental care or informal care, may

help reduce the importance of family background on child development and thereby favour equal opportunity. There are several observational studies on the effects of maternal employment or ECEC on child development outcomes (cognitive, behavioural, socioemotional, and health related). We briefly summarize the main evidence and refer the reader to Almond and Currie (2011) and our Appendix for more details.

First, on children aged 0 to 2, there is a growing body of empirical results indicating that maternal employment and time spent in childcare during the first year of life can have adverse effects on a child's developmental outcomes (such as verbal, reading and math scores, and indices of behavioural problems) observed at later ages (Ruhm, 2004; Waldfogel et al., 2002; Brooks-Gunn et al., 2002; Hill et al., 2002; Hill et al. 2005; Gregg et al. 2005).

Second, for children aged 3 to 5, several studies on the effect of preschool programs find significant positive effects on cognitive outcomes (letter-word identification, spelling and applied problems) and measures of school readiness (Gormley and Gayer, 2005; Gormley et al., 2005; Magnuson et al., 2007, 2004), and especially so for disadvantaged children (e.g. Doyle et al., 2009.; Burger, 2010; Sammons et al., 2002, 2003).

Third, while the quality of care seems to have positive, but small, effects on cognitive outcomes (Blau, 1999; Duncan et al., 2003; Belsky et al. 2007), longer hours in all types of preschool programs seem to be associated with increased behavioural problems that persist over time (Magnuson et al., 2004, 2005; Loeb et al., 2007).

Finally, the existing American studies on full-day versus half-day kindergarten suggest that the impact of full-day kindergarten on academic and social outcomes is mainly positive (Lee et al., 2006; DeCicca, 2007; Zvoch et al, 2008.

In Canada, a handful of studies have investigated related questions, mainly by exploiting the Québec daycare reform. Baker et al. (2008), using a DD approach, highlight the harmful effects of the Québec daycare policy on both parental behavior and health measures and parent-reported behavioural scores and health indicators for children aged 0 to 4. The authors suggest that these negative effects may be temporary and associated to the rapid expansion of the childcare system. Kottelenberg and Lehrer (2013) extend their analysis using later waves of the NLSCY. Using the same method as Baker et al. (2008), they also find negative impacts on children behavioural and health measures, but non-significant results for father and family outcomes. Using an instrumental variables estimator (assuming the endogeneity of childcare) to recover estimates of the local average treatment effect (LATE) of childcare attendance (i.e., the effect on children in Québec with mothers who send their child in daycare with the policy but who would not have otherwise), Kottelenberg and Lehrer again find mostly negative and significant LATE's of childcare attendance on the scores used with the DD approach.

The quandary with several of the outcomes in these two studies are their subjective nature. In the NLSCY, the behavioural scores are constructed by Statistics Canada (using item response theory) with a dozen of questions asked to the "Person Most Knowledgeable"

of the child, most of the time the mother but also some other members of the family. One may wonder whether the impact of the policy on the mother's participation in the labour force may indirectly affect their perception of problematic behaviour by the child.

On the timing of maternal labour supply, Baker and Milligan (2010 and 2011) find that reduced maternal labour supply in the first year of life has no impact on cognitive and behavioural development measured between ages 1 and 5, while Haeck (2011) finds positive impacts on cognitive development and neutral effects on behavioural development measured at ages 4 and 5.[13]

In sum, it appears that high quality care contributes positively to the development of children from less favoured family environments. The impacts on other children are mixed and the optimal timing of entry in daycare appears to be beyond age one. This paper contributes to the literature by further documenting the impacts of the Québec daycare reform on children's cognitive development at ages 4 and 5. For the first time, the impact on children aged 5 is estimated and all of the 8 available waves of the NLSCY are used. Children observed in later waves were eligible to low-fee daycare as of birth and were therefore treated more intensely than children observed in prior studies.

# 4 Econometric modeling

To estimate the effects of the daycare reform, we rely on a non-experimental evaluation framework based on multiple pre-and post-treatment periods. We use a "difference-in-differences" (DD) model where the treatment group includes Québec's children before and after the reform and the control group includes children of the same age in the RofC observed for the same time period. This approach is now well established to evaluate natural experiments (Blundell and Costa Dias, 2009), but has recently raised a number of concerns (e.g. Bertrand et al., 2004). Concerns related to our application are addressed below.

We use data from all 8 waves of the NLSCY.[14] Wave 1 (1994-1995) and 2 (1996-1997) are considered pre-treatment, while waves 3 (1998-1999) to 8 (2008-2009) are considered post-treatment. The program was originally implemented in late 1997. Some children surveyed in wave 2 were interviewed in 1997, but all were interviewed before the implementation of the program. In wave 3, only children aged 3 and 4 were eligible to low-fee daycare and the number of available spaces was fairly constrained. Starting in wave 4 (2000-2001), all children residing in Québec were eligible. It is also around that time, that the "constraint" on the number of low-fee spaces was loosened. In the spirit of Francesconi and Van der Klaauw (2007), we write down a model that accounts for the relatively long implementation period. The model is as follows:

[13] These authors exploit variation in the parental leave reform in Canada (excluding Québec) to identify the impact on the child of staying out of the labour market for a longer period in the child's first year of life.

[14] The data set is further discussed in the next section.

$$Y_{ij} = \alpha + \theta Q_{ij} + \gamma I(j \geq s) + \sum_{j=3}^{8} \beta_j W_j Q_{ij} + \Phi X_{ij} + \varepsilon_{ij}. \quad (1)$$

where $Y_{ij}$ represents the outcome of child $i$ (or the child's mother or father) in wave $j$. We study the following outcomes: weekly hours in childcare, mother's (and father's) labour force participation and weeks worked, and the cognitive test scores of children at ages 4 and 5. The term $Q_{ij}$ takes the value of 1 if the child $i$ lives in Québec in wave $j$, and otherwise takes the value 0. $I(\cdot)$ is an indicator function taking the value 1 if the wave $j$ is greater or equal to $s = 3$ (1998-1999). The term $\gamma$ represents a change in the value of the outcome studied post reform that is shared by both regions. To account for the progressive implementation of the policy, a set of dummies $W_j$ for each of the post-reform waves $j = 3, 4, 5, 6, 7, 8$ interacted with $Q_{ij}$ is included. This allows the effect of the reform to be different over time. Between wave 3 (1998-1999) and wave 8 (2008-2009), more than 110,000 new low-fee spaces were created (an average of 14,000 per year). The term $X_{ij}$ is a vector of socioeconomic control variables and $\Phi$ is a vector of parameters. This allows us to control for socioeconomic changes in group composition. Finally, $\varepsilon_{ij}$ is an i.i.d. error term. Assuming the effects of the policy are heterogenous, we estimate the Average Treatment on the Treated effect (ATT).

To account for unobserved transitory shocks at the group level, we also implement a two-step procedure to adjust the standard errors (Donald and Lang, 2007). Effectively, we first regress the outcome variables on a set of sixteen dummies, one for each region-wave interaction, and $X_{ij}$, while taking into account the population weights. Then, we regress the estimated coefficients of the sixteen interaction terms on a constant, a post treatment dummy, a Québec dummy and the six interaction terms $W_j Q_{ij}$. Each observation is weighted by the inverse of the variance of the estimated interaction term. According to Donald and Lang, inferences should be conducted using a Student's $t$-distribution with seven degrees of freedom ($t_7$-distribution), but since our group sizes are large, we follow Wooldridge (2006) and use the standard normal distribution for inference.

For the estimation, we use different subsamples of the NLSCY waves 1 to 8 data set. We first selected all children aged 0 to 5. Children living in foster families are excluded as well as those (very few) with a mother observed with missing values for the socioeconomic control variables. This constitutes our main sample. From this sample, a number of subsamples are created. The main sample is divided by age of the child, by maternal education (those with a high-school diploma or less, and those with a post-secondary diploma or degree) and by type of family (single-parent, and two-parent family). We specify in the tables of results which subsample is used for each estimation and provide bootstrapped standard errors (including for the two-step procedure) using the 1,000 bootstrap weights provided by Statistics Canada to account for the complex survey design of the NLSCY.

The following sections present the empirical analysis. First, we present the data. Second, we discuss the impact of the reform on hours of childcare and present the estimated impacts

on labour force participation, weeks worked, and on different measures of family well-being (e.g. income). Third, we display the results on cognitive test scores. Finally, the fiscal implications of the policy are discussed in the last section.

# 5 Data set

We use the NLSCY, a biennial survey conducted by Statistics Canada, started in 1994-95 (wave 1) and ended in 2008-09 (wave 8).[15] It asks Canadian parents a wide range of questions on the use of childcare and their labour force participation,[16] which allows us to trace their evolution in Québec and the RofC using comparable data. The unit of analysis for the NLSCY is the child or youth. The NLSCY not only provides information on representative provincial samples of all children, but in contrast with administrative data, it also provides information on both regulated and non-regulated (more informal) types of care.

Table 1 presents the descriptive statistics for children aged 0-5 by region (Québec and RofC) and by wave (1994 to 2008). Generally speaking, the observed characteristics are fairly comparable across region and years, but a few differences and trends are worth mentioning. While mothers' education is comparable in 1996 in Québec and the RofC, mothers in Québec become more educated over time with 68.6% receiving a post-secondary diploma or degree in 2008 compared to 59.6% in the RofC. Over the entire period of observation, there are relatively more immigrant mothers in the RofC , approximately 9 percentage points and more mothers giving birth at 35 years of age or over, approximately 4 percentage points. Family composition is comparable and relatively stable over time. A large fraction of children in Québec and the RofC live in a large urban area (more than 500,000 inhabitants). Finally, family total gross income ($2002) is higher in the RofC, but the gap is fairly stable over time.

We showed above that the care of young children in Québec has changed in important ways. These changes become even more dramatic when the evolution of the use of childcare in Québec is compared with that of the RofC using the NLSCY data set. Figure 3 summarizes, for Québec and the RofC, the four principal care arrangements used by parents for children aged 1 to 4 from 1994 to 2008. The vertical line indicates the third wave of the survey (1998), which corresponds to the second year of policy implementation. Prior to the daycare reform, the care arrangements in Québec and the RofC were fairly comparable. Most children were in parental care (around 55%). Some were in out-of-home care[17] (around 25%), and a comparable fraction (around 10%) were either in centre-based care or cared for at home but

[15] From here on, we refer to years instead of waves, and use only the first year of the two-year period. As such, we refer to 1994 for wave 1, 1996 for wave 2, and so on.

[16] A parent is participating in the labour force if he/she answers yes to the question "Do you currently work?". Results are robust to the other question "Did you work in the past 12 months?".

[17] Out-of-home care includes family-based care (regulated or not) and care by relatives outside of the child's home.

not by their parents. Home care is slightly higher outside of Québec, while centre-based care is slightly higher in Québec. Starting in 1998, the use of centre-based care increases rapidly in Québec while parental care (and to a lesser extent out-of-home care) decreases rapidly. In contrast, in the RofC, no such dramatic changes are noticeable. Parental care has remained fairly stable at approximately 50% since 1998. After parental care, family-based care outside of the child's own home remains the most widely used mode of care in the RofC for most of the period. To summarize, the figure shows an important shift in daycare use occurring in Québec after the introduction of the daycare policy in 1997. No comparable shift is observed in the RofC.

Variations in care arrangements in Québec are also observed by income group. Using the NLSCY wave 8 (2008-09) data, we document the working status of parents and childcare use by family total current income quartile, as well as the percentage of children aged 0-59 months in different modes of care by family income quartile. Table 2 shows that quartiles of income are highly correlated with the more formal mode of care (i.e., daycare centre). Approximately 65% of children with parents in the highest income quartile attend daycare centres, compared to 31% in the lowest income quartile. A high proportion of low-income families (quartile 1) do not use childcare at all (45%). Of those who work or study, only 8% do not use childcare in the highest income quartile, compared to 14% in the lowest income quartile. These figures show that there are important differences in care arrangements across the income distribution. For fiscal year 2011-2012, the total yearly subsidy for a child aged 0 to 17 months in a not-for-profit centre is $17,913, and for a child aged 18 to 59 months is $12,406. The average subsidies in a for-profit centre for children of the same age are respectively of $16,037 and $11,456$. The subsidy for family-based childcare is on average $9,000. As a result, high-income families receive (indirectly, not taking into account that they pay higher income taxes) a disproportionate share of the total subsidy to the program not only because they use childcare services more, but also because they use the more expensive type of childcare services. As not-for-profit centres generally offer a higher quality[18] of service, these findings raise the question of vertical equity, both in terms of quality and quantity of services received.

The change in care arrangements is also combined with a change in the intensity of care. Figure 4 presents the mean hours (conditional and non conditional on the use of childcare) per week children spend in their primary care arrangement in Québec and the RofC. Non conditionally, prior to the childcare reform, children aged 1 to 4 in both regions spent on average 11 to 12 hours per week in childcare. Starting in 1998, the average hours children spend in daycare in Québec starts to increase and continues to do so for the entire period of

[18] On quality see ISQ (2004) and Japel et al. (2005). These studies show that the average quality in 2003 in Québec's subsidized daycare network was at best satisfactory and in many cases the level of quality was low or not acceptable, particularly for children in lower-income families. The ISQ report shows that a higher proportion of not-for-profit centres offer good or very good quality, more than 40%, compared to only 19% in family-based care and 11% in for-profit centres.

observation. By 2008, children in Québec spend on average 23 hours per week in daycare, while children in the RofC spend 12 to 13 hours. Conditional on attending daycare, we find that children in Québec prior to the reform were already in care for longer hours, 29 to 30 hours compared to 27 hours in the RofC. This difference becomes even more striking as the reform's implementation progresses. By 2006-2008, children in Québec attending daycare spend on average 33 hours per week in daycare compared to 28 hours in the RofC. This figure shows that not only more children started to attend daycare in Québec following the reform, but the intensity of care for those attending daycare also increased.

To summarize, the figures presented so far show important shifts in daycare use, modes, and intensity occurring in Québec after the introduction of the childcare policy in 1997, but not in the RofC. These important shifts are coupled with a greater use of the more expensive and higher quality modes of care by high-income families, which necessarily raise the question of the vertical equity of the program, also addressed by Duclos (2006).

# 6 Results on hours of care and parental labour force participation

**Children aged 1 to 4 and family structure** We start by providing evidence on the effects of the program on hours of care and parental labour force for children aged 1 to 4, by type of family (all families, two-parent families, and single-parent families) for waves 3 to 8. Here, we simply extend the observation period, relative to former studies, to observe whether the leading effects identified by previous studies are persistent. Compared to previous work which had analysed participation in chilcare, we add some results on the occurrence and intensity of care using hours in care both conditionally and unconditionally on attending any form of non-parental care.

Table 3 shows the estimated effects of the policy. Our evaluation strategy relies on equation (1), where $Y_{ij}$ is the number of hours per week spent in the primary mode of care for child $i$ in wave $j$ including zero hours (columns 1 to 4, top panel) and excluding zero hours (columns 5 to 8, top panel), the current labour force participation of the mother (columns 1 to 4, bottom panel) and the number of weeks worked by the mother in the reference year (columns 5 to 8, bottom panel). Columns 4 and 8, denoted by "#", are computed with the two-step procedure detailed in the previous section. The socioeconomic controls $X_{ij}$ include the sex of the child, child age dummies, the age group of the mother at child birth (25-29, 30-34, 35 or more with 14-24 the omitted group), the family type (step-family, single-parent, with two-parent family the omitted group), a dummy for whether the mother was born in Canada or not, the mother's highest level of education (less than a high school diploma, high school diploma, some post-secondary education, trade or college diploma or with a university diploma or more the omitted group), the presence of siblings (older, younger or same age, no sibling omitted) and other children, and the size of the community of residence

(five groups from rural to 500,000 habitants, more than 500,000, the omitted group). These characteristics are presented in Table 1 for children aged 0 to 5 for both regions.

For unconditional hours of care (including zero hours), the effects increase substantially from 1998 to 2008, from 2.0 to 10.8 hours for the 1-4 age group (column 3). As new spaces are created every year during this period, it is not surprising to find that the effects are generally increasing over time. The first two columns of the table reveal that the effects are slightly larger for children living in a single-parent family (3.5 to 14.2 hours) compared to children living in a two-parent family (1.9 to 10.4 hours). In general, the estimation shows that the effect increases from 1998 to 2008 reflecting the addition of new low-fee spaces. From these results, it is clear that from 2004 to 2008 children were more exposed to daycare. These effects are largely significant and remain so once we account for unobserved aggregate transitory shocks (column 4).[19] These effects must be considered very large and represent a dramatic change in the lives of children in Québec.

The unconditional number of hours certainly increased due to the higher rate of participation in daycare post reform (see Figure 3), but also possibly due to the longer hours of services offered by the subsidized providers. To see whether children in care were there for longer hours post reform, we estimate the impact on hours of care conditional on attending daycare (i.e., we now exclude children with zero hours of care from our sample). We find that conditionally, children in any type of family spend more time in care post reform: 1.8 hours more per week in 1998 to 3.3 hours in 2008. The effect is largest in 2004 at 5 hours per week. Similar patterns can be observed by family type, but while the effects remain significant for children in two-parent families, they are not for children in single-parent families.

