

# The Effects of Cash Transfer Fertility Incentives and Parental Leave Benefits on Fertility and Labor Supply: Evidence from Two Natural Experiments

Xiaoling Lim Ang

Published online: 28 March 2014  
© Springer Science+Business Media New York (outside the USA) 2014

**Abstract** This paper examined the labor supply and fertility effects of fertility incentives by making use of two major policy changes that occurred in Canada over the past 25 years: the Quebec Parental Insurance Program which provided generous parental leave benefits, and the series of cash-transfer fertility incentives introduced in Quebec in the 1980s. The empirical work for these projects was conducted using confidential versions of the Canadian Census and the Labour Force Surveys on-site at Statistics Canada. I found that while increases in the generosity of parental leave benefits substantially increased the birth rate and induced increases in labor supply among women of childbearing age, cash-transfer fertility incentives only slightly increased birth rates and decreased female labor supply. The net government cost of each additional birth due to an increase in the generosity of parental leave programs was \$15,828 in 2008 Canadian dollars, whereas the net government cost of an additional birth due to cash-transfer fertility incentives was \$223,625 in 2008 Canadian dollars. Therefore, paid parental leave is a low-cost way to increase fertility whereas the price per additional birth due to cash-transfer fertility incentives is quite high.

**Keywords** Fertility incentive · Fertility · Labor supply · Parental leave · Canada · Natural experiment

## Introduction

As fertility control has become quite reliable, having children has become more of an economic decision. Since having a child is an irreversible decision and children are very time and resource intensive, the trade-offs between family and career are hard to ignore. The ability to control fertility through effective oral contraceptives increased women's career investments and labor force participation, delayed marriage, and decreased fertility expectations (Goldin and Katz 2002; Bailey 2006). Fertility rates have fallen to below replacement rates in many developed countries (Bongaarts 2002). Low fertility rates have raised concerns about aging populations and the viability of social security systems. In response to these concerns, various governments, including the national governments of Singapore, Germany, Poland, and Italy, have introduced pronatalist policies intended to raise the birth rate. Some of these benefits have been sizeable. For example, Singapore's Working Mother's Child Relief provided a maximum annual transfer of S\$50,000 per child in 2009 (Inland Revenue Authority of Singapore 2009) and January 1, 2007 Germany increased the maximum monthly payment of *eltengeld*, which was paid to stay-at-home payment of infants, from € 450 to € 1800 (Kulish 2007). Beyond potentially expanding the next generation's workforce through encouraging fertility, fertility incentives may also impact the labor supply of the current generation of women of childbearing age. The effects of fertility incentives on labor supply bring into play two classical problems in labor economics: the effect of social programs on labor supply and the effect of fertility on labor supply. These programs have taken on two major flavors: cash-transfer fertility incentives and parental leave benefits. The implementation of these programs raises three intuitive questions:

---

X. L. Ang (✉)  
Consumer Financial Protection Bureau, Office of Research,  
1700 G St NW, Washington, DC 20552, USA  
e-mail: xiaoling.ang@cfpb.gov

1. To what extent do fertility incentives increase the birth rate?
2. What are the effects of fertility incentives on labor supply?
3. Net of labor supply, what is the cost per additional birth generated by fertility incentives?

This paper considered two natural experiments that occurred in Canada in the last three decades, and evaluated fertility incentives with regards to their effects on birth rates and female labor supply. I found that cash-transfer fertility incentives had small positive effects on the birth rate and were associated with decreases in labor supply while increases in the generosity of parental leave benefits both increased birth rates substantially and also increased labor supply. Specifically, the pronatalist policies introduced in Quebec in the late 1980s, including the Allowance for Newborn Children, which provided a baby bonus, and the Availability Allowance, which made annual payments to families with children five years old and younger, provided an opportunity to study the effect of cash-transfer fertility incentives as similar programs were not implemented in the other Canadian provinces and territories at the same time. Using data from the 1986, 1991, and 1996 Canadian Census 20 % Master Files I found that the program was associated with a 1.72 % increase in the birth rate and a decrease in labor force participation of approximately 4 percentage points among women who had a child age five or under. This corresponds to an 0.8 percentage point decline in labor force participation of women of childbearing age and a decline in earnings of C\$403 per year in 1986 dollars. In contrast, when I evaluated the Quebec Parental Insurance Program (QPIP), which was introduced by the provincial government of Quebec in January 2006 and increased the benefit level of maternity leave benefits from the federal level of 55 % of previous income to 70 % of previous income for the first 25 weeks from takeup and also increased the cutoff for maximum insurable earnings, the results were starkly different. Using data from the Labour Force Survey (LFS) Master Files, I found that the implementation of the program was accompanied by a 23.53 % increase in the birth rate as well as a 1.5 percentage point increase in the labor force participation rate of women age 25–45. Among women with infants there was an increase in leave-taking from work of about 5.4 percentage points.

## Review of Literature

The irreversibility of the fertility decision and the fact that children are parental time-intensive makes the demand for births and the effects of additional births different from the

case of the typical good in the consumer problem. When it offers a fertility incentive, a government clearly has an interest in the quantity and quality of children produced as a consequence of the program. However, it has very little influence over how the transfer money is spent. Not only are transfers received by inframarginal families that would have the same number of children without the subsidy, but within a family transfers may not be entirely directed towards the wellbeing of children. In particular, if adult family members consume more leisure because of the transfers, this will drive up the cost of the program by reducing the tax base.

The most straightforward question to ask about fertility incentives is to what extent they increase fertility. In the very short run, the timing of births might be adjusted through scheduled caesareans and inductions in order to receive benefits. Dickert-Conlin and Chandra (1999) found that the US personal exemption for dependent children and standard deduction for heads of household caused mothers to shift their delivery dates from January to December. Gans and Leigh (2009) found that the announcement of the AU\$3000 Australian Maternity Payment in 2004 led pregnant women to shift their delivery dates to after the introduction date of the program. Similarly, Whittington et al. (1990) found that the American federal personal exemption for dependent children led to a positive and significant effect on the birth rate. Parent and Wang (2007) found that, while the 1970s reform of family allowances in Canada led to short run increases in births, these effects appeared to be tempo effects, so the reforms did not affect the total number of children born to women in the long run. Considering the longer term effects of cash-transfer fertility incentives on birth rates, Milligan (2005) attributed a 12 % increase in fertility in Quebec to the Allowance for Newborn Children, while Kim found that this program had little permanent impact on fertility and that the impact was largest for women with lower income (Kim 2012, 2014). The analysis of cash transfer fertility incentives in this article differs from Milligan's and Kim's work because it considered labor market outcomes in addition to fertility incentives, used the Canadian Census Master Files instead of the public microdata files so that age and parity of children are precisely constructed, and took account of other cash-transfer programs for families with dependent children that were concurrently introduced in Quebec, such as the Availability Allowance, in the cost-benefit analysis.

Fertility has been shown to respond to other public policies that are tied to the number and ages of children in a household. Baughman and Dickert-Conlin (2003) found that increases in the generosity of the American Earned Income Tax Credit led to an increase in births among both married and unmarried non-white women and an insignificant effect among white women. Using the National

Longitudinal Survey of Youth 1979, Rosenzweig (1999) found that higher Aid to Families With Dependent Children (AFDC) and lower marital prospects increased the probability of having a birth out of wedlock, while Hoffman and Foster (2000) found that a 25 % increase in AFDC benefits implied a 5 % increase in nonmarital births using the Panel Study of Income Dynamics. Also, Lundberg and Plotnick (1995) found that welfare guarantees increased premarital births among white adolescents, and Grogger and Bronars (2001) found that higher welfare payments prolonged the time between a woman's first birth and marriage for unwed whites and a moderate link between base welfare benefits and subsequent fertility of unwed blacks. Using an experiment in the early 2000s in New Jersey that denied US\$102 per month of benefits to recipients who conceived and gave birth to a second child while on welfare and US\$64 per month for higher parity children, Jagannathan et al. (2004) found that lowered benefits reduce birth rates and that this effect was larger for groups who received benefits for less time.

The effect of fertility incentives on labor supply might depend on the magnitude of the fertility response as well as policy design. One of the most common ways to encourage childbearing while taking career considerations into account is through job-protected parental leave, which legally mandates that a parent's employer preserve her job while she is on leave. These policies have taken on different forms, varying in the duration of leave offered, eligibility criteria, and the generosity of benefits payments during period of leave.

Most of the previous research on the effects of parental leave focused on the existence of parental leave and not on its characteristics. One of the most broadly studied programs was the American 1993 Family and Medical Leave Act (FMLA), which mandated 12 weeks of unpaid maternity leave. When considering general equilibrium effects, Gruber (1994) found that the group-specific mandate reduced the hourly wages of married women of childbearing age, which was the group most at risk of taking unpaid leave and thus the most likely to impose costs on employers. With respect to the impact of FMLA on mothers, Klerman and Leibowitz (1994) found that the introduction of the program increased the employment rates and the rates of being on leave of mothers of children less than 1 year old relative to those with children who were 2 or 3 years old. Using a comparison group of all other women, Baum (2003) found that the FMLA did not have a significant effect on the labor supply or wages of mothers with infants or women of childbearing age. In contrast, Waldfogel (1998) found that maternity leave had a positive effect on the wages of returning mothers and increased the probability that they returned to the same employer. In a separate study Waldfogel (1997) found that

those who were formally covered by maternity leave had the steepest rate of wage growth.

The FMLA did not provide any income replacement, so its effects may be substantially different from programs that provide paid benefits. Understanding the effects of the different components of paid maternity leave benefits is of clear public policy interest. In a cross-country analysis of developed nations Ruhm (1988) found that countries with paid maternity leave had higher female employment to population ratios, but did not establish causality. Waldfogel (1988) argued that negative effects of mandated paid benefits may be counteracted by positive employment effects. Her argument was based on the fact that the United States, which had no paid parental leave, had a larger pay gap between women with and without children than the United Kingdom, which provided some income replacement during mandated parental leave. In defense of maternity benefits being productive, Ruhm and Teague (1997) found that, while unpaid maternity leave had no effects on GDP, paid leave was associated with an increase in GDP. Turning attention to the study of specific programs, Phipps (2000) found that the 1997 increase the minimum number of hours worked required to qualify for parental leave benefits in the year prior to takeup from 20 weeks with 15 h worked per week (300 h total) to 700 h over the course of year did not cause women in Canada to adjust their labor supply. Considering the effects of an increase in the duration of maternity benefits in Canada in 2001 Baker and Milligan (2008) found that an extension of the duration led to an increase in time away from work of mothers with infants. The effect of parental leave policies tend to effect mothers' labor supply more than fathers' labor supply. For example, in studies using Norwegian administrative data, Lappegard (2012) found that in a gender egalitarian parental leave scheme, mothers still took the majority of parental leave and Ugreninov (2013) found that paternity leave did not have a significant effect on mothers' sick leave absences.

The effects of cash-transfer fertility incentives on labor supply have been less widely studied. Some of the most salient research has studied welfare benefits whose generosity depends on family structure. Since these programs are means-tested and often also have labor supply restrictions, they have a direct impact on the labor supply of people who are eligible. Livermore and Powers (2006) found that nutrition, employment, and instrumental social support programs were associated with higher employment among single mothers, while other social programs may have provided a disincentive to participating in the labor force. The American Earned Income Tax Credit (EITC) has been one of the most widely studied such programs and requires that participants work in order to receive benefits. Not surprisingly, various authors, including Eissa and Liebman

(1996), Meyer (2002), and Meyer and Rosenbaum (2001) found that the expansion of the benefit amount encouraged labor supply. However, most of the change occurred along the extensive margin and, at the higher eligible income levels, where benefits are being phased out, there seemed to be no adjustment in hours worked. Also, Cancian and Levinson (2006) considered the Wisconsin EITC supplemental benefit for families with three children and found that it had no significant effect on labor supply. Milligan and Stabile (2007) examined the case of the 1998 Canadian National Child Benefit which was integrated with social assistance payments in a subset of the provinces, and found that the integration of the benefit effectively lowered the welfare wall and led to a decrease in social assistance receipt.

## Materials and Methods

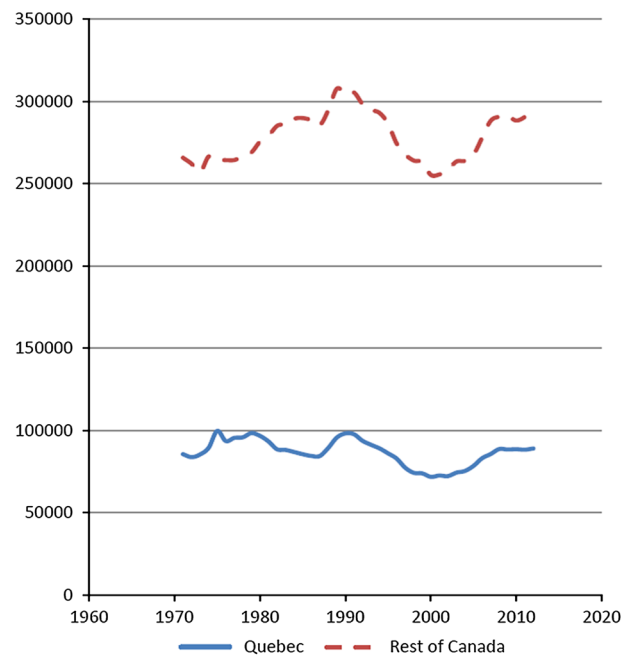
### Policy Variation

Figure 1, which was constructed using Statistics Canada's series of live births (Statistics Canada 2013a, b), plots the number of births in Quebec and Canada. Panel A shows the number of births for all women from 1971 to 2011 and Panel B shows the number of births for women age 25–44 from 1991 to 2011. Note that in both graphs the trends of crude birth rate are roughly parallel. Over this period, the total fertility rates in Quebec lagged behind those in the rest of Canada and are well below the North American replacement total fertility rate of 2.085 (Espenshade et al. 2003). To counteract these trends, the government of Quebec introduced a series of policies designed to encourage childbearing in the late 1980s. These programs were mostly not income tested and applied to all parents of young children. This situation provided an appropriate policy environment to study the effects of cash-transfer fertility incentives on labor supply because similar programs were not introduced in the rest of Canada at the time. The programs in Quebec tended to favor higher parity children and, through a combination of allowances and tax exemptions, provided large subsidies to families with dependent children. This series of programs ended in 1997, due to the perceived ineffectiveness of the programs. In 2006, a second set of Quebec-specific fertility incentives was introduced: The QPIP effectively increased the income replacement rate of parental leave benefits.

