

Long-Run Effects of Quebec Family Policy:

Revisiting *Universal Child Care, Maternal Labour Supply and Family Well-Being*

by

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1 Introduction

Among parents, politicians, policy-makers and researchers, universally provided and publicly funded child care is an issue of great importance. In a recent survey conducted by Environics Research Group, 770 of the 1000 Canadians surveyed agreed that the lack of affordable child care is a serious problem [27]. On the Canadian political stage, debates on government strategies towards child care—such as parent targeted subsidies or program based funding—featured prominently in recent national and provincial elections. Meanwhile, documented benefits of pre-kindergarten programs targeting disadvantaged children, such as those found in the Perry Preschool Project and the Abecedarian Project, have policy-makers and researchers alike investigating whether making such programs universal might also produce desirable effects. These issues, among others, were addressed in 2008 by Michael Baker, Jonathan Gruber, and Kevin Milligan in *Universal Child Care, Maternal Labour Supply and Family Well-Being* [7]. This article provided an initial analysis of the impact of the Quebec Family Policy. Implemented in 1997, this legislation promised universal access to five-dollar-a-day daycare across the province. With the study of a child care program unique to North America, the research by Baker *et al.* (2008) proved to be highly influential, and, with the availability of further data, now deserves a second look.¹

Three primary reasons exist for a re-analysis of the work completed by Baker *et al.* (2008), henceforth referred to as *BGM*. First, their research evaluated the Quebec Family Policy at a time when the program was still newly implemented. For this reason their results may be capturing short-run changes that differ from the long term impact. The implementation of large scale social programs is rarely frictionless, and often requires time for setup and societal integration. As discussed below, many reasons exist to believe that

¹This article won the 2009 Doug Purvis Memorial Prize for a highly significant written contribution to Canadian economic policy. The working paper also featured in a New York Times article in June 2006 [36].

the initial child care program offered in Quebec, and its utilization, have evolved with time and thus the long term impact merits attention. The most up-to-date data available from the National Longitudinal Study of Children and Youth (NLSCY) includes two new cycles, enabling the present study to revisit the original results with a long-run perspective.

Key to the assessment of any child care policy is the degree to which behavioural and cognitive development outcomes dissipate over time.² Concerns over initial behavioural and developmental setbacks resulting from the Quebec Family Policy were reported in *BGM*. First, these motivate an assessment of child progress beyond the program's targeted age group of 0-4, as undertaken by this study. The opportunity to make such an assessment was also supplied in the new NLSCY data. Now available is a cohort of children aged 6-7 with whom regression analysis can be completed for measures of disruptive behaviour and academic performance. In particular, the examination of grade retention has significant implications for the cost/benefit analysis of the universal child care program.³ Second, the initial setbacks reported in *BGM* also merit a gendered analysis. Recent evidence suggests that the effects of child care between children of different sexes is significant [3]. In particular, females appear to make more gains by way of child care attendance, which may also be contributing to the growing gender gap in academic achievement.

Finally, this research extends the existing child care literature by opening a discussion on and executing a study of a technical distributional analysis. If by providing early childhood education the government hopes to address the issues of equity in child educational outcomes, or attempts to reduce other educational costs associated with lower portions of the achievement distribution, such as special education, then a greater focus must be placed

²In a summary of the effect of early childhood programs, Currie shows that in many cases initial gains to achievement tests and IQ scores can diminish over time [19].

³Research studying the impacts of grade retention, suggest that retained students may perform worse academically and may also be at a greater risk of dropping out of school before completing high school [5]. Losses, then, can occur both from the cost of extra schooling and from lower average wages earned by drop-out students.

on the results of students achieving at the lowest levels. In this regard, mean effects are unable to provide an accurate depiction of the child care impact. Unconditional quantile regressions, a recently developed econometric technique, make such an analysis possible. By employing this method our research illustrates the heterogeneous and nuanced effects of the Quebec Family Policy that exists across child developmental scores.

This paper is structured in the following way. Sections 2 and 3 describe the context of the current study: the state of North American child care and details of the Quebec Family Policy, followed by an overview of the existing child care literature. An outline of the NLSCY data and the difference-in-difference empirical strategy is given in section 4. Here particular attention is placed on the necessary two parent family sample restriction, adjustments to the original setup, and a description of the unconditional quantile regression technique. Next, in section 5, we recreate the results found in *BGM* and consider alternative variable definitions and inclusions. By establishing clear comparability, a discussion of the main results in the remaining sections can link new results to *BGM* freely.

Section 6 splits its focus. First, attention is given to long-run effects for children aged 0-4. This analysis uncovers significantly larger estimates with regards to child care uptake and growth in maternal labour supply, shifting trends in overall time spent in child care and type of child care used and mixed evidence supporting expectations of reductions in negative child outcomes fostered by program maturity. Next, attention turns to the estimated mean results for children aged 6-7, highlighting a lasting negative behavioural effect and significant reductions in grade retention. In this section, we also uncover surprising evidence which suggests that the reduction in grade repetition is driven by success from male children rather than females. The unconditional quantile regression estimates are reported in the following section. The revelation of larger negative effects to the lower part of the aged 0-3 developmental distribution and negative effects to the top of the age 6-7 test distribution,

indicate the importance of a distributional analysis in addition to a study of mean effects. In the concluding section we summarize the impact of our findings, and provide direction for future research.

2 North American Child Care and the Quebec Family Policy

Ongoing interest in child care issues has been stimulated in part by a trend towards the increasing labour participation of mothers with young children. In both Canada and the United States the employment rate of mothers with children under the age of 6 has risen substantially: in Canada from 31% in 1976 to 71% in 2008, and in the United States from 34% in 1976 to 56% in 2001.⁴ This labour supply trend has been coupled with a growing focus—in both public and academic spheres—on the need for governmental participation in the provision of child care. The supply and cost of child care have increasingly become pertinent issues across North America. In 2008, CBC News reported complaints concerning the few available spaces in existing daycare facilities. The Child Care Advocacy Association of Canada suggested that, “the federal government has simply failed to meet the child care needs of Canadian families” [54]. Meanwhile, numbers taken from the Survey of Income and Program Participation demonstrate that the average American family using child care pays a whopping \$6,708(US) annually for this service.

The Quebec Family Policy, promising universal access to five-dollar-a-day daycare, is one of the most comprehensive policy measures taken by any North American government in response to child care trends and concerns. In the United States particular attention has instead been placed on the development of a pre-kindergarten system: 41 of 52 states have publicly funded pre-kindergarten programs serving children to varying degrees. However,

⁴The statistics for Canada are derived by the author from the Canadian Labour Force Survey, while the American statistics are calculated in *BGM* from the Current Population Survey.

despite support for a Zero-to-Five early education model by current President Barack Obama [45], there remains no state in which universal child care access is provided from the earliest years of a child's life.⁵

In 1997, the Quebec government implemented a bold set of policies in hopes of encouraging higher birth rates, primarily by strengthening governmental support of parents. In large part, this support came in the form of a massive expansion of the child care system at a variety of age levels. Parents with children aged 0-4 would now have access to child care at a rate of \$5 per day (becoming \$7 per day in 2004). This program was implemented gradually; access was extended to children aged 4 in 1997, aged 3 in 1998, aged 2 in 1999 and aged 0-2 in 2000. Child care services were also increased with the introduction of full-day kindergarten and, although not officially part of the policy, more child care spaces for school aged children [51]. The Quebec Family Policy also increased parental leave benefits and provided families with a standard child allowance based on income, family type (single parent, two parent), and number of children.

The Quebec Family Policy's extension of highly subsidized universally available child care to children aged 0-4 provides a unique opportunity to examine the impact of a switch to a comprehensive system of child care support. Does universal access to child care alter parental labour supply decisions? To what degree can increases in labour supply help to finance such a program through the generation of additional tax revenue? Does a publicly funded program simply crowd out the provision of child care on the private market without inducing changes to child care usage or labour supply? Many advocates point to the potential benefits of early childhood education to supplementing early human capital accumulation. This includes cost saving through reduction in grade retention and developmental delays. However, the question remains: does making child care more accessible,

⁵Only Oklahoma and Georgia provide true universal access for pre-kindergarten, which only targets children aged 4 [49].

particularly for children in the earliest stages of life, also benefit development in this way? Previous research into the universal subsidization or provision of child care outside of the case of Quebec has begun to address these, and other similar questions.

3 Previous Research

3.1 Child Care Usage and Maternal Labour Supply

A prominent starting point in research relating to universal child care conducted to date has been the question of how price changes in child care will affect its usage. The demand for child care has steadily increased, in tandem with the increasing participation of mothers in the workforce. As a result, the benefits of universal child care subsidization extend beyond benefits to children, by providing potential economic gains from a swelling maternal labour supply. The issue then is how effective government subsidies to child care are in increasing the utilization of these services. The degree to which parents respond to price will reflect whether tax subsidies will induce child care usage or simply crowd out private expenditure. A number of studies have undertaken the estimation of own-price elasticity, finding a wide range of estimates. Blau and Hagy (1998) find an estimate as low as -0.34 [14], where studies by Powell (2002), and Connelly and Kimmel (2003) find estimates higher than -1.0, depending on the type of child care used [48, 18].

Perhaps even more important is the issue of whether the subsidies to child care also induce changes in labour supply decisions. Existing models of child care subsidies suggest that increases in labour supply are likely a result of the fact that reduction of the cost of child care will lower the reservation wage for those who are not working. The issue, however, becomes an empirical question as these same child care subsidies can also be modelled to reduce labour supply for those already working. For those in the labour force

the subsidy can be modelled as a pure income effect. If leisure is a normal good than the subsidy would decrease labour supply [30]. Thus, empirical research has focused attention on understanding these opposing effects through study of the cross-price elasticity of child care and labour supply. The findings of this research are summarized by Blau (2003) and Anderson and Levine (2000), who report a range of estimates from 0 to -1.26 [13, 4].

In general, this literature has failed to isolate exogenous changes to child care price. Studies which attempt to estimate likely child care cost before estimating elasticities are in many cases missing key variables impacting labour supply decisions, and often ignore the fact that employment conditions and child care price are likely not exogenous [6]. There are two studies which have successfully isolated for price changes using exogenous policy change [16] or instrumental variable strategies [10]. Both estimates pertain to the implementation of kindergarten rather than child care for younger ages, and in the second case the study focuses on single parent families only.⁶

3.2 Child Social and Cognitive Development

Despite varying estimates of elasticities, a consensus has been reached that there is room for child care policy to affect labour supply to some degree. Consequently, attention must also turn to the critical issue of whether such child care increases are also beneficial to a child's social and cognitive development. Psychologists agree that a nurturing learning environment during the early years of a child's life is an important element in brain development, and in achieving social and cognitive potential in later life [26]. Economist

⁶Although elasticities are useful in some respect this study will not re-estimate elasticities from *BGM* as the focus of this study will be on the shift in program usage and labour supply uptake resulting from the maturing of the Quebec child care system. It remains, however, that the results in this paper clearly indicate that the own-price elasticity of child care and the cross-price elasticity of child care and labour supply were underestimated in *BGM*. The process of estimating the elasticities is a relatively simple extension, but requires a large time investment in understanding and using Canadian Tax and Credit Simulator (*CTaCS*) package developed by Kevin Milligan. This package is used to calculate the % change in price induced by subsidies which would then be used as a explanatory variable in the place of the policy dummy.