Figure 5 presents descriptive statistics for children aged 1 to 4 from the eight waves of the NLSCY on the labour force participation of mothers (in single and two-parent families) and fathers (in two-parent families). The main changes are for mothers. In two-parent families in Québec, mothers' labour supply increases in most waves, starting at 55 percentage points in 1994 and reaching 76 percentage points in 2008. In the RofC, the participation of mothers is fairly stable at around 65 percentage points. For single mothers, there are large increases for both Québec and the RofC, but the original gap, in favour of mothers in the RofC is totally closed by 2008 where the participation rate is exactly 53 percentage points in Québec and the RofC. For weeks worked, we observe the same patterns.[20] For mothers in two-parent families, the descriptive statistics suggest that there were no changes in the RofC, while the number of weeks worked increased by 7 weeks in Québec over the period.

Table 3 further shows that for the 1 to 4 year-old group taken as a whole (columns 3 and 4, bottom panel), the effects on labour force participation are large and significant. The smallest effect, 6 percentage points in the participation rate, is in 1998. As of 2000, the effects are already twice as large (11 percentage points), in line with the addition of new low-fee

[19] These effects remain significant even if we use the more restrictive $t_7$-distribution for inference.

[20] See Figure A2 in the Appendix for more details.

spaces. The effect slightly increases up to 13 percentage points by 2008. Columns1 and 2 present the results for mothers by family structure. The effects for mothers in a two-parent family are all significant, large and increasing. For single mothers, the effect is very large in wave 3, and remains high until 2008. This may be in part due to the smaller sample size for this group, but may also reflect the role played by other policies impacting single parents over the period, such as the NCBP supplement of 1998 and the specific adjustments to this supplement in Québec. The measure of labour force participation which is participation at the time of the survey is "bumpier" than annual weeks worked. Indeed, as shown below, the year to year increase in annual weeks worked is more in line with the increase in low-fee childcare spaces, but the standard errors are relatively larger. We will return to this discussion when we present the results by the education of the mother.

The standard labour supply model predicts that mothers active in the labour market (with or without the low-fee program) could decrease their number of weeks worked with the low-fee program due the income effect. In addition to the income effect, as documented above, the low-fee daycare program also resulted in a large increase in the labour force participation of mothers. This positively impacts the number of weeks worked, as a large fraction of mothers move from working zero weeks to a positive number of weeks. Since the labour force effect is so large, we expect this effect to dominate the income effect, and thus to observe positive effects on weeks worked. Columns 5 to 8 of the bottom panel of Table 3 presents the results for annual weeks worked. We observe that for the 1 to 4-year-olds there is a sustained positive policy effect from 2000 to 2008. In terms of family structure, again the main effects on weeks worked are observed for mothers in two-parent families, mirroring the effects for participation. For both labour force participation and weeks worked, the results are robust to the correction of standard errors using the two-step procedure. As mentioned earlier, the effects for single mothers is in line with the policy but are not significant.

In sum, the effects are generally positive and significant on hours in care. In contrast with previous work that focused on participation in daycare, this further shows that not only does participation increase, but so does the number of hours in care, conditional on attending daycare. In line with previous work, we also find that maternal labour force participation and weeks are impacted positively by the reform, and we further show that these effects are persistent up until 2008 and are generally increasing over time. More importantly, we find strong but imprecisely estimated effects for single mothers. Given the high cost to the government of this particular group in terms of transfers, this result is very important.

**Hours of care by age** We now present the effects of the reform by age of the child as well as analyzing the effects by family structure and maternal education. We start with hours of care, and then present the results related to the labour supply of mothers. To better grasp the interaction between the parental leave reform and the daycare reform, we separate children aged 0 in two groups: those aged 0 to 5 months and those aged 6 months

or more. Also, we analyse age 5 children eligible for kindergarten separately from same age children not age-eligible for kindergarten. This allows us to estimate the effect of the full-day kindergarten policy. Table 4 shows the estimated effects of the policy on weekly hours in childcare by age (from 0 to 5). We start with the effect on hours of care not conditional on attending daycare (top panel) and then present the effect on hours of care conditional on attending daycare (bottom panel).

For children aged 5 months or less, the effect of the low-fee daycare program is not significant (except for 2004 where it is negative and weakly significant).[21] One main feature of Québec's family programs explains these results. Long before the daycare reform was implemented, working Canadian mothers became eligible to a total of 25 weeks of paid leave to stay at home and care for their children. As a result, in Québec, children aged 5 months or less are largely taken care of by their mothers whether she is active in the labour market or not. Even after the implementation of the daycare program, mothers continue to stay at home in the first few months of their child's life. The daycare program did not impact infants aged 0 to 5 months. For children aged 6 months or more, the effects are different. First, the impact is positive and weakly significant in 1998 (3.3 hours), positive and largely significant in 2000 and 2002 (6.4 and 7.4 hours), and not significant from 2004 onwards. In 1998, newborn children were not eligible to low-fee daycare and paid parental leave only lasted 25 weeks (slightly less than 6 months). The weak positive effect may reflect a desire for parents to secure a space in low-fee daycare as several providers expected to be subsidized given government announced implementation plan in this regard. At the time, the importance of securing a place early on and the timeline of eligibility for children aged 0 to 5 was largely advertised by the government. In 2000, children were now eligible for low-fee daycare and the parental leave was still limited to 25 weeks. The large positive effect is therefore not surprising. The effect in 2002, however, is surprising as this coincides with the extension of the Canadian federally funded parental leave policy. While children aged 0 and 1 in 2000 were born prior to the parental leave extension, those of 2002 were born after. Parents of 2002 children (under certain conditions) now had the possibility to stay at home in the first year of their child's life for 50 weeks compared to 25 weeks before. The large effect on hours of care (7.4 hours) reflects both the reduction in hours of care in the RofC following the parental leave reform and the increase in hours of care in Québec. Again, the increase in Québec most likely reflects the need to secure a space in low-fee daycare at a time when the number of spaces was limited, especially for this age group. As of 2004, the effects on hours of care vanishes as Québec children also start to stay at home for a longer period. As the number of spaces increase, the need to secure a space early decreases and mothers can take advantage of the extended parental leave to care for their children.

For ages 1 to 4, we find that the number of hours spent in care is increasing during the

[21] As of 2000, the number of children aged less than 5 months is extremely small in the NLSCY. The results must be interpreted with some caution.

period across all age groups. It is generally not significant in 1998 when children aged 0 to 2 are not eligible and the number of spaces is still relatively constrained. At the beginning of the program, existing spaces are converted to low-fee spaces such that eligible children not already in care could not easily be included in low-fee daycare (see Figure 1).

For children aged 5 not yet age-eligible for kindergarten, we find that hours of care increased significantly as a result of the daycare reform. As of 2000, these children spend 6.2 hours more in daycare per week, by 2008 they spend 16.2 hours more. This effect is very large. The larger effects are found in 2006 and 2008 (16.7 and 16.2 hours respectively). These children were the first to be eligible for low-fee daycare since birth. For age 5 children age-eligible for kindergarten, the effects are negative and significant as early as 1998. As these children switched from half-day kindergarten to full-day kindergarten (as of 1998), they only attended daycare before- and after-school (if they did at all). This effect is more or less constant and ranges from 4 to 5 hours per week between 1998 and 2008.

Again (bottom panel of Table 4), to measure the impact on the intensity of care for children attending daycare, we now discuss the effects of the reform on the sample of children with a positive number of hours in care (i.e., hours $> 0$).[22] We focus on children aged 1 to 5, because the samples are too small for children aged 0 (especially in the RofC following the parental leave reform). While the intensity of care does not significantly increase for children aged 1 and 2, it increases for age 3 to 5 children not yet in school. The effects are larger the older the child, and especially so from 2004 onwards. Age 3 children spend on average 4 more hours per week in care, post reform, while age 4 children spend as much as 8 more hours per week and age 5 children (not yet in school) spend 11 more hours. Not only did the number of children in care increase, but also the intensity of care for age 3 to 5 children. For age 5 children in school, the number of hours in care (conditional on using non-parental care) decreases substantially as of 1998 (8.8 hours per week). This reflects the implementation of full-day kindergarten as of 1998. Age 5 children in school attend kindergarten all day, and are in care only before- and after-school. Not surprisingly, they spend considerably less time in care: their hours of care decrease by 8.8 hours in 1998 up to 11.1 hours in 2008.

We estimated this specification with the subsample of children whose mother has a high school diploma or less and the subsample of children whose mother has a post-secondary diploma or degree.[23] We find that the effects are larger for children of highly educated mothers, but clearly positive for both groups with children aged 1 to 4. The results by age group for children of less educated mothers are slightly less stable, probably due to the smaller sample size. But for the aggregated group of 1 to 4-year-olds, the effects are increasing, though small and not significant in 1998. These results suggest that less educated mothers responded to the low-fee incentive less quickly, which further suggests that highly

[22] The estimate should be downward biased because the post-treatment sample should on average contain more mothers with a lower attachment to the labour market.

[23] The results are presented in Appendix Table A.2. Post-secondary degree includes college, trade and university.

educated mothers had an "early advantage". This may not be surprising if we assume that highly educated mothers have the most to lose, in terms of career advancement, from a prolonged absence from the job market. The difference between the estimated effects on highly educated mothers and less educated mothers is even more striking when looking at single mothers. Educated single mothers benefited most from the reform. The effects are very large for post-secondary educated mothers.

In sum, regardless of the education of the mother, children from 2004 to 2008 were more intensely affected by the program than children observed earlier on, which is consistent with the increased number of low-fee spaces.

**Mothers' labour force participation** For labour force participation, the top panel of Table 5 shows the evolution of the impact of the reform by age group. For mothers of children aged 5 months or less, the impact is generally not significant, except for 2002 when it is large and negative and 2006 when it is large and positive. As mothers of these children were generally eligible to paid maternity leave before and after the reform, we expect no effects over the period. For mothers of children aged 6 months or more, we find that they increase their labour force participation early in the program (1998 to 2002), but while the effect remains fairly large in 2004 (0.09) it is not significant. As of 2006, the effect completely vanishes. This coincides with the enhancement of the Québec parental leave program, which relaxed the eligibility criteria and increased the amount paid to mothers on leave. This reform reversed the labour supply effect initiated by the daycare reform for mothers with newborns (less than 1 year-old).

For children aged 1 and 2, not eligible for low-fee daycare in 1998, it is surprising to observe strong effects for mothers of these children in 1998, but in line with the policy implementation to see a jump as of 2000. As mentioned above, the fact that new low-fee spaces would eventually open up and also cover younger children was well advertised by the government in the early years of the program. As there was a very strong incentive to secure a space early to reap benefits from the policy for as many years as possible, it is possible that parents simply rushed into the labour market assuming that they would soon find a space in low-fee daycare for their child. This incentive was lower for mothers with older children as the benefits of the new policy lasted for a much shorter time. This is confirmed by the non-significant effect on labour force participation of mothers with a 3 or 4 year-old in 1998. As of 2000, the effects for mothers with a child aged 1 to 4 are generally positive, large, significant and increasing over time.

The effects on the labour force participation of mothers with a child aged 5 not yet age-eligible for kindergarten are generally not significant, except for 2006 (0.17). The number of weeks worked is however increasing over time, following a pattern similar to the number of hours of care for this group**.** While the number of hours of care was larger for these children, their mothers did not participate more in the labour market. Mothers of age 5 children

eligible for kindergarten increased their labour force participation as of 2004 (0.11), but these children effectively spent less time in daycare. What is particular of the children from the later waves is that the number of childcare spaces available is substantially higher for them since birth. Therefore, the positive (and sometimes significant) effects at age five in the later waves could be due to the availability of low-fee spaces since birth. Therefore, simply changing kindergarten policy from a part-time to a full-time system may not be enough to increase the labour supply of mothers with a 5-year-old if it is not combined with a daycare policy for the very young. This is in line with previous findings in Fitzpatrick (2010) on the impact of adding one more year of full-time schooling (in this case prekindergarten).

Table A.3 presents the results for mothers with a high school diploma or less (panel one) and with a post-secondary diploma or degree (panel two). We report the results for children aged 5 months or less for completeness but do not comment on them as the extremely small number of observations casts doubts on the reliability of the estimated effects for that subgroup. Starting with mothers with a high school degree or less, we find that the estimated effects are generally not significant by age group, except for children aged 2. By family type, we find that they are also not significant for single mothers, but they are large and significant for mothers in two-parent families. For highly educated mothers, the evidence is fairly different. The effects are large and significant in all subgroups, except for children aged 0 (6 months or more) and children aged 5 not in school who show positive but not significant effects (most likely because of the smaller sample size). By family type, the effects are larger for single mothers than for mothers in two-parent families. These findings suggest that the benefits of the reform for single mothers are very different depending on their level of education. This may be, in part, explained by the strong link between education and income, combined with the available childcare subsidy to low-income families prior to the reform. Before the reform, low-income families were eligible to a childcare subsidy making the net cost of daycare comparable to the post-reform cost. As a result, for these families, which include a fair number of single-parent families with a low level of education, the low-fee daycare did not imply a particularly strong monetary incentive. In contrast, prior to the reform highly educated mothers with high potential earnings were not eligible to the childcare subsidy. For them, the implementation of low-fee daycare thus constituted a strong incentive to return rapidly to the labour market. It could also be that labour market skills are low for those with less education making them much less attractive for employers. Finally, the 1998 and 2005 child benefit reforms increased the incentive to work in particular for single mothers, so that both may have played a part in considerably boosting participation for single mothers.

The pattern for weeks worked by the mother is consistent with those of labour force participation. Weeks worked is measured over the past 12 months and includes weeks on paid maternity or parental leave. We find that although the impacts are not significant for age 0 children, they are generally positive. For the 1- to 4-year-olds we generally find positive

and significant effects in line with the previous finding on labour force participation. While we observe a monotonic increase from 1998 to 2008 for children aged 2 to 4, the pattern for age 1 children is also increasing at first, but decreasing as of 2004, and not significant as of 2006. This may be attributed to the Québec parental leave reform, which increased the benefit paid to mothers and reduced the eligibility criteria. As of January 2006, mothers of a newborn in Québec receive a more generous parental leave benefit and their job continues to be protected for up to 70 weeks. They can afford to work a few weeks less early on in their child's life. Finally for the 5-year-olds, there are generally no significant effects, but the effects are positive as of 2004 for children in school, and as of 2006 for children not yet in school. This is in line with the above finding on labour force participation and further suggests that full-day kindergarten alone is not enough to raise the labour force participation of mothers with children aged 5.

The results by education and type of household (panels three and four of Table A3) mimic quite closely those found on participation. For mothers with a high school diploma or less (third panel) and children aged 1 to 4, the policy also has mainly positive but not significant effects. These effects are generally smaller (and less significant) than for the well educated (fourth panel). When we compare the results for mothers in two-parent households with those of single mothers, we find that they are in line with the differentiated effects found on labour force participation. Lower educated single mothers generally did not react to the reform, while highly educated single mothers not only reacted to the reform, but did so more strongly than highly educated mothers in two-parent families (14.4 weeks compared to 5.5 weeks in 2008).

In sum, we find that the effects on hours of care, labour force participation and weeks worked are stronger in the early years of the reform for children aged 6 months or more, generally increasing in time for children aged 1 to 4, and positive in the later years for children aged 5 not yet eligible to kindergarten. Age 5 children in the later waves were eligible to low-fee daycare since birth. Because of the implementation of full-day kindergarten, the effects on hours of care are negative and significant in all years for children eligible for kindergarten, and positive on labour force participation in later waves which suggests that low-fee daycare (as opposed to full-day kindergarten) triggered these effects. Post-secondary educated mothers have responded more strongly to the reform, and single mothers with post-secondary education even more so. In line with the progressive implementation of the reform the evidence presented here suggests that the effect is increasing with the number of subsidized spaces.

**Fathers labour force participation and weeks worked** There is no evidence to our knowledge on the impact of daycare reforms on fathers' labour force participation. Figure 5 presents descriptive statistics for children aged 1-4 from the eight waves of the NLSCY on labour force participation of fathers (in two-parent families). From 1998 to 2008, the changes

of the two indicators are marginal: labour supply is high at around 93 percentage points. For weeks worked, we observe the same patterns.[24] Table 6 shows the estimated effects on fathers' (in two-parent families) labour force participation (top panel) and annual weeks worked (bottom panel). For each age group, the effects are rarely significant and relatively small. These results are also robust to the two-step procedure accounting for unobserved transitory shocks.[25] Looking at weeks worked (second panel, Table 6), we find that over the years, fathers have barely changed their number of weeks worked. Interestingly, in cycle 8, the effect on weeks is for fathers with a child less than 6 month is around minus 6 weeks, corresponding to the additional 5 weeks of paid leave that is available strictly since 2006 for fathers residing in Québec.

# 7 Results on family income, welfare receipt, poverty and family structure

The NLSCY data sets also provide information on family income, parental earnings, likelihood of welfare receipt, poverty and changes in family structure. Since these indicators of well-being are impacted by a large number of factors such as the changes in income taxes, family credits and transfer policies (important at both levels of government), we did not produce estimates on these measures. However, for each indicator, we graphed the changes over time for the same sample of children aged 1-4, by family type and region (Québec, RofC).

Figure 6 shows total mean income ($2002) from all sources before taxes for Québec and the RofC by family type. For two-parent families, the $6,700 income gap in 1994 in favour of RofC families has increased up to $13,700 in 1998, and then decreased back to $6,700 in 2008. This suggests that pre reform the income gap between Québec and the RofC was increasing, but started to decline as of 2000 when the daycare reform really kicked in and mothers in Québec started to increase their labour force participation. For single-mother families, the $4,500 income gap in 1994 in favour of RofC families gradually decreases over the post reform period to almost $0 in 2008. This also corroborates our results on labour force participation and weeks worked for single mothers, especially for the well educated.