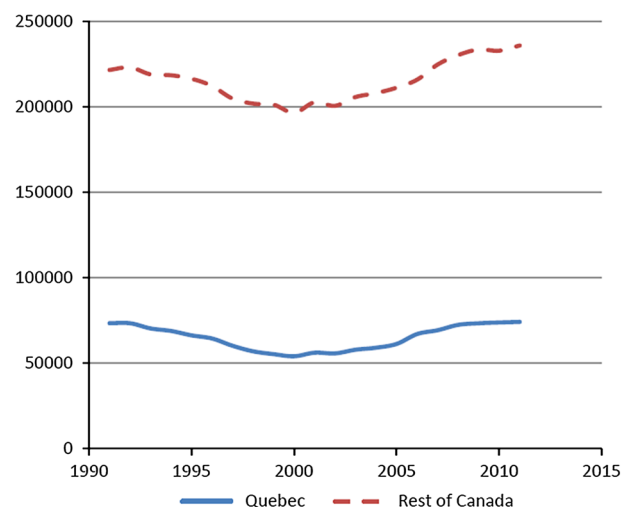
### Cash-Transfer Fertility Incentives

Figure 2 presents a timeline of the Quebec policy changes, and Table 1 summarizes the benefits for families earning C\$40,000. The largest expansion of pronatalist policy was

Panel A: Live Births to Women of All Ages, 1971–2011



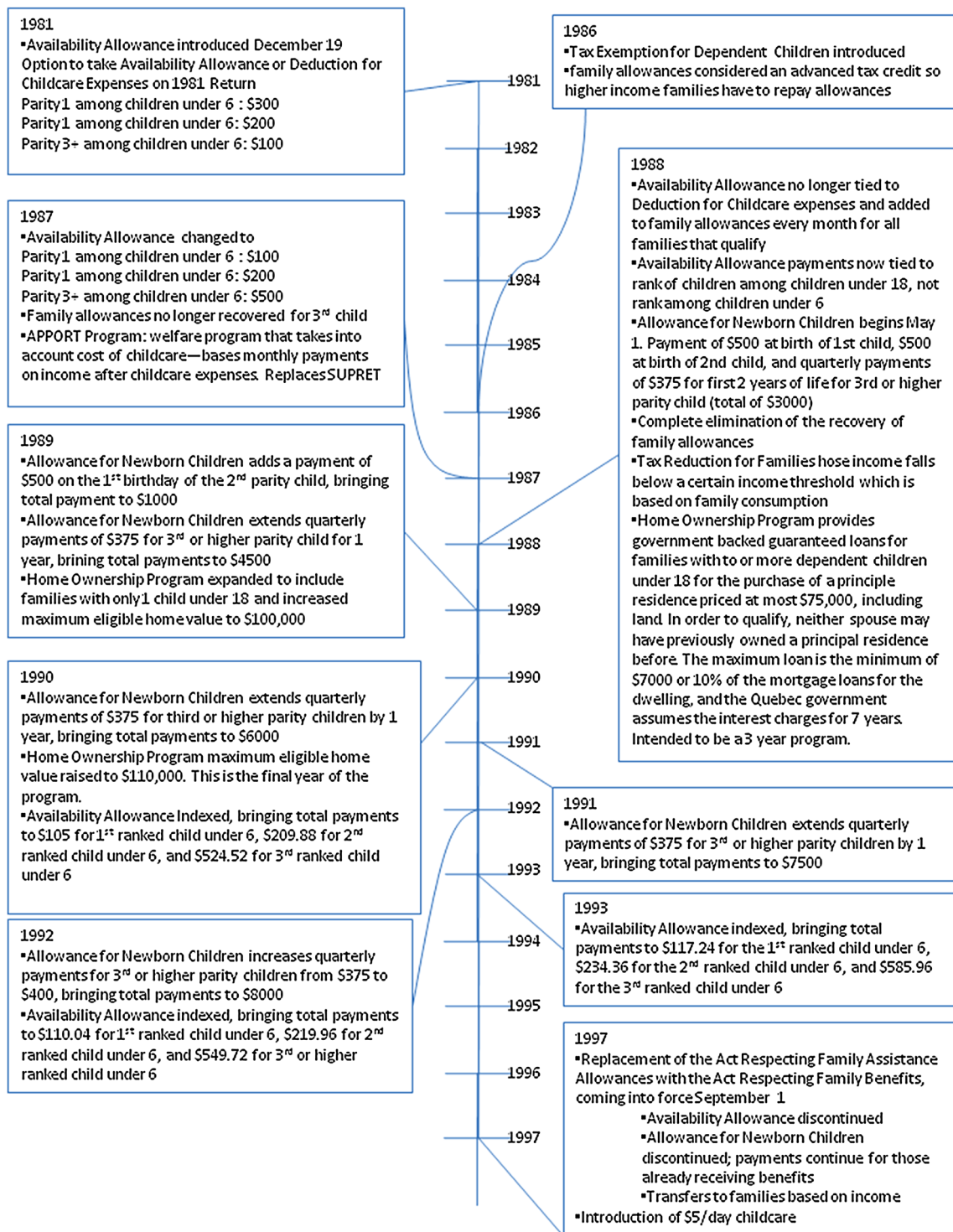
Panel B: Live Births to Women Age 25–44, 1991–2011



Statistics Canada Table 051-004 Table 102-4503.

Fig. 1 Live births to women of all ages, 1971–2011

announced in the 1988 Quebec Budget Speech (Levesque 1988). These new policies included introducing of the Allowance for Newborn Children, which provided cash payments at birth; making the Availability Allowance, which provided payments to parents of children five and under, universal; and the eliminating the recovery of family allowances. Another major change occurred in 1986 when tax exemptions for dependent children were introduced. One of the key features of the programs implemented between 1988 and 1997 was that they were more generous for children of third or higher birth order and increased in

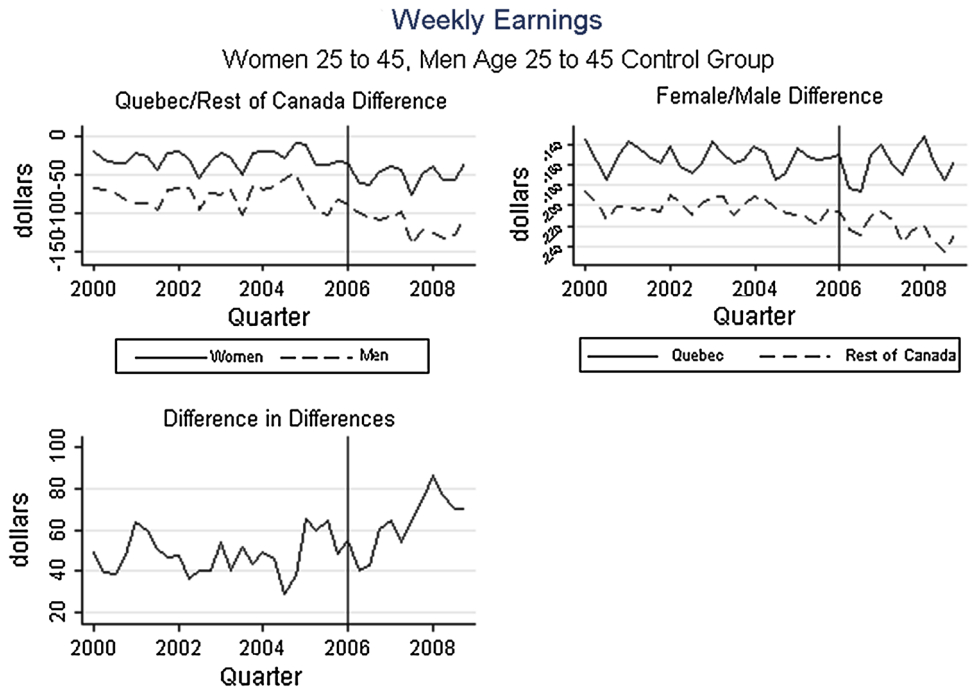


**Fig. 2** Timeline of cash-transfer fertility incentives

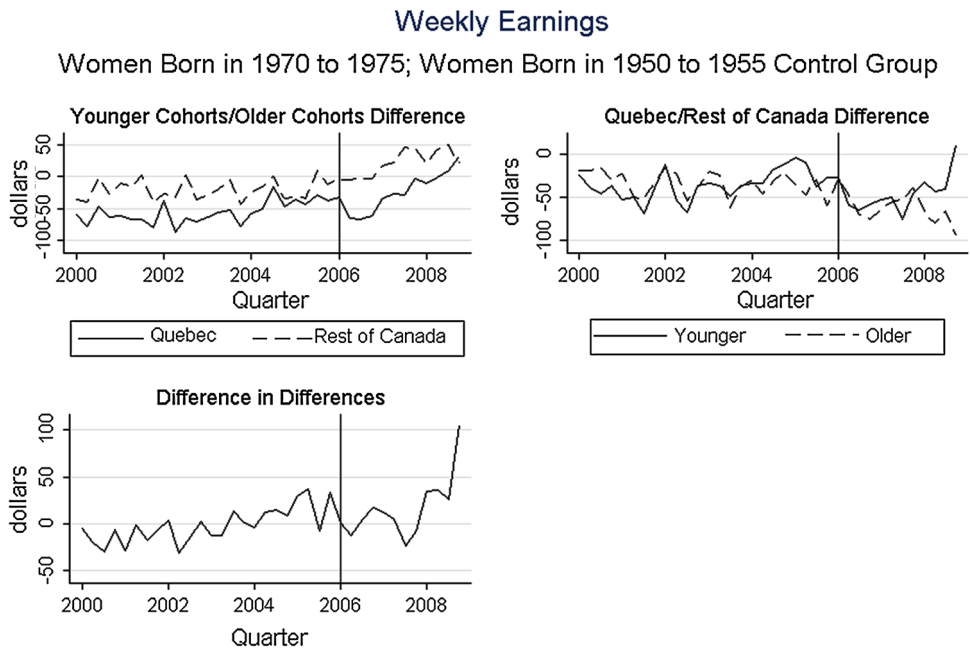
generosity over time, as shown in Table 2 for the Allowance for Newborn Children. While payments for first and second parity children were either C\$500 or C\$1000 total for most of the life of the program, benefits for third or higher parity children increased from a total of C\$3000 in 1988 to C\$8000 at the end of the program.

In addition to these universal programs, Quebec also separated the Availability Allowance from the tax deduction for childcare expenses, further increasing transfers to families. The government of Quebec also introduced a home ownership program that provided government backed guaranteed loans for families with dependent

**Fig. 3** Female–male differences in weekly earnings, individuals age 25–45



**Fig. 4** Differences in weekly earnings, women born 1970–1975 and 1950–1955



children to purchase a first home. For low income families, Quebec revised its welfare program to take into the account the costs of childcare and also provided tax relief to families. These programs were eliminated with the replacement of the Act Respecting Family Assistance Allowances with the Act Respecting Family Benefits on September 1, 1997 (Québec 1997). The policies implemented by this legislation included the introduction of five Canadian dollar per day childcare. Details of these policy changes are available upon request.