James Heckman suggests that from a perspective of economic gain there is no better time to invest in human capital than in the earliest years [31]. Heckman's work stresses the importance of not only cognitive growth but also of healthy socio-emotional growth in facilitating future learning. His findings have also been supported by educational physiologists [33]. Thus, much of the subsequent child care research, discussed below, has focused on reaching out to disadvantaged children in the expectation of improving cognitive and socio-emotional outcomes by eliminating significant barriers to development in negative home environments. In applications of child care at the universal level, as in the Quebec Family Policy, a range of effects are expected. In addition to the positive gains mentioned above, negative outcomes might also be present, as children who receive strong one-on-one parental care at home may shift to potentially less effective child care with higher adult-child ratios away from home, and while in the home may be subjected to working parents affected by potentially higher levels of stress.

In past literature the presence of positive mean effects on development outcomes have been crucial to discussions surrounding the implementation of child care programs. To date, research has primarily focused on understanding these effects outside the context of universal subsidization, as many studies have attempted to quantify the mean effects of targeted and private child care programs. Within this average effect context, the conclusion has been reached that program usage is associated with an increase in emotional and behavioural problems [42, 37]. It is suggested that such effects stem from the inability of caregivers to maintain consistent, responsive, and sensitive emotional interaction, as well as from alterations in peer interactions [21, 55]. Evidence for positive cognitive gains, on the other hand, is not as consistent. For example, NICHD-ECCRN (2002a) and Magnuson *et al.* (2007) find benefits from child care [40, 38], while Lefebvre and Merrigan (2002) find no change at all [34].

The evidence on universally implemented programs is decidedly sparse. Several studies have examined universal pre-kindergarten programs for children aged 4 in the United States, and have found significant improvement to child outcomes after program implementation [25, 32]. However, these programs remain unable to address the effects of extending full access child care to children ages 0-4. In one recent discussion paper, Havnes and Mogstad (2009) explore the impact of subsidized and universally provided child care on extended long-run outcomes, such as educational attainment and labour market participation [29]. Their study uses a difference-in-difference approach and makes use of a 1970's expansion of a universal child care program in Norway. While they find positive outcomes for the variables of interest, such long-run studies often suffer from confounding effects caused by contemporaneous policy change.

Earlier studies have also failed to address the issue of differing effects across the distribution of child developmental scores, focusing instead on mean outcomes alone. When such issues have been given attention, it is only through analysis on subsets of the overall sample. For example, studies such as Magnuson *et al.* (2007), Gormley *et al.* (2005) and Henry *et al.* (2004) discuss the bottom of the distribution by focusing on the greater positive mean effect of the treatment on children from situations of economic disadvantage, such as minorities and low income families [38, 25, 32]. While students from these subgroups often make up a more significant proportion of students falling behind [50], there is still no clear indication that child care is reducing the achievement gap for the very worst of these students.

Another unanswered question concerning universal programs is whether child care related cognitive and behavioural effects persist in later years of schooling. In reviews of existing studies, both Barnett (1998) and Anderson *et al.* (2003) suggest that there are significant cognitive benefits to early childhood education which persist into later years

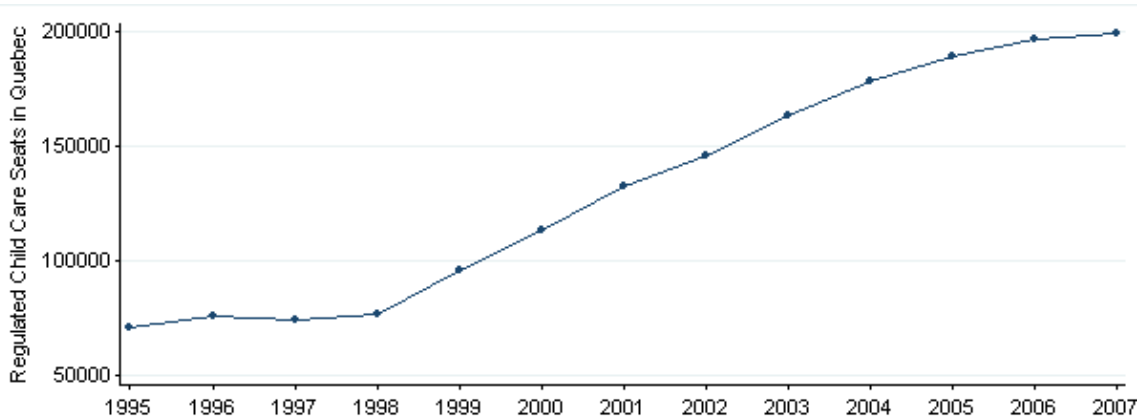
of education [2, 8], although this has only been addresses in the case of low income and minority groups. This is consistent with research by Davidson *et al.* (2004) which suggests that the achievements gaps formed prior to entry into primary school stay with students for the remainder of their education.[20] The extent to which similar effects will exist for universal programming is therefore tied to the ability of child care provision to bolster initial school readiness. On the question of the persistence of negative behavioural effects, *BGM* suggest the possibility that initial deterioration in behaviour represents a socialization cost for children, which is experienced at an earlier age when a child is placed in child care. This implies that behaviour problems associated with children attending child care will dissipate as their peers face similar socialization costs when entering primary school. Results outside the context of universal child care provision are unclear. On one hand Vandell and Corasaniti (1990) and Peisner-Feinberg *et al.* (2001) find that behavioural problems do persist into primary school [46, 53], while on the other hand Colwell *et al.* (2001) suggest that they do not [17].

3.3 A Program in Transition: Revisiting Baker, Gruber, and Milligan

Many of the questions pertaining to universal child care unanswered by earlier research were addressed in *BGM*. The Quebec Family Policy provided an opportunity to use an exogenous change in price to examine relevant price elasticities, as well to as address some of the mean effects on developmental outcomes for children in a universal implementation setting. Why then revisit these findings?

The primary reason to reconsider the results found by *BGM* is that this study looked at family and child outcomes during a time when the program was rapidly expanding to meet additional demand. The implementation of child care for all ages in Quebec was completed in 2000, however the number of available places in subsidized daycare did not

Figure 1: Total Number of Regulated Child Care Seats in Quebec



— Note: Figure 1 was produced using Table 2 in Lefebvre and Merrigan (2008)[35].

come close to satisfying demand. From 2000 to 2007 the province increased its available spaces in the program from approximately 110,000 to 200,000 (see Figure 1). *BGM* uses only data until 2002-2003, when the number of available places was still just over 150,000. The question then arises: do initial estimates using this data reflect short-run rather than long-run effects of the policy? One particular concern is that long queues to access child care are reported to have existed even into 2005 [44]. This leads to the belief that the usage rates and labour supply changes reflected in the data used in *BGM* may represent initial adjustments rather than true long-run changes, and consequently may also underestimate the relevant price elasticities.

Another rationale for examining the long-run effects of a universal child care program stems from the potential for a transition in the quality of care provided. A large body of evidence exists which suggests that the quality of child care is extremely important in the successful improvement of development outcomes for children attending child care[40, 46, 47]. A universal program provides child care access for children who on average are more

advantaged and, therefore, child care must replace already effective home care in order to have positive effects. Changes in quality, then, play an important role in determining the effectiveness of a universal program on developmental outcomes.

Several reasons exist to suggest that quality of care might have increased as Quebec's program stabilized. The first is that the rapid growth of the child care services in Quebec may have placed significant strain on employers seeking quality employees to fill vacancies in the early years of the program. Second, the Quebec Family Policy was coupled with new regulations for *centres de la petite enfance* (CPE) employee qualifications, as well as increases in wages to caregivers, which would also attract higher quality employees. For example, the Quebec government legislated in 2000 that two thirds of the staff at CPE's must be trained in early childhood education (previous requirements were at one third), while at the same time wages for caregivers were scheduled to rise 35%-40% over a four year period. Simultaneously, the Quebec government began to actively promote and support training and to provide access to relevant college level courses for those already employed in the field. The concern for quality increases culminated in legislation in August 2006, prior to the last available cycle of the NLSCY, which required two thirds of staff to have college diplomas or university degrees in early childhood education. These human capital investments made by the government in education incentives may take several years to be fully utilized. New centers which suffered from initial knowledge constraints at the time of setup might benefit from learning-by-doing, becoming more efficient and effective over time. In a 2002 report covering the Quebec Family Policy, Tougas suggests that there was a lack of training in current administration of child care facilities to deal with human resource, financial and management issues [51].

A final reason for revisiting *BGM* is that usage patterns in modes of child care may not be consistent in the short and long-run. The initial surge in demand for child care

in Quebec will have led to growth in the provision of child care facilities. Growth in home-based care operations may have outpaced growth in institutional based facilities, due to lower start up and organizational costs. A pair of studies conducted by NICHD ECCRN explore how modes of care play a role in effecting child care outcomes [41, 43]. For example, they suggest that center-based care is associated with better academic and language skills than other types of care arrangements, such as care in another’s home[41]. In their 2004 study, they also propose that modes of care play a role in the level of child care usage[43]. Center-based care in particular provides parents with more flexible usage and is associated with increases in the hours spent in another’s care—a factor associated strongly with behavioural problems.

4 Data and Methodology

4.1 Data

As in *BGM*, the data used in this study is taken from the NLSCY. However, in this case cycles 6 (2004-05) and 7, (2006-07) which were not available in the previous study, will also be included. The NLSCY is a longitudinal data set comprised of a rich set of demographic and child care choice and outcome related variables. The survey’s first cycle, taken in 1994-95, sampled Canadian children aged 0-11. This sample was restricted to Canada’s ten provinces and excluded both full time members of the Canadian Armed Forces and people living on Aboriginal reserves.⁷ In addition to a biannual follow up with the existing cohort, a new cohort of children aged 0-1 has been added at each new cycle. In each cycle approximately 2,000 children are represented at each age level, with the exception of missing data on children age 6-7 in cycle 5 and children aged 6-9 in cycle 6. This allows for the construction of a sizeable repeated cross-sectional data set.

⁷These exclusions represent about 2% of the Canadian population.

The NLSCY is particularly useful because it contains both child developmental scores and extensive questions relating to child care usage, parental labour supply, and other demographic characteristics. This provides the opportunity to understand the effects of child care policy on a variety of childhood development and behaviour indicators. These include the revised Peabody Picture Vocabulary Test (PPVT) score for children aged 4, a standardized motor and social development score for children aged 0-3, a math test score and grade retention for children aged 6-7, and a series of child behavioural scores relating to hyperactivity, anxiety, physical aggression and opposition. The number of hours and mode of child care usage are also included in the NLSCY, allowing for a more complete breakdown of post-policy child care uptake.

4.2 Estimation Procedure

The natural experiment created by the implementation of the Quebec Family Policy, coupled with the repeated cross-section data of the NLSCY, makes a difference-in-difference approach an appropriate strategy for isolating a causal effect on child care use, labour supply, and development scores. The validity of such an estimation technique relies on several key assumptions.