The NLSCY, as of wave 3, also provides information on earnings for mothers' and fathers', which was not available for total income.[26] Generally, for both two-parent and single-parent families, the earnings gap between regions has evolved in a similar way as the total income gap discussed above. The breakdown between mothers and fathers earnings in two-parent families however reveals that while Québec mothers earnings have increased relative to RofC mothers, Québec fathers earnings have decreased relative to RofC fathers. More specifically,

[24] See Figure A2 in the Appendix for more details.
[25] These estimates can be obtained from the authors on request.
[26] These descriptive statistics can be obtained from the authors on request.

we find that the average earnings gap between mothers in Québec versus the RofC has reversed over the years, from $1,200 in favour of RofC mothers to $3,400 in favour of Québec mothers. This implies that by 2008, relative to 1998, mothers in Québec earned $4,600 more compared to mothers in the RofC. This is consistent with Lefebvre and Merrigan (2008). At the same time, the earnings of Québec fathers remained stable over the period, while that of RofC fathers increased by about $2,500. The average earnings gap between fathers in the RofC versus Québec has increased from $4,900 in 1998 to $7,400 in 2008 in favour of RofC fathers. As a result, the family gap did not change as much as Québec mothers earnings relative to RofC mothers.

This evidence suggests that the childcare policy had a positive impact on the earnings of mothers in two-parent and single-parent families, but in real terms the monetary resources of families with very young children have scaled-up in both Québec and the RofC. Because there is a positive impact of the policy on mothers' earnings and no impact on fathers' participation or weeks worked, we propose three reasons for the small impact on family income (two-parent families). First annual earnings are increasing faster for fathers in the RofC; second there may be a relative decrease in the weekly hours (unavailable in this data set) worked for fathers in Québec; third, the increase in mother's earnings reduces transfers (unavailable in this data set for waves 1-3) based on the lowest income in the household.

Figure 7 displays the percentage of families receiving welfare benefits in the reference year by region and family type. This percentage is very low for two-parent families. In Québec, we observe a percentage of 7.5 in 1994, compared with 5.7 for the RofC. By 2008, the percentage had fallen to 3.0 in Québec and 2.7 in the RofC, almost completely closing the gap between Québec and the RofC. For single-parent mothers the drop in percentage points has been dramatic: from 68% in 1994 to less than 40% in 2008 for both regions. From 2004, the decline has been more pronounced in Québec, but it is not clear from the previous results (section 6) if these changes are closely linked to labour force participation, weeks worked or earnings that might have been influenced by the childcare policy or the other policies mentioned above. An alternative explanation lies with the 2005 Québec family policy which introduced a work income supplement that may have increased participation. Figure 8 reports the percent of families under Statistics Canada yearly Low-Income Cut Off (LICOs), a poverty threshold. The percentage of two-parent families in both regions under the LICOs' has been going down: from 18 to 9 percentage points in Québec and from 16 to 12 in the RofC, but the changes are in unison except from 2006 to 2008 in Québec were a large drop is observed, suggesting that the childcare policy was not a major factor in the poverty rate drop off. For single-parent mothers, the same LICOs pattern prevails for both regions with a similar 20 percentage point decline in the likelihood of being under the LICOs.

We have also examined if the percentages of children by family type (two-parent, single-parent, step-family) have changed over time, but did not find major changes (Table 1 shows that for children aged 0 to 5, the proportion living in a two-parent family in 2008 is slightly

higher than in 1994, but this pattern also holds true for the RofC).

# 8 Fiscal benefits of the policy

We now turn to the fiscal benefits of the childcare policy. By increasing the labour supply of mothers with young children the policy has increased the tax base for both the provincial and federal governments. Also, given that tax credits decrease with 'net' family (taxable) income, both federal and provincial transfers should be lower as a result of the policy. We simulated the fiscal benefits of the policy for the year 2004. This year is chosen because the program was fully implemented and the year after (in 2005) an earned income tax credit policy for low-income families participating the labour market was introduced in Québec.[27] We use Statistics Canada's SLID data set which provides information on income sources, taxes, credits, and transfers for an individual and for the family. In line with the results of Lefebvre et al. (2009) based on the SLID, we suppose that the policy increased the participation rate of mothers who have at least one child aged 1 to 11 by 10 percentage points.

To compute the fiscal impacts we use the software written by Milligan (2008). We first simulate the income taxes and transfers for all working mothers and then subtract the simulated income taxes and transfers assuming that 10% of mothers leave the labour market (corresponding to the counterfactual no daycare policy). The question then becomes which mothers' earnings are set to zero? The benefits to the government of increased labour force participation are most likely a positive function of the earnings of the mothers reacting to the policy change. To estimate the benefits of the daycare program to the government, we perform a number of simulations by changing the labour force participation of different subsets of mothers. This allows us to bound the benefits to the government.

Effectively, we first order mothers based on their earnings, while keeping only mothers with positive earnings in our data set. Taking into account the population weight of each mother, we set the earnings to 0 for a number of earners that correspond to 10 percent of our sample (reducing the participation rate by 10 percentage points, this corresponds of course to more than 10% of earners), and we run our first simulation. In the second simulation, we move the 10% window by five observations, such that in our next sample, we set to zero again the earnings of a number of earners that correspond to 10 percent of our sample, while retaining the observed earnings of the five lowest paid mothers. In the third simulation, we move again the 10% window by five observations, and so forth. We repeat this procedure 85 times until the 10% window reaches the very top of the earnings distribution. As such, in the sample used to compute the last simulation, the top earners (corresponding to 10 percent of the sample) have their earnings set to zero.

[27] More specifically, as of January 2005, the wage subsidy replaced an extremely targeted wage assistance program. Also at the same time, the non-refundable tax credit for dependent children, the family allowances and the tax reduction for families were replaced by a single enhanced child tax benefit.

The results are presented in Figure 9. The figure shows the aggregate increase in income taxes and the aggregate decrease in credits and transfers for both level of governments (provincial: Québec and federal: Canada). The x-axis represents the simulation number, with simulation zero being the one which excludes mothers with the lowest earnings and simulation eighty-five being the one which excludes the highest earning mothers. At the provincial level (Québec), this figure shows that the transfers to families decrease due to the increased participation rate in all simulations. The amounts range from approximately -10 to -50 million dollars. The decrease is however not monotonic. Wealthy mothers at the provincial level are in families that receive fewer credits and transfers if they do not work. The decrease at the federal level (Canada) is however monotonic. The income threshold for credits and transfers is much higher at the federal level. The amounts range from approximately -40 million to almost -120 million dollars. Therefore, the credits decreased between 50 and approximately 170 million dollars when we combine both level of governments.

In terms of income taxes, the increase at the provincial level (also shown in Figure 9) starts at about 50 million and increases more or less monotonically up to 450 million, and from 50 to 550 million at the federal level. The overall gains from income taxes range from 100 to 1,000 million dollars. The total benefits to the government (including increased income taxes and reduced credits and transfers) are between 60 to 500 million dollars at the provincial level, and 90 to 670 million dollars at the federal level. As such, the combined total benefits range between 150 million and 1.2 billion dollars.

For fiscal year 2004-2005, the fiscal credits devoted to the program were 1.4 billion dollars. For the same year, families paid to daycare providers approximately $345 million dollars (189,380 subsidized spaces times 52 weeks times $35 per week). Families supported around 20% of the total cost (1,745 millions). For year 2010-2011, this ratio decreased to 15.6%. As such, at the Québec government level, even in the best case scenario, the costs were larger than the benefits (1.7 billion versus 500 million). When we look at both levels of government, and again assume the best case scenario, the costs are only slightly larger than the fiscal benefits (1.7 billion dollars versus 1.2 billion). For more realistic cases, the gains are likely to be relatively small compared to the costs. For example, if it is the median wage earners who are enticed by the policy to enter the labour market, then the fiscal gains for the provincial government are less than 200 million dollars. However, since 2005, the family credits for low-income families in Québec are higher, therefore the aggregate savings from transfers are probably higher as of 2005.

Other possible gains could be accounted for, such as those from inducing mothers on welfare to move into the labour market, and those associated with getting childcare workers to report their earnings, but these would be fairly small as individuals on welfare typically do not earn high income when they return to work and daycare workers do not pay considerable amounts of taxes. As such, even then the policy seems very costly. Furthermore, previous research documented harmful effects of the childcare policy on early childhood developmental

measures (before age 5). We pursue this line of research by investigating whether the effects have persisted over time (up to 2009) and whether they persist up to age 5 at the time of school entry using additional developmental measures.

# 9 Child cognitive development tests

Using the NLSCY data on 4 and 5-year-olds, we estimate the impact of the reform on three cognitive tests: the Peabody Picture Vocabulary Test (PPVT), the 'Who Am I?' test (WAI), and the Number Knowledge test (NK). These tests may be used to measure school readiness for children in these age groups. We first provide a brief overview of each of the three tests (details are presented in Appendix) and then discuss the results. The PPVT is a widely used measure in the literature on early childhood development (Mayer, 1997). It measures the listening comprehension for spoken words in standard English (French for children with French as their mother tongue). The WAI measures the child's understanding and use of conventional symbols, and early learning skills such as the ability to reproduce a figure. The NK test assesses the child's understanding of whole numbers.

**PPVT** The NLSCY master files provide both the PPVT raw (PPVT-Raw) and the PPVT standardized (PPVR-SD) scores. Statistics Canada has used different methodologies to standardize the scores over time. The released PPVT-SD scores for waves 1 to 3 are standardized within wave (with slight variations in the methodology), while for waves 4 to 8 scores are standardized over the grand population of all tests over the first 5 waves of data. In waves 1 to 3, scores within wave are standardized by age group to have the same mean of 100 and standard deviation of 15. This type of standardization is common for analysis of domains within a wave; however it provides limited insight for in-between wave analysis. For robustness and to allow analysis of changes through time (to capture true population differences over time and not simply differences resulting from sampling error), we have re-standardized (using Statistics Canada smoothing routine) the PPVT-Raw scores using all 8 waves of the NLSCY (as of now PPVT will refer to this standardized score).[28] We selected all children aged 4 and 5 from the data sets of all 8 waves.

It is important to point out that this section is not about the evaluation of the effects of childcare on the development of children, but an evaluation of the effects of a low-fee for long-hours daycare policy on child development. Non-experimental studies that attempt to estimate the effects of childcare on child outcomes are plagued by problems of identification and spurious correlation. First, because most children who are in daycare have working mothers, regression methods have difficulty disentangling the effects of non-parental daycare

[28] Following the approach of Statistics Canada, the standardization was done separately for the PPVT and the EVIP (the acronym for the French adaptation of the test). This should be of no concern as our estimates are based on differences in changes of scores over time between the children of Québec, more than 80% French speaking, and those from the RofC or Ontario.

relative to parental daycare from the effects of having a working mother relative to a mother staying at home. Second, because using childcare is a choice, it is a function of unobservable preferences that can also determine the cognitive performance of children. For example, mothers who stay home with their child may in general prefer spending long hours with their child which could be beneficial to the child. On the other hand, some mothers with very low levels of human capital do not work and do not use childcare, and their children score poorly on cognitive tests on average. These type of biases are not present in our analysis given that we are estimating the impact of the policy and not daycare attendance. Again, we estimate the model presented in equation (1). However, since a large proportion of children aged 4 and 5 were not treated by the reform in 1998, we considered that children aged 4 to 5 in 1998 were pre-reform.

The estimated effects on the PPVT score are presented in Table 7.[29] We first discuss the results of the policy on 4-year-old children (columns 1 to 4 of Table 7), then on 5-year-olds (columns 5 to 12). For the full sample of children aged 4, we find that the effects measured by the PPVT (column 1) are negative, but generally not significant. They also tend to be larger in later years, as could be expected, since a larger fraction of children are treated and for a longer period. When we separate the sample by the education level of the mothers, the negative effects become much larger for children with low-educated mothers, reaching a significant level of -4.1 in 2002 and -7.7 in 2008 (almost half of a standard deviation). Strangely the 2006 estimate for this group is null (0.06), however there are only 44 observations in Québec in 2006. The coefficients for children with a post-secondary educated mother (column 2) is usually small, negative and never significant.

Children in Ontario provide an interesting comparison group as the province offers half-day kindergarten to 4 year-olds. When they are used as a control group, we find again non-significant effects that are somewhat smaller in magnitude (column 4). Although not presented here, we have checked whether the inclusion of certain control variables were key to our results and found that the results are extremely similar whether they are included or not. Clearly, the policy has no positive effects on age 4 children. The signs generally suggest negative effects, stronger for children of low-educated mothers.

Turning to the 5-year-olds not of school age (columns 5 to 8), we find larger negative effects but they remain not significant. The large negative and significant effect in 2000 is surprising as these children were not eligible from a very early age to low-fee daycare. Although they were not yet eligible from the start, estimates of the cumulative effects on hours of care between age 1 and 5 (column 2, Table A.4) show that these children have spent significantly more hours in care on average than comparable children prior to 2000 (4.83 hours). The large negative effects in the later years for children of less educated mothers suggests that they did not benefit from low-fee daycare. These children were treated since

[29] Estimates using the PPVT raw score while controlling for age at the time of test lead to comparable conclusions and can be obtained from the authors on request.

birth, and most likely included a larger number of more vulnerable children, those that low-fee daycare was supposed to help the most. Looking at the 5-year-olds of school age (columns 9 to 12), we find sizable negative and significant effects, from -2.9 in 2000 to -5.3 in 2008 ($p<.01$ or $<.05$). This is a large and increasing effect (almost one third of a standard deviation of the dependent variable). As a comparison, the ceteris paribus "effect" of having a mother with a post-secondary diploma or degree, as opposed to a high school diploma is approximately 3.4.[30] The effects on cumulative hours of care for this group is also increasing over time (column 3, Table A.4). The effects are smaller in magnitude compared to those of age 5 children not yet age-eligible for kindergarten, because the number of hours of care for children in school decreased following the introduction of full-day kindergarten (see Table 4). Again, the results are robust using Ontario as a control group instead of the RofC (columns 8 and 12).

When we separate the samples by the level of education of the child's mother, we find comparable, but somewhat less significant estimates. Interestingly, the difference by mothers' education is somewhat less striking for children of kindergarten age. This suggests that schools are able to reduce the knowledge gap observed prior to school entry. Looking at the Québec coefficient, we further see that schools are successful in Québec as the coefficient becomes largely significant for age 5 children of kindergarten age, and is generally not significant for children not yet in kindergarten (aged 4 and 5). This suggests that the school setting is more successful in addressing the cognitive development of children. Schools and daycare differ in a number of ways. While the number of children per educator is higher in kindergarten (15 to 20 versus 6 to 10 depending on the age group in childcare), the qualifications of educators in school are also much higher. School educators are required to have a 4-year university degree, while the requirements for a daycare provider are considerably lower. This suggests that the qualification of educators may be crucial to the provision of a high quality service able to serve the children most in need. This corroborates much of the recent literature in economics on the importance of teacher quality.

In sum, the results are not significant for children aged 4 and negative and significant for children aged 5. Since one of the objectives of the policy was to increase early literacy skills and better prepare children for school, our results suggest that on this front the policy may not have been successful. Our findings suggest that a better way to address the needs of children likely lies in the differences between the Québec school setting and daycare settings. Increased qualification of educators might be one solution, or junior kindergarten available to all 4 year-olds, with smaller groups for the disadvantaged.

**WAI and NK results** Although the WAI and the NK were only administered as of 2000 (wave 4), after the start of the childcare reform, these test scores allow us to see whether the increased number of spaces over the years relative to the 2000 level is paralleled with

[30] The estimated coefficients on control variables are not presented here, but can be obtained on demand.

changes in test scores over the same period.

The NLSCY's master files contain two measures for each test score. For the WAI scores, Statistics Canada provides a raw score (values between 10 and 40) and a standardized scale score (values 0 to 174), and for the NK, a level (0, 1, 2) representing the age equivalent for the child interpreted as a direct measure, and an age standardized 30-point raw score (values between 50 and 165). In both cases we use the standardized score. The take-up rate of the WAI test is lower than for the PPVT: 76% for our sample compared to 90% for the PPVT. The response rate to the NK is comparable to that of the PPVT at 90-91% in all waves.

The top panel of Table 8 provides the estimated coefficients for the WAI. Estimates are generally not significant for the 4-year-olds. For age 5 children not of school age, the trend appears to be negative, and especially so for children of less educated mothers. For age 5 children of kindergarten age, the trend is largely not significant. We notice that the Quebec dummy is negative and significant for aged 4 and 5 children not age-eligible for kindergarten, while it is closer to zero and not significant for aged 5 children of school age. The negative Québec coefficient on pre-school children is even larger when we use Ontario instead of the RofC, but of similar magnitude and also not significant for children in school. This suggests that (1) the Ontario 4-year-old kindergarten helps children better perform on cognitive test scores, and (2) the Québec 5-year-old kindergarten helps Québec children close the gap on cognitive test scores. This suggests that the school setting is particularly effective in teaching children cognitive abilities.

The bottom panel of Table 8 shows the estimated coefficients for the NK. For the 4-year-olds, we find large positive trends, which are even larger for children of less educated mothers. The skills measured by the NK rely on a small number of words related to numbers. These appear to be well covered by daycare providers, but the early advantage quickly disappears. Indeed, these effects are no longer observed at age 5, whether in school or not, using both comparison groups (RofC and Ontario). Again we find that the Quebec dummy is large and negative for pre-school children and small and not significant for in school children.