Table 1 describes the benefits received by families of different compositions from the Allowance for Newborn Children, the Availability Allowance, family allowances, and tax exemptions for dependent children. The hypothetical families have taxable income of C\$40,000 and their benefit levels are calculated for 1986, 1991, and 1996. Since most of the universal child-benefit programs in provinces outside of Quebec were administered through the income tax system and all provinces but Quebec were part of a federal-provincial tax agreement that made provincial

**Table 1** Transfer levels for a family with \$40,000 taxable income

	Transfers, no additional child				Transfers, birth in 1st period				Gains from additional child			
	(1) Quebec	(2) Ontario	(3) QC- ONT	(4) QC-ONT vs 1986	(5) Quebec	(6) Ontario	(7) QC- ONT	(8) QC-ONT vs 1986	(9) Quebec	(10) Ontario	(11) QC- ONT	(12) QC-ONT vs 1986
Panel A: first year of transfers												
Moving to 3rd child, previous children age 3 and 7												
1986	1,532	982	550		2,612	1,969	643		1,080	987	93	
1991	2,255	1,148	1,107	557	6,140	2,295	3,845	3,201	3,885	1,147	2,738	2,644
1996	2,607	1,549	1,058	508	6,969	2,857	4,112	3,469	4,363	1,308	3,055	2,961
Moving to 2nd child, previous child age 3												
1986	981	712	269		1,732	1,425	307		751	712	38	
1991	1,143	574	569	299	3,054	1,148	1,906	1,598	1,911	574	1,337	1,299
1996	910	529	381	112	3,154	1,762	1,392	1,085	2,244	1,233	1,011	973
Moving to 1st child, no previous children												
1986					981	712	269		981	712	269	
1991					1,643	550	1,093	823	1,643	550	1,093	823
1996					1,410	529	881	612	1,410	529	881	612
Panel B: sum of transfers until youngest child is 18, discount factor 5 %												
Moving to 3rd child, previous children age 3 and 7												
1986	12,773	9,223	3,550		24,878	20,616	4,262		12,105	11,393	712	
1991	20,978	11,111	9,868	6,318	50,404	24,133	26,272	22,010	29,426	13,022	16,404	15,692
1996	23,567	12,979	10,588	7,038	57,357	26,278	31,080	26,818	33,790	13,298	20,491	19,779
Moving to 2nd child, previous child age 3												
1986	8,171	7,646	525		16,285	16,233	51		8,114	8,587	-473	
1991	11,731	6,161	5,570	5,045	28,474	13,080	15,394	15,342	16,743	6,919	9,824	10,297
1996	9,189	6,876	4,809	4,284	28,952	16,834	12,117	12,066	19,763	9,958	9,805	10,278
Moving to 1st child, no previous children												
1986					9,567	8,587	979		9,567	8,587	979	
1991					13,817	6,630	7,187	6,208	13,817	6,630	7,187	6,208
1996					10,884	5,095	5,789	4,809	10,884	5,095	5,789	4,809

Transfers consist of family allowances, Allowance for Newborn Children, Availability Allowance, child tax benefits, and exemptions for dependent children for a family with \$40,000 taxable income in Quebec or Ontario. Present discounted value of transfers calculated using transfer levels in reference year. Marginal tax rates are obtained from various editions of The National Finances

income taxes proportional to federal income taxes, I took Ontario's benefit levels to be representative of benefits in the rest of Canada. Panel A of Table 1 describes the 1 year benefits received by the constructed families while Panel B describes the total benefits that the family would have received for the existing children given the policy environment of that year through the age of 17, with an annual discount factor of 0.95. The constructed families have either zero children, one child age three, or two children age three and seven. Column 1 calculates the benefit level for each family in Quebec and Column 2 calculates the benefit level for each family in Ontario. Column 3 takes the difference between Column 1 and 2, which is the difference in benefits for a particular family composition in Quebec versus Ontario. Column 4 takes the difference

between a given year's value in Column 3 and the corresponding value for 1986. This number is the amount by which benefit increases since 1986 in Quebec exceed benefit increases in Ontario. Columns 5 through 8 repeat the exercise, adding an infant to each hypothetical family. Columns 9 through 12 consider the gains from having this additional child.

The most salient feature of Table 1 is that the gains in Quebec over the gains in Ontario relative to the 1986 benefit levels in Columns 4, 8, and 12 are positive in both panels. The positive values in Columns 4 and 8 show that all families with young children, regardless of whether or not they changed their fertility, would have received higher transfers in 1991 and 1996 than they would have under the programs in place in 1986. The positive values in Column

**Table 2** Allowance for Newborn Children benefits

Period	1st child	2nd child	3rd or higher child
May 1988–April 1989 (Levesque 1988)	C\$500 at birth	C\$500 at birth	8 quarterly payments of C\$375 (C\$3000 total)
May 1989–April 1990 (Levesque 1989)	C\$500 at birth	C\$500 at birth, C\$500 on 1st birthday	12 quarterly payments of C\$375 (C\$4500 total)
May 1990–April 1991 (Levesque 1990)	C\$500 at birth	C\$500 at birth, C\$500 on 1st birthday	16 quarterly payments of C\$375 (C\$6000 total)
May 1991–April 1992 (Levesque 1991)	C\$500 at birth	C\$500 at birth, C\$500 on 1st birthday	20 quarterly payments of C\$375 (C\$7500 total)

**Table 3** Parental leave benefits

Type of benefit	Quebec basic plan		Quebec special plan		Federal plan	
	Number of weeks	Income replacement (%)	Number of weeks	Income replacement (%)	Number of weeks	Income replacement (%)
Maternity	18	70	15	75	15	55
Paternity	5	70	3	75	0	–
Parental	7	70	25	75	35	55
	25	55				
Maximum total benefit	C\$40430.29		C\$37521.63		C\$21750	

12 show that the increase in benefits for having an additional child compared to the benefit levels in 1986 was larger in Quebec than in Ontario. Interestingly, from Panel A it is clear that while the one year gain in benefits for having an additional child in Quebec relative to the rest of Canada was growing between 1991 and 1996 for third or higher parity children, it was actually declining for first and second parity children. Similarly, the present discounted value of the increase in lifetime benefits in Quebec from having an additional child relative to the benefits gain in Ontario in Column 12 of Panel B are increased from C\$15,692 to C\$19,779 between 1991 and 1996 for third parity children. For second parity children this barely changed; in 1991 the relative benefit gain is C\$10,297 while in 1996 it is C\$10,278. For first parity children, however, this gain declined, from C\$6,208 in 1991 to C\$4,809 in 1996.

One of the key features of cash-based fertility incentives is that they provide benefits to families who do not necessarily adjust their fertility because of the program. Columns 4 and 8 capture this effect. Comparing the lifetime benefits gains in Quebec versus Ontario in Columns 4 and 8 in Panel B it is clear that they were increasing in the parity of the child. For example, a family that has a first parity infant Quebec in 1996 could have expected a lifetime gain in benefits versus 1986 C\$4,809 larger than the same family residing in Ontario. In comparison, a family

that had a second parity child could have expected a relative lifetime gain of C\$12,066 and a third parity child could expect a relative lifetime gain of C\$26,818. Gains for infants were substantially larger than gains for older children. This occurred as a consequence of the Allowance for Newborn Children as well as the generosity of the Availability Allowance increasing in the parity of a child.

#### *Quebec Parental Insurance Program*

Prior to 2006 parental benefits in all Canadian provinces were administered at the federal level as prescribed by the Employment Insurance Act of 1996 and its amendments in 2000. Under the act major attached claimants, defined as those with at least 700 h of insurable earnings over the past year, could receive up to 15 weeks of pregnancy benefits and 10 weeks to care for a newborn infant, to be split between parents, at a 55 % replacement rate up to a cap of C\$39,000 average annual earnings (Canada 1996). In 2000 the federal Employment Insurance Act was modified to extend the number of weeks of benefits for caring for a newborn from 10 to 35 to be shared between parents, leading to a total of 50 insured weeks. Furthermore, the definition of a major attachment claimant was redefined as one who has at least 600 h of insurable earnings over the past year (Canada 2000).



**Table 4** Means for women age 25–45, Census Master Files

Variable	1986		1991		1996	
	Quebec	Rest of Canada	Quebec	Rest of Canada	Quebec	Rest of Canada
Age	34.215	34.461	34.775	34.590	35.593	35.309
Education						
High school dropout	0.307	0.308	0.255	0.307	0.239	0.209
High school graduate	0.171	0.255	0.277	0.171	0.194	0.245
Some post-secondary	0.387	0.329	0.337	0.387	0.413	0.377
University degree +	0.135	0.108	0.131	0.135	0.154	0.168
Marital Status						
Is married	0.726	0.708	0.554	0.726	0.663	0.446
Is married or commonlaw	0.715	0.700	0.718	0.715	0.735	0.687
Official languages spoken						
English	0.991	0.427	0.439	0.991	0.478	0.992
French	0.122	0.953	0.957	0.115	0.956	0.116
Naturalized Canadian citizen	0.132	0.060	0.062	0.134	0.143	0.07
Labour force participation	0.765	0.688	0.764	0.818	0.800	0.754
Hours worked						
Including zeros	22.326	19.310	21.925	24.310	22.300	24.335
Positive only	35.303	34.260	34.708	35.572	34.634	35.374
Weeks worked						
Including zeros	31.051	28.123	32.549	34.862	31.889	33.989
Positive only	40.612	40.892	42.588	42.607	42.267	42.502
Earnings in 1986 dollars						
Including zeros	10,822	9,650	11,852	13,190	13,078	11,733
Positive earnings	14,425	14,371	16,350	15,635	15,795	16,640
Sample size	232,545	629,710	238,175	677,280	237,125	719,840

Sample sizes rounded to the nearest 5 for data security reasons.

Data from Census Master Files. Restricted to women 25 to 45 years old who are Canadian citizens and either heads of household, lone persons, or wife or female commonlaw partner

Starting January 1, 2006 benefits in Quebec have been administered by the provincial government under the QPIP.<sup>1</sup> This program increased income replacement rates, increased maximum insurable earnings, extended benefits to the self-employed, and introduced 7 weeks of designated paternity leave. The replacement rate was increased to 70 % for the first 18 weeks of maternity benefits, the 5 weeks of paternity benefits, and the first 7 weeks of parental benefits. For the remaining 25 weeks of parental benefits, the replacement rate remained 55 %. Maximum insurable earnings were also increased to C\$60,500 from their previous level of C\$39,000. Families also had the option to choose a special plan equal to 75 % of average weekly earnings, shortening the duration of benefits to 15 weeks for maternity leave, 3 weeks for paternity benefits, and 25 weeks for parental benefits. A minimum of C\$2000 of annual earnings was required to qualify with no accompanying hours requirement. Average weekly earnings were calculated as the average of earnings in the 26

weeks prior to takeup. If less than 26 weeks were worked, then the average was the individual’s earnings over the 26 weeks prior to takeup divided by the larger of the number of weeks worked or 16. Also, maximum annual insurable earnings in Quebec were increased to C\$60,500. Table 3 compares the design of the QPIP to the federal program. Under the federal program the maximum total benefit was C\$21,750 while under the Quebec program the maximum total benefit was C\$40,340.29. These benefits are financed by a payroll tax which was levied at a rate of 0.416 % on employees and 0.583 % on employers in 2006 and 2007 which was increased to 0.450 % on employees and 0.630 % on employers in 2008 (Québec 2007, 2008, 2009).

Empirical Strategy

The evaluation of each set of fertility incentives followed parallel difference-in-difference (DID) strategies. To understand the effects of the programs, I considered the effects of the policy changes on women of childbearing age who are exposed to the programs and the effects of the policy changes on women who are eligible for the program. In practice, I considered women age 25–45 to be of

<sup>1</sup> While the legislation was drafted by the Quebec National Assembly in 2001 (Québec 2001) as an Act Respecting Parental Insurance it was only brought into force by an amendment in 2005 (Québec 2005b).

**Table 5** Means for women age 25–45, Labour Force Surveys

	Before 2006		In or after 2006	
	Quebec	Rest of Canada	Quebec	Rest of Canada
Age	35.722	35.592	35.287	35.454
High school dropout	0.266	0.274	0.204	0.238
High school graduate <sup>a</sup>	0.030	0.038	0.023	0.030
Some higher education	0.460	0.440	0.482	0.429
University degree +	0.244	0.248	0.291	0.304
Married	0.402	0.625	0.332	0.597
Common-law	0.310	0.096	0.360	0.112
Married or common-law	0.712	0.721	0.692	0.709
Labor force participation	0.814	0.813	0.836	0.818
Employed	0.753	0.764	0.786	0.778
Employed and present	0.664	0.686	0.672	0.692
Actual total hours worked	22.898	24.043	23.197	24.439
Total usual hours worked, nonzero	34.734	35.406	35.023	35.823
Weekly earnings	363.127	397.249	420.834	472.908
Observations	249,700	1,147,800	109,800	541,500

Sample sizes are rounded to the nearest 100 for data security reasons

<sup>a</sup> Individuals who entered post-secondary education but did not receive a diploma or certificate are considered to have received some post-secondary education

childbearing age. In the case of the cash-transfer fertility incentives, the group eligible was women with children age five or under, and when I considered parental leave benefits, the group eligible was either women who were pregnant or women who had children less than 1 year old. The effect on women who were eligible captured changes in takeup rates, and when considering the effects of parental leave on pregnant women, whether they engaged in strategic behavior to increase their benefit amounts. The average effect of the programs on women of childbearing age took into account these effects, as well as any effect the program may have had on women who adjusted their labor supply in anticipation of potential future benefits. Furthermore, an estimate of the effect of the program on the earnings of women of childbearing age makes it possible to calculate the extent to which tax revenues are affected by the programs.

$$y_i = \beta_0 + \beta_1 \text{Quebec}_i + \beta_2 \text{post}_i + \beta_3 \text{Quebec}_i \times \text{post}_i + \varphi X_i + \varepsilon_i \quad (1)$$

Since the generosity of pronatalist benefits were increased only in Quebec, the other Canadian provinces serve as a control group. Consider the effect of the introduction of a program on the average woman of childbearing age. In Eq. 1, let  $y_i$  be the outcome variable of interest,  $\text{Quebec}_i$  be an indicator for residing in Quebec, let  $\text{post}_i$  be an indicator for the period after the program has been implemented, let  $\text{Quebec}_i \times \text{post}_i$  be the interaction of the two indicators,

and let  $X_i$  be a vector of demographic characteristics. Assuming that, absent intervention, the change in the outcome variable  $y$  over time in Quebec and the rest of Canada would occur at the same rate,  $\beta_3$  identifies the effect of the program.

$$y_i = \beta_0 + \beta_1 \text{Quebec}_i + \beta_2 \text{treated}_i + \beta_3 \text{post}_i + \beta_4 \text{treated}_i \times \text{post}_i + \beta_5 \text{Quebec}_i \times \text{treated}_i + \beta_6 \text{Quebec}_i \times \text{post}_i + \beta_7 \text{Quebec}_i \times \text{treated}_i \times \text{post}_i + \varphi X_i + \varepsilon_i \quad (2)$$

The assumption that the growth rate of  $y$  is the same in Quebec as it is in the rest of Canada can be relaxed by finding a group in geographic areas that was not directly affected by the policy change. Since the effect of maternity leave benefits on the labor supply of men and of women who were beyond childbearing age were second order, either group could serve as a valid control group. Let  $\text{treated}_i$  be a dummy for being in the treated group. Depending on the context, the treated group is either all women or childbearing age or the group of women who would have been eligible to receive the benefits if they had lived in Quebec. Then, assuming that absent the program the growth rate of  $y$  would be the same for the treated group in Quebec as it would be for the group that is not treated, then  $\beta_7$  identifies the program effect in Eq. 2. Like any DID estimates, the results of this paper assume that, after controlling for observables, the change in outcomes of the comparison groups would be parallel to the counterfactual outcomes for the treated group. Since I am considering one pre-period, I do not control for region specific trends

**Table 6** Births, all women 25–45

Panel A: All Women 25–45						
	(1)	(2)	(3)	(4)	(5)	(6)
	All women	Women with 0 children	Women with 1 child	Women with 2 children	Women with 3 children	Women with 4 or more children
After 1986 × Quebec	0.001 (0.001)*	0.004 (0.001)**	-0.007 (0.003)**	-0.001 (0.001)	-0.000 (0.002)	0.064 (0.010)**
Observations	2,728,675	1,335,535	465,330	615,805	224,385	104,505
Panel B: all women 25–45 with controls <sup>a</sup>						
	(1)	(2)	(3)	(4)	(5)	(6)
	All women <sup>b</sup>	Women with 0 children	Women with 1 child	Women with 2 children	Women with 3 children	Women with 4 or more children
After 1986 × Quebec	0.002 (0.001)**	0.004 (0.001)**	-0.005 (0.002)*	-0.002 (0.001) <sup>†</sup>	-0.003 (0.002)	0.034 (0.009)**
Observations	2,728,675	1,335,535	465,330	615,805	224,385	104,505

Standard errors in parentheses. Canadian Census Master Files 1986, 1991, and 1996 restricted to Canadian citizens. Sample sizes rounded to the nearest 5 for data security reasons.