First, as Meyers (1995) and Besley and Case (2000) highlight, it is important that natural experiments originate from a true source of exogenous change [39, 12]. They cite examples in which estimates are misleading because the direction of causation from policy change to variation in dependent variables was reversed. In the present case the change stems from the Quebec Family Policy, and in particular the implementation of the child care subsidy. Thus, this legislation must not be a response by the Quebec government to increasing maternal labour and child care trends. Although such trends were present in Quebec prior to 1997, the scope and magnitude of the Quebec child care program is such

that exogeneity is plausible. Another important condition outlined by Meyers (1995) is the absence of pre-treatment effects [39]. This equally plausible assumption requires that prior knowledge of the Quebec Family Policy should not have impacted decisions by parents before the 1997 implementation of the program.

The validity of the difference-in-difference estimation also implies the conditions of common trend and common support. These conditions require a strong link between the treatment and comparison groups. In our case the similarities between these groups should be such that one could expect similar uptake in child care and maternal labour supply along two dimensions. Without policy change, uptake, or the change in usage or supply, should be the same in both the treatment and comparison groups over time, satisfying the common trend assumption. In the case of policy change for either group, the resulting uptake should be the same in both the treatment and comparison groups, thereby fulfilling the common support assumption.⁸ These constraints lead to a restriction of the sample to two-parent families. Such a restriction eliminates issues connected to other pre-policy subsidization, which was much higher for single parent families, and also isolates an appropriate comparison group not affected by changes in other policies during the course of the study, such as paternity leave regulations. While such a limitation reduces the reach of this study, the two-parent family remains a key focus of the universal child care debate, which is most concern with extending subsidized access to child care where it is not already available, as it is for many single-parent families.

Given these assumptions and sample restrictions, this study examines two key groups of interest using a difference-in-difference approach. The first of these two groups, and the initial focus of this study, are children aged 0-4 in two parent families, as in the original

⁸The common support assumption may also be weakened by differences in francophone and anglophone populations. To ensure the validity of our results this group we perform our estimation procedure on a francophone and anglophone sub-samples and find that the results are similar to the full sample. These results can be found in Table 5 .

paper by *BGM*. The introduction of a full day kindergarten program alongside Quebec’s child care initiatives requires that children aged 5 be excluded from the analysis, to isolate the impact of the provision of child care.

The general regression technique used will separate policy effects by comparing the difference in Quebec and the rest of Canada in both pre- and post-policy periods. In all cases relating to this particular age group, 0-4, the NLSCY cycles 1 (1994-95) and 2 (1996-97), will be used as the pre-policy period. The post-policy period defined in this study differs from the original specification. *BGM* used cycles 4 (2000-01) and 5 (2002-03), excluding cycle 3 on the basis that the program was not yet fully implemented during 1998-99. Although child care was serving all age groups during cycle 4, access to the child care program was still in a state of transition. On this basis, we exclude cycle 4 from our estimation of the long-run effects.⁹ The estimation equation used for the outcome of interest Y is as follows:

$$Y_{ipt} = Policy_{ipt} + Prov_p + Year_t + X_{ipt} + \varepsilon_{ipt} \quad (1)$$

where i , p , and t index individual, province, and year respectively. The vector of covariates X , found in Table 1a, includes controls for child, parent, family, and geographic characteristics and $PROV$ and $YEAR$ are a series of province and time dummies. The estimated policy coefficient α captures the effect of being eligible for universally subsidized child care in Quebec on the outcome of interest. It represents the change in outcomes in Quebec pre- and post-reform relative to changes in other provinces over the same time period.

A second focus of the study will be an older group of children, aged 6-7, who will help to identify the lasting effects of the Quebec Family Policy. Although study of this group

⁹Further discussion is held on the inclusion and exclusion of different cycle in section 6.1.

Table 1: Independent Variables and Summary Statistics

(a) Independent Variables List

Independent Variable	Description
Province	A dummy for each province, Quebec is used as the base group.
Cycle	A dummy for each cycle, Cycle 1 is used as the base group.
Mother / Father Age	A dummy for both mother and father, each age category beginning with 16-20 and increasing by increments of 5. The last dummy created groups Mothers / Fathers aged 46 -99 together.
Mother / Father Education	A dummy for both mother and father for each level of education completed: high school drop-out, high school graduate, some post-secondary and university degree.
Mother / Father Immigration Status	A dummy for both mother and father indicating whether they have ever been landed immigrants.
Urban/Rural Area	A set of dummies indicating living setting. Categories are rural or urban setting with a population of 0-30k, 30k-100k,100k-500k, or 500k+.
Younger and Same Aged Siblings	A set of dummies indicating number of younger and same aged siblings. Categories are 0,1, or 2 or more younger and same aged siblings.
Older Siblings	A set of dummies indicating number of older siblings. Categories are 0,1, or 2 or more older siblings.
Child Age	A set of dummies indicating age of the child: 0,1,2,3 or 4.
Male Child	A dummy indicating whether the child is a male or not.

(b) Select Summary Statistics

Covariate of Interest	Average in Quebec		Average in Rest of Canada	
	Pre-Policy	Post-Policy	Pre-Policy	Post-Policy
Living in Urban Area (500k+)	0.579	0.581	0.428	0.445
Number of Older Siblings	0.715	0.685	0.796	0.755
Number of Younger/Same Aged Siblings	0.268	0.217	0.255	0.246
Mother				
Age	30.93	31.37	31.74	32.65
Immigrant Status	0.089	0.137	0.214	0.252
High School Drop Out	0.133	0.110	0.106	0.075
University Degree	0.203	0.331	0.206	0.343
Father				
Age	33.51	34.20	34.14	35.28
Immigrant Status	0.097	0.162	0.208	0.252
High School Drop Out	0.168	0.139	0.138	0.098
University Degree	0.194	0.291	0.214	0.306
Male Child	0.509	0.514	0.509	0.514
Age of Child	2.026	1.965	1.991	2.021

— Note: The means calculated in this table are for the ¹⁸two-parent family sub-sample: 38648 observations. The data is split between Quebec and the rest of Canada as well as into the pre-policy period, from 1994-97, and the post policy period, from 2002-2007.

brings exciting new policy implications it also complicates the identification of a causal effect. Since Quebec’s child care policy was coupled with full-day kindergarten as well as an increase in after school child care programs, both of which may have significant impact on academic performance, it is difficult to isolate the effect of the child care policy alone. There are two approaches to deal with these complications. The first is to analyze the Quebec Family Policy holistically using Equation 1 applied to 6-7 year olds, where the policy dummy represents exposure to child care, full-day kindergarten, and higher levels of school aged care. The second approach is to attempt to capture the effects of exposure to full-day kindergarten in a second dummy variable, *FDKIND*:

$$Y_{ipt} = Policy_{ipt} + FDKIND_{ipt} + Prov_p + Year_t + X_{ipt} + \varepsilon_{ipt} \quad (2)$$

The NLSCY provides three groups of 6-7 year olds in Quebec to help isolate this effect: a group completely unaffected by the policy change, a group which received access to full-day kindergarten but was too old to be eligible for child care service, and finally a group which had access to both five dollar-a-day child care and full-day kindergarten. The use of the second dummy variable is also supported by additional variation in data from two other provinces, New Brunswick and Nova Scotia, which have switched from primarily half-day to full-day kindergarten.¹⁰ This approach helps to separate full-day kindergarten effects from those associated with the increase in access to child care; however, it still neglects the presence of increases to child care for school aged children.

This paper deviates from the province-year cluster method for calculation of standard

¹⁰Access to full-day kindergarten is available in many provinces but in most cases requires parents to pay for a portion of the cost. In Ontario, kindergarten is determined at the school board level and a variety of programs are offered; therefore in our analysis we check whether results are sensitive to inclusion of this province.

errors¹¹, replacing this inference technique with a *wild cluster bootstrap-t* procedure recommended by Cameron, Gelbach, and Miller (2007) [15]. In any difference-in-difference estimation attention must be given to the dependence of errors on province/state grouping and to potential serial correlation. A technique commonly used to address the first of these two issues is the above mentioned province-year clustering, which accounts for shared random effects that occur at the province-year level. Bertrand, Duflo, and Mullainathan (2004) provide a critique of difference-in-difference estimates using this clustered approach, arguing that the presence of serial correlation poses a serious complication for calculation of correct standard errors [11].

One potential solution for addressing this concern is through the use of bootstrapping techniques. The basic procedure of constructing possible alternative data sets, and subsequently alternative coefficient estimates, through sampling the observed data with replacement is adapted to a cluster setting to address serial correlation. Bertrand *et al.* (2004) suggest clustering by province/state alone and then performing a block bootstrap, where the state blocks are sampled with replacement, rather than individual observations [11]. Such a procedure, however, relies on larger numbers of clusters to ensure the bootstrapped estimates are able to approximate the true distribution of the data. Improvements to this techniques are provided by Cameron *et al.* (2007); they introduce the *wild cluster bootstrap-t* which produces an accurate p-value for t-tests on coefficient estimates with very small numbers of clusters (as few as 5 clusters) [15]. Therefore, To address serial correlation, our study clusters at the province level following the suggestion of Bertrand *et al.* (2004), and conducts inference using the more reliable *wild cluster bootstrap-t* method

¹¹*BGM* undertake several techniques exploring the calculation of standard errors. They include standard error estimates for alternative clusters, a Hansen (2007) FGLS estimation AR(1) process, and simulated p-values from the distribution of “placebo” estimates in non-treated provinces[28]. Bertrand *et al.* (2004) suggest that parametric correction, such as including an AR(1) process, are not typically sufficient for dealing with serial correlation in difference-in-difference estimations[11].

developed by Cameron *et al.* (2007).¹²

4.3 Distributional Analysis

To explore beyond the mean effects of the Quebec Family Policy on available child development scores this paper makes use of a recently developed regression technique: unconditional quantile regression. This method was introduced in a paper by Firpo, Fortin, and Lemieux (2009), in which the authors illustrated how the marginal effect on any quantile of changing a covariate *ceterus paribus* can be calculated [24]. The computation of the impact on the τ^{th} quantile (q_τ) of the unconditional distribution follows from a simple transformation of the outcome variable called the *Recentered Influence Function* (RIF), defined as follows:

$$RIF(Y; q_\tau) = q_\tau + \frac{\tau - I\{Y \leq q_\tau\}}{f_Y(q_\tau)} \quad (3)$$

where $I\{\cdot\}$ is an indicator function and f_Y is the density of the marginal distribution of outcome Y . Essentially, the RIF describes the impact of an outcome, Y , on the location of any given quantile, and can also be generalized to other distributional statistics such as variance. The sample counterpart of the RIF transformation, defined in equation 4 and constructed of the observed τ^{th} quantile (\hat{q}_τ) and a kernel density estimator ($f_Y(\hat{q}_\tau)$), replaces the outcome variable of interest (Y_{ipt}) in the general OLS Equations 1 and 2.

$$RIF(Y; \hat{q}_\tau) = \hat{q}_\tau + \frac{\tau - I\{Y \leq \hat{q}_\tau\}}{f_Y(\hat{q}_\tau)} \quad (4)$$

Such a regression produces the desired coefficient estimates of all covariates corresponding to the τ^{th} quantile, thereby revealing the impact of an independent variable on the unconditional distribution of an outcome. In the present case, this allows for an in depth look

¹²Rather than present the estimated p-values, we calculate approximate standard errors using the Student's t-distribution to make comparisons between this paper and *BGM* easier.

at how the implementation of such an extensive child care system impacts the patterns in gains and losses for the differing portions of the distribution. It also enables calculation of the impact on the overall variance of key dependent variables, and is employed to understand whether the Quebec Family Policy results in more homogeneous human capital investments.

