Subsidizing the Stork: New Evidence on Tax Incentives and Fertility *

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Abstract

This paper exploits the introduction of a pro-natalist transfer policy in the Canadian province of Quebec that paid up to C$8,000 to families having a child. I implement a quasi-experimental strategy by forming treatment and control groups defined by time, jurisdiction, and family type. The incentive was available broadly, rather than to a narrow population as studied in previous work, providing an exceptional opportunity to investigate heterogeneous responses. I find a strong effect of the policy on fertility, and some evidence of a heterogeneous response that may help reconcile these results with previous estimates.

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1 Introduction

Families with children receive special treatment under the tax and transfer provisions in twenty-eight of the thirty OECD countries (OECD (2002)). These policies may be motivated by a concern for equity: the presence of children alters their parents' ability to pay, and so merits recognition in the tax liability assigned to the family.[1] In addition to equity considerations, family fiscal policy may be motivated by a desire to increase fertility. Economic models of fertility following Becker (1960) have studied the influence of the cost of children on fertility decisions. In turn, empirical researchers have shown great interest in trying to uncover evidence of a relationship between prices and fertility. The endogeneity of key variables has frustrated this effort. Women may have unobserved proclivities for different family sizes. If differences in these proclivities lead to different human capital accumulation and marital decisions, then the opportunity cost of time out of the labor market will be jointly determined with fertility.

Hotz et al. (1997) conclude their survey on the economics of fertility by stating that "the crucial challenge is to find plausibly exogenous variation in proxies for the price and income concepts appearing in the theories." Fiscal policy may present a solution to this problem. If families with children are treated differently by tax and transfer policies than families without children, then the tax system introduces variation in the after-tax price of children. If this variation is unrelated to individuals' choices, then it can be used to test for evidence of a relationship between fertility and prices.

Many researchers have studied the impact of fiscal incentives on fertility. Demeny (1986) explores the political context of pro-natalist fiscal policy, and reviews the international evidence from the 1970s and early 1980s. Policies in the German Democratic Republic were studied by Buttner and Lutz (1990), finding evidence of a jump in time-series fertility rates corresponding to the introduction of a family subsidy program. Both Hoem (1990) and Walker (1995) examine the impact of Sweden's social policies on fertility. Boyer (1989) uses parish-level data to study the effect of the Poor Law on fertility in England. Hyatt and Milne (1991) and Zhang et al. (1994) both take a time-series approach to fertility and policy with Canadian data. Gauthier and Hatzius (1997) build a cross-country panel of fertility and family fiscal policy, finding evidence of an effect of policy only in a subset of the countries. Finally, Manski and Mayshar (2003) develop and implement an econo-

[1] See, for example, Pechman (1983) for the development of these arguments.

metric strategy to account for Israel's unique social structure and find evidence that pro-natalist incentives played a role in fertility patterns.

In the United States, work in Whittington et al. (1990), Whittington (1992), and Whittington (1993) has focused on the fertility effects of the dependent exemption, finding evidence that fertility was responsive to this tax measure. Another large body of evidence has studied the effect of welfare payments on fertility. The Hoynes (1997) survey of the literature concludes that there is no compelling evidence of an effect of welfare on fertility, while another survey by Moffitt (1998) interprets the evidence as being in favor of a relationship, although without robustness.

Several empirical problems raise questions about the existing literature. The time-series approach leaves the identification vulnerable to trends in unobserved variables. Specifically, if unobservable characteristics important for child-bearing decisions change through time, then time-series variation in general is not sufficient to identify fertility effects of policy. For micro-data studies, Moffitt (1998) and Hoynes (1997) emphasize the importance of using within-jurisdiction *and* across-time variation in the estimation of policy effects. While this approach can account for jurisdiction-specific effects that may influence fertility, existing studies have suffered from the limited magnitude of the available policy variation.

In this paper, I exploit the introduction of a pro-natalist tax policy in the Canadian province of Quebec. The Allowance for Newborn Children paid up to C$8,000 to families following the birth of a child.[2] I implement a quasi-experimental empirical strategy using vital statistics and microdata derived from the public-use files of the Canadian Census. The structure of the Allowance for Newborn Children, described in detail below, allows for the formation of treatment and control groups defined by time, jurisdiction, and family type.

This strategy offers at least three major improvements on the existing literature. First, the size of the incentive is large. Families having a third child under the Allowance for Newborn Children were paid C$8,000. Relative to previous studies of policy reforms, this benefit is large and not tied together with receipt of other public benefits, such as the food stamps program. This makes the source of the variation clear, and the causal attribution of behavioral changes to the incentive more credible.