<sup>†</sup> Significant at 10 % level; \* Significant at 5 % level; \*\* Significant at 1 % level.

<sup>a</sup> Controls include age, being a high school dropout, having some post-secondary education, and having completed university.

<sup>b</sup> Additional control for number of children in Census family

**Table 7** Effect of cash-transfer fertility incentives on all women of childbearing age

		(1) DID All women Age 25–45 With Cohort FE	(2) DIDID All women Age 25–45 <sup>a</sup> With Cohort FE	(3) DIDID Partnered women Age 25–45 <sup>a</sup> With Cohort FE	(4) DIDID Single women Age 25–45 <sup>a</sup> With Cohort FE	(5) DIDID Women born 1956–1961 <sup>b</sup>
(1)	Labor force participation	0.009 (0.002)** 1,888,585	−0.008 (0.002)* 3,049,475	−0.016 (0.003)** 2,460,430	0.011 (0.007) 589,040	−0.023 (0.004)** 1,202,285
(2)	Earnings	−519.555 (44.963)** 1,888,585	−403.397 (85.666)** 3,049,475	−507.990 (94.285)** 2,460,430	−554.228 (211.632)** 589,040	−440.705 (86.610)** 1,202,285
(3)	Earnings, if positive	−635.130 (52.749)** 1,420,325	161.299 (115.358) 2,155,515	172.773 (126.776) 1,752,745	−99.850 (281.630) 402,775	867.871 (137.220)** 859,985
(4)	Hours	−0.197 (0.070)** 1,888,585	−1.212 (0.131)** 3,049,475	−1.496 (0.145)** 2,460,430	−0.763 (0.321)* 589,040	−0.669 (0.177)** 1,202,285
(5)	Hours, if positive	−0.128 (0.062)* 1,216,760	0.010 (0.135) 1,844,725	−0.034 (0.152) 1,494,915	−0.084 (0.297) 349,805	0.982 (0.166)** 722,460
(6)	Weeks	−0.394 (0.078)** 1,888,585	−1.153 (0.149)** 3,049,475	−1.441 (0.165)** 2,460,430	−0.399 (0.016)** 589,040	−1.070 (0.199)** 1,202,285
(7)	Weeks, if positive	−0.727 (0.063)** 1,441,075	−0.640 (0.130)** 2,184,045	−0.608 (0.145)** 1,771,510	−0.917 (0.312)** 412,535	0.025 (0.167) 872,155

Standard errors in parentheses. Sample sizes listed below standard errors. Canadian Census Master Files 1986, 1991, and 1996 restricted to Canadian citizens. Sample sizes rounded to the nearest 5 for data security reasons.

† Significant at the 10 % level; \* Significant at the 5 % level; \*\* Significant at the 1 % level

<sup>a</sup> Sample is restricted to individuals born between 1931 and 1961 so that individuals will be 25 and older and 65 and under in all 3 Censuses. For DIDID estimates, women over 45 are the control group. Fixed effects are for groups defined by year of birth and whether or not an individual resides in Quebec.

<sup>b</sup> Women born between 1936 and 1941 serve as control group. Partnered women are women who are either married or in commonlaw relationships. Single women are women who are neither married nor in commonlaw relationships. All regressions include a constant and controls for age, number of children, and dummies for being a high school dropout, having some post-secondary education, finishing university, speaking English, speaking French, and being a naturalized citizen.

since they would be collinear with the estimate of the program effect. Since the Canadian Human Rights Act was passed in 1977 (Canada 1985) and the Quebec Charter of Human Rights and Freedoms (Quebec 2008) was passed in 1975, which predates either natural experiment, institutional barriers that may have differentially affected the labor market participation of different demographic groups in Quebec or the Rest of Canada were mitigated.

When considering women beyond childbearing age as a control group, one possible threat to validity is that there may have different labor market and educational environments for women between provinces prior to the 1970s. From 1960 to 1966 Quebec experienced the Quiet Revolution, which was associated with rapid political and ideological changes with the goal of assuring that Quebec

“keep up with the rest of modernizing North America” (Pollard and Wu 1998). Because of different exposure to these attitudes and opportunities, this increase in labor force participation may have been in large part due to differences between cohorts. In order to avoid misattributing cohort effects to program effects I implemented two strategies: controlling for cohort by Quebec fixed effects and following a synthetic cohort.

## Data

### *Census Master Files*

The empirical analysis used data from the 1986, 1991, and 1996 Canadian Census 20 % Master Files, and analysis

**Table 8** DIDID estimates of the effects of cash-transfer fertility incentives on women with children less than 6 years old

		1991 and 1996		1991 and 1996		
		Censuses combined		Censuses separated		
		(1)	(2)	(3)	(4)	(5)
		Program effect	Observations	1991 Program effect	1996 Program effect	Observations
(1)	Labor force participation	-0.041 (0.003)**	2,496,335	-0.028 (0.003)**	-0.051 (0.003)**	2,496,335
(2)	Earnings	-428.006 (79.261)**	2,496,335	-256.767 (92.492)**	-548.124 (89.126)**	2,496,335
(3)	Earnings, if positive	-189.835 (97.626) <sup>†</sup>	1,893,700	-171.169 (112.365)	-199.994 (108.874) <sup>†</sup>	1,893,700
(4)	Hours	-1.201 (0.127)**	2,496,335	-1.092 (0.148)**	-1.288 (0.142)**	2,496,335
(5)	Hours, if positive	0.430 (0.121)**	1,606,810	0.0322 (0.141)*	0.520 (0.134)**	1,606,810
(6)	Weeks	-2.145 (0.140)**	2,496,335	-1.737 (0.163)**	-2.424 (0.157)**	2,496,335
(7)	Weeks, if positive	-0.890 (0.121)**	1,922,040	-1.073 (0.140)**	-0.724 (0.135)**	1,922,040

Canadian Census Master Files 1986, 1991, and 1996 restricted to female Canadian citizens age 25–45. Sample sizes rounded to the nearest 5 for data security reasons. All regressions include a constant and controls for age, number of children, and dummies for being a high school dropout, having some post-secondary education, finishing university, speaking English, speaking French, and being a naturalized citizen. Earnings are reported in inflation adjusted 1986 dollars.

All results are from a single regression so column (4) is the sum of column (3) and (5) and standard errors are constructed by taking the square root of the sum of the squares of the standard errors from column (3) and (5)

<sup>†</sup> Significant at the 10 % level; \* Significant at the 5 % level; \*\* Significant at the 1 % level

**Table 9** Difference-in-difference-in-difference estimates of the effect of cash-transfer fertility incentives on labor force participation by age and parity of youngest child

	(1) Age 0	(2) Age 1	(3) Age 2	(4) Age 3	(5) Age 4	(6) Age 5
Parity 1	-0.033 (0.011)*	-0.035 (0.010)*	-0.002 (0.008)	-0.030 (0.009)*	-0.020 (0.010) <sup>†</sup>	-0.006 (0.011)
Parity 2	-0.033 (0.011)**	-0.058 (0.010)**	-0.049 (0.008)**	-0.035 (0.008)**	-0.006 (0.008)	0.006 (0.008)
Parity 3+	-0.067 (0.015)**	-0.077 (0.014)**	-0.079 (0.011)**	-0.096 (0.011)**	-0.065 (0.011)**	-0.025 (0.011)*
Observations	2,496,335					

Sample sizes rounded to the nearest 5 for data security reasons. Canadian Census Master Files 1986, 1991, and 1996 restricted to female Canadian citizens age 25–45. Regression includes a constant and controls for age, number of children, and dummies for being a high school dropout, having some post-secondary education, finishing university, speaking English, speaking French, and being a naturalized citizen. Earnings are reported in inflation-adjusted 1986 dollars

<sup>†</sup> Significant at the 10 % level; \* Significant at the 5 % level; \*\* Significant at the 10 % level

was conducted on-site at Statistics Canada in Ottawa. This data set consists of records at the individual level for all individuals in a 20 % sample of households in Canada on Census Day. The age and parity of children in each Census family was reconstructed from individual records. The

sample was then restricted to households where the female household head, wife, or female common-law partner was between the age of 25–45 and was a Canadian citizen. Non-citizens were excluded because they were less likely to be eligible for benefits. The lower bound on age was

**Table 10** Births, women 25–45

Panel A: all women 25–45						
	(1) All women	(2) Women with 0 children	(3) Women with 1 child	(4) Women with 2 children	(5) Women with 3 children	(6) Women with 4 or more children
In or after 2006	0.012	0.010	0.025	0.007	0.001	0.024
× Quebec	(0.002)**	(0.004)**	(0.007)**	(0.004) <sup>†</sup>	(0.006)	(0.013) <sup>†</sup>
Observations	2,052,800	781,900	450,100	568,300	192,500	59,900
Percentage of Additional Births		31.68 %	45.59 %	16.12 %	0.78 %	5.83 %
Panel B: all women 25–45, with controls for labor market characteristics						
	(1) All women	(2) Women with 0 children	(3) Women with 1 child	(4) Women with 2 children	(5) Women with 3 children	(6) Women with 4 or more
In or after 2006	0.011	0.008	0.022	0.006	0.001	0.021
× Quebec	(0.002)**	(0.004)*	(0.007)**	(0.003)	(0.006)	(0.013)
Observations	2,052,800	781,900	450,100	568,300	192,500	59,900

Robust standard errors in parentheses; standard errors clustered at the person level. Sample size is rounded to the nearest 100 for data security reasons. Canadian Labour Force Surveys 2000 through 2008 restricted to women 25–45. All regressions are linear probability models. Labor market controls are age, age squared, being a high school dropout, having some post-secondary education, and completing university

<sup>†</sup> Significant at 10 %;

\* Significant at 5 %;

\*\* Significant at 1 %

imposed in order to capture women who were likely to have completed their formal education and the upper bound on age was imposed to capture only women who were of childbearing age.

The outcomes that I focused on were births, labor force participation, weekly hours worked, annual earnings, and annual weeks worked. An individual was defined as participating in the labor force if she reported having worked a positive number of weeks in the year preceding the Census year. Earnings refers to employment income in the preceding year and were inflation adjusted to 1986 dollars. Weeks were defined as the self-reported number of weeks worked in prior the calendar year, and, if weeks were not reported because the individual did not work in the previous year, they were recoded as 0. Weekly hours worked corresponds to the number of hours worked in the reference week.

I constructed various control variables. The number of children in the Census family was created by counting the number of individuals under 18 in the Census family. An individual was considered to speak French if she reported “French” or “French and English” in response to a question that asked which official languages she spoke, and similarly, considered to speak English if she reported speaking “English” or “French and English.” An individual was defined as married if she reported being legally married and was considered married or common-law if she was a female wife or common-law partner with a spouse or partner present in the household. Since some women may have been legally married but living separate from their spouses, “married” is not a proper subset of “married or

common-law.”<sup>2</sup> Table 4 presents the means of select variables.

Table 4 is a Table of sample means for women 25–45 who are Canadian citizens. The sample was split by Census as well as by whether an individual resided in Quebec or the rest of Canada. Over the three Censuses, the mean sample ages in both Quebec and the rest of Canada increased. In 1986 the mean age of the sample in Quebec was 34.2, in 1991 the mean age in the sample in Quebec was 34.8, and in 1996 the mean age in the sample in Quebec was 35.6. This corresponds with the aging of the baby boomer population.

As is often discussed, the proportion of women who are married differs dramatically between Quebec and the rest of Canada and changes dramatically over the sample period. Between 1986 and 1996 the proportion of women who were married in Quebec dropped by 26.3 percentage points whereas the drop in the rest of Canada is only 13.5 percentage points. However, the proportion of women who were either in married or common-law partnerships both in Quebec and the rest of Canada was relatively constant across censuses at roughly 70 % of the population. Because of this fact, instead of emphasizing the group of married women I drew particular attention to the combined group

<sup>2</sup> Commonlaw couples live together but are not legally married. While a woman could report her marital status as common-law in 1991 and 1996, this definition of common-law was used in order to remain consistent with the 1986 Census where common-law status was not explicitly asked.