5 Replication of Baker, Gruber, and Milligan

In order to establish a direct link between the original results and the extensions presented in this paper an exact replication of *BGM* was necessary. The NLSCY is a large and cumbersome data set, in particular when using cross cycle data. It is not uncommon for variables to change from one cycle to the next, as questions are frequently refined or dropped altogether, and available responses or coding of those responses change. This creates greater potential for variable definition and coding related errors. Further, the detail provided in the NLSCY creates the possibility of different definitions for one variable. For example, parental immigration status could be defined either as being a landed immigrant, or as having a birth country other than Canada. By replicating the results of *BGM*, this paper ensures that seemingly trivial differences in dependent and independent variables are not driving any of the changes reported. In this way, the sensitivity of the original results can also be tested for such differences.

In completing the replication, this study validates and reinforces the original estimation procedure and results given in *BGM*, albeit with more conservative estimates of significance levels. The primary results of the original paper consist of 31 regressions covering the use of child care, maternal labour supply, and child and parent related scores. These have been

replicated, and are shown in Table 2 and 3.¹³ Exhaustive checking of variable definitions and coding resulted in the achievement of a sample size of 34033, just one over the original sample size, and the exact reproduction of 30 out the 31 results.¹⁴ The one regression not consistent with *BGM* was that of the hyperactivity and inattention index, a child behavioural score calculated as a sum of responses to questions related to frequency of various behaviours. In cycle 4 of the NLSCY the calculation of this index was changed: two questions making up part of the index were removed and one new question was added. This difference was overcome in the replication by the merging of the existing indexes to produce one in which all questions are common.¹⁵ This change results in a larger policy effect estimate on the hyperactivity and inattention index.

During the replication, attention was also given to the selection of covariates. The search for a correct sample size led to different definitions of several of the independent variables, including the example given above of parental immigration status. Despite these differences results remained stable, thus ruling out the possibility that changes in the original definitions play significant roles in driving outcomes.¹⁶ Although some key variables,

¹³We do not present three results presented by *BGM*. Not included are variables for whether a child has had an asthma attack in the past twelve months, whether a child has been injured in the past twelve months, and marriage satisfaction. The first two results are insignificant in both the replication and long run estimation. The marriage satisfaction variable is not available after cycle 4 and therefore irrelevant to our discussion.

¹⁴Different legitimate sample sizes can be obtained. The differences in these samples stem from the use of different definitions of several key covariates, in particular that of immigration, the use of cohort age rather than the actual age at time of the interview, and the definition of two parent family to include non-parent two caregiver households. Small differences, such as the immigration difference, were resolved through discussion with author Kevin Milligan.

¹⁵The old index was made up of seven questions prior to cycle 4 and six question after cycle 4. We construct an index made of six questions for all cycles by manipulating index scores prior to cycle 4. Responses to two questions, “How often would you say that this child: (1) fidgets, (2) is impulsive” are removed from the index. The question “How often would you say that this child: has difficulty waiting for his turn in games or groups?” was added to the index. Answers were coded 0 for never or not true, 1 for sometimes or somewhat true, and 2 for often or very true.

¹⁶Other tested definition changes include: using age of child at the time of the interview rather than cohort age, including same aged siblings as part of the older group of siblings rather than the younger group, and allowing for the highest category of same aged and younger and older siblings to be 3 or more rather than 2 or more.

such race and religion, are absent in *BGM*, this was found to be the best solution possible given the nature of available data.¹⁷ Finally, it is important to note that the bootstrapped standard errors are much more conservative than the province-year cluster standard errors provide in *BGM*. Changes in the level of significance are observed in 18 cases, and in 8 estimates we reject the null hypothesis when we should fail to reject it.

6 Long Run Results

6.1 Child Care Use and Maternal Labour Supply in the Long-Run

The following section will initiate the comparison between the short-run estimates presented in *BGM* and the long-run results produced using additional NLSCY data. This discussion will begin with an analysis of total child care usage, and then turn to maternal labour supply, mode of child care and time spent in care.

During the NLSCY survey respondents are asked: while you (and your spouse/partner) are at work or studying, do you currently use child care such as daycare, babysitting, care by a relative or other caregiver, or a nursery school/preschool? If answering, yes, respondents are then required to answer a battery of questions dealing with the modes of child care, as well as time spent in each type. Using these follow-up questions, a report is generated on the type of primary care used and the time spent in child care, identifying changes as a result of the Quebec Family Policy. The estimated long-run policy coefficients are reported in Table 2 alongside the replication estimates, and can be interpreted in a straightforward manner: where the variable is dichotomous the coefficient represents the percentage point trend deviation in the variable of interest. In the case of linear variables, the coefficient can be understood as the deviation induced by the policy.

¹⁷While the NLSCY data set does include race and religion variables, it is not until later cycles. Income levels, although tested by *BGM*, are excluded in the replication because they pose endogeneity for labour supply variables. Provincial unemployment levels added in *BGM* were found to have little effect on results.

Table 2: Child Care and Labour Supply Results

Dependent Variables	Long Run Estimates		Replication Estimates
	Mean (Std. Deviation)	Policy Effect (Std. Error)	Policy Effect (Std. Error)
In Any Care	0.455 (0.498)	0.196 (0.084)**	0.146 (0.081)*
Care in Another's Home	0.224 (0.417)	-0.032 (0.025)	0.002 (0.015)
Care in Own Home	0.097 (0.295)	-0.017 (0.015)	-0.009 (0.012)
Institutional Care	0.133 (0.339)	0.244 (0.038)***	0.152 (0.078)**
<i>Break Down of Care in Another's Home</i>			
Licensed Non-Relative	0.049 (0.217)	0.038 (0.020)*	0.048 (0.030)
Non-Licensed Non-Relative	0.106 (0.308)	-0.043 (0.024)*	-0.025 (0.017)
Relative	0.068 (0.251)	-0.027 (0.014)**	-0.021 (0.014)
Hours in Child Care	13.761 (18.901)	8.552 (3.32)***	6.393 (3.887)*
Fulltime Care (20+ Hours / Week)	0.336 (0.472)	0.222 (0.096)**	0.149 (0.091)*
Mother Works	0.606 (0.489)	0.110 (0.047)**	0.077 (0.012)***
Mother Works / Using Child Care	0.401 (0.49)	0.155 (0.067)**	0.125 (0.064)**
Mother Works / Not Using Child Care	0.203 (0.402)	-0.048 (0.022)**	-0.048 (0.031)
Mother Not Works / Using Child Care	0.053 (0.224)	0.042 (0.020)**	0.023 (0.035)
Mother Not Working / Not Using Child Care	0.343 (0.475)	-0.150 (0.077)**	-0.100 (0.043)**

* Significant at the 10 percent level. ** Significant at the 5 percent level. *** Significant at the 1 percent level.
— Note: Table 2 and 3 provide the estimation results for the policy dummy in Equation 1. The estimation includes the entire sample of children aged 0-4 who have given a valid response for the corresponding variable of interest. To facilitate a comparison with *BGM*, we calculate an approximate standard error from the bootstrapped p-values.

Table 3: Child and Parent Outcomes

	Long Run Estimates			Replication Estimates
	Range of Values	Mean (Std. Deviation)	Policy Effect (Std. Error)	Policy Effect (Std. Error)
Child Outcomes				
Hyperactivity and Inattention	0-12	3.608 (2.383)	0.33 (0.195)*	0.211 (0.208)
Emotional Anxiety	0-12	1.204 (1.466)	0.205 (0.094)**	0.12 (0.085)
Physical Aggression	0-16	4.868 (2.939)	0.601 (0.258)**	0.38 (0.148)***
Separation Anxiety	0-10	2.626 (1.975)	0.164 (0.149)	0.098 (0.133)
MSD	0-177	99.185 (15.121)	-1.688 (0.861)**	-1.645 (0.875)*
PPVT	0-179	100.665 (15.169)	-0.435 (0.766)	0.361 (0.847)
Child in Excellent Health	0/1	0.658 (0.474)	-0.049 (0.036)	-0.055 (0.041)
Never had a Nose/Throat Infection	0/1	0.396 (0.489)	-0.015 (0.017)	-0.011 (0.014)
Never had an Ear Infection	0/1	0.416 (0.493)	-0.002 (0.063)	-0.029 (0.016)*
Parental Outcomes				
Mother in Excellent Health	0/1	0.086 (0.28)	-0.03 (0.055)	-0.022 (0.055)
Father in Excellent Health	0/1	0.079 (0.27)	0.003 (0.019)	0.006 (0.011)
Family Dysfunction	0-36	7.875 (5.089)	0.133 (0.247)	0.254 (0.277)
Aversive Parenting	0-20	6.372 (3.204)	0.361 (0.176)**	0.198 (0.124)
Hostile/Ineffective Parenting	0-26	8.634 (3.852)	0.749 (0.342)**	0.728 (0.338)**
Consistent Parenting	0-20	13.975 (3.129)	-0.215 (0.157)	-0.504 (0.283)*
Mother's Depression Score	0-36	4.093 (4.686)	0.659 (0.147)***	0.42 (0.163)***

* Significant at the 10 percent level. ** Significant at the 5 percent level. *** Significant at the 1 percent level.

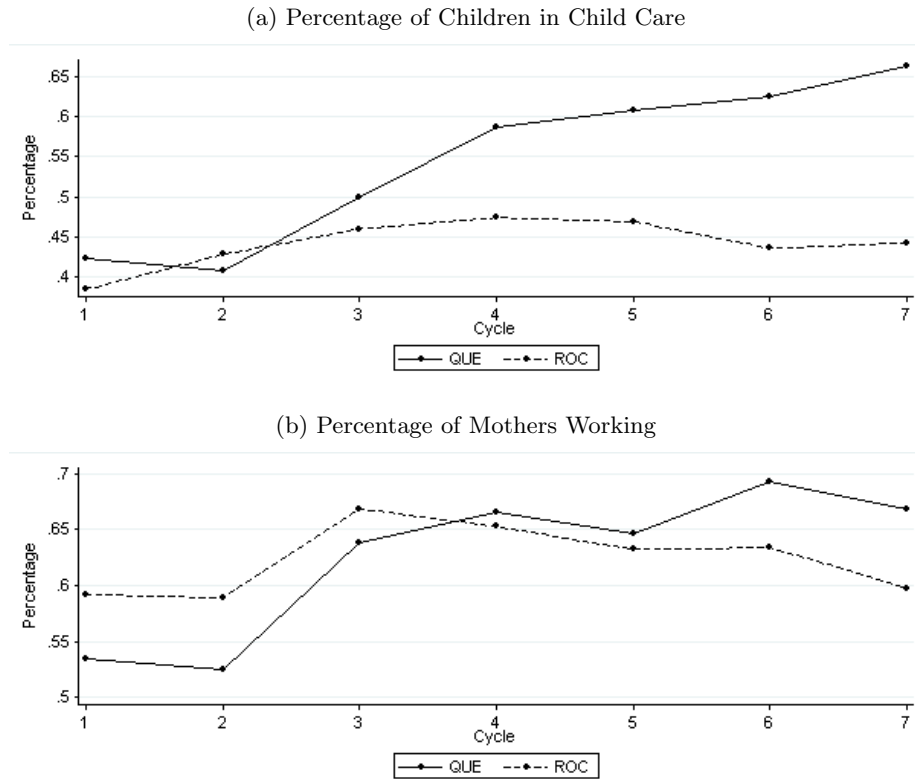
— Note: A description of select dependent variables is available in Table 4.