**Discussion** In summary, the results by mothers' level of education suggest that the policy did not reduce "social" gaps in school readiness. In fact, the negative estimated impacts of the policy are generally larger for children whose mother is less educated. We provide three explanations to help reconcile our results with former studies on the impact of ECEC on preschool cognitive development. First, most studies evaluating the impact of daycare are plagued by endogeneity or spurious correlation problems which is not the case in our study.

Second, rarely can we observe variations in hours of non-parental care for young children of the magnitude observed after the implementation of the program. Services are available 10 to 12 hours (depending on the setting) per day, 261 days a year and at the same low-fee per day for all children. For example, using the NLSCY, we observe that in 1994, 45% of all children aged 1 to 4 were in childcare and 68% for more than 21 hours per week (excluding

children with 0 hours); in 2002, 70% of children aged 1 to 4 were in childcare and 78% for more than 21 hours; in 2008, 78% were in childcare and 83% for more than 21 hours per week. Not only are more children in daycare but they are there for much longer hours. The increase in the number of hours certainly reflects the increased labour force participation of mothers, but it may also be attributed to the structure of the program and its financial incentives[31]. The government asks daycare providers to ensure parents use daycare services every day of the week (unless the child is sick or on vacation with his family): if a space is not occupied full-time the subsidy may be reduced. In theory, a provider may offer part-time spaces, but in practice they almost exclusively offer full-time full-week spaces because it is easier to manage.

Third, although more children are now in regulated types of daycare, which is supposed to be helpful or at a minimum not harmful, two major studies on the first years of the program (ISQ, 2004; Japel et al., 2005) show that the average quality in Québec's subsidized daycare network is at best satisfactory and in many cases low or not acceptable, particularly for children in lower-income families. Part of this is explained by the rush to implement the program, build up new settings and create new spaces to respond to the excess demand for spaces, which forced the government to accept daycare workers with no specific training in ECEC. The Ministry of the Family imposes an "official" ECEC program (embedded in the childcare law) that childcare providers must follow. However, according to a recent audit on educational childcare services conducted by the Office of the Auditor General of Québec (VGQ, 2011), it is difficult to determine if the program is implemented in specific daycare settings and no action to enforce the program or measures to train the educators have been observed across the province. The audit also finds that the percentage of subsidized centres not respecting the maximum ratio of number of children per qualified educator was 42% in 2008-2009 and 54% in 2009-2010.

Therefore, the negative effects we uncovered may not relate to childcare per se, but to the structure of the program which creates strong incentives for families to use long hours of care starting at a very young age and offers at best average quality. A number of policies possibly influencing child development were mentioned in Section 2. Reforms common to both Québec and the RofC are accounted for through our control group. However, the Québec 2005 earned income supplement remains unaccounted for. It benefits families by raising their disposable income. This likely has positive impacts on child development, or at worse no impact. This implies that the negative effects we have uncovered with respect to the daycare reform are most likely underestimated for 2006 and 2008.

[31] In fact, the $7 day fee translates to $3.5 (approximately 3 euros at the actual 2013 exchange rate) after taking into account the federal income taxes (childcare fees are deductable expenses), family transfers based on net taxable income, and a universal subsidy of $100 per month for each child aged 0 to 5 to help families pay for childcare.

# 10 Conclusion

In this paper we analyse the long-term/enduring effects of the Québec daycare reform and provide a comprehensive review of the costs and benefits of the program. We showed that the reform had important and lasting effects on the number of hours children spend in daycare from age 1 to 4. Not only the number of children attending daycare increased, but also the number of hours they spend in daycare conditional on attending daycare.

The NLSCY compared to the SLID provided sufficient data to estimate the effects of the policy by sub-group. We found that the increased labour force participation and weeks worked of mothers was also long lasting and mainly driven by highly educated mothers, in particular for single mothers, the effects of the program for single-mothers are estimated to be very high, 25 to 40 percentage points and 13 to 16 weeks, but with a large standard deviation. The effects are also positive for mothers with a high school diploma or less but much smaller (around 11 percentage points and up to 8 weeks).

We also found that the policy had no effect on the labour supply of mothers with a very young child (less than 6 months), and positive effects for mothers with a child 6 to 12 months before the introduction of the more generous parental leave, after which effects estimated are not significant. This is in line with the changes in parental leave benefits over the period. We do find evidence that the Québec parental leave policy induces fathers to take a 5 week paid leave during the first five months after birth, in line with the availability of this leave in the new policy.

Interestingly, for children aged 5 we uncovered strong evidence that implementing full-day kindergarten alone was not enough to increase maternal labour force participation and weeks worked, but when combined with the low-fee daycare program it was. Indeed, mothers whose child was eligible to low-fee daycare early on were more likely to participate in the labour market once their child reached age 5 compared to mothers whose child was not. The policy did not impact the labour force participation of fathers, and had minor impacts on their number of weeks worked.

We did not find evidence that the evolution of family income changed in Québec after the policy relative to the RofC, while mothers' earnings increased more rapidly in Québec compared to the RofC**,** the earnings of fathers in the RofC increased faster than in Québec, probably because of a high level of economic activity in the western part of the country sustained by the demand for natural resources, in particular in the first decade of the millennium.

Finally, but certainly not least importantly, we found negative impacts on the cognitive development of age 5 children. These effects are also present for age 4 children, but not significant. Clearly, the daycare reform did not raise the average cognitive ability of children. Again, we emphasize that we are estimating the effects of a complex daycare policy, which increased the number of hours of care and offered at best average quality care, as opposed to the effect of childcare per se. Estimates for children aged 5 in school settings suggests

that schools successfully raise the achievement of children in Québec and reduced the ability gap observed prior to school entry between children of less educated mothers and highly educated mothers. This finding suggests that the school setting is more successful in raising children's cognitive ability than the daycare setting. Therefore, raising the qualification of childcare educators or a junior kindergarten program for 4 year-olds could be helpful for the cognitive development of such children.

Since the policy aimed to increase the labour force participation of mothers and help children be better prepared for school, we conclude that the policy was only partially successful. These partial effects generated both private and social benefits, mainly to mothers (such as financial independance, more work experience, extended social network, empowerment). But they also came at a fairly high cost to the government.

We showed that the provincial costs were most likely a lot larger than the fiscal benefits, at about 1.2 billion dollars versus 60 million to, at best, 500 million in 2004. This policy turned out to be advantageous at the federal level as it increased the fiscal revenues of the government by about 90 to 670 million, and reduced the fiscal credits related to daycare expenses. Relative to the province's GDP (in current Canadian dollars), the total costs increased from 0.16 percentage points in 1996 to 0.63 percentage points in 2009. Thus the policy's costs, in terms of GDP, have quadrupled in ten years. Both the increasing number of individuals employed in the subsidized network (29,228 jobs in 2001 to 62,233 in 2010, mostly educators with 95% of all jobs occupied by women) and the rise in salaries paid to these employees largely explain this trend. Since the government wants to fund more new spaces, it will need to attract more employees to the sector. We therefore expect wages and total costs to further increase. Any major effort of this kind in other provinces or countries should be done much more slowly, the labour supply effects will be smaller, but the likelihood of an increase in cognitive development will increase if well-trained personnel and lower child/educator ratio are the norm.

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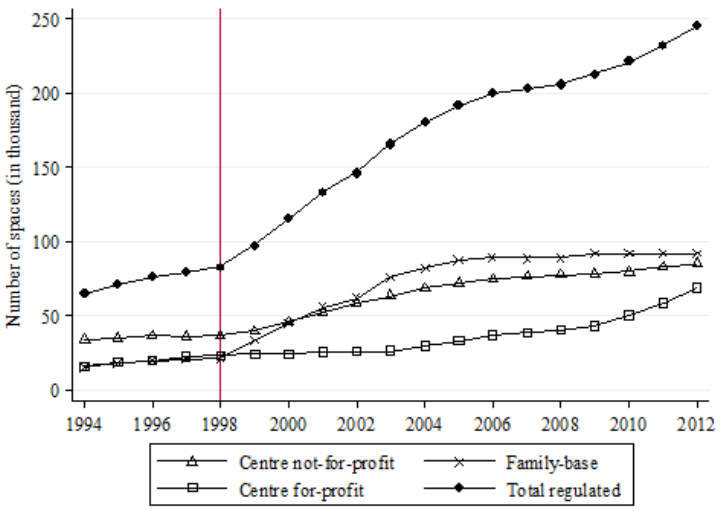
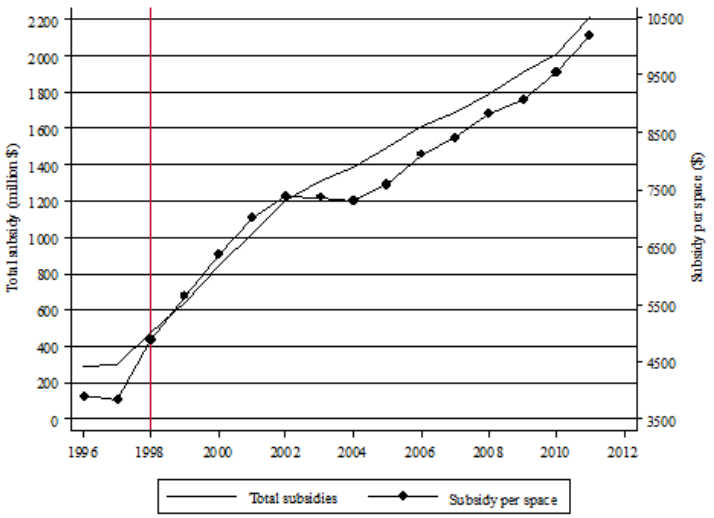
# 12 Figures

Figure 1: Number of regulated spaces



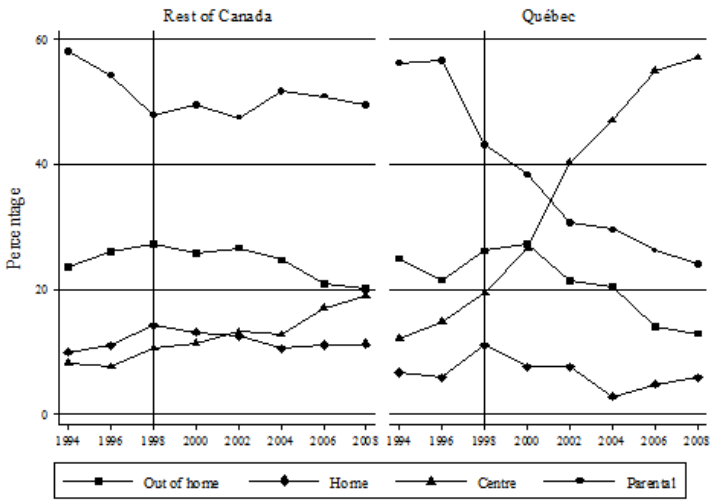

**Note:** Shows the evolution of the number of spaces by mode of care between 1994 and 2012. As of 2001, all spaces are in centre, not-for-profit, and family-based care. Most spaces in centre for-profit care are at the subsidized low fee. The number of spaces is measured on March $31^{st}$ of each year by the Direction générale des services de garde, Ministry of Families and Elders (MFA). The vertical line marks the first post-reform year. The data can be accessed at www.mfa.gouv.qc.ca/fr/services-de-garde/portrait/places/Pages/index.aspx.

Figure 2: Total public subsidies and subsidy per space



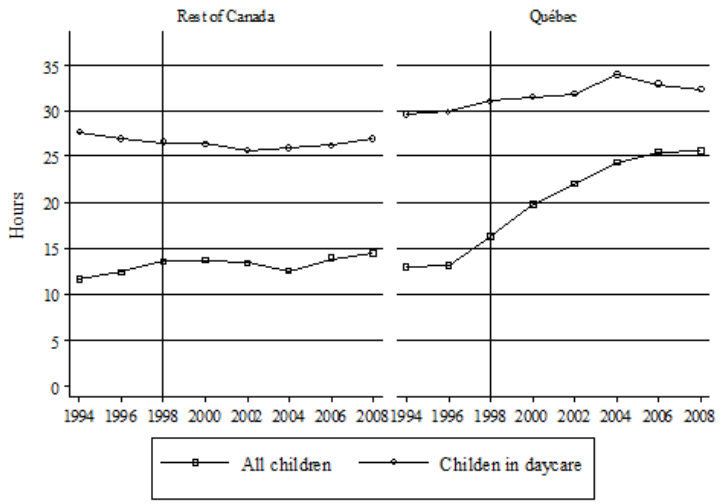

**Note:** The solid line shows the evolution of the total annual public subisdies allocated to the ECEC program in millions of dollars (left axis). The solid-dotted line shows the annual subsidy per space in dollars (right axis). The subsidy per space is the mean subsidy for both providers and families before 2000 and low-fee spaces since 2000. Our sources of data are the Ministry of Families and Elders (number of spaces) and the Treasury Board (total subsidies).

Figure 3: Primary care arrangement of children aged 1 to 4 by year in percentages



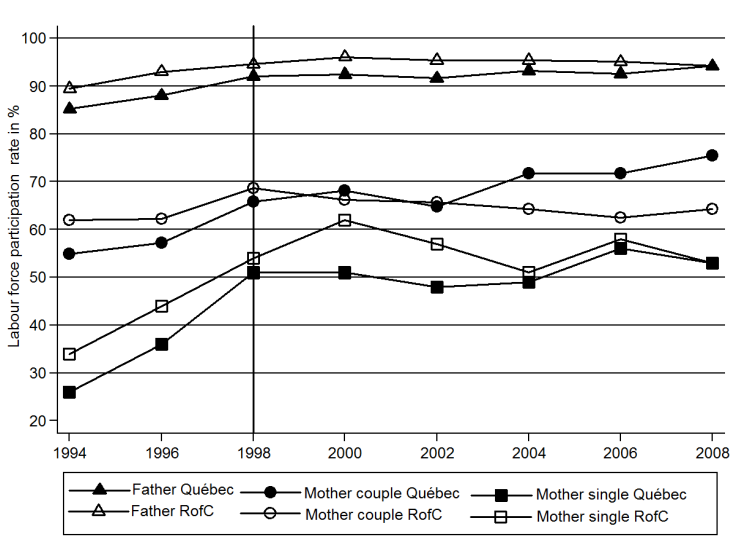

**Note:** Shows the evolution of the percentage of the primary modes of care in the Rest of Canada (left panel) and Québec (right panel) by wave. The sample includes NLSCY cross-sectional children aged 1 to 4.

Figure 4: Mean hours per week spent in the primary care arrangement for children aged 1 to 4



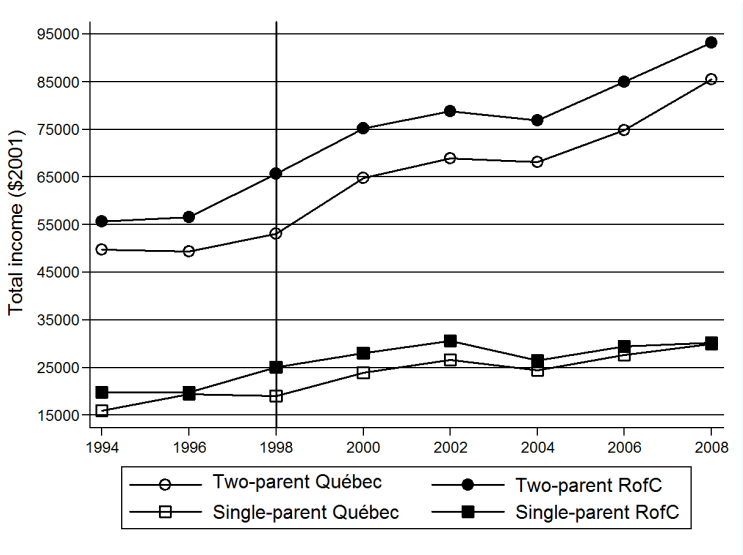

**Note:** Shows the evolution of the mean number of hours per week spent in the primary mode of care in the Rest of Canada (left panel) and Québec (right panel) non conditionally (hollow square) and conditionally on attending childcare (hollow circle). The sample includes NLSCY cross-sectional children aged 1 to 4.