**Table 11** Estimates of the effects of QPIP on women age 25–45

		(1) DID Women 25–45	(2) DIDID control Men 25–45	(3) DIDID control Women 46–62	(4) DIDID synthetic Cohort <sup>a</sup>
(1)	Labor force participation	0.015 (0.004)** 2,048,800	0.016 (0.005)** 3,973,100	0.015 (0.008)* 3,108,0000	0.033 (0.011)** 1,130,500
(2)	Employed	0.017 (0.004)** 2,048,800	0.019 (0.006)** 3,973,100	0.010 (0.008) 3,108,0000	0.030 (0.013)* 1,130,500
(3)	Employed at work	0.002 (0.005) 2,048,800	0.007 (0.006) 3,973,100	−0.002 (0.007) 3,108,000	0.020 (0.012) <sup>†</sup> 1,130,500
(4)	Present at work if employed	−0.017 (0.003)** 1,555,600	−0.014 (0.004)** 3,212,400	−0.012 (0.005)* 2,242,200	−0.007 (0.008) 823,100
(5)	Weekly earnings	−20.979 (4.070)** 2,048,800	17.255 (6.504)** 3,973,100	−1.28 (7.140) 3,108,000	20.655 (11.267) <sup>†</sup> 1,130,500
(6)	Weekly earnings if employed and present	−26.653 (4.570)** 1,387,100	12.594 (7.148) <sup>†</sup> 1,688,700	12.145 (8.902) 2,018,500	22.286 (13.460) <sup>†</sup> 730,700
(7)	Actual total hours worked	−0.129 (0.180) 2,048,800	−0.008 (0.254) 3,973,100	0.088 (0.293) 3,108,000	0.895 (0.493) <sup>†</sup> 1,130,500
(8)	Actual total hours worked if employed and present	−0.242 (0.120)* 1,387,100	−0.324 (0.166) 1,688,700	0.608 (0.229)** 2,018,500	0.500 (0.503) 730,700
(9)	Usual total hours Worked	0.486 (0.174)** 2,048,800	0.474 (0.237)* 3,973,100	0.583 (0.313) <sup>†</sup> 3,108,000	1.596 (0.487)** 1,130,500
(10)	Usual total hours Worked if employed and present	−0.134 (0.111) 1,387,100	−0.226 (0.149) 1,688,700	0.729 (0.216)** 2,018,500	0.930 (0.323) 730,700

Robust standard errors in parentheses. Standard errors are clustered at the person level. Sample sizes rounded to the nearest 100 for data security reasons. Canadian Labour Force Surveys 2000 through 2008. All regressions include controls for age, age squared, being a high school dropout, having some post-secondary education, and completing university.

<sup>†</sup> Significant at the 10 % level;  
\* Significant at the 5 % level;  
\*\* Significant at the 1 % level  
<sup>a</sup> Treated cohort was born 1970–1975 and control cohort was born 1950– 1955

of married and common-law women as it was more comparable across provinces.

*Labour Force Surveys*

The analysis of the effect of maternity benefits on labor supply was performed onsite at Statistics Canada using all of the monthly LFS from January 2000 until December 2008. The LFS is a monthly survey of households that is representative of the civilian, noninstitutionalized population in the 10 provinces; the population in the Yukon, the Northwest Territories, and Nunavut are not sampled. Each month approximately 54,000 households are sampled. The survey design is a rotating panel that follows households for six consecutive months. Following Bertrand et al.

(2004) , observations from multiple months were collapsed into pre- and post-periods in order to produce consistent standards errors. For the reasons discussed above, I focused most of my analysis on individuals aged 25–45 inclusive.

In order to identify individuals who were pregnant, births were imputed by finding the month in which the age of the youngest child became zero. For families with older children, this was a change from some nonzero number to zero and for families for which this was a first child it was a change from a valid missing value to zero. Mechanically, this resulted in an undercount of the number of births since births that occurred in the first month an individual was surveyed or births that occurred in families that had another child under the age of one were not counted. Consequently, when considering the fertility effects of the program I focused on

**Table 12** Effects of QPIP on all pregnant women and all women with infants, age 25–45

		DIDID estimates			Bias corrected estimates	
		(1)	(2)	(3)	(4)	(5)
		Currently pregnant	Has a baby	Observations	Currently pregnant	Has a baby
(1)	Labor force participation	0.046 (0.032)	0.001 (0.017)	2048800	0.046	0.001
(2)	Employed	0.052 (0.033)	0.008 (0.018)	2048800	0.053	0.009
(3)	Employed at work	−0.005 (0.034)	−0.052 (0.014)**	2048800	−0.006	−0.053
(4)	Present at work if employed	−0.026 (0.037)	−0.053 (0.018)**	1555600	−0.028	−0.055
(5)	Weekly earnings	23.559 (31.895)	−6.229 (9.777)	2048800	23.258	−6.531
(6)	Weekly earnings if employed and present	105.581 (51.983)*	52.972 (34.366)	1387100	107.416	54.807
(7)	Actual total hours worked	0.858 (1.249)	−1.307 (0.507)**	2048800	0.823	−1.342
(8)	Actual total hours worked if employed and present	2.154 (1.054)*	1.994 (1.392)	1387100	2.181	2.021
(9)	Usual total hours worked	3.319 (1.281)**	0.716 (0.683)	2048800	3.365	0.762
(10)	Usual total hours worked if employed and present	2.851 (0.856)**	1.581 (1.253)	1387100	2.893	1.624

Robust standards errors are in parentheses. Canadian Labour Force Surveys 2000–2008, restricted to women 25–45. Sample sizes rounded to nearest 100 for data security reasons. All regressions include a constant and controls for age, age squared, being a high school dropout, having some post secondary education, finishing university, and number of own children in the following age categories: less than 1 year old, 1 or 2 years old, 3 years old, 4 years old, 5 years old, 6–12 years old, 13–15 years old, 16 years old, 17 years old, 18 years old, 19 years old, 20 years old, 21–24 years old, and 25 years and older

† Significant at 10 % level;  
\* Significant at 5 % level;  
\*\* Significant at 1 % level

whether or not a family had a child under one instead of the constructed birth variable, although both yielded similar results. This construction also undercounted pregnancies in progress. If an individual was pregnant but did not give birth in the six consecutive months she was in the survey, then she would not have been counted as pregnant. Randomization into the sample implies that approximately a third of pregnancies were not counted. This, combined with the age restrictions on the sample mean that I only considered approximately half of the pregnancies that occur in Canada. To account for the mechanical undercount of pregnancies, I produced a bias correction.<sup>3</sup> Another source of concern with this construction is that it only captured women who were in the last few months of their pregnancies. Perhaps women in

their first trimester behaved differently from the pregnant women captured by this construction.

The measures of whether or not an individual participated in the labor force, was employed, and was employed and present at work were taken from self-reported labor force status. Earnings were measured as self-reported weekly earnings in dollars. Hours were measured in two ways: the self reported total number of hours an individual worked in the reference week as well as her self reported usual total hours worked.

Table 5 presents summary statistics for women in Quebec and the rest of Canada before 2006 and in or after 2006. Since the sample was restricted to individuals who are 25–45 inclusive it is not surprising that the mean age of each of the groups the sample was approximately 35.5. High school graduates account for only about 3 % of the populations. However, the group with some post-secondary education includes individuals who self-reported having some post-secondary education who had not received any degree or certificate, who would often be classified as being

<sup>3</sup> Let  $\mu$  represent the true population mean and let  $p$  index pregnant women,  $n$  index non-pregnant women, and  $b$  index women with children less than 1 year old. Let  $\pi$  represent the pregnancy rate and  $\bar{y}$  represent the estimated mean. Then  $\mu_p - \mu_n = \frac{\frac{1}{2}\pi + (1-\pi)}{(1-\pi)} E[\bar{y}_p - \bar{y}_n]$  and  $\mu_b - \mu_n = \left(\frac{\frac{1}{2}\pi + (1-\pi)}{(1-\pi)}\right) E[\bar{y}_b - \bar{y}_n] - \left(\frac{\frac{1}{2}\pi}{(1-\pi)}\right) E[\bar{y}_b - \bar{y}_p]$ .



high school graduates in other studies. Additionally, since the classroom training for apprenticeships may have been obtained during high school but a certificate may not have been attained until after a formal apprenticeship was completed, individuals with trades certification may have been classified as high school graduates under a different system. The group with some post-secondary education includes individuals who self-reported having some post-secondary education and those who had a trades certificate or diploma, community college or CEGEP degree, or a university certificate below a bachelor’s degree.

Something that is very striking from the table of means is that the proportion of individuals who were married in Quebec was much lower than in the rest of Canada. Among women, 40.2 % were married in Quebec prior to 2006 while 62.5 % were married in the rest of Canada at the same time. In or after 2006, these proportions were 33.2 and 59.7 % respectively. The opposite relationship holds for common-law couples. Prior to 2006, 31.0 % of women in Quebec were in common-law relationships compared to 9.6 % in the rest of Canada. In or after 2006, 36.0 % were in common-law relationships in Quebec while only 11.2 % were in common-law relationships in the other provinces. However, the sum of the proportion of individuals who were married and of individuals who were in common-law relationships was remarkably stable and similar across geographic areas: prior to 2006 71.2 % of women in Quebec were in married or common-law relationships compared to 72.1 % in the rest of Canada. In or after 2006 these proportions are 69.2 and 70.9 % respectively. Therefore, the combined group of married and common-law women should be more comparable across provinces than either the married or common-law group.

**Theory**

In order to fix ideas about the effects of the generosity of cash-transfer fertility incentives on fertility and labor supply, I considered the effects of both types of fertility incentives in the same simple theoretical framework. Suppose that an individual has an additively separable intertemporal utility function in consumption,  $c_t$ , leisure,  $l_t$ , and number of children,  $n_t$ , over a finite number of periods,  $T$ . The number of children,  $n_t$ , is a monotonically increasing, discrete stock of children that can increase by at most one per period. Let the individual’s discount factor be equal  $\beta \leq 1$  and assume that  $u(\cdot)$ ,  $v(\cdot)$ , and  $z(\cdot)$  are twice differentiable with positive first derivatives and negative second derivatives.

$$U(\{c_t\}_{t=0}^T, \{l_t\}_{t=0}^T, \{n_t\}_{t=0}^T) = \sum_{t=0}^T \beta^t [u(c_t) + v(l_t) + z(n_t)] \tag{3}$$

For a family that does not have any additional children the budget constraint is

$$0 = \sum_{t=0}^T \beta^t [y_t + w_t(L - l_t) - c_t - p(m_t)] \tag{4}$$

where  $w_t$  is the period-specific wage and  $p(m_t)$  is the minimum cost of caring for a family of structure  $m_t$  so that the cost of children can vary with their ages. While the utility derived from having a given number of children does not change as they age, presumably they eventually grow up and no longer require parental support, so  $p(m_t)$  changes over time even if  $n_t$  does not. To simplify things, assume that the path of  $m_t$  and hence  $n_t$  are predetermined as is the path of wages,  $w_t$ . This implies that  $\sum_{t=0}^T \beta^t z(n_t)$  and  $\sum_{t=0}^T \beta^t p(m_t)$  are fixed.

Because of the assumption that the individual’s discount rate is equal to the interest rate, from the first order conditions it is clear that consumption is constant across periods and labor supply is higher in periods where the wage is higher. Since  $c$  and  $l$  are normal goods an increase in nonlabor income net of fixed costs,  $\sum_{t=0}^T \beta^t [y_t - p(m_t)]$ , will lead to an increase in consumption and leisure.

First, consider a program that provides cash transfers that are tied to having children, but are not income contingent. For a given path of wages,  $\{w_t\}_{t=0}^T$ ,  $c_t$  is clearly lower for families with more children since  $p(m_t)$  is at least as high for all  $t$  and higher for some  $t$ . If a program offers transfers that are tied to having children, then the program will have a larger positive impact on the utility of larger families. Comparing utility levels between different fertility paths,  $\{n_t\}$ , demonstrates that the marginal benefit of having an additional child in any period has increased, and the implementation of such a policy should thus also lead to an increase in fertility.

Next, consider a world with parental leave benefits. For a family expecting a birth in period 1, let  $b$  be the income replacement rate of maternity benefits. When considering the effects of the generosity of maternity benefits on mothers, one must consider both the case of women who give birth in period 1 who would be employed in period 0 without the benefit increase and the case of women who give birth in period 1 who would not be working in period 0 were the old maternity benefit policy in place. For the former, the amount of benefits received under the new program is  $bw_0(l_1 - l_0)$  and, assuming that the interest rate is equal to the discount rate, the woman’s budget constraint is

$$0 = y_0 + w_0(L - l_0) - c_0 - p(m_0) + \beta [y_1 + w_1(L - l_1) + bw_0(l_1 - l_0) - c_1 - p(m_1)] + \sum_{t=2}^T \beta^t [y_t + w_t(L - l_t) - c_t - p(m_t)] \tag{5}$$

The assumptions above produce the result that in equilibrium consumption is equal in all periods and, for  $T \geq t \geq 2$ ,  $c'(l_t) = w_t u'(c)$ . Furthermore,  $v'(l_0) = (w_0 + \beta b w_0) u'(c)$  and  $v'(l_1) = (w_1 - b w_0) u'(c)$ . Note that this is identical to a situation in which the period 0 wage is increased by  $\beta b w_0$  and the period one wage decreased by  $b w_0$ . Let  $f$  be the inverse function of  $v'$ . Then  $f' = \frac{1}{v''} < 0$ . Using the equilibrium conditions and substituting them into the budget constraints and differentiating implicitly yields the results that consumption is increasing in the income replacement rate, that is  $\frac{dc}{db} > 0$ . The effect of the income replacement rate on leisure demand is of ambiguous sign in period 0 since the program effectively raises an expectant mother's wage by  $\beta w_0$ , which leads to competing income and substitution effects, which are summarized by the following equation

$$\frac{dl_0}{db} = \frac{\left( \beta w_0 u'(c) + (w_0 + \beta b w_0) u''(c) \frac{dc}{db} \right)}{\left( (w_0 + \beta b w_0) u'(c) \right)} \quad (6)$$

In all periods after period 0, demand for leisure is increasing. In period one, the relationship between the income replacement rate is as follows

$$\frac{dl_1}{db} = \frac{\left( -w_0 u'(c) + (w_1 - b w_0) u''(c) \frac{dc}{db} \right)}{\left( (w_1 - b w_0) u'(c) \right)} > 0 \quad (7)$$

and for all subsequent periods

$$\frac{dl_t}{db} = w_t u''(c) f'(w_t u'(c)) \frac{dc}{db} > 0, \quad 2 \leq t \leq T \quad (8)$$

so demand for leisure is only affected by the income replacement rate through its effect on consumption.