Table 4: Brief Description of Child and Parent Behavioural Indexes

Dependent Variable	Description
Hyperactivity and Inattention	A high score indicates the presence of behaviours associated with hyperactivity/inattention in children.
Emotional Anxiety	A high score indicates the presence of behaviours associated with anxiety and emotional disorder in children.
Physical Aggression	A high score indicates behaviours associated with physical aggression and opposition in children.
Separation Anxiety	A high score indicates behaviours associated with separation anxiety in children.
Family Dysfunction	A high score indicates family dysfunction.
Aversive Parenting	A high score indicates punitive/aversive interactions between parent and child.
Hostile/Ineffective Parenting	A high score indicates hostile/ineffective interactions between parent and child.
Consistent Parenting	A high score indicates consistent parenting behaviour between parent and child.
Mother's Depression Score	A high score indicates the presence of depression symptoms in the mother.

In what way did this subsidy affect the overall usage of child care in Quebec, and how does a short-run view of this policy skew the expected results? Estimates of the overall increase in child care usage correspond to the first row of Table 2, labeled In Any Care. The short-run specification estimated increases compared to the rest of Canada (ROC) in child care usage by 14.6 percentage points, where the long-run estimation produced changes by 19.6 percentage points. There is a difference of 5 percentage points, representing a 33% increase. This fits neatly into the framework of a program which is still growing in order to meet the demands of the population. This is also apparent in Figure 2a, which compares the percentage of child care use by two parent families over the seven available cycles of the NLSCY for Quebec and the rest of Canada. Child care usage in Quebec was steadily on the rise from the implementation of the program during cycle 3 until it levels off following cycle 4.

Figure 2: Mean Trends in Child Care and Maternal Labour Supply



The long-run effects on maternal labour supply follow a similar pattern to that of child care usage. The same lag in supply of child care, leading to a lower uptake of child care use in the short run, also leads to a lower estimated increase in maternal employment. The change in the percentage of mothers working over the course of the seven NLSCY cycles can be seen in Figure 2b, which illustrates a continued movement away from the expected trend.¹⁸ The estimate of the policy effect can also be seen in Table 2, where a large gap between the short-run and long-run estimates also exists. The long-run deviation

¹⁸We run statistical tests checking whether the proportions of child care users and mothers supplying labour has changed across cycles. Evidence is found supporting the suggested increase in child care and maternal labour supply over the course of the later portion of the study.

from the trend in maternal labour supply is estimated to be 11.0%, a 3.3 percentage point increase and a 42.9% increase from the short-run estimate of 7.7%. It is also clear from this result, and that of overall child care usage, that both the child care own-price elasticity and cross-price elasticity with labour supply, as reported by *BGM*, are underestimated. Additional regression analysis on the number of hours worked suggests that the majority of the labour uptake by mothers is full-time work, 30-40 hours a week. Additionally, there is a small increase to part-time working mothers and a slight decrease in mothers working 40-50 hours a week.¹⁹

While the long-run results are significantly higher than short-run estimates, child care usage and maternal labour supply both rise in tandem, leaving a large gap (8.6 percentage points) between the increase in child care usage and the increase in mothers working. This gap may be explained by two causes, illustrated using the last four rows of Table 2. First, there is an increase in the use of child care by non-working mothers by 4.2 percentage points. Second, changes in the types of available care cause a switch from unreported informal child care arrangements to reported formal care arrangements. In both the short and long-runs there is a 4.8 percentage point decrease in working mothers who do not use child care. The suspected cause of this trend is unreported informal care. Thus, the increase in overall child care use may be better understood as the uptake of formal child care.

Differences Across Sub-Samples

It is worthwhile to note that the child care usage and maternal labour supply induced by the Quebec Family Policy stem from varying sources. Presented in Table 5, several auxiliary regressions using selected samples provide additional insight into uptake patterns. Contrary

¹⁹The full table of results is available from the author upon request.

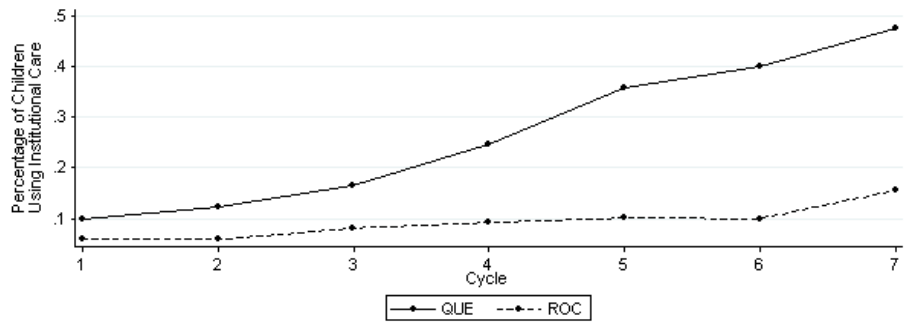
Table 5: Child Care Usage and Maternal Labour Supply Outcomes by Sub-Sample

Breakdown of Sample	Estimate of Policy Effect	
	In Any Care	Mother Works
Full Sample (Two Parent Family)	0.196	0.110
Single Parent Family	0.253	0.061
Mother's Education Level		
High School Dropout	0.121	-0.008 ^a
High School Graduate	0.270	0.166
Some Post Secondary	0.222	0.110
University Degree	0.133	0.099
Urban / Rural Setting		
Rural Area	0.181	0.103
Population of 0-30K	0.182	0.099
Population of 30-100K	0.196	0.119
Population of 100-500K	0.217	0.086
Population of 500K+	0.210	0.119
Mother Immigrant Status		
Non-Immigrant Mother	0.188	0.112
Immigrant Mother	0.182	0.057
Parent's Immigrant Status		
At-Least One Non-Immigrant Parent	0.187	0.109
Immigrant Parents	0.141	0.121
Mother's Age		
Mother's Aged 21 to 25	0.162	0.130
Mother's Aged 26 to 30	0.252	0.139
Mother's Aged 31 to 35	0.211	0.130
Mother's Aged 36 to 40	0.072	0.021 ^a
Mother's Aged 41 to 45	0.275	-0.048 ^a
Age of Child		
Child Aged 0	0.125	0.090
Child Aged 1	0.224	0.152
Child Aged 2	0.250	0.078
Child Aged 3	0.219	0.141
Child Aged 4	0.178	0.088
Speaking Language		
One or More French Speaking Parents	0.192	0.098
One or More English Speaking Parents	0.174	0.094
One or More Parents Speak Another Language	0.225	0.161
Cycle Specifications		
Includes Cycles 1 2 4 5 6 7	0.170	0.100
Includes Cycles 1 2 5 6	0.191	0.105
Includes Cycles 1 2 4 5 6	0.158	0.094
Includes Cycles 1 2 6 7	0.196	0.125
Includes Cycles 1 2 7	0.203	0.121
Includes Cycles 1 2 6	0.186	0.131

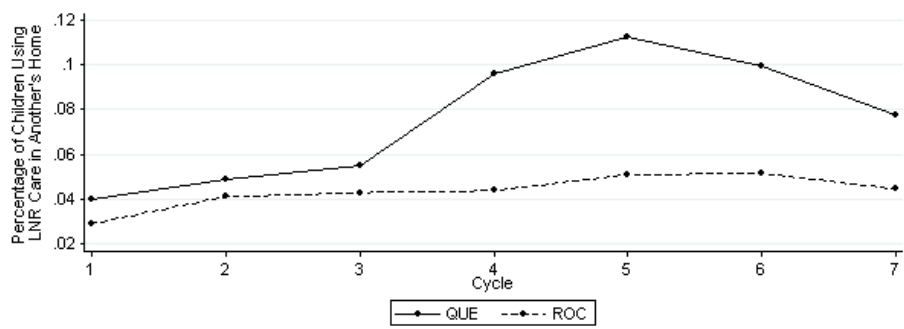
— Note: ^a denotes outcomes which are insignificant.

Figure 3: Mean Trends in Child Care Modes and Time

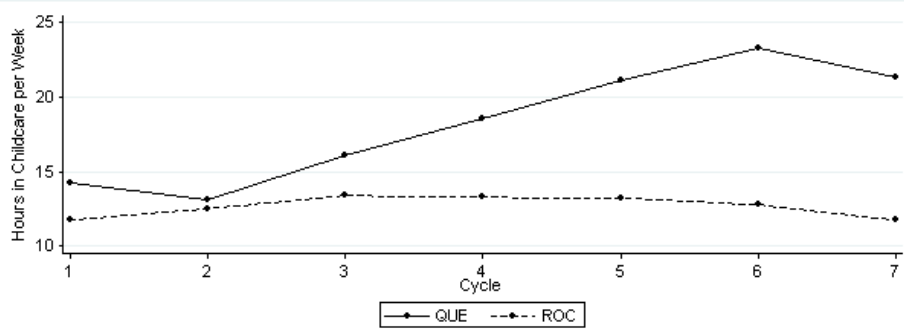
(a) Institutional Child Care



(b) Another's Home: Licensed Non-Relative Child Care



(c) Hours in Child Care per Week



to reported results in *BGM* suggesting that uptake was higher among those of higher education, our analysis reveals that the policy effect on high school graduates is larger than in any other group—an increase in child care use by 27 percentage points and maternal labour supply of 16.6 percentage points. Respective increases for university graduates are only 13.3 and 9.9 percentage points. The misrepresentation by *BGM* originates in their grouping of high school graduates and high school drop-outs. Our finding suggests that unlike the policy effect on high school graduates, effects on drop-outs are the smallest for child care usage and insignificantly negative for maternal labour supply. As low education levels are associated with lower income levels, these results highlight the inability of the Quebec Family Policy to make a meaningful impact on the very worst off in Quebec, although providing more significant options to the more generally disadvantaged.

There are two other patterns of note. First, the policy effect on the labour supply of immigrant mothers was significantly lower than non-immigrant mothers; however, maternal labour supply was much higher in families where both the mother and the father were immigrants. These results may reflect differences between a desire and a need for employment. Second, the largest trend-breaking difference in the usage of child care and maternal labour supply uptake came from parents with children aged 1-3. The uptake of child care child under a year old remains relatively low.

Modes of Child Care

Another interesting aspect of the long-run analysis is the way in which the use of different types of child care evolves overtime. Rows 2-7 of Table 2 explore how the types of child care used in Quebec changed with respect to the rest of Canada following the Quebec Family Policy. Three main categories are used to characterize child care usage: *Institutional Care*, in CPEs or other center-based care, *Care in Own Home*, either by a family member or

by an external care giver, and *Care in Another's Home*. Here, the short-run results are consistent with *BGM*, however the long-run results give rise to a noteworthy pattern in the primary mode of child care.