Figure 5: Labour force participation of mothers (two-parent and single-parent families) and fathers by region



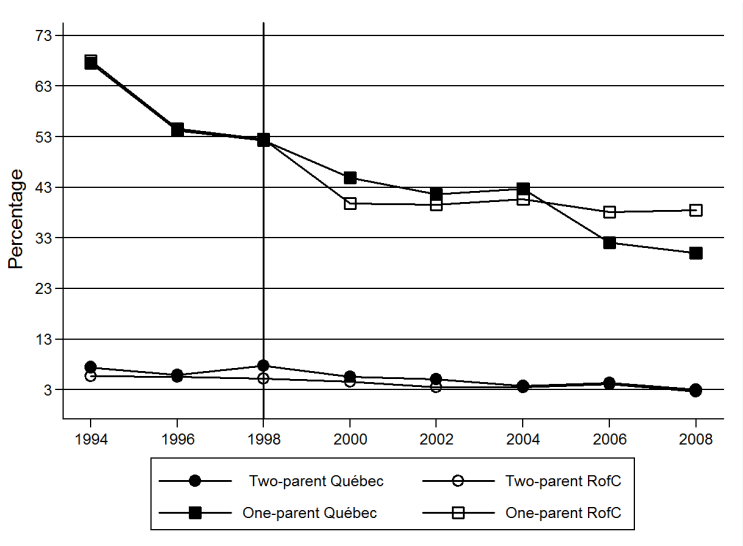

**Note:** Shows the evolution of parental labour force participation for the NLSCY cross-sectional children aged 1 to 4.

Figure 6: Family total income by family type and region



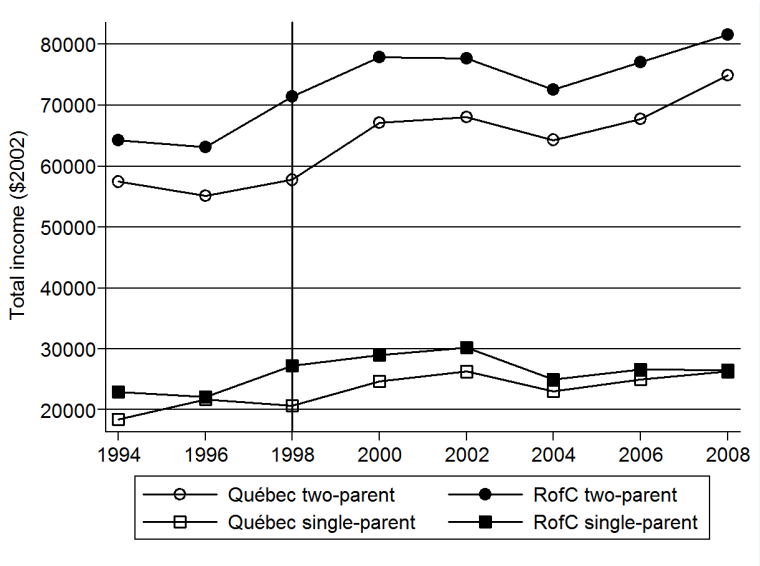

**Note:** Shows the evolution of mean total household income in the reference year from all sources before taxes by family type, for NLSCY cross-sectional children aged 1 to 4.

Figure 7: Percentage of families receiving welfare transfers by family type and region



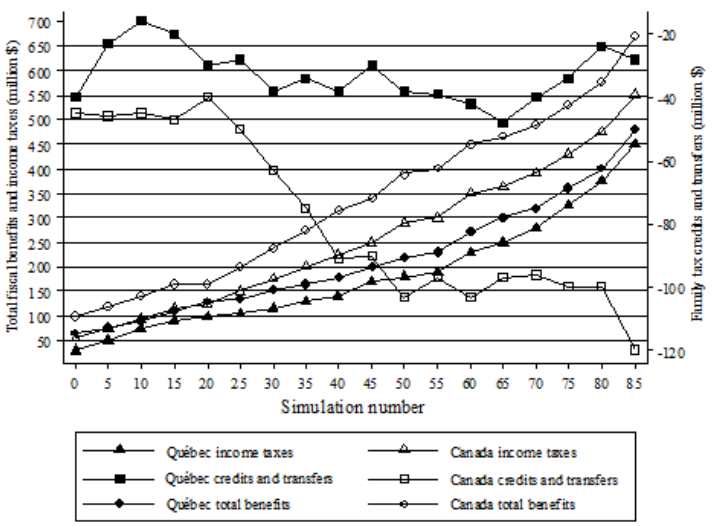

**Note:** Displays the percentage of NLSCY cross-sectional children aged 1 to 4 whose parents receive welfare benefits in the reference year.

Figure 8: Percentage of families below LICO's by family type and region




**Note:** Displays the percentage of families below Statistics' Canada Low-Income Cut-Offs (LICOs) for the NLSCY cross-sectional children aged 1 to 4.

Figure 9: Simulated changes in families' credits, transfers and income taxes by level of governement for year 2004




**Note:** Shows the simulated changes in provincial (Québec) and federal (Canada) income taxes (left axis) and credits and transfers (right axis) from a 10 percentage point increase in the labour market participation of mothers. The simulation uses SLID data for mothers with at least one child aged 1 to 11. Simulation number 1 assumes that the lowest earners join the labour market, while simulation number 85 assumes that the highest earners join the labour market (corresponding to 10 percent increase in labour force participation of mothers with at least on child aged 1 to 11) . From simulation 1 to 85, the 10% window moves from the bottom of the income distribution to the top by 5 observations at each simulation.

## 12.1 Tables

Table 1: Mean Characteristics of all mothers and families with at least one child aged 0-5 by region and wave

| Year | 1994 | 1996 | 1998 | 2000 | 2002 | 2004 | 2006 | 2008 |
|---|---|---|---|---|---|---|---|---|
| Québec | | | | | | | | |
| Child is a girl | 51.6 | 51.0 | 51.3 | 51.5 | 51.3 | 52.1 | 51.5 | 51.8 |
| Mother | | | | | | | | |
| Less than high school | 18.7 | 15.8 | 15.4 | 15.4 | 14.5 | 16.8 | 9.8 | 8.1 |
| High school diploma | 15.8 | 15.3 | 12.7 | 16.8 | 17.3 | 15.0 | 11.3 | 12.0 |
| Some post-secondary | 25.3 | 24.0 | 25.0 | 20.0 | 20.8 | 12.1 | 14.5 | 11.3 |
| Post-secondary degree | 40.2 | 45.0 | 47.0 | 47.7 | 47.4 | 56.1 | 64.4 | 68.6 |
| Age 14-24 at birth | 20.7 | 20.9 | 22.2 | 26.2 | 24.6 | 22.5 | 17.4 | 15.6 |
| Age 25-29 at birth | 40.4 | 36.7 | 34.2 | 34.2 | 34.6 | 37.2 | 37.9 | 37.3 |
| Age 30-34 at birth | 29.2 | 31.6 | 32.0 | 27.5 | 27.3 | 27.2 | 31.0 | 33.5 |
| Age 35 or more at birth | 9.8 | 10.8 | 11.6 | 12.1 | 13.5 | 13.2 | 13.7 | 13.6 |
| Born in Canada | 90.6 | 91.5 | 88.8 | 88.4 | 85.9 | 82.8 | 82.0 | 81.1 |
| Family | | | | | | | | |
| Single-parent | 12.3 | 13.3 | 13.9 | 14.0 | 10.7 | 12.7 | 10.9 | 10.4 |
| Two-parent | 87.7 | 86.7 | 86.1 | 86.0 | 89.3 | 87.3 | 89.1 | 89.6 |
| Older siblings | 50.5 | 53.7 | 55.7 | 54.4 | 53.8 | 53.2 | 52.5 | 52.1 |
| Younger siblings | 26.0 | 23.2 | 21.3 | 23.1 | 23.9 | 21.6 | 21.0 | 25.1 |
| Presence of other children | 2.0 | 2.9 | 2.9 | 2.9 | 1.5 | 1.4 | 1.9 | 2.6 |
| Size of area of residence >499K | 55.2 | 59.8 | 59.9 | 59.5 | 55.3 | 56.6 | 63.2 | 62.0 |
| Size of area of residence 100-499K | 11.6 | 6.2 | 6.0 | 6.2 | 5.9 | 5.1 | 6.9 | 7.0 |
| Size of area of residence 30-99.999K | 8.3 | 9.2 | 10.1 | 8.8 | 8.3 | 7.2 | 10.4 | 9.6 |
| Size of area of residence < 30K | 7.9 | 10.9 | 10.5 | 10.0 | 17.0 | 17.9 | 6.4 | 7.2 |
| Size of area of residence: rural | 17.0 | 14.0 | 13.5 | 15.5 | 13.6 | 13.2 | 13.1 | 14.1 |
| Household income ($2002) | 51,744 | 51,491 | 56,710 | 61,858 | 63,998 | 60,278 | 65,424 | 70,978 |
| N | 2,236 | 2,045 | 4,013 | 2,766 | 2,143 | 1,522 | 1,520 | 1,727 |
| Rest of Canada | | | | | | | | |
| Child is a girl | 51.1 | 51.5 | 51.4 | 51.2 | 51.2 | 51.2 | 51.2 | 51.0 |
| Mother | | | | | | | | |
| Less than high school | 14.7 | 11.6 | 11.4 | 12.5 | 10.3 | 9.7 | 8.8 | 9.1 |
| High school diploma | 18.1 | 18.1 | 17.1 | 18.4 | 21.8 | 20.8 | 18.2 | 17.5 |
| Some post-secondary | 28.5 | 28.8 | 26.8 | 21.9 | 13.7 | 12.7 | 12.7 | 13.7 |
| Post-secondary degree | 38.7 | 41.5 | 44.7 | 47.1 | 54.3 | 56.9 | 60.3 | 59.6 |
| 14-24 years at birth | 19.3 | 18.3 | 17.9 | 21.2 | 18.8 | 19.3 | 18.7 | 18.6 |
| 25-29 years at birth | 35.8 | 34.5 | 32.0 | 31.9 | 31.7 | 28.9 | 28.8 | 29.2 |
| 30-34 years at birth | 31.3 | 32.8 | 33.8 | 31.8 | 32.8 | 33.2 | 33.7 | 32.9 |
| 35 years or more at birth | 13.6 | 14.4 | 16.3 | 15.2 | 16.7 | 18.7 | 18.8 | 19.3 |
| Born in Canada | 79.7 | 78.8 | 80.0 | 78.1 | 74.9 | 74.5 | 72.1 | 73.4 |
| Family | | | | | | | | |
| Single-parent | 15.0 | 13.9 | 13.7 | 13.5 | 12.1 | 12.2 | 13.2 | 13.2 |
| Two-parent | 85.0 | 86.1 | 86.3 | 86.5 | 87.9 | 87.8 | 86.8 | 86.8 |
| Older siblings | 57.3 | 57.3 | 57.9 | 56.4 | 56.7 | 55.9 | 55.4 | 55.6 |
| Younger siblings | 24.8 | 25.2 | 24.2 | 24.6 | 23.0 | 22.4 | 22.4 | 23.0 |
| Presence of other children | 1.8 | 2.0 | 2.7 | 3.2 | 3.1 | 3.3 | 3.6 | 3.9 |
| Size of area of residence >499K | 41.9 | 43.2 | 44.8 | 46.8 | 42.7 | 41.5 | 48.9 | 48.2 |
| Size of area of residence 100-499K | 20.7 | 22.2 | 21.6 | 21.3 | 14.9 | 14.7 | 21.2 | 21.3 |
| Size of area of residence 30-99.999K | 7.6 | 8.3 | 8.8 | 8.7 | 8.9 | 8.8 | 9.3 | 9.6 |
| Size of area of residence < 30K | 12.8 | 14.4 | 13.3 | 13.1 | 23.4 | 24.6 | 9.3 | 9.2 |
| Size of area of residence: rural | 17.0 | 11.9 | 11.5 | 10.2 | 10.1 | 10.4 | 11.2 | 11.7 |
| Household income ($2002) | 58,036 | 56,747 | 63,978 | 70,622 | 72,130 | 68,645 | 72,969 | 77,243 |
| N | 9,721 | 8,589 | 15,950 | 13,870 | 10,465 | 8,528 | 9,657 | 10,429 |

**Note:** Shows the weighted summary statistics for children aged 0 to 5 by year. All statistics are percentages except household income.

Table 2: Parental work-childcare profile and mode of care used by quartile of gross family total income

| | Quartile 1 | Quartile 2 | Quartile 3 | Quartile 4 | All |
|---|---|---|---|---|---|
| Family total income quartile cut-off point | $47,400 | $71,200 | $102,220 | - | na |
| Mean income of quartile | $29,744 | $59,101 | $84,943 | $140,208 | $78,447 |
| Parental work-childcare usage profile | | | | | |
| Parent(s) work/study and use childcare | 51 | 67 | 73 | 84 | 69 |
| Parent(s) work/study and no childcare | 14 | 12 | 16 | 8 | 12 |
| Parent(s) do not work/study | 36 | 21 | 11 | 8 | 19 |
| Total | 100 | 100 | 100 | 100 | 100 |
| Mode of care used | | | | | |
| Family-based (other home) | 8 | 11 | 13 | 8 | 10 |
| Family-based (other, relative) | 5 | 3 | 5 | 2 | 4 |
| Child's home (by a non relative/relative) | 7 | 6 | 3 | 8 | 6 |
| Daycare centre | 31 | 45 | 52 | 65 | 47 |
| Does not use childcare (not working/studying) | 45 | 31 | 25 | 14 | 30 |
| Not asked | 4 | 4 | 2 | 3 | 3 |
| Total | 100 | 100 | 100 | 100 | 100 |
| Number of children un-weighted | 372 | 400 | 401 | 315 | 1,482 |
| Weighted observations | 101,763 | 101,312 | 101,466 | 101,299 | 405,840 |

**Note:** The statistics presented in this table were computed using the 2008-09 NLSCY data on cross-sectional children aged 0 to 59 months in Québec. The mode of care used is only asked to parents using childcare for work or study. As such, we pooled children of parents who do not work or study under the label "Not asked".

Table 3: Estimated effects of the policy on weekly hours spent in the primary mode of care: children aged 1 to 4

| Type of family | Hours of care | | | | Conditional hours of care (intensity) | | | |
|---|---|---|---|---|---|---|---|---|
| | two parents | single parent | all family | all family# | two parents | single parent | all family | all family# |
| $\beta_3$ (1998-99) | 1.86** | 3.52 | 2.05** | 2.06** | 1.79* | 2.96 | 1.84** | 1.88* |
| | (0.84) | (2.47) | (0.81) | (0.80) | (1.01) | (2.52) | (0.94) | (0.94) |
| $\beta_4$ (2000-01) | 5.99*** | 4.59* | 5.72*** | 5.74*** | 3.17* | 0.45 | 2.74*** | 2.78*** |
| | (0.85) | (2.54) | (0.79) | (0.79) | (0.88) | (2.76) | (0.86) | (0.86) |
| $\beta_5$ (2002-03) | 7.90*** | 10.78*** | 8.29*** | 8.30*** | 3.41*** | 3.98* | 3.42*** | 3.45*** |
| | (0.90) | (2.55) | (0.85) | (0.85) | (0.93) | (2.35) | (0.86) | (0.86) |
| $\beta_6$ (2004-05) | 9.93*** | 10.98*** | 10.01*** | 10.02*** | 5.47*** | 3.15 | 5.05*** | 5.09*** |
| | (0.99) | (3.01) | (0.96) | (0.96) | (0.98) | (2.66) | (0.90) | (0.90) |
| $\beta_7$ (2006-07) | 10.79*** | 12.57*** | 11.05*** | 11.08*** | 4.12*** | 1.77 | 3.74*** | 3.78*** |
| | (0.89) | (2.52) | (0.85) | (0.85) | (0.90) | (2.53) | (0.83) | (0.83) |
| $\beta_8$ (2008-09) | 10.36*** | 14.20*** | 10.82*** | 10.85*** | 3.53*** | 2.07 | 3.33*** | 3.37*** |
| | (0.93) | (2.63) | (0.87) | (0.87) | (0.95) | (2.73) | (0.95) | (0.86) |
| N | 56,576 | 8,672 | 65,248 | 16 | 29,635 | 4,876 | 34,511 | 16 |
| | Mother's labour force participation | | | | Mother's weeks worked | | | |
| | two parents | single parent | all family | all family# | two parents | single parent | all family | all family# |
| $\beta_3$ (1998-99) | 0.05** | 0.12* | 0.06** | 0.06*** | 0.96 | 2.73 | 1.14 | 1.26 |
| | (0.02) | (0.06) | (0.02) | (0.02) | (1.11) | (2.94) | (1.03) | (1.03) |
| $\beta_4$ (2000-01) | 0.11*** | 0.11* | 0.11*** | 0.11*** | 4.17*** | 3.69 | 3.99*** | 4.07*** |
| | (0.02) | (0.06) | (0.02) | (0.02) | (1.13) | (3.13) | (1.07) | (1.07) |
| $\beta_5$ (2002-03) | 0.08*** | 0.12* | 0.09*** | 0.09*** | 4.19*** | 4.25 | 4.15*** | 4.21*** |
| | (0.02) | (0.06) | (0.02) | (0.02) | (1.12) | (3.19) | (1.04) | (1.04) |
| $\beta_6$ (2004-05) | 0.14*** | 0.06 | 0.13*** | 0.14*** | 5.54*** | 1.27 | 5.01*** | 5.07*** |
| | (0.03) | (0.07) | (0.02) | (0.02) | (1.21) | (3.54) | (1.15) | (1.15) |
| $\beta_7$ (2006-07) | 0.11*** | 0.13* | 0.11*** | 0.11*** | 3.61*** | 5.00 | 3.72*** | 3.75*** |
| | (0.03) | (0.07) | (0.02) | (0.02) | (1.28) | (3.61) | (1.22) | (1.22) |
| $\beta_8$ (2008-09) | 0.14*** | 0.09 | 0.13*** | 0.13*** | 5.88*** | 3.96 | 5.61*** | 5.62*** |
| | (0.03) | (0.07) | (0.02) | (0.02) | (1.26) | (3.47) | (1.18) | (1.18) |
| N | 57,267 | 8,613 | 65,880 | 16 | 57,211 | 8,595 | 65,806 | 16 |

**Note:** We use the sample of all children aged 1 to 4. The dependent variables are the number of hours in care (columns 1 to 4), a dummy for labour force participation at the time of the interview (columns 5 to 8) and the number of weeks worked in the reference year (columns 9 to 12). All specifications control for the sex of the child, the age of the child in years, the age group of the mother at child birth (25-29, 30-34, 35 or more with 14-24 the omitted group), the family type (step-family, single-parent, with two-parent the omitted group), a dummy for whether the mother was born in Canada or not, the mother's highest level of education (less than a high school diploma, high school diploma, some postsecondary education, with post-secondary diploma, the omitted group), the presence and number of older or younger siblings or the presence of a child of the same age, the size of the community (five groups from rural to 500,000 or more the omitted group). Except for columns labeled "all family#", our evaluation strategy relies on equation (1). Estimates denoted with the supercript "#" are obtained using a two-step procedure to account for unobserved aggregate transitory shocks. Standard errors are in parentheses and all are bootstrapped to account for the sampling design of the NLSCY. Statistical significance is denoted using asterisks: *** is p<0.01, ** is p<0.05, and * is p<0.1.