In the case that an expectant mother would not be employed under the old regime and there are no minimum hours restrictions to the program she similarly maximizes utility in Eq. 3 subject to the budget constraint in Eq. 5. Realistically, most parental leave programs require that a minimum number of hours be worked or that an individual must have minimum earnings to qualify for benefits. Since wages are predetermined, these concepts are equivalent in the model. Let  $\bar{h} = L - \bar{l}$  be the minimum number of hours of work required in period 0 in order to qualify for benefits in period 1. An individual who would not work under the old policy compares her maximized utility in the scenario in which she does not work in period 0 to her maximized utility in the case where she works at least  $\bar{h}$  hours in period 0. If she works at least  $\bar{h}$  in period 0, that is, if  $l_0 \leq \bar{l}$ , utility is increasing in  $b$  and there is no change in utility if  $l_0 > \bar{l}$ . Therefore, the probability that individuals opt to work at least  $\bar{h}$  hours in period 0 increases in  $b$ .

Suppose that prior to period 0 an individual can decide whether or not to have a child who will be born in period 1. An increase in the income replacement rate,  $b$ , has no effect on the individual's optimization problem conditional on having no additional children. However, for women who would opt to work conditional on having a child in period one under the new policy there is an increase in utility from having a child so more women will choose to have children if benefit levels increase.

Note that the model implies that both cash-transfer fertility incentives and parental leave should increase fertility rates and increase the consumption of individuals who receive benefits. However, cash-transfer fertility incentives unambiguously decrease the labor supply of recipients, while parental leave benefits unambiguously increases the probability that individuals work prior to giving birth and have ambiguous effects on labor supply along the intensive margin.

## Results

Because of the parallel structure of the evaluation of each program and the quantity of information presented on each program, the empirical results of the evaluation of cash-transfer fertility incentives are separately.

### Cash-Transfer Fertility Incentives

#### Fertility Effects

Table 6 presents basic DID estimates of the probability of a woman 25–45 of having a child less than one year old. Panel A presents results for all women age 25–45 and Panel B includes controls for demographics. The first column of each panel presents the results for all women and the second through the sixth columns condition the sample on whether a woman had zero, one, two, three, or four or more children, excluding any children less than 1 year old.

Dividing the DID estimate of the program effect for all women of 0.001 from Column 1 of Panel A by the counterfactual probability of a birth in Quebec after 1986 of 0.058 (obtained from evaluating the estimated Eq. 1 with the coefficient on *Quebec*  $\times$  *Post* set to zero), shows that the birth rate increased by 1.72 % due to the cash transfer fertility incentives. Moving across Columns 2 through 6 it becomes immediately apparent that the size of the effects differed by the number of children already in a family. Interestingly, most of the additional births due to the cash-transfer program are attributable to first births and births of fifth or higher parity. Given that there was a large increase in benefit levels for having a third or higher parity child, it is surprising that the point estimates of the probability of

moving from two to three children are negative and nonsignificant.

#### *Labor Supply of Women of Childbearing Age*

Table 7 presents estimates of the impact of cash-transfer fertility incentives on women of childbearing age. Column 1 presents DID estimates for women age 25–45, controlling for cohort fixed effects and demographic characteristics. The 0.9 percentage point increase in labor force participation in Row 1 of Column 1, which suggests an increase in the labor force participation of women age 25–45 due to the program, was not robust to the DIDID strategy with women beyond childbearing age as an additional control group.<sup>4</sup> Column 2 presents estimates of Eq. 2 with cohort fixed effect for a sample restricted to those born in 1931–1961. The lower bound on birth years was imposed so that women in the control group would not exceed the age of 65 in 1996. This specification yielded an estimated program effect of a 0.8 percentage point decline in labor force participation among women of childbearing age. Column 4 reports results from a similar analysis on a sample restricted to women who were either married or in common-law relationships, and Column 5 reports results from a sample restricted to single women. Interestingly, the decline in labor force participation of all women appears to have been driven by a 1.6 percentage point decline in labor force participation rates of married or common-law women; single women's labor force participation was not significantly affected by the program. This is unsurprising as married or common-law women were more likely to have children and also likely to have had more financial support outside of their labor earnings. Column 5 presents results for the cohort born between 1956 and 1961 where the cohort born from 1946 to 1941 was used as an additional control group. This specification attributed a 2.3 percentage point decline in labor force participation to the cash-transfer incentives.

Considering the effects of the program on earnings in Row 2 of Columns 2 and 5, it appears that the program reduced earnings of women of childbearing age by approximately C\$400 per year. Since earnings among those with positive earnings did not change significantly due to the program in Row 3 of Column 2 and actually increased in Column 5, this reduction in average earnings was likely due to the reduction in labor supply. Similarly, hours in Row 4 declined by 1.5 h per week in Column 2 and 0.7 h in Column 5, yet hours among those who worked in the reference week are unaffected in Column 2 and increased in Column 5. Weeks worked decreased due to the program in

<sup>4</sup> Men may seem like a viable control group but they may be inappropriate since married or common-law fathers are part of households receiving the transfers.

Row 6 in the DIDID estimates using older women as controls as well as the DIDID estimates using synthetic cohorts. While it appears that for the cohort born from 1956 to 1961 weeks worked among those who worked at least 1 week during the year did not change in the synthetic cohort DIDID in Column 5, but did decline by 0.6 weeks per year when a cohort fixed effects approach was used.

Once these effects and Quebec-specific trends not attributable to the program are controlled for, it appears that the program led to a decline in labor supply which, except for a small decline in weeks worked among those who worked during the year, are largely attributable to declines in labor force participation.

#### *Effects on the Labor Supply of Women With Children Under Age Six*

As is clear from Fig. 2, mothers of children under age six received much larger transfers than women without children under age six. While there may be concerns about selection into the group of mothers with children under age six, using standard instruments for fertility such as Angrist and Evans (1998) use of the sex-composition of the first two births would not have been valid to identify the treatment-on-the-treated effect. The marginal family that decided to have a child because their first two children were of the same sex in Quebec may have differed from the marginal family in the rest of Canada because they faced different costs of an additional child, so the local average treatment effects of the two groups would not be comparable and the instrumented DIDID estimate of the effect of the program would not have identified the true treatment-on-the-treated effects. Similarly, Heckman two-step selection corrections for labor force participation using family composition would have been invalid. Although concerns about selection into motherhood due to the program are warranted, they may not be so severe as the program did not have a sizeable fertility effect, so I proceed without correcting for selection.

Table 8 presents results from DIDID estimates of the effect of the cash-transfer fertility incentives on the labor supply of women age 25–45 who had children under the age of six using all other women age 25–45 as a control group. Column 1 of Table 8 presents program effects where both data from the 1991 and 1996 Censuses were considered to be in one “post” period. Since benefit generosity increased and possible awareness of the programs may also have increased between 1991 and 1996, Columns 3 and 4 present program effects where the 1991 and 1996 Censuses were handled as separate treatment groups. These differences persisted when women were split by marital status.

Column 1 of Row 1 shows that, consistent with the theoretical model, labor force participation among mothers

of children under age six declined by 4.1 percentage points due to the program. In 1991 this decline was 2.8 percentage points, and by 1996 this decrease grew to 5.1 percentage points. This decrease in labor force participation contributed to an overall reduction of hours worked of 1.2 h per week in Row 4 and to a reduction in weeks worked of 2.1 weeks per year in Row 6. Also, mothers of young children who worked at least 1 week during the year reduced average weeks worked by 0.9 weeks per year, this could suggest that working women may have been taking more days off due to the program. Interestingly, the average number of hours worked in the reference week for women who reported a positive number of hours worked increased by 0.4 h. Perhaps mothers of young children who participated in the labor force when the programs were in place were more likely to have careers that demand that they work full time.

One of the most striking effects of the program on mothers of young children appears in Row 2. The average decrease in earnings for mothers of young children across both Censuses in Column 1 was C\$428, which is significant at the 1 % level. The results in Columns 3 and 4 show that earnings among the average mother of a child age five or under in Quebec declined by C\$257 due to the program in 1991 and C\$548 due to the program in 1996. To put the magnitude of the effects in perspective, a back-of-the-envelope calculation yields a total provincial loss in earnings among women with children under six in 1986 dollars of C\$307.8 million in 1990 and C\$649.9 million in 1995, compared to similarly deflated combined costs of the Allowance for Newborn Children and Availability Allowance of C\$198.1 million and C\$238.9 million respectively (Québec 2005a). The implicit additional cost to the government of Quebec due to the reduction of labor supply, of course, depends on the marginal tax rates on these amounts.

Effects also differed by the age and parity of a woman's youngest child. To demonstrate this, Table 9 breaks down effects by the age of the youngest child and whether that child was of first, second, and third or higher parities. All of the results are from a single regression that considered the effect of the program on the labor force participation of mothers. The point estimates for the labor supply response along the extensive margin are consistently much larger for women whose youngest child was of parity 3 or higher, which corresponded to much larger incentives. For example, for a woman whose youngest child was 3, for the first parity child the program effect was a nonsignificant decline in labor force participation of 0.2 percentage points, whereas for a woman with a second parity child the effect was a decline of 4.9 percentage points which was significant at the 1 % level, and for a woman with a third or higher parity child, the effect was a decline of 9.6 percentage point which is significant at the 1 % level. Results for other labor market outcomes were similar; patterns

analogous to those for labor force participation were found for positive weeks worked.

### *The Cost of an Additional Child*

If labor market effects are not taken into consideration, an estimate of the government cost of an additional birth,  $C_1$ , to the government is the total cost of the benefits for the average family receiving benefits,  $B$ , divided by the change in the probability of having a birth in a given year,  $\Delta F$ .

$$C_1 = \frac{B}{\Delta F} \quad (9)$$

An underestimate of  $B$  can be calculated from the total amount paid in Availability Allowance and Allowance for Newborn Children benefits from 1989 to 1996 divided by the total number of women in the population. This is a clear underestimate as it does not take into account the cost of programs such as child tax exemptions. Total transfers paid are obtained from the Régie des Rentes 2004 report, *Les Prestations Familiales: Statistiques 2004 (2005a)* and the number of women in the population age 25–45 in Quebec is obtained by multiplying the average of the number of women in this group in the 1991 and 1996 Censuses by 5. Taking an average over all 8 years results in an annual program cost per woman of C\$174. Dividing by  $\Delta F$ , which is taken to be 0.002 from Column 1 of Panel D of Table 6, produces an estimate of a cost per additional birth of C\$87,225 in 1986 dollars per child.

Since I demonstrated that the cash-transfer programs led to significant declines in earnings among women of childbearing age and women with young children the loss of tax revenue caused by behavioral responses to the program must also be taken into account. Let this net government cost per additional birth be denoted  $C_2$ . In the equation below,  $\tau$  is the marginal tax rate, which I take to be 20 %, and  $\Delta y$  is the change in earnings of the average woman due to the program, which, from Row 2 of Column 2 of Table 7, is C\$403.

$$C_2 = \frac{B + \tau \Delta y}{\Delta F} \quad (10)$$

Adding the loss in tax revenue per additional child,  $\frac{\tau \Delta y}{\Delta F}$ , to the cost of the program implies a cost per additional child of C\$127,565 in 1986 dollars.

Note that since none of these estimates takes into account the cost of tax exemptions, welfare programs, or public education they are actually underestimates of the fiscal cost of increasing the birth rate. As a point of reference, at a 4 % discount rate Lee and Miller (1997) projected that the fiscal impact of an incremental birth in 1996 to an American high school graduate and all the

descendants of the child for the next 300 years would be approximately US\$61,000, which is C\$61,630 in 1986 Canadian dollars. It should be noted that their calculations sum both state and national fiscal benefits, and that US government policy differs from Canadian government policy, so this estimate is intended to be used only for benchmarking purposes. Since all of the cash-transfer fertility benefits studied in this paper are issued by a provincial government, the government that paid for the fertility incentives does not fully capture the fiscal benefit from the increase in population due to the program.

## Parental Leave Benefits

### *Fertility Effects*

Parallel to Table 6, Table 10 presents linear probability models of having a child less than 1 year old. Panel A presents results for all women 25–45 and Panel B adds controls for demographic characteristics. The first column of each panel presents the results for all women in the appropriate subsample and the second through sixth columns are conditional on having zero, one, two, three, or four or more children in the family, excluding children less than 1 year old. Using the DID estimate of the program effect in Column 1 of Panel A and dividing by the counterfactual probability of having a child in Quebec after 2006 of 0.051 shows that the fertility rate increased 23.5 % due to the increase in parental leave benefits. A similar calculation for married or common-law women results in a 26.8 % increase in the birth rate due to the program, and the DID estimate for fertility effect of the program on single women was an increase of births of 0.1 percentage points with a standard error of 0.02 percentage points.