Initial short-run results reported that the child care policy did not have a significant effect on use of *Care in Another's Home*. This led *BGM* to the disaggregation of this variable into three components: care by a *Licensed Non-Relative*, care by a *Non-Licensed Non-Relative*, or care in a *Relative's Home*. The short-run results reported in Table 2 rows 4-7 illustrate a small increase in the use of non-relative care, and a decrease in the use of care by a relative in one's own home. Given the magnitudes of these estimates we also expect a similar long-run increase of *Care in Another's Home*, however this is not the case. Instead, *Care in Another's Home* is negative with a magnitude of 3.2 percentage points, although insignificant. Using the graphical evidence provided in Figure 3a and Figure 3b, we are better able to interpret this result. It is evident from these figures that the excess demand created by the policy change was initially met through the use of home-based care.²⁰ Child care centers require a larger amount of resources and organization in order to run effectively, and it appears that a short term excess of demand gave rise to an increase in licensed home provided care. Center-based care takes time to setup, and thus the lag in the uptake of institutional care. This trend is an important one as it plays a role in the way that the Quebec residents use child care. As discussed, the flexible nature of institutional care leads to higher levels of usage, a pattern—illustrated in Figure 3c—which is associated with increased behavioural problems for children.

²⁰The decrease in use of home-based care is also evident in the long-run policy estimate which is statistically lower than the original short-run specification. Furthermore, we conduct a test of proportions on the use of home-based licensed non-relative care and find a significant difference in usage from cycles 5 to 7. Similar tests and results are also produced for the use of institutional care and the hours of child care used per week. These statistical differences confirm the patterns seen in Figure 3.

Cycle Specifications

The maintenance of overall child care and labour supply trends in Canada and Quebec creates concerns over the inclusion of cycles of the NLSCY because federal funding for child care has changed in several ways during the years included in the study. There was initial talk of the provision of child care spaces by the federal government in 2004. Although these plans were scrapped by the Conservative government in 2006 before any action could be taken, there were increases to federal funding earmarked for early childhood education during the 2005-06 and 2006-07 fiscal years. In 2006, parents were provided with further support, through the Universal Child Care Benefit tax credit, which allots parents \$1200/year for each child under the age of 6. A final change was a small price increase in Quebec's child care system from \$5 to \$7 per day in 2004.

In light of this, several specifications of the data are used to test the sensitivity of the estimation to inclusion and exclusion in particular cycles. The results of which are reported in Table 5. First, the inclusion of cycle 4 (2000-01) is tested to illustrate that the program was still in transition during this period. Second, because of the increases in funding to the provinces, the estimation results are also compared to those found by removing cycle 7 (2006-07). These checks confirm our original choice for cycle inclusion. Adding cycle 4 (2000-01) reduces the magnitude of the estimates in a similar way as the specifications by *BGM*. Given that this study focuses exclusively on two parent families the issue of increases to federal funding in 2005-07 may be quite limited, as funding provided to provinces was for the most part directed to those most in need. It is not surprising then that the removal of cycle 7 (2006-07) results in only minor changes in estimation.

6.2 Child Behavioural and Developmental Outcomes

Children Aged 0-4: Short-Run vs. Long-Run

Attention is now given to the impact on child outcomes of increases to child care use and maternal labour supply. In the long run the combination of program stability and improving employee education and wage policies is likely to lead to a significant increase in the quality of child care in Quebec, and thus potentially an improvement in child outcomes.²¹ At the same time, increases in the weekly child care hours and changes in the mode of child care may also create discrepancies between initial and long-run policy effects.

BGM examined child outcomes using four indexes of child behaviour and two measures of child development. The original estimates are presented in Table 3. The behavioural indexes used reflect responses about the frequency of observed behaviours such as impulsiveness or fighting, for children aged 2-3.²² They include *Physical Aggression*, *Hyperactivity and Inattention*, *Emotional Disorder and Anxiety* and *Separation Anxiety*. The development scores consist of the Motor and Social Development (MSD) index, an index constructed from responses concerning child ability by the person most knowledgeable,²³ and the Peabody Picture and Vocabulary Test (PPVT), a standardized language related score constructed from child responses to a test conducted by an external interviewer. All of these measures have undergone rigorous testing.

There is little evidence to suggest that in the long run the Quebec Family Policy has reduced negative short run effects on childhood behaviour and development. In all

²¹The improvement in child care quality is tested by examining teacher-student ratios and the percentage of child care workers with early childhood related education. Unfortunately, these variables are not available until the post-policy period, in cycle 4. Despite this limitation there is some indication that student-teacher ratios are decreasing and that caregiver education levels are increasing in Quebec from 2000-2007.

²²Behavioural indexes are available for children aged 4 but are not composed of the same base questions. These indexes are also tested and reveal a similar pattern as the indexes for children aged 2-3.

²³For example, questions ask whether a child has ever sat up for ten minutes without assistance, or whether the child has said more than two recognizable words.

Table 6: Average Treatment Effects on the Treated

	Replication		Long Run	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound
Hyperactivity and Inattention	1.445	2.740	1.684	3.000
Emotional Anxiety	0.822	1.558	1.046	1.864
Physical Aggression	2.603	4.935	3.066	5.464
Separation Anxiety	0.671	1.273	0.837	1.491
MSD	-11.267	-21.364	-8.612	-15.345
PPVT	2.473	4.688	-2.219	-3.955

measures the initial short-run estimates presented in Table 3 imply either insignificant changes or a worsening effect. The size of these negative policy effects grow in the long run for all variables. It is imperative, however, to consider the above results as intention-to-treat effects, rather than actual outcomes. The implementation of the policy results in a changed choice of labour supply or child care usage by some, but not all. Those who select different actions post-policy drive the behavioural and developmental changes reported in the regression results. Thus, the true treatment effect can be calculated by dividing the intention-to-treat effect, the policy coefficient reported in the regression tables, by the probability of being treated. Although it is not entirely clear how to define what treatment is, child exposure to either maternal labour supply or enrolment in formal child care are possibilities. From prior estimates of increases in maternal labour supply and formal child care usage we expect that the probability of treatment lies between 7.7% and 14.6% in the short run and 11.0% and 19.6% in the long run. Using these estimates, the calculated average treatment effects on the treated are reported in Table 6.

Examining the average treatment effects exposes the following results. The inclusion of long-run data does in fact result in increases of negative mean treatment effects in all categories but the MSD score. These results come in the presence of moves toward institu-

tional care and longer hours of usage, which are associated with higher language scores for children and increased behavioural problems (NICHD-ECCRN, 2002b) [41]. This indicates that child care quality is an ineffective solution for improving child PPVT scores in a universal setting, as these results come in the presence of observed increases in staff education levels and reductions in child-staff ratios between 2000-2007. In turn this may suggest that child care programs, unlike pre-kindergarten programs, do not place a significant focus on language development, thereby limiting staffing effects. Further, it is unclear how the quality of child care is able to improve behavioural outcomes for children, as trends towards center-based care might be the driving force for worsening behavioural outcomes.²⁴ Finally, improvements in the offered child care appears to be an effective way of improving MSD outcomes for children aged 0-3, although likely not so effective as to remove negative effects altogether. With regard to this, it is important to note the magnitudes of all of these results. In the statistically significant cases the lower bounds represent at least a mean treatment effect close to half of a standard deviation.

Differences by Age and Gender

An important question to be answered is whether universal child care is appropriate for children of any age. Disaggregating the main sample by child age, we examine the MSD score for children aged 0-3 in Table 7a. From this breakdown it is evident that the policy effect on children varies by age. There are extremely large negative effects for newborns placed in child care. In calculating the treatment effect we find a mean decrease in the

²⁴The worsening of child behaviour might have its roots in worsening parental outcomes. *BGM* suggested that behavioural problems might be from reporting artifacts as parents who switch into employment face higher levels of stress. Our analysis of average treatment effects for Family Functioning, Hostile/Ineffective Parenting, Consistent Parenting, and Mother's Depression Score, (see Table 3 for the intention-to-treat effects), indicates that parents seem to be adjusting better to new working conditions in some respects. This implies a reduction in this negative type of stress-related behaviour reporting.

MSD score of close to two standard deviations.²⁵ For children aged 1-2 the treatment effects are also negative, but between one third and one half of a standard deviation. On the other hand, estimates for children aged 3 suggest treatment effect gains close to one third of a standard deviation. If we are to take Heckman's argument for early human capital accumulation serious [31], these results suggest that universal child care might be better suited for children aged 3 and up, and thus alternative ways of encouraging development in young children should be sought.

In the same way as patterns of child development across age groups complicate the effects of child care, so gender differences in child development also play a role in understanding the effects of child care. These effects are initially explored in Table 7b, and further attention is given to these differences in section 7. To begin, we note that there is no statistical difference between the increase in usage of child care between males and females. These results, however, point to several differences in the cognitive and behavioural development scores. Negative effects are found for male children in the hyperactivity and inattention index, as well as in their MSD score, where none are found for female children. On the other hand, female children alone exhibit increases to their emotional anxiety and separation anxiety scores and decreases in their overall health.

In their explanation of negative emotional effects of child care on female children, Benenson, Morash and Petrakos (1998) outline the existence of a higher degree of emotional closeness between girls and their mothers at the pre-school age [9].²⁶ The nature of gendered play is a potential factor in increased hyperactivity in male children. Interactions in child care are often gender separated, and boys tend to emphasize conflict and physical play [22]. Furthermore, some research suggests that female children, not only play more cooperatively, but also receive more supervision and form closer connections to care-

²⁵As this score is standardized the standard deviation is close to 15 in all age groups.

²⁶Emotional closeness was measured by physical proximity mutual eye contact and global level of enjoyment.

Table 7: Policy Effects by Age and Gender

(a) Motor and Social Development Policy Effects by Age

	Age 0	Age 1	Age 2	Age 3
In Any Care	0.125 (0.053)**	0.224 (0.013)***	0.250 (0.032)***	0.219 (0.029)***
MSD	-4.049 (1.706)**	-1.496 (0.635)**	-2.346 (0.880)**	1.179 (0.82)
Average Treatment Effect	-32.392	-6.679	-9.384	5.384

(b) Policy Effects by Gender

	Female Children	Male Children
In Any Care	0.186 (0.021)***	0.205 (0.023)***
Hyperactivity and Inattention	0.136 (0.163)	0.511 (0.144)***
Emotional Anxiety	0.333 (0.097)***	0.100 (0.111)
Physical Aggression	0.718 (0.205)***	0.527 (0.089)***
Separation Anxiety	0.210 (0.104)**	0.130 (0.096)
MSD	-1.560 (1.020)	-1.740 (0.556)***
PPVT	-0.912 (1.204)	-0.033 (1.143)
Child in Excellent Health	-0.071 (0.019)***	-0.029 (0.026)

* Significant at the 10 percent level. ** Significant at the 5 percent level. *** Significant at the 1 percent level.
 — Note: Average treatment effects in Table 7a are calculated using the policy effect estimates for an increase in child care usage presented in the first row. Standard errors are reported in brackets.

givers [23, 1]. We suggest future research exploring whether this extra supervision and relationship development for girls play a significant role in the gendered effects of the MSD score.

Children Aged 6-7

In order to assess whether the Quebec Family Policy has any lasting effect on childhood development, attention is now given to primary school children. The NLSCY makes it possible to track an age comparable hyperactivity and inattention index, a math test score, and grade retention for children aged 6-7.²⁷ The mean effects of the policy and a gendered analysis are presented in Table 8 using both the separated and holistic approach of estimation.²⁸ Our results suggest that negative hyperactivity and inattention effects do not dissipate as children enter into primary school, and are also now manifest in female children. Both estimation strategies produce results which fall in the region of 1/6 of standard deviation, thereby implying a treatment effect with a lower bound close to 5/6 of a standard deviation. This finding dismisses the argument that children face a socialization cost when first entering a classroom-like setting, and suggests more permanent disruptions in child behaviour as a result of exposure to child care.