Table 4: Estimated effects of the policy on weekly hours spent in the primary mode of care by age of the child

| Age of children | 0 $\leqslant$ 5 mths | 0 $\geqslant$ 6 mths | 1 | 2 | 3 | 4 | 5 not eligible for K-5 | 5 eligible for K-5 |
|---|---|---|---|---|---|---|---|---|
| Hours of care | | | | | | | | |
| $\beta_3$ (1998-99) | 2.06 | 3.30* | 1.66 | 2.89* | 0.94 | 2.65 | 2.26 | -5.34*** |
| | (1.28) | (1.74) | (1.11) | (1.72) | (1.53) | (1.73) | (2.25) | (1.15) |
| $\beta_4$ (2000-01) | 0.73 | 6.38*** | 4.03*** | 8.20*** | 5.21*** | 5.81*** | 6.25** | -3.66*** |
| | (1.29) | (1.79) | (1.39) | (1.43) | (1.34) | (1.88) | (2.61) | (1.31) |
| $\beta_5$ (2002-03) | 0.06 | 7.39*** | 7.81*** | 9.50*** | 7.26*** | 8.24*** | 11.16*** | -4.02*** |
| | (0.88) | (2.10) | (1.70) | (1.76) | (1.64) | (1.59) | (2.37) | (1.22) |
| $\beta_6$ (2004-05) | -1.11* | -1.33 | 9.97*** | 11.17*** | 8.69*** | 10.20*** | 6.05* | -4.73*** |
| | (0.63) | (1.79) | (1.61) | (1.85) | (1.86) | (2.17) | (3.57) | (1.31) |
| $\beta_7$ (2006-07) | -0.89 | 0.24 | 7.99*** | 10.06*** | 11.92*** | 14.05*** | 16.72*** | -4.29*** |
| | (0.61) | (1.82) | (1.57) | (1.72) | (1.54) | (1.81) | (3.62) | (1.33) |
| $\beta_8$ (2008-09) | -0.70 | 3.06 | 7.25*** | 9.74*** | 12.62*** | 14.33*** | 16.20*** | -4.42*** |
| | (0.76) | (1.99) | (1.44) | (1.93) | (1.58) | (1.77) | (2.97) | (1.33) |
| N | 2,963 | 11,668 | 19,363 | 13,978 | 18,105 | 13,802 | 6,594 | 16,424 |
| Conditional hours of care (intensity) | | | | | | | | |
| $\beta_3$ (1998-99) | - | - | -0.92 | 0.25 | 2.19 | 6.95*** | 2.99 | -8.79*** |
| | | | (1.23) | (2.00) | (1.72) | (1.85) | (3.13) | (1.48) |
| $\beta_4$ (2000-01) | - | - | 1.46 | 2.71 | 3.70*** | 4.29** | 2.45 | -8.82*** |
| | | | (1.36) | (1.67) | (1.39) | (1.93) | (3.69) | (1.63) |
| $\beta_5$ (2002-03) | - | - | 1.27 | 3.79** | 4.08** | 4.88*** | 6.73** | -9.67*** |
| | | | (1.62) | (1.65) | (1.62) | (1.72) | (3.20) | (1.54) |
| $\beta_6$ (2004-05) | - | - | 2.69* | 6.03*** | 4.08** | 8.29*** | 12.72*** | -10.28*** |
| | | | (1.38) | (1.72) | (1.76) | (1.94) | (3.72) | (1.57) |
| $\beta_7$ (2006-07) | - | - | 0.89 | 1.76 | 4.08** | 8.63*** | 8.93** | -11.72*** |
| | | | (1.44) | (1.71) | (1.52) | (1.70) | (3.68) | (1.70) |
| $\beta_8$ (2008-09) | - | - | 0.25 | 1.91 | 4.72*** | 7.02*** | 1.82*** | -11.12*** |
| | | | (1.50) | (1.82) | (1.57) | (1.93) | (3.47) | (1.65) |
| Observations | - | - | 9,605 | 7,398 | 10,065 | 7,443 | 3,252 | 8,005 |

**Note:** The dependent variables are the number of hours in care including zero hours of care (top panel) and excluding zero hours of care (bottom panel). The age of children included in the sample is specified at the top of each column, **with children aged 5 divided in two groups: (1) not age eligible to kindergarten (K-5) and (2) age eligible to K-5**. Children from all family types are included. We include the same controls as in Table 3. Standard errors are in parentheses and all are bootstrapped to account for the sampling design of the NLSCY. Statistical significance is denoted using asterisks: *** is p<0.01, ** is p<0.05, and * is p<0.1.

Table 5: Estimated effects of the policy on mothers' labour force participation and weeks worked by age of the children

| Age of children | 0 $\leqslant$ 5 mths | 0 $\geqslant$ 6 mths | 1 | 2 | 3 | 4 | 5 not eligible for K-5 | 5 eligible for K-5 |
|---|---|---|---|---|---|---|---|---|
| Mother's current labour force participation | | | | | | | | |
| $\beta_3$ (1998-99) | 0.00 | 0.13*** | 0.08*** | 0.11** | 0.06 | -0.01 | -0.04 | -0.04 |
| | (0.07) | (0.05) | (0.03) | (0.05) | (0.04) | (0.05) | (0.07) | (0.04) |
| $\beta_4$ (2000-01) | 0.08 | 0.15*** | 0.11*** | 0.15*** | 0.03 | 0.13** | -0.06 | 0.00 |
| | (0.10) | (0.05) | (0.04) | (0.04) | (0.04) | (0.05) | (0.08) | (0.05) |
| $\beta_5$ (2002-03) | -0.29** | 0.11** | 0.12*** | 0.10** | 0.03 | 0.08* | 0.07 | 0.00 |
| | (0.11) | (0.06) | (0.04) | (0.04) | (0.05) | (0.04) | (0.07) | (0.05) |
| $\beta_6$ (2004-05) | 0.07 | 0.09 | 0.15*** | 0.15*** | 0.12*** | 0.12** | -0.07 | 0.11* |
| | (0.15) | (0.06) | (0.04) | (0.05) | (0.04) | (0.05) | (0.09) | (0.06) |
| $\beta_7$ (2006-07) | 0.22* | 0.00 | 0.13*** | 0.12** | 0.12*** | 0.07 | 0.17* | 0.09 |
| | (0.12) | (0.06) | (0.04) | (0.05) | (0.04) | (0.05) | (0.10) | (0.06) |
| $\beta_8$ (2008-09) | 0.16 | 0.04 | 0.07* | 0.20*** | 0.09** | 0.17*** | 0.01 | 0.09* |
| | (0.17) | (0.05) | (0.04) | (0.05) | (0.04) | (0.04) | (0.08) | (0.05) |
| N | 2,980 | 11,797 | 19,650 | 14,114 | 18,210 | 13,906 | 6,668 | 16,608 |
| Mother's weeks worked in reference year | | | | | | | | |
| $\beta_3$ (1998-99) | -1.95 | 3.02 | 3.97*** | 2.54 | 1.37 | -2.79 | -1.26 | -2.73 |
| | (3.25) | (2.12) | (1.47) | (2.37) | (1.95) | (2.00) | (3.34) | (2.11) |
| $\beta_4$ (2000-01) | 3.13 | 4.73** | 6.64*** | 4.00** | 1.20 | 4.29* | -3.58 | -0.43 |
| | (4.20) | (2.40) | (1.83) | (1.88) | (1.76) | (2.39) | (3.57) | (2.43) |
| $\beta_5$ (2002-03) | -4.82 | 7.01*** | 7.67*** | 2.77 | 2.05 | 4.13** | 3.36 | -1.68 |
| | (5.49) | (2.61) | (2.08) | (2.10) | (2.19) | (1.99) | (3.54) | (2.37) |
| $\beta_6$ (2004-05) | 3.98 | 2.80 | 5.38*** | 4.96** | 4.79** | 5.27** | -0.29 | 4.45* |
| | (8.02) | (2.32) | (1.97) | (2.18) | (2.21) | (2.36) | (4.48) | (2.66) |
| $\beta_7$ (2006-07) | 8.56 | -0.72 | 2.63 | 4.74* | 4.95** | 2.80 | 6.11 | 3.09 |
| | (7.13) | (2.50) | (2.04) | (2.71) | (2.02) | (2.41) | (4.89) | (2.72) |
| $\beta_8$ (2008-09) | 5.95 | 0.55 | 3.14 | 7.17*** | 5.40*** | 7.46*** | 4.67 | 2.20 |
| | (8.32) | (2.08) | (1.96) | (2.51) | (1.94) | (2.33) | (4.03) | (2.73) |
| Observations | 2,972 | 11,758 | 19,585 | 14,101 | 18,202 | 13,918 | 6,673 | 16,589 |

**Note:** The dependent variables are a dummy for maternal labour force participation (top panel) and the number of weeks worked by the mother in the reference year (bottom panel). Children from all family types are included. We include the same controls as in Table 3. Standard errors are in parentheses and all are bootstrapped to account for the sampling design of the NLSCY. Statistical significance is denoted using asterisks: *** is p<0.01, ** is p<0.05, and * is p<0.1.

Table 6: Estimated effects of the policy on fathers' labour force participation and weeks worked by age of the children

| Age of children | 0 $\leqslant$ 5 mths | 0 $\geqslant$ 6 mths | 1 | 2 | 3 | 4 | 5 not eligible for K-5 | 5 eligible for K-5 |
|---|---|---|---|---|---|---|---|---|
| Father's current labour force participation | | | | | | | | |
| $\beta_3$ (1998-99) | 0.07* | -0.01 | 0.01 | 0.02 | -0.04 | 0.00 | -0.07* | -0.04* |
| | (0.04) | (0.04) | (0.02) | (0.03) | (0.03) | (0.03) | (0.04) | (0.03) |
| $\beta_4$ (2000-01) | 0.11*** | 0.05 | 0.03 | 0.01 | 0.02 | 0.01 | -0.01 | 0.00 |
| | (0.04) | (0.04) | (0.03) | (0.03) | (0.02) | (0.04) | (0.05) | (0.03) |
| $\beta_5$ (2002-03) | -0.05 | 0.05 | 0.04 | -0.01 | 0.02 | -0.01 | -0.02 | -0.02 |
| | (0.09) | (0.04) | (0.03) | (0.03) | (0.03) | (0.03) | (0.04) | (0.03) |
| $\beta_6$ (2004-05) | 0.00 | -0.01 | 0.06** | 0.04 | 0.05** | -0.03 | -0.06 | -0.01 |
| | (0.10) | (0.04) | (0.03) | (0.03) | (0.02) | (0.04) | (0.07) | (0.04) |
| $\beta_7$ (2006-07) | 0.08 | 0.08** | 0.02 | -0.03 | 0.02 | 0.01 | -0.11 | -0.01 |
| | (0.05) | (0.03) | (0.03) | (0.04) | (0.02) | (0.03) | (0.10) | (0.03) |
| $\beta_8$ (2008-09) | -0.10 | 0.01 | 0.01 | 0.01 | 0.01 | 0.03 | -0.08 | 0.02 |
| | (0.18) | (0.04) | (0.03) | (0.03) | (0.03) | (0.03) | (0.06) | (0.03) |
| N | 2,627 | 10,315 | 16,984 | 12,108 | 15,518 | 11,760 | 5,623 | 13,855 |
| Father's weeks worked in reference year | | | | | | | | |
| $\beta_3$ (1998-99) | 2.62 | -0.30 | 0.09 | -1.07 | -1.93 | 0.34 | -1.95 | -2.83** |
| | (2.35) | (1.95) | (1.24) | (1.50) | (1.31) | (1.24) | (1.74) | (1.23) |
| $\beta_4$ (2000-01) | -0.10 | 2.37 | 2.36* | -0.43 | 0.54 | 0.50 | -1.56 | -0.27 |
| | (3.21) | (1.65) | (1.24) | (1.31) | (1.24) | (1.45) | (2.11) | (1.38) |
| $\beta_5$ (2002-03) | 2.03 | 1.95 | 1.32 | -0.38 | 0.65 | 0.46 | -0.51 | -1.35 |
| | (3.35) | (1.79) | (1.46) | (1.46) | (1.28) | (1.31) | (2.05) | (1.58) |
| $\beta_6$ (2004-05) | 3.23 | 0.06 | 1.45 | -1.26 | 2.44** | -3.21* | -2.75 | -0.29 |
| | (3.64) | (1.81) | (1.22) | (1.45) | (1.10) | (1.87) | (3.10) | (1.70) |
| $\beta_7$ (2006-07) | 4.91* | 2.02 | -0.38 | -3.45* | 0.51 | -0.19 | -4.76 | -1.57 |
| | (2.80) | (1.66) | (1.35) | (2.01) | (1.22) | (1.51) | (5.01) | (1.91) |
| $\beta_8$ (2008-09) | -6.38 | -0.82 | 0.06 | 0.61 | -0.61 | 0.30 | -4.12 | -1.08 |
| | (8.61) | (1.71) | (1.32) | (1.45) | (1.34) | (1.41) | (2.87) | (1.58) |
| N | 2,620 | 10,279 | 16,916 | 12,084 | 15,495 | 11,759 | 5,618 | 13,889 |

**Note:** The dependent variables are a dummy for paternal labour force participation (top panel) and the number of weeks worked by the father in the reference year (bottom panel). Children from all family types are included. We include the same controls as in Table 3. Again the superscript "#" denotes the two-steps procedure. Standard errors are in parentheses and all are bootstrapped to account for the sampling design of the NLSCY. Statistical significance is denoted using asterisks: *** is p<0.01, ** is p<0.05, and * is p<0.1.

Table 7: Estimated effects of the policy on PPVT scores

| | 4-year-olds | | | | 5-year-olds not eligible for K-5 | | | | 5-year-olds eligible for K-5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | All | PostS | HighS | Ontario | All | PostS | HighS | Ontario | All | PostS | HighS | Ontario |
| PPVT | | | | | | | | | | | | |
| Québec | 0.73 | 0.86 | 0.06 | 0.74 | 1.80* | 1.72 | 2.23 | 1.43 | 3.51*** | 3.57*** | 4.05** | 3.87*** |
| | (0.80) | (1.22) | (1.37) | (0.93) | (1.07) | (1.36) | (2.03) | (1.29) | (0.82) | (1.06) | (1.59) | (0.95) |
| $\beta_4$ (2000-01) | -1.19 | 0.37 | -1.91 | -0.19 | -4.53** | -5.58** | -2.08 | -3.76* | -2.88** | -1.24 | -3.19 | -2.95** |
| | (1.41) | (2.22) | (2.41) | (1.51) | (1.78) | (2.38) | (3.01) | (1.97) | (1.26) | (1.50) | (2.60) | (1.38) |
| $\beta_5$ (2002-03) | -1.45 | -0.48 | -4.08* | -0.47 | -1.63 | 0.20 | -3.69 | -0.89 | -2.67** | -2.88* | -2.87 | -2.66** |
| | (1.30) | (2.03) | (2.21) | (1.40) | (1.63) | (2.79) | (2.66) | (1.87) | (1.11) | (1.50) | (2.15) | (1.25) |
| $\beta_6$ (2004-05) | -2.34 | -0.56 | -3.94 | -1.40 | -3.52 | -4.01 | -1.25 | -2.55 | -2.55* | -1.51 | -5.71** | -2.55* |
| | (1.44) | (2.03) | (2.49) | (1.54) | (2.25) | (2.82) | (3.94) | (2.37) | (1.39) | (1.87) | (2.38) | (1.53) |
| $\beta_7$ (2006-07) | -2.44* | -2.56 | 0.06 | -1.58 | -1.95 | 2.33 | -10.59* | -1.30 | -3.16** | -3.15 | -1.49 | -3.20** |
| | (1.38) | (1.95) | (2.69) | (1.50) | (3.03) | (3.51) | (5.58) | (3.10) | (1.52) | (2.00) | (3.23) | (1.62) |
| $\beta_8$ (2008-09) | -1.45 | 0.40 | -7.73*** | -0.80 | -2.92 | -0.16 | -8.72** | -2.11 | -5.31*** | -5.88*** | -5.52* | -5.17*** |
| | (1.85) | (2.21) | (2.94) | (1.93) | (2.22) | (3.06) | (3.67) | (2.40) | (1.60) | (2.03) | (2.94) | (1.67) |
| N | 12,070 | 6,064 | 3,525 | 5,190 | 5,848 | 2,780 | 1,830 | 2,494 | 14,753 | 7,231 | 4,321 | 6,000 |

**Note:** The dependent variable is the PPVT standardized score. The subsamples are identified at the top of each columns: all NLSCY cross-sectional children (All), children of mothers holding a high school degree or less (HighS), children of mothers holding a post-secondary degree (PostS) and children of Québec versus Ontario (Ontario). We include the same controls as in Table 3. Standard errors are in parentheses and all are bootstrapped to account for the sampling design of the NLSCY. Statistical significance is denoted using asterisks: *** is p<0.01, ** is p<0.05, and * is p<0.1.