Moving across Columns 2 through 6 of both panels of Table 10, it becomes immediately apparent that the size of the effects differs by the number of children already in a family, with large and strongly significant effects for first and second parity children of parity 1 and 2 as can be seen from Columns 3 and 4. The majority of additional births attributed to the introduction of the QPIP were of first or second parity. Summing the last Rows of Columns 2 and 3 of Panel A of Table 10, 77.3 % of births attributable to the introduction of the program are of first and second parity. Births of second parity represent the largest proportion of the increase, accounting for 45.6 % of additional births.

Because the introduction of QPIP provided a such large increase in benefits there may have been concerns that the program was temporary. A belief that the program was short lived may have caused families to move up their childbearing in order to take advantage of the program but not actually increase their lifetime number of children. If this were the case, the program would simply affect the tempo of

childbearing but not the quantum. Since the program was introduced recently, it is difficult to test whether the fertility effect is merely a tempo effect since women exposed to the program have not completed their childbearing years. Intuitively, if the program was only shifting forward the timing of births then the average age of the women giving birth in Quebec should decrease in the first few years of the program relative to women giving birth in the rest of Canada. Controlling for educational attainment categories and clustering at the individual level, I found that the average age of mothers of infants increased by 0.439 (0.180) years due to the introduction of the program, which is significant at the 5 % level.<sup>5</sup> This suggests that QPIP is actually increasing total fertility and is not just shifting the timing of births.

### *Average Labor Supply Effects on Women of Childbearing Age*

Since the value of the maternity benefit payments a woman was eligible to receive was increasing in her income in the period before she took leave, there was a clear incentive for women who planned to have children to be employed. Predictions about responses along the intensive margin, however, were less clear as an increase in the replacement rate induces both a income and substitution effect. Knowing the effect of the program on the labor supply of the average woman of childbearing age makes it possible to calculate the cost of the program net of labor supply effects.

Column 1 of Table 11 presents estimates of Eq. 1, the DID estimate of the program effect on various outcome measures among women age 25–45, controlling for age, age squared, and level of education. Rows 1 and 2 make it apparent that women increased their labor supply along the extensive margin in response to the program. Labor force participation increased by 1.5 percentage points and employment increased by 1.7 percentage points. Interestingly, Row 4 shows that the proportion of women who were at work conditional on being employed decreased by 1.7 percentage points. This offsets the increase in participation and employment so, as is evident from Row 3, the proportion of women who were employed and at work did not change significantly. These results suggest that much of the increase in labor force participation and employment may have been due to a change in labeling among women who were employed and not present at work; instead of being out of the labor force they were considered to be on leave. Consequently, when women who were not present at work are included in Row 7, actual total hours worked did not change significantly due to the program.

<sup>5</sup> Note that if older women who would not have had additional children in the absence of the programs give birth due to the programs, this would increase the average age of mothers in Quebec in the post-period. As a robustness check, nonparametric methods also indicate an increase in the age distribution of mothers in Quebec.

Among those who were employed and present, however, actual hours declined significantly by 0.242 h per week in Row 8, which suggests an increase in the proportion of working women who were working less than full time. Since employment increased, it is unsurprising that self-reported usual total hours worked increased by 0.486 h per week in Row 9 while usual total hours worked among the employed and present did not change significantly in Row 10. The decline in weekly earnings of C\$20.98 in Row 5 seems at odds with the increase in labor supply. Although actual hours worked if employed and present declined due to the program, the decline in earnings among those who were employed and present in Row 6 of C\$26.65 per week seems large relative to the approximately 15 min per week decline in actual hours worked. This suggests that wages in Quebec did not keep pace with the rest of Canada.

If wages for all workers in Quebec were growing at a slower rate than those in the rest of Canada, then comparison groups are needed that were unaffected by the program. Analogous to methods used in the analysis of cash-transfer programs, I considered men age 25–45, older women, and synthetic cohorts as additional comparison groups, in Columns 2, 3, and 4 respectively. In order to verify that these estimates were valid insofar as the DIDID assumption of parallel wage growth paths was met, Fig. 3 presents quarterly graphs of the Quebec/Rest of Canada difference in female-male weekly earnings gaps over time and the female/male difference in Quebec versus rest of Canada weekly earnings, and Fig. 4, presents weekly earnings of the younger cohort increase relative to the earnings of the older cohort in Quebec after the introduction of the program but not in the rest of Canada. Taking the double difference over time, it is clear that prior to 2006 these gaps follow roughly parallel paths, so men and older cohorts are a valid control groups. When men age 25–45 were used as a comparison group in Column 2, earnings of women in Quebec were estimated to have increased by C\$17.26 due to the program, and when a synthetic cohort was used as a comparison group in Column 4, weekly earnings among women of childbearing age were estimated to increase C\$20.66 per week.

The results presented for all women above suggest that more generous maternity leave benefit replacement rates are associated with higher female employment rates and earnings.

#### *Effect of QPIP on the Labor Supply of Women Eligible for Transfers or Eligible to Qualify for Transfers*

Beyond the effect of the program on the average woman it is of obvious importance to quantify the extent to which women were directly affected by the program. In the theoretical framework women who are pregnant in period 0

can adjust their labor supply in order to qualify for benefits in period 1, and women who have an infant in period 1 qualify for benefits that effectively decrease their wage if they worked. The first column of Table 12 presents the estimated DIDID program effects for women who were imputed to be pregnant and the second column presents the program effect for women who had babies less than 1 year old, controlling for individual characteristics. Because the presence of children other than infants may also have strong effects on the labor supply of women, I controlled for the age composition of a woman's children using the number of children in particular age categories. I adjust for the bias as follows: For each geographic region by period group I calculate the pregnancy rate in the population,  $\pi$ , by taking  $\frac{9}{12}$  of the birth rate, and recover group specific  $E[\bar{y}_p - \bar{y}_n]$  and  $E[\bar{y}_b - \bar{y}_p]$  from regression results. Note that if the undercount of pregnancies was the only source of bias, then  $\mu_{baby} - \mu_{pregnant} = \bar{y}_{baby} - \bar{y}_{pregnant}$ . Comparing the last two columns to the first two in Table 12 it appears that the bias is negligible.

Concentrating first on the effects on pregnant women in Column 1, the effects of the program on labor market status in the first four rows are nonsignificant but suggest that, consistent with the model, women may have started employment in order to receive benefits and may have begun taking them up late in their pregnancies. Row 9 shows that there was an average increase of 3.32 usual hours worked per week among all women who were pregnant and an average increase of 2.85 usual hours worked per week among women who were pregnant and employed and present at work, which is significant at the 1 % level. As I mentioned earlier, usual hours worked are a measure of general labor force attachment so this may indicate that women with stronger labor force attachment were becoming pregnant. Among pregnant women who were present at work, there was a significant C\$105.58 increase in weekly earnings in Row 6 and an increase of 2.15 h actual hours worked in the reference week in Row 8. These results suggest that women may have been increasing their labor supply along the intensive margin while pregnant in order to increase their benefit payments.

Focusing on the effects of the program of the program on women who had an baby under a year old, it appears that the results were driven primarily by leave-taking. Among these mothers, there does not appear to have been a discernible change in labor force participation in Row 1 of Table 12 or employment rates in Row 2. However, consistent with the theoretical model, the proportion who were employed and at work declined substantially by 5.2 percentage points in Row 3. Among mothers of infants who were employed, the proportion who were present at work declined by 5.3 percentage points in Row 4. Among those

who worked, earnings increased insignificantly by C\$52.97 in Row 6. This may have be due to differences in who selected into being present at work due to the program. For example, those whose salaries exceed the C\$60,500 insurable earnings cap may have received a bigger increase in benefits from the introduction of QPIP, but the opportunity cost of taking maternity leave was still quite high. Considering the results of Row 7 and 8 it appears that the decline in hours is driven for the most part by a decrease in mothers being present at work; actual hours worked for this group declined by a statistically significant 1.31 h per week due to the program while actual hours conditional on being present at work increased by a statistically nonsignificant 1.99 h per week. Mothers of infants were not changing their labor force attachment in response to the program; estimates in Rows 9 and 10 show that usual hours worked did not change significantly. I found similar results when I restricted the sample to married and common-law women.

*Cost Per Additional Child*

In order to calculate the cost of an additional child given the program I calculated the cost per woman of the program and divide through by the change in fertility due to the program. The weekly cost of the program per woman,  $C$ , is calculated as follows,

$$C = \rho v \Delta B - \tau \Delta y \tag{11}$$

where  $\rho$  is the probability of having a child under 1,  $v$  is the probability of takeup,  $B$  is the average payment to mothers conditional on having a child and taking up,  $\tau$  is the marginal tax rate, and  $y$  is unconditional earnings.

Let  $B^0$  denote a woman’s benefit level under the old program and let  $B^1$  denote her benefit level under the new program. Since the maximum replacement rate under the federal program was 55 % and the maximum insurable earnings were C\$39,000 while the maximum replacement rate under the regular QPIP program was 70 % and the maximum insurable earnings were C\$60,500 the following relation must hold

$$B^1 \leq \frac{0.70 \times 60,500}{0.55 \times 39,000} B^0 \tag{12}$$

which implies

$$\Delta \bar{B} = \bar{B}^1 - \bar{B}^0 \leq \left[ 1 - \frac{0.55 \times 39,000}{0.70 \times 60,500} \right] \bar{B}^1 \tag{13}$$

where upper bars denote means. In 2006,  $\bar{B}^1$ , the average weekly benefit transferred to mothers was C\$408 (Québec 2007), and we can use this result to get an upper bound on  $\Delta \bar{B}$  of C\$201.35. The takeup rate,  $v$ , was calculated as the product of the proportion of women who had infants in

Quebec who were employed with the proportion of women who had infants and who were employed but were not present at work. In this sample the proportion is 0.56.

In 2006 and 2007 the provincial tax rate on the first C\$29,289 of taxable income was 16 %, the tax rate on income from C\$29,290 to C\$58,594 was 20 %, and the tax rate on income above C\$58,595 was 24 %. In 2008 the threshold were revised to C\$37,500 and C\$75,000 respectively (Revenu Québec 2008). For the sake of simplicity, I assumed that  $\tau = 0.2$ . I took  $\Delta y$  to be C\$17.26, the value from using men as a comparison group in Row 5 of Column 3 in Table 11. I found that  $\rho v \Delta B$ , the additional cost of benefits per woman, was C\$7.10 and the additional tax revenue per woman,  $\tau \Delta y$ , was C\$3.45, for a net weekly cost per woman of C\$3.65.

Taking the additional weekly cost benefits per woman, multiplying by 52 weeks of possibly having a child under 1, and dividing through by the 1.2 percentage point increase in fertility yields an average cost per additional birth in increased benefits of C\$30,782. However, this cost was offset by C\$14,954 in additional tax revenue due to the increase in labor supply due to the program, resulting in a net government cost per additional birth of C\$15,828. As a basis of comparison, the Lee and Miller (1997) projection that the fiscal impact of an incremental birth in the United States is C\$102,161 in 2008 Canadian dollars. Therefore the increase in benefit generosity due to QPIP may have resulted in a large fiscal benefit in the long run.

QPIP was financed by a payroll tax imposed on all employers, employees, and the self-employed. In 2006 the program-specific tax rate was 0.416 % levied on employees 0.583 % levied on employers, which offset a reduction in federal payroll Employment Insurance taxes of 0.340 %. Using revenues from the payroll tax and tax rates for those who were not self-employed reported by the Conseil de Gestion de l’Assurance Parentale Québec (2007, 2008, 2009), this payroll tax resulted in an additional C\$1.9 billion dollars in revenue from 2006 through 2008 relative to the case where tax rates were kept at the federal level. The revenue raised per additional child born to women age 25–45 can be estimated multiplying the C\$1.9 billion in increased revenue by the proportion of births that occurred to women 25–45, which I assumed to be 80 %, dividing through by number of life-years lived by women age 25–45 in 2006 through 2008 (Statistics Canada 2009), and dividing through by the 1.2 percentage point increase in the birth rate shows that an additional C\$47,856 was raised per child born. Given that this more than offset the net government cost per child of C\$15,828, the payroll tax levied to support the program may have been too high.

## Conclusion

This paper has added to the evidence that pronatalist policies have distortionary effects on labor markets, and it is therefore fiscally prudent to take labor supply effects into account when designing fertility incentives by evaluating the cash-transfer fertility incentives that were introduced in Quebec in the late 1980s and 1990s and the QPIP that was introduced in 2006. I demonstrated that cash-transfer fertility incentives have minor impacts on fertility but, consistent with theory, reduce the labor supply of mothers of young children. In contrast, increasing the generosity of parental leave benefits increases the birth rate substantially and also induces increases in the labor supply of women of childbearing age. This article provided a cost-benefit analysis that makes it possible to directly compare the cost and benefits of cash-transfer versus parental leave policy, which has not previously been done in the literature. These very different responses result in a large difference in the estimated cost per additional birth due to the program: the estimate net government cost of an additional birth due to an increase in parental leave benefits is C\$15,828 in 2008 Canadian dollars, whereas the cost of an additional birth due to cash-transfer fertility incentives is C\$223,628 in 2008 Canadian dollars (C\$127,565 in 1986 Canadian dollars).