The math test score, a shortened version of the standardized Canadian Achievement Tests, requires students to answer 20 grade appropriate computational questions, and reports a scaled score based on the number of questions answered correctly. Coefficients for the policy dummy are insignificant at the 95 percent confidence interval in both estimation

²⁷A slight difference in the hyperactivity and inattention index for children aged 2-3 and 4-9 leads to the creation of a new index. This new index is constructed such that it can be compared across all ages using all of the same questions.

²⁸To conserve space we present only the estimates for the policy effect and do not include results on full-day kindergarten policy dummy.

Table 8: Outcomes for Children Aged 6-7

	Separated Approach			Holistic Approach		
	Overall	Females	Males	Overall	Females	Males
Math Score	-5.087 (4.195)	-17.737 (4.144)***	2.862 (6.52)	-7.111 (4.078)*	-15.829 (3.934)***	-2.600 (6.977)
Grade Retention	-0.014 (0.002)***	-0.007 (0.003)**	-0.022 (0.004)***	-0.018 (0.002)***	-0.009 (0.007)	-0.028 (0.006)***
Hyperactivity and Inattention	0.501 (0.116)***	0.608 (0.133)***	0.390 (0.145)**	0.476 (0.131)***	0.342 (0.145)**	0.592 (0.176)***

* Significant at the 10 percent level. ** Significant at the 5 percent level. *** Significant at the 1 percent level.
— Note: We present the estimation results of the policy dummy for Equation 2 under the heading Separated Approach and for Equation 1 under the heading Holistic Approach. The estimation includes the entire sample of children aged 6-7 who have given a valid response for the corresponding variable of interest. Note: The standard errors are reported in brackets.

procedures, indicating no lasting mean effect on mathematical achievement for students.²⁹

Our breakdown by gender reveals a pattern of large losses for female children, while the effects to male children remains insignificant.

Despite this negative effect on math scores, the Quebec Family Policy as a whole appears to reduce the number of students required to repeat grades by 1.4% percentage points. The prevention of grade repetition illustrated here suggests large savings for the Quebec government, and provides additional justification for the large amount of tax dollars directed toward the universal child care program. In the presence of increased hyperactivity and some lower math scores, it is also points to the possibility that mean effects are not capturing the whole story.

Since results vary between the sexes for math scores, we check for differences in the reduction of grade retention as well. The main portion of this reduction appears to be generated through benefits to male students: the estimated policy effect on the grade rep-

²⁹We test whether the results are sensitive to the scaling by running the regression on the raw score and find that our results are consistent.

etition of male students is 2.2%. Only weak evidence is found to suggest a reduction in grade retention for females, and the estimated effect is much lower—approximately 0.7%. These findings are somewhat controversial given existing perceptions that schooling typically benefits females more than males [52]. They also stand in contrast to a recent analysis by Anderson (2008) which suggests that female children performed better in comparison with male children in key targeted pre-kindergarten programs [3].³⁰ This suggests the presence of significant differences in the operation of targeted and universal programs.

7 Distributional Effects

In this section, we turn to the distributional analysis in hopes of providing a window into the heterogeneous effects of the Quebec Family Policy on child development. Figures 4, 5, and 6, present the unconditional regression estimates of the impact of the Quebec Family Policy impact on the quantiles of key developmental variables. Results can be interpreted as the change in the location of the quantile in response to the implementation of the policy. For example, the policy change induced a decrease in the location of the 5th percentile of the MSD scores distribution by -1.6 (corresponding to Figure 4a).

The most striking result revealed by this analysis is found in Figure 4a, which illustrates the distributional results of the MSD score for children aged 0-3. This figure provides a sharp contradiction to hypotheses suggesting that child care should improve outcomes at the lower end of the distribution. Strong advocates of universal child care have pointed to the extensive literature revealing positive effects of at-risk target child care programs such as Head Start. The argument is made that positive developmental gains for children in most need of the services provided through child care will counteract the losses that

³⁰The programs studied by Anderson (2008) were the Abecedarian study, the Perry Preschool Project, and the Early Training Project [3].

will occur for children taken from more effective parental care. Under this reasoning, initial negative mean results are understood to be an average of losses for highly developed children and gains for less developed children. Our estimates for children aged 0-3 provide evidence suggesting that this may not be the case. The estimates for quantiles in the lower half of the distribution are negative and significant, and the largest reported effect occurs at the 10th quantile. On the other hand, children in the upper portion of the distribution are seemingly unaffected by the shift to a universal child care program, as estimates are negative but mainly insignificant. This indicates that children in need of developmental support lose ground as a result of child care, and in turn casts some doubt on the ability of a universally available program to aid needy children in a similar way as targeted programs.

The observed variation across age and gender in the mean policy effects of MSD scores encourages further analysis by way of a distributional analysis, and subsequently leads to two main conclusions. First, the negative mean policy effects at lower ages are induced from a decline in the bottom portion of the distribution. This is clearly illustrated in Figure 4b which presents the distributional analysis for children aged 0 and shows significant decreases to the 1st, 3rd, and 10th quantile. Second, the breakdown by gender reveals a similar pattern of losses to the lower half of the distribution for female children, depicted in Figure 4c, while there remains few distributional effects for males.³¹ This result helps to explain the differences between the sexes in grade retention and raises questions about potential differences in treatment received for female children of varying ability. Additionally, it becomes clear that the effects of a universal child care system are less straightforward than would otherwise be indicated by a mean analysis, which had suggested that males fell behind and females remained constant (see Table 7b).

The use of unconditional quantile regressions on the math test score further exposes

³¹To conserve space we present only part of the graphical analysis for the breakdown by age and gender. Results are available upon request.

the limitation of average effects. The mean effects reported using Equation 2 are insignificant suggesting a limited impact of the Quebec Family Policy. The RIF regressions of this equation reveal declines in the test scores of the students performing the best.³² In particular, the 75th, 80th, 85th and 95th quantiles are all significantly negative. Since the impact of the policy was limited a small portion of the distribution insignificant mean estimates were unable to reveal any pattern of gains and losses. On the other hand, the results of analysis on the PPVT, presented in Figure 5a, are not as profound; coefficient estimates are insignificant across the distribution. It is important to note that we conduct analysis—and find similar results—on the both the standardized and raw PPVT scores, since the standardization of the score is designed to alter its overall distribution.

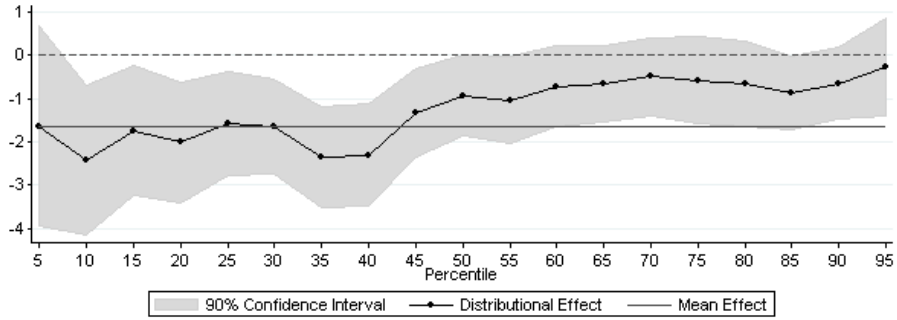
To some degree, this study must reconcile the lack of support for increases in the bottom portion of the developmental scores with the apparent reduction in grade retention discussed above. As language problems may pose larger barriers for children in achieving completion of kindergarten and grade one, it is possible that the MSD and math test scores do not adequately reflect achievement criteria for early grade completion. This explanation is an unlikely fit for the PPVT score which is both language related and a commonly used indicator for school readiness, and so this remains a mystery. Overall, this distributional analysis calls into question the reasoning that suggests a universal child care program can operate in a similar way to that of a targeted child care program, in particular for children aged 0-3. Attention should be directed towards existing child care practices in Quebec and the discovery and handling of developmental delayed or struggling children may warrant more focus in day to day practices.

Similar to policy effects on MSD scores above, we find that female children are the main force behind losses in the upper portion of the distribution for math scores (See Figures 5c

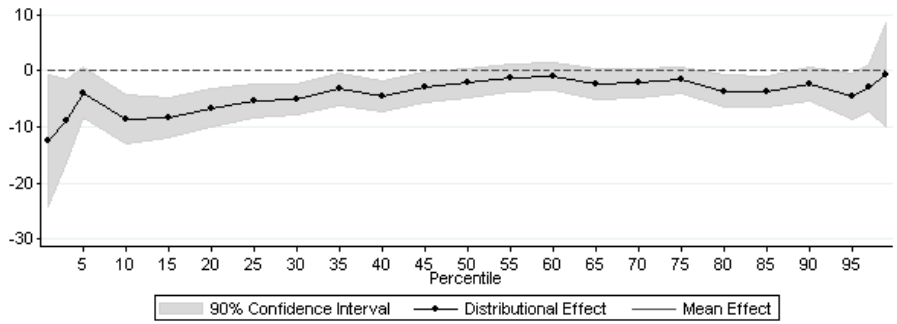
³²We also perform this estimation using Equation 1 and find a similar (but stronger) pattern of effects.

Figure 4: Distributional Effects I

(a) Motor and Social Development - Children Aged 0-3



(b) Motor and Social Development - Children Aged 0



(c) Motor and Social Development - Female Children Aged 0-3

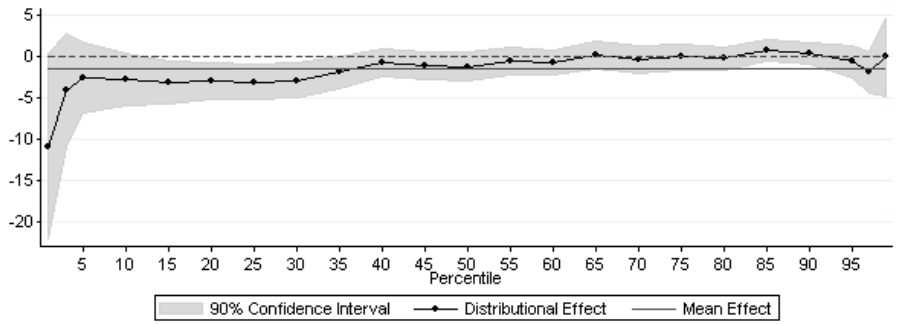
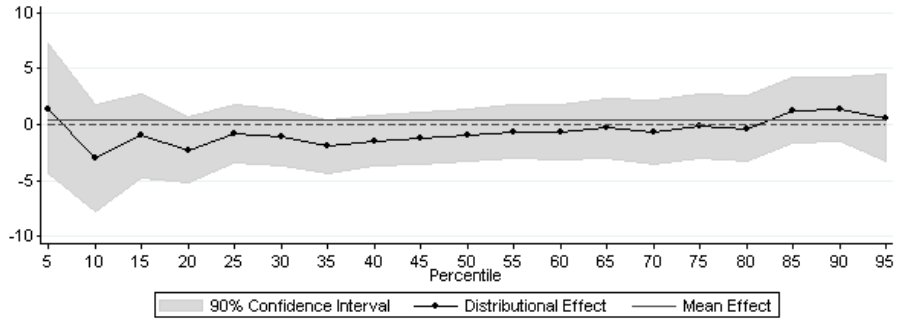
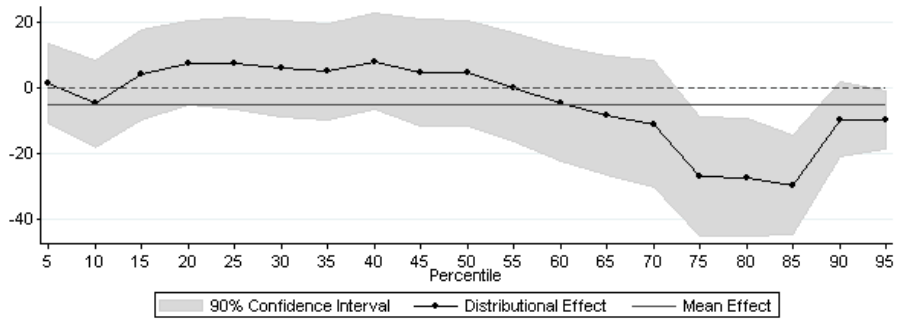