Table 8: Trend effects on WAI and NK scores

| | 4-year-olds | | | | 5-year-olds not eligible for K-5 | | | | 5-year-olds eligible for K-5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | All | PostS | HighS | Ontario | All | PostS | HighS | Ontario | All | PostS | HighS | Ontario |
| Who Am I? | | | | | | | | | | | | |
| Québec | -5.02*** | -5.99*** | -5.72*** | -7.15*** | -5.07*** | -6.45*** | -4.78*** | -5.72*** | -1.01 | -0.38 | -1.13 | -1.12 |
| | (1.16) | (1.71) | (2.16) | (1.37) | (1.08) | (1.80) | (1.69) | (1.49) | (0.78) | (0.78) | (1.71) | (0.94) |
| $\beta_5$ (2002-03) | 3.59*** | 4.73** | 2.99 | 4.37*** | -0.92 | -0.40 | -1.51 | -2.67 | -2.19** | -1.85 | -2.62 | -4.07*** |
| | (1.36) | (2.13) | (2.43) | (1.54) | (1.41) | (2.30) | (2.38) | (1.76) | (0.98) | (1.15) | (2.00) | (1.15) |
| $\beta_6$ (2004-05) | 0.65 | 1.71 | 1.73 | 1.30 | -6.22** | -3.70 | -9.04* | -8.18*** | 0.11 | 1.76 | -1.66 | -1.33 |
| | (1.58) | (2.18) | (3.02) | (1.74) | (2.72) | (3.42) | (5.20) | (2.88) | (1.47) | (1.84) | (2.40) | (1.60) |
| $\beta_7$ (2006-07) | -0.63 | -0.07 | 1.14 | 0.02 | -6.72*** | -5.37 | -8.54* | -8.20*** | -1.51 | -1.62 | -1.59 | -2.95** |
| | (1.45) | (2.06) | (3.01) | (1.64) | (2.50) | (3.36) | (5.14) | (2.78) | (1.30) | (1.55) | (3.04) | (1.43) |
| $\beta_8$ (2008-09) | 2.44 | 3.14 | 0.09 | 3.10* | -3.68* | -0.29 | -11.45*** | -5.28** | -2.56** | -2.77** | -2.16 | -3.98*** |
| | (1.72) | (2.32) | (3.23) | (1.86) | (2.18) | (3.19) | (3.08) | (2.49) | (1.30) | (1.38) | (3.90) | (1.44) |
| N | 6,899 | 3,882 | 1,916 | 2,862 | 3,206 | 1,701 | 995 | 1,126 | 8,686 | 4,776 | 2,418 | 3,010 |
| Number know. | | | | | | | | | | | | |
| Québec | -8.68*** | -8.63*** | -11.80*** | -10.57*** | -7.36*** | -7.82*** | -6.48*** | -9.39*** | -1.95* | -0.47 | -3.41 | -1.65 |
| | (1.37) | (1.91) | (2.52) | (1.62) | (1.52) | (2.20) | (2.28) | (2.16) | (1.17) | (1.56) | (2.28) | (1.53) |
| $\beta_5$ (2002-03) | 3.94** | 3.71 | 6.05** | 4.73** | 3.39 | 3.46 | 3.22 | 3.39 | -1.15 | -1.96 | -0.18 | -2.23 |
| | (1.73) | (2.53) | (3.01) | (1.99) | (2.10) | (3.30) | (3.35) | (2.60) | (1.38) | (1.88) | (2.80) | (1.72) |
| $\beta_6$ (2004-05) | 3.83** | 3.22 | 6.63* | 4.86** | 1.59 | 5.12 | -0.61 | 1.43 | -4.27*** | -6.11*** | -1.69 | -5.08*** |
| | (1.88) | (2.64) | (3.49) | (2.09) | (3.03) | (5.25) | (4.15) | (3.51) | (1.64) | (2.35) | (2.77) | (1.96) |
| $\beta_7$ (2006-07) | 2.49 | 1.83 | 7.49* | 3.45* | -3.79 | -3.31 | -12.33** | -3.37 | -2.01 | -2.94 | 2.54 | -2.73 |
| | (1.84) | (2.41) | (4.27) | (2.05) | (2.68) | (3.58) | (6.24) | (3.17) | (1.72) | (2.19) | (3.86) | (2.04) |
| $\beta_8$ (2008-09) | 5.10** | 4.32* | 12.46** | 6.29*** | -2.28 | -0.03 | -4.94 | -1.68 | -2.3 | -4.37* | 1.29 | -2.90 |
| | (2.01) | (2.50) | (5.85) | (2.20) | (2.32) | (3.01) | (4.48) | (2.85) | (1.84) | (2.26) | (3.71) | (2.12) |
| N | 7,476 | 4,182 | 2,091 | 3,069 | 3,411 | 1,804 | 1,055 | 1,216 | 9,217 | 5,029 | 2,594 | 3,241 |

**Note:** The dependent variables are the Who Am I? standardized score and the Number Knowledge age equivalent score (Number know.). We use the full-sample of cross sectional children from wave 4 to 8. We include the same controls as in Table 3. Standard errors are in parentheses and all are bootstrapped to account for the sampling designed of the NLSCY. Statistical significance is denoted using asterisks: *** is p<0.01, ** is p<0.05, and * is p<0.1.

# Web Appendix to Canadian Evidence on Ten Years of Universal Preschool Policies: The Good and the Bad

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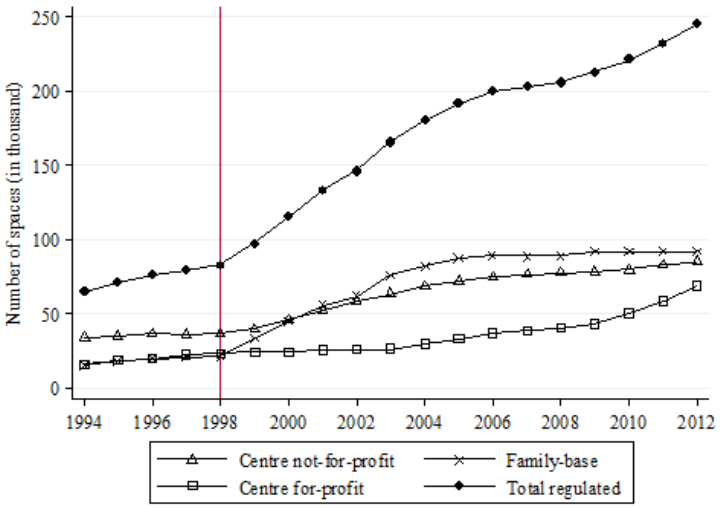
In this Web Appendix we present additional information on the evolution of the childcare network and the net cost to families, the literature on ECEC and child development and the cognitive tests score used. Additional figures and tables are also presented to further support our paper's discussion.

## 1 Evolution of the childcare network and net costs to families

Figure A. 1: Number of regulated spaces




This figure corresponds to Figure 1 in the paper. Not only does it show the evolution in the total number of spaces, but it also shows that as of 2000, not-for-profit centres and family daycare services offered exclusively low-fee spaces and continued to do so over the entire observation period. For-profit centres provide a fairly stable number of spaces over the period, except in recent years when it has increased. These centres regroup those that are subsidized by the government (and offer low-fee spaces) and those that are fully private but regulated. Prior to 2001, these two categories cannot be distinguished with publicly available

data. As of 2001, most of these centres were subsidized by the government and offered low-fee spaces (97%). While the number of low-fee spaces in for-profit centres remained stable from 2001 onwards, the number of fully private regulated spaces increased.

Even if the number of spaces has been steadily increasing, the perception has always been that the demand for low-fee spaces was above the number of available spaces because of long waiting lists. Unregulated spaces eligible for a fiscal treatment (a deduction at the federal level and a refundable tax credit at the prvincial level) offer an alternative solution to regulated spaces. To ease off the pressure on the demand for low-fee spaces and to reduce the net-cost difference between private childcare and low-fee childcare, the scale of the refundable tax credit for those not using low-fee daycare was increased twice (2008 and 2009). Since 2009, the maximum annual expense eligible for a tax credit is $9,000 per child less than 7 years of age. The minimum credit rate is 44% (compared to 26% earlier) and the maximum remained unchanged at 75%. The minimum rate is applied to a family whose household income is $125,000 or over (compared to 84,040$ earlier). In 2004, the daily price of $5 was increased to $7.

Accounting for federal tax credits and family transfers, the net cost for a subsidized space for a child under age 5 is in fact $2.87 per day for a family income up to $150,000. Assuming a chilcare cost of $25 per day per child for 260 days ($6,500), the enhanced refundable tax credit reduces the net cost to $3.31 per day for families with less than $125,000 of income. This partially explains the recent increase in the number of spaces in for-profit centres (see Figure 1).

# 2 Complement to ECEC and child development literature

In this section we expand some of the content presented in the paper while keeping the same structure (and in some cases we repeat some of the content of the paper). Again, for a more detailed overview of the literature we refer the reader to Almond and Currie (2011). We firstrst briefly review research on children aged 0 to 2, then on children aged 3 to 5. Then, we discuss evidence on the impact of the quality and intensity of care, and the optimal entry age in daycare. We provide additional details on research on part-time versus full-time kindergarten. Finally, we provide further details on the measures used by Baker et al. (2008).

First, on children aged 0 to 2, there is a growing body of empirical results indicating that maternal employment and time spent in childcare during the first year of life can have adverse effects on a child's developmental outcomes (such as verbal, reading and math scores, and indices of behavioural problems) observed at later ages (Ruhm, 2004; Waldfogel et al., 2002; Hill et al. 2005), even after controlling for childcare quality, the quality of the home environment, and maternal sensitivity (Brooks-Gunn et al., 2002; Hill et al., 2002; and for United Kingdom, Gregg et al. 2005).

Second, for children aged 3 to 5, several studies on the effect of preschool programs find significant positive effects on cognitive outcomes (letter-word identification, spelling and applied problems) and measures of school readiness (Gormley and Gayer, 2005; Gormley et al., 2005; Magnuson et al., 2007, 2004). For disadvantaged children (whether defined by poverty status, low maternal education, single-parent headship, or mothers who do not speak English) the cognitive gains are larger and longer lasting (e.g. Burger, 2010) A large-scale UK study following children aged 2 or more attending centre-based preschool finds similar results (Sammons et al., 2002, 2003).

Third, while the quality of care seems to have positive, but small, effects on cognitive outcomes (Blau, 1999; Duncan et al., 2003; Belsky et al. 2007), longer hours in all types of preschool programs seem to be associated with increased behavioural problems that persist over time (Magnuson et al., 2004, 2005). On the intensity of care, Loeb et al. (2007) find that for disadvantaged children (aged 2-3), 30 hours per week of care for at least 9 months per year has little detrimental effect on their behaviour, while producing positive effects on their cognitive outcomes. In contrast, the cognitive development of children from wealthier households appears to benefit from daycare outside the home only if it is part-time (between 15 to 30 hours per week for at least 9 months per year).

Fourth, the existing American studies on full-day versus half-day kindergarten suggest that the impact of full-day kindergarten on academic and social outcomes is somewhat mixed. Most studies fail to control for student assignment to kindergarten programs and have fairly short observation periods. Using American longitudinal data providing extensive information on the child's socioeconomic context and school[32] Lee et al. (2006) find that full-day kindergarten children learn more in literacy and mathematics over the kindergarten year than those in half-day programs. In contrast to previous studies, they do not find that full-day kindergarten is more effective for low-income/at-risk children. Using data from the same survey, DeCicca (2007) finds that full-day kindergarten has sizeable impacts on academic achievement during the first year of program implementation, but the estimated gains are short-lived, particularly for minority children. However, the efficiency of the full-day kindergarten intervention may be contingent upon class size as students in smaller full-day classes benefit more (Zvoch et al, 2008).

Finally, in Canada, the Baker et al. (2008) study highlights some negative effects of the Québec daycare policy on both behavioural scores and health indicators of Québec's children and parents. For the 0-2 year-olds parent-reported measures such as "never had a nose/throat/ear infection" are used. These are benign health outcomes and this life experience may have reinforce their immunitary system and their long term health (Ball et al. 2002; Lu et al. 2004; Côté et al. 2010). For children aged 2 to 3 the behaviour of the child is measured using an emotional anxiety score, a physical aggression score, and a

[32] The Early Childhood Longitudinal Study – Kindergarten cohort, a nationally representative sample of over 8,000 kindergarteners.

separation anxiety score, each based on a serie of parent-reported measures. Finally, for the 0-4 year-olds, the authors use the answer excellent to the question: "In general, would you say this child's health is ... at time of survey". For parents, the mother's depression score and the family dysfunction index are used.

# 3 Cognitive tests

In this section we provide further details on the cognitive tests available in the NLSCY and used in this research.

For the PPVT, children are presented with a number of pictures arranged in a multiple-choice format and asked to select the one that best illustrates the meaning of the word orally presented by the examiner. Vocabulary is highly correlated with general intelligence and represents knowledge closely aligned with the "cultural capital" of the child's environment. It is not easy to shift vocabulary up as it depends on years of conversations between adults and children and it also depends on adults reading to children.

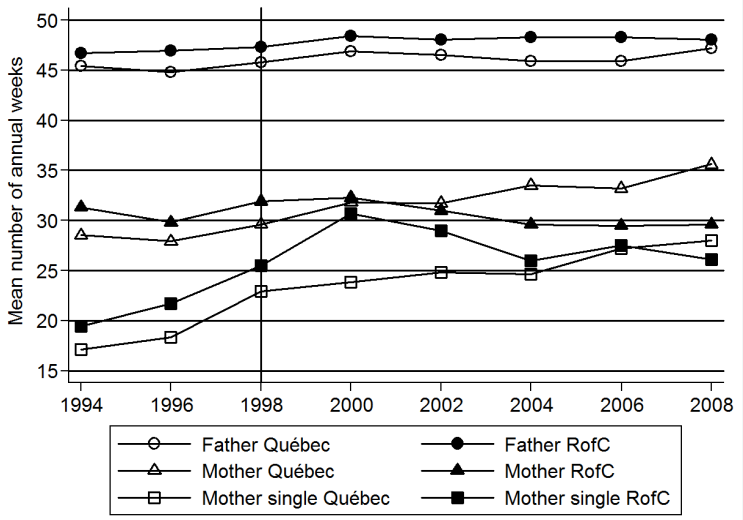
The WAI test includes two sets of tasks. The copying scale measures the ability to conceptualize and reproduce a given figure (e.g., a circle, cross, square, triangle and diamond which the child attempts to copy), while the symbol scale focuses on the understanding of the meaning of specific symbols (e.g., letters, numbers, words, and sentences). Children are only required to complete as much as they feel they can, but they are encouraged to at least attempt each task.

The NK test for this age group defines three levels of understanding: pre-dimensional (levels 0), unidimensional (level 1), and bidimensional (level 2). Statistics Canada considers that the assessment provides data users with information about the child's acquisition of the necessary skills to succeed at math in school.

While the PPVT was administered in all waves of the NLSCY, the WAI and NK were only administered as of wave 4 after the policy was implemented. However, given that the policy had large effects on hours in care in waves 5 to 8 relative to wave 4, we felt compelled to estimate models for WAI and NK using wave 4 as the comparison year.

# 4 Figure

Figure A. 2: Annual weeks worked by mothers (in two-parent or single-parent households), fathers and families by region




**Note:** Shows the evolution of parental weeks worked for NLSCY cross-sectional children aged 1 to 4.

# 5 Tables

Table A. 1: Regulated child care spaces by province (estimates) in 2001 and 2006

| Province/Year | Number of regulated spaces[1] 2001 | 2006 | Number of subsidized spaces[2] 2006 | Provincial subsidy in million $[3] 2006 | Median daily fee[4] infant-child 2006 | Net income threshold for subsidy[5] 2006 | Number of children aged 0 to 5 2005 |
|---|---|---|---|---|---|---|---|
| Newfoundland Labrador | 3,632 | 5,017 | 1,459 | 12,3 | 21-45 | 37,600 | 28,900 |
| Prince Edward Island | 3,697 | 3,394 | 843 | 4,7 | 20-30 | 51,040 | 7,900 |
| Nova Scotia | 11,314 | 13,093 | 2,804 | 23,7 | 23-27 | 34,992 | 50,900 |
| New Brunswick | 5,820 | 13,163 | 3,868 | 22,5 | 22-25 | 24,180 | 43,800 |
| Québec | 132,545 | 200,005 | 196,618 | 1,493 | 7 | N/A | 434,800 |
| Ontario | 118,110 | 158,727 | 109,813 | 534,1 | 25-36 | Multiple[6] | 822,000 |
| Manitoba | 14,130 | 19,473 | 10,830 | 86,3 | 10-25 | 40,475 | 76,900 |
| Saskatchewan | 4,106 | 7,805 | 3,672 | 22,8 | 13-18 | 54,960 | 67,100 |
| Alberta | 41,011 | 47,587 | 11,932 | 72,5 | 18-26 | 77,400 | 228,400 |
| British Columbia | 36,383 | 54,007 | 10,665 | 176,1 | 25-34 | 71,016 | 233,200 |
| Canada | 370,748 | 522,371 | 352,504 | 2,448 | - | - | 1,993,900 |

1. Center-and family-based full-and part-day chilcare for preschool-aged children (0-5, and 0-4 in Québec)

2. Number of children in regulated chilcare receiving subsidies

3. Provincial allocation (fee subsidy + one time funding + recurring funding) for regulated chilcare in 2005-2006

4. Median daily fee (infant -older children). For Ontario, Manitoba, Saskatchewan, Alberta and BC we divided the monthly fees by 22.