The effects of both sets of programs are heterogeneous by the parity of the child: the increase in births due to cash transfers was driven primarily by first births whereas 68 % of the increase in births attributable to QPIP were of second or higher parity. When designing fertility incentives, policymakers should take into account how they may affect the quantum of fertility. For example, if they believe that larger families are more desirable due to returns to scale within families, then they should favor parental leave benefits.

The magnitude of the estimates of the program effects is attributable in part to the Canadian context. Unlike the United States, the price of health care does not vary discontinuously with hours worked. This may give Canadian workers more flexibility in choosing their hours along the intensive margin, since there is not a similar kink in total compensation at 30 hours worked per week as in the United States. Nevertheless, the effects of implementing similar policies in other political systems should be qualitatively similar.

Since the intent of many fertility programs is to increase the future tax base by increasing the next generation's workforce, it will be interesting to see how these programs affect the outcomes, particularly with respect to labor supply and education, of the cohorts who were born when the programs were in place. This could operate through multiple mechanisms. For example, since mothers are

about five percentage points more likely to stay at home with their infants, does this have any effect on the well-being of the average child? If the effects are in line with Baker and Milligan (2008), who found that extended leave taking due to the extension of the duration of maternity leave benefits led to increased duration of breastfeeding and favorable infant outcomes, beyond achieving a larger future workforce a second order effect might be a healthier workforce. While this is outside of the scope of this paper, it is also feasible that in the long run educational investments may increase among women who anticipate being better able to balance family and career.

The primary innovation in this paper is the estimation of causal labor supply and fertility effects of fertility incentives in order to generate plausible cost-benefit comparisons between different types of programs. The empirical results clearly suggest that generous maternity leave benefits dominate cash-transfer fertility incentives in their cost per additional birth. Given this result and the literature on the benefits of parental leave benefits on female employment (Ruhm 1988; Waldfogel 1988) and GDP (Ruhm and Teague 1997), governments interested in increasing birth rates should consider shifting resources from cash-transfer fertility incentives to increasing the generosity of paid parental leave programs.

**Acknowledgments** This research was supported by the Statistics Canada Tom Symons Research Fellowship and the National Science Foundation Graduate Research Fellowship. I am grateful for the insightful comments from Henry Farber, Orley Ashenfelter, David Lee, seminar participants at Statistics Canada, Princeton University, and two anonymous referees.

## References

- Angrist, J., & Evans, W. (1998). Children and their parents' labor supply: Evidence from exogenous variation in family size. *The American Economic Review*, 88(3):450–477. Retrieved October 30, 2013 from <http://www.jstor.org/stable/116844>.
- Bailey, M. (2006). More power to the pill: The impacts of contraceptive freedom on women's life cycle labor supply. *The Quarterly Journal of Economics*, 121(1), 289–320. doi:10.1162/003355306776083491.
- Baker, M., & Milligan, K. (2008). Maternal employment, breastfeeding, and health: Evidence from maternity leave mandates. *Journal of Health Economics*, 27, 871–887. doi:10.1016/j.jhealeco.2008.02.006.
- Baughman, R., & Dickert-Conlin, S. (2003). Did expanding the EITC promote motherhood? *The American Economic Review*, 93(2), 247–251. doi:10.1257/00028280321947137.
- Baum, C. I. (2003). The effects of state maternity leave legislation and the 1993 family and medical leave act on employment and wages. *Labour Economics*, 10(5), 573–596. doi:10.1016/S0927-5371(03)00037-X.
- Bertrand, M., Duflo, E., & Mullainathan, S. (2004). How much should we trust difference-in-difference estimates? *The Quarterly Journal of Economics*, 119(1), 249–275. doi:10.1162/003355304772839588.



- Bongaarts, J. (2002). The end of the fertility transition in the developed world. *Population and Development Review*, 28(3), 419–443. doi:10.1111/j.1728-4457.2002.00419.x.
- Canada. (1985). Revised Statutes of Canada, chapter c H-6, Canadian Human Rights Act. Government of Canada.
- Canada. (1996). Acts of the Parliament of Canada Passed in the Year 1996, chapter S.C. c. 23, Employment Insurance Act. Queen's Printer of Canada.
- Canada. (2000). Acts of the Parliament of Canada Passed in the Year 2000, chapter S.C. c. 14, Budget Implementation, 2000. Queen's Printer of Canada.
- Cancian, M., & Levinson, A. (2006). Labor supply effects of the earned income tax credit: Evidence from wisconsin's supplemental benefit for families with three children. *National Tax Journal*, 59(4), 781–800.
- Dickert-Conlin, S., & Chandra, A. (1999). Taxes and the timing of births. *Journal of Political Economy*, 107(1), 161–177. doi:10.1086/250054.
- Eissa, N., & Liebman, J. (1996). Labor supply response to the earned income tax credit. *The Quarterly Journal of Economics*, 111(2), 605–637. doi:10.2307/2946689.
- Espenshade, T., Guzman, J. C., & Westoff, C. (2003). The surprising global variation in replacement fertility. *Population Research and Policy Review*, 22(5–6), 575–583. doi:10.1023/B:POPU.0000020882.29684.8e.
- Gans, J., & Leigh, A. (2009). Born on the first of july: An (un)natural experiment in birth timing. *Journal of Public Economics*, 93(1–2), 245–263. doi:10.1016/j.jpubeco.2008.07.004.
- Goldin, C., & Katz, L. (2002). The power of the pill: Oral contraceptives and women's career and marriage decisions. *Journal of Political Economy*, 110(4), 730–770. doi:10.1086/340778.
- Grogger, J., & Bronars, S. (2001). The effect of welfare payments on the marriage and fertility behavior of unwed mothers: Results from a twin experiment. *Journal of Political Economy*, 109(3), 529–545. doi:10.1086/321016.
- Gruber, J. (1994). The incidence of mandated maternity benefits. *The American Economic Review*, 84(3):622–641. Retrieved October 30, 2013 from <http://www.jstor.org/stable/2118071>.
- Hoffman, S., & Foster, E. M. (2000). AFDC benefits and nonmarital births to young women. *The Journal of Human Resources*, 35(2), 376–391. doi:10.2307/146330.
- Inland Revenue Authority of Singapore. (2009). Working mother's child relief. Retrieved September 16, 2009 from <http://www.iras.gov.sg/irasHome/page04.aspx?id=220>.
- Jagannathan, R., Camasso, M., & Killingsworth, M. (2004). New jersey's family cap experiment: Do fertility impacts differ by racial density? *Journal of Labor Economics*, 22(2), 431–459. doi:10.1086/381256.
- Kim, A. Y.-I. (2012). Impacts of direct cash transfer on fertility by income and education subgroup: Study of allowance for newborn children of canada. *Korean Journal of Population Studies*, 35(3), 29–55.
- Kim, A. Y.-I. (2014). Lifetime impacts of cash transfer on fertility. *Canadian Studies in Population* (forthcoming).
- Klerman, J., & Leibowitz, A. (1994). The work-employment distinction among new mothers. *The Journal of Human Resources*, 29(2), 277–303. doi:10.2307/146099.
- Kulish, N. (2007). *Falling german birthrate dispels baby miracle myth*. New York: The New York Times.
- Lappegard, T. (2012). Couples' parental leave practices: The role of the workplace situation. *Journal of Family and Economic Issues*, 33(3), 298–305. doi:10.1007/s10834-012-9291-6.
- Lee, R., & Miller, T. (1997). *The New Americans: Economic, demographic, and Fiscal effects of immigration, chapter 7. The future Fiscal impacts of current immigrants* (pp. 297–362). Washington, DC: National Academy Press.
- Levesque, G. (1988). *1988–1989 Budget: Budget speech and additional information*. Montreal, QC: Gouvernement du Québec: Ministère des Finances.
- Levesque, G. (1989). *1989–1990 Budget: Budget speech and additional information*. Montreal, QC: Gouvernement du Québec: Ministère des Finances.
- Levesque, G. (1990). *1990–1991 Budget: Budget speech and additional information*. Montreal, QC: Gouvernement du Québec: Ministère des Finances.
- Levesque, G. (1991). *1991–1992 Budget: Budget speech and additional information*. Montreal, QC: Gouvernement du Québec: Ministère des Finances.
- Livermore, M., & Powers, R. (2006). Employment of unwed mothers: The role of government and social support. *Journal of Family and Economic Issues*, 27(3), 479–494. doi:10.1007/s10834-006-9027-6.
- Lundberg, S., & Plotnick, R. (1995). Adolescent premarital child-bearing: Do economic incentives matter? *Journal of Labor Economics*, 13(2), 177–200. doi:10.1086/298372.
- Meyer, B. (2002). Labor supply at the extensive and intensive margins: The EITC, welfare, and hours worked. *American Economic Review*, 92(2), 373–379. doi:10.1257/000282802320191642.
- Meyer, B., & Rosenbaum, D. (2001). Welfare, the earned income tax credit, and the labor supply of single mothers. *The Quarterly Journal of Economics*, 116(3), 1063–1114. doi:10.1162/00335530152466313.
- Milligan, K. (2005). Subsidizing the stork: New evidence on tax incentives and fertility. *The Review of Economics and Statistics*, 87(3), 539–555. doi:10.1162/0034653054638382.
- Milligan, K., & Stabile, M. (2007). The integration of child tax credits and welfare: Evidence from the canadian national child benefit program. *Journal of Public Economics*, 91(1), 305–326. doi:10.1016/j.jpubeco.2006.05.008.
- Parent, D., & Wang, L. (2007). Tax incentives and fertility in canada: Quantum vs. tempo effects. *Canadian Journal of Economics*, 40(2), 371–400. doi:10.1111/j.1365-2966.2007.00413.x.
- Phipps, S. (2000). Maternity and parental benefits in canada: Are there behavioural implications? *Canadian Public Policy*, 26(4), 415–436. doi:10.2307/3552609.
- Pollard, M., & Wu, Z. (1998). Divergence of marriage patterns in quebec and elsewhere in canada. *Population and Development Review*, 24(2), 329–356. doi:10.2307/2807978.
- Québec (1997). Statutes of Quebec 1997, chapter S.Q. c. 57 An Act Respecting Family Benefits. Éditeur Officiel du Québec.
- Québec (2001). Statutes of Quebec 2001, chapter S.Q. c. 9, An Act Respecting Parental Insurance. Éditeur Officiel du Québec.
- Québec (2005a). Les prestations familiales: Statistique 2004. Technical report, Régie des Rentes du Québec : Direction de L'Évaluation et de la Révision.
- Québec (2005b). Statutes of Quebec 2005, chapter S.Q. c. 13, An Act to Amend the Act Respecting Parental Insurance and Other Legislative Provisions. Éditeur Officiel du Québec.
- Québec (2007). 06=une année de croissance: Rapport annuel de gestion. Technical report, Conseil De Gestion de L'Assurance Parentale du Québec.
- Québec (2008). Rapport annuel de gestion 2007. Technical report, Conseil du Gestion de l'Assurance Parentale du Québec.
- Quebec (2008). Revised Statutes of Quebec, chapter c C-12 Charter of Human Rights and Freedoms. Éditeur officiel du Québec.
- Québec (2009). Rapport annuel de gestion 2008. Technical report, Conseil du Gestion de l'Assurance Parentale du Québec.
- Revenu Québec. (2008). Guide: Income tax return 2008.

- Rosenzweig, M. (1999). Welfare, marital prospects, and nonmarital childbearing. *Journal of Political Economy*, 107(6), S3–S32. doi:10.1086/250102.
- Ruhm, C. (1988). The economic consequences of parental leave mandates. *Quarterly Journal of Economics*, 103(1), 485–515. doi:10.1162/003355398555586.
- Ruhm, C., & Teague, J. (1997). *Parental Leave Policies in Europe and North America* (Chapt. 5, pp. 133–165). New York: Russell Sage Foundation.
- Statistics Canada. (2009). *CANSIM: Live births, crude birth rate, age-specific and total fertility rates, Canada, Provinces and Territories, Annual (135 Series)*.
- Statistics Canada. (2013a). *Table 051–0004. Canada, Provinces and Territories, Annual (Persons): Components of Population Growth*.
- Statistics Canada. (2013b). *Table 102–4503 Live Births. Canada, Provinces and Territories, Annual: By Age of Mother*.
- Ugreninov, E. (2013). Can family policy reduce mothers sick leave absence? a causal analysis of the norwegian paternity leave reform. *Journal of Family and Economic Issues*, 34(4), 435–446. doi:10.1007/s10834-012-9344-x.
- Waldfogel, J. (1988). Understanding the “family gap” in pay for women with children. *Journal of Economic Perspectives*, 12(1), 137–156. doi:10.1257/jep.12.1.137.
- Waldfogel, J. (1997). Working mothers then and now: A cross-Cohort analysis of the effects of maternity leave on womens’ pay (Chapt. 4, pp. 92–129). New York: Russell Sage Foundation.
- Waldfogel, J. (1998). The family gap for young women in the united states: Can maternity leave make a difference? *Journal of Labor Economics*, 16(3), 505–545. doi:10.1086/209897.
- Whittington, L., Alm, J., & Peters, E. (1990). Fertility and the personal exemption: Implicit pronatalist policy in the united states. *The American Economic Review*, 80(3):545–556. Retrieved October 30, 2013 from <http://www.jstor.org/stable/2006683>.

**Xiaoling Lim Ang** is an economist at the Consumer Financial Protection Bureau. Her current research projects focus on the effects of bankruptcy regulation on student lending, student loan underwriting, and the effects of regulation on access to credit. She received her PhD in economics from Princeton University in 2011. This article is the result of the author’s independent research while at Princeton University and as a Tom Symons Research Fellow at Statistics Canada and a National Science Foundation Graduate Research Fellow and does not necessarily represent the views of the Consumer Financial Protection Bureau or the United States.