Figure 5: Distributional Effects II

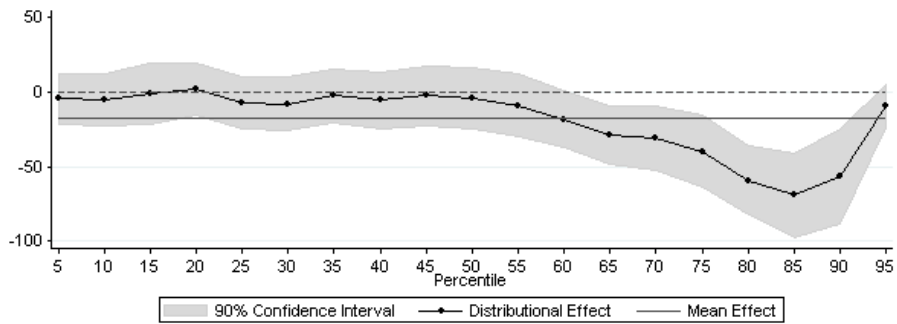
(a) Raw Peabody Picture and Vocabulary Test - Children Aged 4



(b) Math Test Score - Children Aged 6-7



(c) Math Test Score - Female Children Aged 6-7



(d) Math Test Score - Male Children Aged 6-7

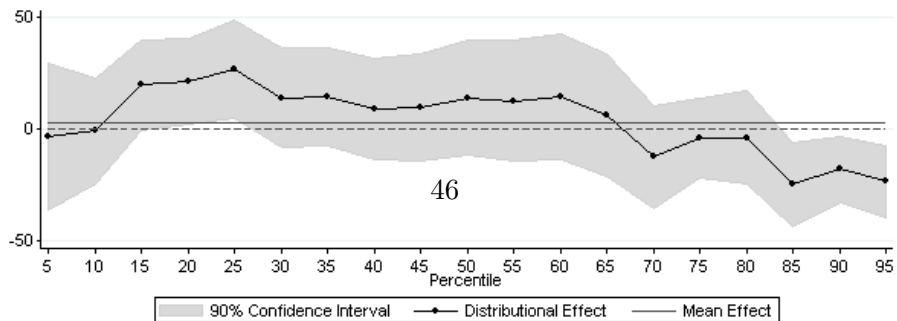
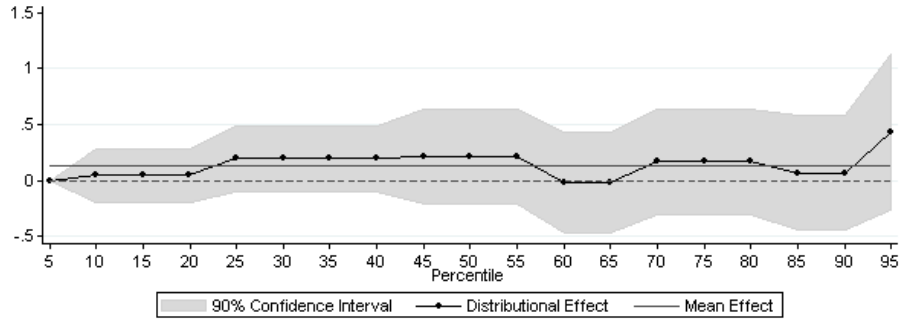
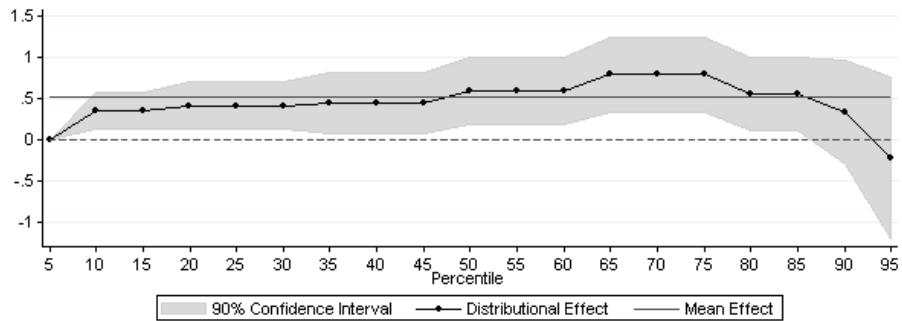


Figure 6: Distributional Effects III

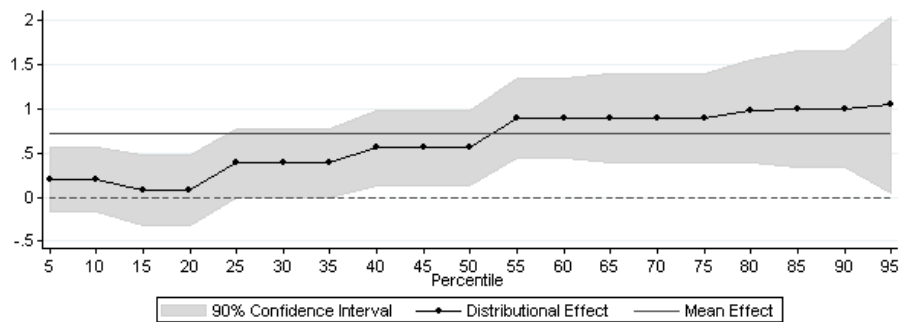
(a) Hyperactivity and Inattention Score - Female Children Aged 2-3



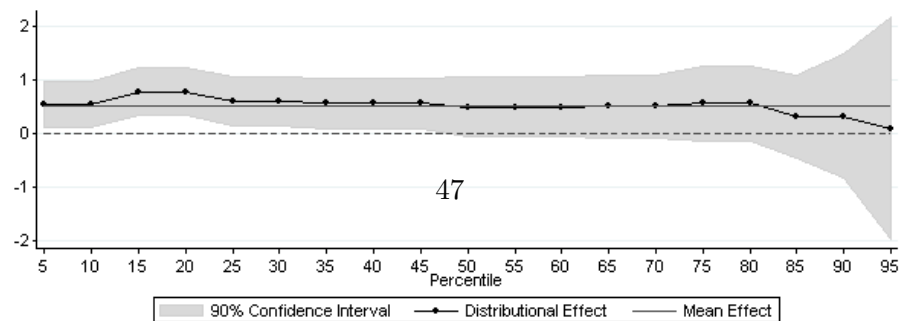
(b) Hyperactivity and Inattention Score - Male Children Aged 2-3



(c) Physical Aggression - Female Children Ages 2-3



(d) Physical Aggression - Male Children Ages 2-3



and 5d). Not surprisingly, such a result suggests that universal child care programs do not provide adequate stimulus for its most advanced participants.

On a final note, we would like to stress the complexities of the effects induced by formal child care enrolment. More interestingly, we find that patterns in gains and losses to behavioural indexes are much more varied between the sexes. In an analysis of the emotional anxiety index (which is not provided here), our findings highlight increases to the upper portion of the distribution for females alone, which indicates that child care may be aggravating pre-existing problems rather than introducing new ones.

In contrast, through the example of the hyperactivity and inattention scores for children aged 2-3 and the use of Figures 6a and 6b, it is evident that effects need not be biased to either side of the distribution. Although different between genders, the overall pattern of effects on hyperactive and inattentive behaviour is relatively consistent. Finally, previous mean analysis suggested that physical aggression increase in both boys and girls as a result of the Quebec Family Policy, see table 7b. The patterns revealed in Figures 6c and 6d, however, highlight major differences in the manifestation of this physical aggression. In females significant effects are found for the higher portion of the distribution while the opposite is true of males. In one case, there is an aggravation of problems, while in the other the creation of new problems. Again, this breakdown by gender and the distributional approach highlights the nuanced nature of child development. It stresses the many changes faced by children in daily interactions with parents, peers, and care givers as a result of child care attendance, and cautions over simplification in addressing child care-related issues.

8 Conclusion

In this paper new evidence is brought to the intensely debated issue of publicly funded and universally provided child care by way of newly available NLSCY data and econometric

techniques. First, we conducted a long-run analysis of the Quebec universal child care program. This highlighted sharp increases in program usage and maternal labour supply, continued degradation to child behavioural scores, and only small reductions in losses to the motor and social development of young children. Next, our examination of the impact of a universal child care program on school aged children reported both persistent negative behavioural effects as well as minimized grade retention. In this analysis we also discovered controversial new evidence suggesting that male children drive these positive effects. Finally, through the introduction of a technical distributional analysis, unconditional quantile regressions, surprising losses to motor and social development were found among the weakest children in the 0-3 age group, and particularly for females.

The overall impact of the Quebec Family Policy, and the subsequent changes to child care programs in the province over time, however, complicate any causal interpretation of these results. Due to shifting quality factors, changes in modes of care, increases to maternal labour supply, and changes in parental behaviour, the exact workings of a universal child care program is less than obvious. Despite this inability to differentiate between causal effects, the outcomes presented in this study still makes several contributions to child care policy debates by approaching reported results as the overall impact of the Quebec Family Policy.

These contributions are mixed in their support for a universal child care program. The child care quality initiatives implemented by the Quebec government were unable to successfully combat negative behavioural. Thus, this research concludes that the improvement of behavioural outcomes by way of quality of care improvements is unlikely. In addition, the persistence of negative behavioural outcomes into later years counters arguments that early behavioural problems are an initial socialization cost to classroom exposure. In spite of the negative behavioural and developmental outcomes, support for universal child care

programs is found in the decline of students repeating early primary grades. Although these findings only reflect the first years of primary school, they still represent cost-savings for the Quebec government.

The holistic approach of this study to the assessment of the Quebec Family Policy emphasizes the need for future research to dissect the mechanics of a universal child care program, in order to clarify causal relationships. Further research is also required to discern why results show a reduction in grade retention when there remains an absence of positive gains on language and math test scores, and when problematic behaviour, such as hyperactivity and inattention, is on the increase. Although providing an initial look at a distributional impact of child care use, the techniques used in this paper warrant further application to child care related problems. In conclusion, we first suggest that the unexpected losses to children at the bottom of the distribution make imperative future qualitative and quantitative research on improving outcomes of struggling children in all types of child care settings. Secondly, we suggest that this additional research be particularly sensitive to gendered effects in order to uncover apparent differences between targeted and universal programs in the treatment of the sexes.

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