5. Break-even point of eligibility for fee subsidy (net income 2005/06), 2 parents, 1 or 2 children

6. The subsidy in Ontario depends on the cost of childcare amd tje net income of the family.

Source: Friendly et al. (2009)

Table A. 2: Estimated effects of the policy on weekly hours spent in the primary mode of care by the mother's level of education

| Age of children | 0 $\leqslant$ 5 mths | 0 $\geqslant$ 6 mths | 1 | 2 | 3 | 4 | 5 not eligible for K-5 | 5 eligible for K-5 | 1 to 4 2-parent | 1 to 4 1-parent |
|---|---|---|---|---|---|---|---|---|---|---|
| High school or less | | | | | | | | | | |
| $\beta_3$ (1998-99) | -1.27 | 2.79 | 0.17 | 6.38* | -2.91 | -4.30 | -0.22 | -5.86*** | 0.32 | 0.30 |
| | (1.57) | (2.58) | (1.64) | (3.40) | (2.97) | (2.68) | (3.45) | (1.92) | (1.72) | (3.02) |
| $\beta_4$ (2000-01) | 2.36 | 3.37 | 2.81 | 4.23** | 0.86 | 2.90 | 3.61 | -4.26** | 2.23 | 4.81 |
| | (5.25) | (2.76) | (2.33) | (2.03) | (2.39) | (3.66) | (4.14) | (2.14) | (1.66) | (3.10) |
| $\beta_5$ (2002-03) | -1.14 | 12.14*** | 2.18 | 10.05*** | 4.13 | 2.04 | 8.18** | -5.08** | 4.35*** | 7.18** |
| | (1.26) | (4.37) | (2.56) | (2.94) | (3.25) | (2.60) | (3.71) | (1.99) | (1.67) | (3.30) |
| $\beta_6$ (2004-05) | | -2.79 | 9.15*** | 12.69*** | 5.35* | 5.25 | -1.75 | -3.61* | 7.62*** | 8.62** |
| | | (2.21) | (2.84) | (2.75) | (3.13) | (3.79) | (4.40) | (2.18) | (1.75) | (4.25) |
| $\beta_7$ (2006-07) | -2.03 | 6.73* | 10.49*** | 13.88*** | 10.32*** | 12.62*** | 30.93*** | -6.07*** | 11.59*** | 13.72*** |
| | (1.25) | (3.48) | (3.34) | (3.91) | (2.81) | (3.86) | (9.93) | (2.15) | (2.01) | (3.41) |
| $\beta_8$ (2008-09) | -1.06 | 5.03 | 8.98*** | 10.00** | 8.88*** | 10.21** | 13.90*** | -4.05 | 7.87*** | 12.32*** |
| | (1.22) | (3.22) | (2.59) | (4.68) | (3.11) | (5.10) | (5.15) | (2.47) | (2.16) | (3.62) |
| N | 920 | 3,496 | 5,915 | 4,302 | 5,687 | 4,184 | 2,117 | 4,992 | 15,929 | 4,159 |
| Post-secondary degree | | | | | | | | | | |
| $\beta_3$ (1998-99) | 4.47** | 4.13 | 2.92 | -0.14 | 2.85 | 4.10 | 2.68 | -3.60* | 1.94 | 10.59** |
| | (2.24) | (2.80) | (1.90) | (2.32) | (2.34) | (2.75) | (4.25) | (2.00) | (1.25) | (5.28) |
| $\beta_4$ (2000-01) | 0.77 | 7.86*** | 6.76*** | 8.41*** | 6.95*** | 4.16 | 8.10* | -1.90 | 6.62*** | 8.14* |
| | (1.52) | (2.85) | (2.32) | (2.26) | (1.87) | (2.62) | (4.65) | (2.14) | (1.17) | (4.81) |
| $\beta_5$ (2002-03) | -1.06 | 7.83** | 9.74*** | 8.46*** | 8.96*** | 10.77*** | 10.12** | -2.25 | 8.97*** | 20.68*** |
| | (1.07) | (3.14) | (2.49) | (2.37) | (2.33) | (2.52) | (4.22) | (2.17) | (1.32) | (4.56) |
| $\beta_6$ (2004-05) | -0.74 | -2.66 | 9.63*** | 8.93*** | 10.58*** | 11.80*** | 10.06 | -4.29** | 9.91*** | 18.70*** |
| | (1.02) | (2.46) | (2.21) | (2.90) | (2.54) | (3.00) | (6.18) | (2.06) | (1.43) | (4.45) |
| $\beta_7$ (2006-07) | -1.01 | -1.20 | 6.77*** | 6.90*** | 13.57*** | 11.76*** | 11.67*** | -2.35 | 9.23*** | 17.08*** |
| | (0.96) | (2.60) | (2.33) | (2.34) | (1.98) | (2.67) | (4.37) | (2.10) | (1.26) | (4.49) |
| $\beta_8$ (2008-09) | -0.92 | 2.44 | 7.19*** | 7.83*** | 14.43*** | 13.01*** | 21.55*** | -2.65 | 10.09*** | 21.43*** |
| | (1.38) | (2.88) | (2.21) | (2.42) | (2.06) | (2.40) | (4.48) | (2.10) | (1.22) | (4.68) |
| N | 1,304 | 5,778 | 9,303 | 6,820 | 8,867 | 6,734 | 3,069 | 7,905 | 29,363 | 2,361 |

**Note:** The dependent variables are the number of hours in care for children whose mother has a high school degree or less (top panel) and a Post-Secondary degree (bottom panel). Children from all family types are included. We include the same controls as in Table 3. Standard errors are in parentheses and all are bootstrapped to account for the sampling design of the NLSCY. Statistical significance is denoted using asterisks: *** is p<0.01, ** is p<0.05, and * is p<0.1.

Table A. 3: Estimated effects of the policy on mothers' labour force participation and weeks worked by the mother's level of education

| Age of children | 0 ⩽ 5 mths | 0 ⩾ 6 mths | 1 | 2 | 3 | 4 | 5 not eligible for K-5 | 5 eligible for K-5 | 1 to 4 2-parent | 1 to 4 1-parent |
|---|---|---|---|---|---|---|---|---|---|---|
| Labour force participation | | | | | | | | | | |
| High school or less | | | | | | | | | | |
| $\beta_3$ (1998-99) | -0.07 | 0.13 | 0.05 | 0.15* | 0.05 | -0.05 | -0.16 | -0.17** | 0.04 | 0.11 |
| | (0.13) | (0.08) | (0.06) | (0.09) | (0.08) | (0.08) | (0.12) | (0.07) | (0.05) | (0.09) |
| $\beta_4$ (2000-01) | -0.02 | 0.17** | 0.10 | 0.15** | -0.01 | 0.19** | -0.06 | -0.07 | 0.09* | 0.16** |
| | (0.28) | (0.09) | (0.08) | (0.07) | (0.06) | (0.10) | (0.14) | (0.08) | (0.05) | (0.08) |
| $\beta_5$ (2002-03) | -0.17 | 0.15 | 0.06 | 0.06 | 0.00 | 0.00 | -0.04 | -0.08 | 0.01 | 0.07 |
| | (0.19) | (0.10) | (0.10) | (0.07) | (0.09) | (0.08) | (0.12) | (0.08) | (0.05) | (0.09) |
| $\beta_6$ (2004-05) | | 0.09 | 0.02 | 0.28*** | -0.02 | 0.07 | -0.26 | 0.04 | 0.12** | -0.03 |
| | | (0.11) | (0.08) | (0.08) | (0.09) | (0.10) | (0.16) | (0.10) | (0.05) | (0.09) |
| $\beta_7$ (2006-07) | 0.08 | 0.17 | 0.22** | 0.21* | -0.01 | 0.10 | 0.37 | 0.08 | 0.12** | 0.12 |
| | (0.30) | (0.10) | (0.09) | (0.11) | (0.09) | (0.10) | (0.27) | (0.10) | (0.05) | (0.11) |
| $\beta_8$ (2008-09) | 0.21 | 0.14 | 0.12 | 0.28** | 0.07 | 0.02 | -0.11 | -0.07 | 0.15*** | 0.05 |
| | (0.39) | (0.09) | (0.08) | (0.12) | (0.08) | (0.12) | (0.16) | (0.11) | (0.06) | (0.11) |
| N | 926 | 3,523 | 5,988 | 4,338 | 5,698 | 4,196 | 2,130 | 4,992 | 16,082 | 4,138 |
| Post-secondary degree | | | | | | | | | | |
| $\beta_3$ (1998-99) | 0.19** | 0.18** | 0.11** | 0.10 | 0.07 | -0.01 | 0.02 | 0.05 | 0.05 | 0.27** |
| | (0.10) | (0.08) | (0.04) | (0.07) | (0.06) | (0.07) | (0.10) | (0.07) | (0.03) | (0.12) |
| $\beta_4$ (2000-01) | 0.29** | 0.14* | 0.15** | 0.16*** | 0.07 | 0.06 | -0.03 | 0.08 | 0.11*** | 0.12 |
| | (0.13) | (0.08) | (0.06) | (0.05) | (0.05) | (0.07) | (0.11) | (0.07) | (0.03) | (0.15) |
| $\beta_5$ (2002-03) | -0.39*** | 0.08 | 0.15*** | 0.11* | 0.06 | 0.13** | 0.12 | 0.04 | 0.11*** | 0.27** |
| | (0.13) | (0.08) | (0.05) | (0.06) | (0.07) | (0.06) | (0.10) | (0.07) | (0.03) | (0.13) |
| $\beta_6$ (2004-05) | 0.12 | 0.05 | 0.15*** | 0.04 | 0.21*** | 0.15** | 0.01 | 0.15** | 0.12*** | 0.41*** |
| | (0.18) | (0.08) | (0.05) | (0.07) | (0.06) | (0.06) | (0.13) | (0.07) | (0.03) | (0.11) |
| $\beta_7$ (2006-07) | 0.41*** | -0.05 | 0.12** | 0.06 | 0.19*** | 0.02 | 0.15 | 0.10 | 0.08** | 0.38*** |
| | (0.10) | (0.08) | (0.05) | (0.07) | (0.05) | (0.07) | (0.10) | (0.08) | (0.03) | (0.13) |
| $\beta_8$ (2008-09) | 0.27 | 0.00 | 0.06 | 0.16** | 0.12** | 0.16*** | 0.12 | 0.15** | 0.11*** | 0.35*** |
| | (0.21) | (0.07) | (0.05) | (0.06) | (0.06) | (0.06) | (0.11) | (0.07) | (0.03) | (0.12) |
| N | 1,308 | 5,855 | 9,456 | 6,899 | 8,950 | 6,826 | 3,112 | 8,016 | 29,780 | 2,351 |
| Weeks worked | | | | | | | | | | |
| High school or less | | | | | | | | | | |
| $\beta_3$ (1998-99) | -2.35 | 4.12 | 1.62 | 5.70 | -0.51 | -3.90 | -6.08 | -7.38** | -0.29 | 4.71 |
| | (6.49) | (3.25) | (2.62) | (4.18) | (3.58) | (3.60) | (6.35) | (3.52) | (2.15) | (4.15) |
| $\beta_4$ (2000-01) | 1.68 | 4.20 | 4.11 | 5.80* | -1.10 | 8.10* | -1.35 | -2.29 | 2.69 | 8.30** |
| | (13.87) | (3.57) | (3.06) | (3.23) | (3.01) | (4.50) | (6.47) | (3.80) | (2.14) | (3.82) |
| $\beta_5$ (2002-03) | -7.34 | 5.61 | 2.46 | 2.68 | 0.72 | 1.82 | -1.30 | -5.87 | 1.38 | 2.86 |
| | (8.26) | (4.07) | (4.00) | (3.52) | (3.84) | (3.65) | (6.75) | (3.85) | (2.15) | (4.22) |
| $\beta_6$ (2004-05) | | 1.83 | -0.35 | 11.04*** | -1.19 | 4.72 | -8.36 | 2.69 | 4.50* | -0.38 |
| | | (4.24) | (3.74) | (3.56) | (4.17) | (4.43) | (7.77) | (4.47) | (2.34) | (4.54) |
| $\beta_7$ (2006-07) | 10.48 | 6.29 | 5.46 | 9.58* | 0.46 | 7.16 | 9.55 | 0.59 | 5.14** | 5.15 |
| | (14.94) | (4.46) | (4.39) | (5.32) | (4.19) | (4.95) | (12.54) | (4.98) | (2.60) | (5.54) |
| $\beta_8$ (2008-09) | 12.87 | 3.65 | 3.52 | 6.15 | 6.34 | 2.92 | -2.09 | -6.01 | 5.06* | 3.41 |
| | (20.76) | (3.57) | (3.46) | (6.30) | (3.92) | (6.16) | (9.09) | (5.57) | (2.90) | (4.72) |
| N | 923 | 3,506 | 5,957 | 4,328 | 5,690 | 4,200 | 2,132 | 4,984 | 16,056 | 4,119 |
| Post-secondary degree | | | | | | | | | | |
| $\beta_3$ (1998-99) | -0.36 | 3.96 | 5.64*** | 0.69 | 0.79 | -1.11 | 1.94 | 0.30 | 0.94 | 7.26 |
| | (4.37) | (3.51) | (2.15) | (3.22) | (2.85) | (2.97) | (4.83) | (3.33) | (1.55) | (6.05) |
| $\beta_4$ (2000-01) | 6.60 | 3.58 | 8.57*** | 3.12 | 2.47 | 1.82 | -3.33 | 2.36 | 4.56*** | 2.32 |
| | (5.84) | (3.81) | (2.64) | (2.63) | (2.46) | (3.64) | (5.49) | (3.63) | (1.48) | (6.74) |
| $\beta_5$ (2002-03) | -7.68 | 4.54 | 9.77*** | 1.18 | 2.65 | 7.09** | 4.78 | 0.71 | 4.87*** | 13.93** |
| | (6.82) | (3.85) | (2.79) | (3.00) | (3.45) | (2.96) | (5.24) | (3.52) | (1.65) | (6.51) |
| $\beta_6$ (2004-05) | 3.50 | 0.99 | 5.76** | -0.05 | 8.74*** | 6.02* | 2.36 | 4.59 | 4.52*** | 13.58** |
| | (8.69) | (3.23) | (2.61) | (3.09) | (2.94) | (3.14) | (6.56) | (3.82) | (1.60) | (6.18) |
| $\beta_7$ (2006-07) | 8.00 | -3.19 | 1.80 | 1.28 | 6.85** | -0.31 | 5.90 | 5.24 | 1.73 | 15.50** |
| | (8.53) | (3.40) | (2.72) | (3.38) | (2.79) | (3.44) | (6.27) | (3.89) | (1.73) | (6.32) |
| $\beta_8$ (2008-09) | 7.88 | -0.64 | 3.64 | 6.22** | 6.74** | 7.02** | 9.68* | 4.95 | 5.53*** | 14.44** |
| | (9.41) | (3.12) | (2.64) | (3.04) | (2.78) | (2.99) | (5.14) | (3.79) | (1.62) | (6.25) |
| N | 1,306 | 5,840 | 9,435 | 6,893 | 8,949 | 6,827 | 3,118 | 8,010 | 29,753 | 2,351 |

**Note:** The dependent variables are a dummy for labour force participation of mothers with a high school degree or less (panel 1) and mothers with a Post-Secondary degree (panel 2), and the number of weeks worked for mothers with a high school degree or less (panel 3) and mothers with a Post-Secondary degree (panel 4). Children from all family types are included. We include the same controls as in Table 3. Standard errors are in parentheses and all are bootstrapped to account for the sampling design of the NLSCY. Statistical significance is denoted using asterisks: *** is p<0.01, ** is p<0.05, and * is p<0.1.

Table A. 4: Estimated effects of the policy on cumulative hours of care

| Age of children | 0 to 4 | 1 to 5 not eligible | 1 to 5 eligible |
|---|---|---|---|
| Cumulative hours of care | | for K-5 | for K-5 |
| $\beta_4$ (2000-01) | 2.60* | 4.83* | 1.20 |
| | (1.42) | (2.68) | (1.47) |
| $\beta_5$ (2002-03) | 5.02*** | 8.82*** | 3.93*** |
| | (1.26) | (2.24) | (1.28) |
| $\beta_6$ (2004-05) | 5.89*** | 7.29** | 5.89*** |
| | (1.49) | (3.14) | (1.47) |
| $\beta_7$ (2006-07) | 7.71*** | 12.75*** | 5.89*** |
| | (1.57) | (2.89) | (1.56) |
| $\beta_8$ (2008-09) | 5.99*** | 16.99*** | 7.47*** |
| | (1.39) | (2.87) | (1.55) |
| Observations | 9,912 | 4,171 | 11,333 |

Note: The dependent variable is the cumulative number of hours in care (including zero hours of care) between ages 0 to 4 and 1 to 5 for longitudinal children from waves 1 to 8. The age of children included in the sample is specified at the top of each column. Children from all family types are included. We include the same controls as in Table 3. Standard errors are in parentheses and all are bootstrapped to account for the sampling design of the NLSCY. Statistical significance is denoted using asterisks: *** is p<0.01, ** is p<0.05, and * is p<0.1.