The second advantage of my approach is that the difference in benefits across family types allows

[2] All dollar values in this paper are expressed in Canadian dollars. In 1995, one US dollar was worth 1.37 Canadian dollars.

the construction of a triple-difference estimator. The standard within-state across-time variation used in the US literature relies on the assumption that fertility trends be similar across states, an assumption which fails to hold in the presence of jurisdiction-specific fertility shocks. In contrast, my strategy using the triple-difference estimator is robust to jurisdiction-specific shocks.

A final advantage is the universality of benefits under the Allowance for Newborn Children. Conditional on residence in Quebec, the benefits were available independent of labor market status, income, and marital status. This permits a richer analysis of heterogeneity in the response to benefits. As well, the universality of the program renders unnecessary any issue of selection into the program meaning that no arbitrary sample selection criteria need be applied.[3]

A paper by Duclos et al. (2001) has examined the same policy episode, finding evidence of an increase in fertility, especially among those with two children. Their paper uses vital statistics data only, which does not contain detailed demographic information about the mother and the family. With the Census data I use, it is possible to use detailed background characteristics to control more richly for confounding factors in the regressions as well as to look at heterogeneous responses to the policy across education and income groups.

Several interesting findings emerge from my analysis. First, the estimates suggest a strong, positive, and robust impact of the policy on fertility. In the model containing the full set of control variables, the fertility of those eligible for the new program is estimated to have increased by 12 per cent on average, and by 25 per cent for those eligible for the maximum benefit. Second, I estimate the responsiveness of fertility to an extra C$1,000 in benefits, finding an increase of 16.9 percent. Finally, I find the response to the policy to be heterogeneous. Subsamples of women similar to those used in previous studies show no statistically significant response to the incentives, while families with higher income show a stronger response.

The paper proceeds as follows. First, I provide details on the relevant institutions and describe the empirical strategy used in the analysis. Next, I document trends in aggregate fertility using data derived from vital statistics, and then proceed to a rigorous empirical examination using microdata sources, including several checks for robustness of the result as well as an examination of heterogeneity in the reaction to the program. The next section estimates the responsiveness of

[3]Typically, studies of welfare benefits have including only those families "at risk" of receiving benefits, where the definition of "at risk" varies from study to study. For example, Rosenzweig (1999) finds that women with parental income greater than ten thousand dollars were much less responsive to the policy. Those with parental income above this threshold were thought to be at less risk of receiving benefits.

fertility to the dollar value of benefits. This is followed by a reconciliation of these results with previous work. Finally, a brief discussion closes the paper.

2 Empirical Strategy

In this section, I first give some institutional background on the Allowance for Newborn Children. This is followed by a discussion of the identification strategy.

2.1 The Allowance for Newborn Children

The Allowance for Newborn Children (ANC) paid non-taxable benefits to residents of Quebec when a child joined the family between May 1, 1988 and September 30, 1997.[4] All citizens and permanent residents of Quebec were eligible for this provincial program. The size of the ANC payment depended on the parity (birth rank) of the child within the family. Initially in 1988, a first or second child entitled the family to a one-time C$500 transfer. For a child of third or higher parity, the government paid a series of eight quarterly payments of $375, totaling C$3,000. Over the next 4 years, the benefit amounts increased, as shown in Table 1. From 1992, the birth of a first or second child brought a C$500 immediate payment. Second children also entitled the family to a further C$500 payment on the child's first birthday, and a third or higher parity child brought twenty quarterly payments of C$400, totaling C$8,000. Children born after the cancellation date of September 30, 1997 were not eligible for payments.

The introduction of the ANC was announced in the Quebec provincial budget on May 12, 1988. In the months preceding the budget, both the main opposition party and the governing party included in their fiscal proposals some changes to Quebec's family policies (Montreal Gazette (1988ab)). However, the provincial government released no hints about the structure of the ANC prior to the budget speech. The day following the release of the budget, the ANC was front page news in both English and French newspapers in Quebec (Montreal Gazette (1988c), La Presse (1988)). This suggests that the ANC is unlikely to have been anticipated, but that information about its surprise introduction was plausibly wide-spread. This enhances the credibility of setting this episode in an experimental framework.

[4]Children born to the mother, as well as children under age five joining a family through adoption, were eligible for the transfer. The benefit did not depend on the mother's marital status. The application for the benefit was typically included with other government forms to be filled out at the hospital and was not tied to tax-filing status.

The ANC was cancelled for children born after September 30, 1997. The cancellation was announced well in advance, and again was well-publicized. As quoted in the Montreal Gazette (1996), the government justified the cancellation by saying they thought the ANC didn't work.[5] As a candidate for a quasi-experimental analysis, the cancellation is less than ideal. A large expansion of public subsidies for childcare was announced at the same time as the cancellation of the ANC.[6] If daycare incentives had impact on fertility decisions, then it is not clear that the absence of the ANC would lead to a fall in fertility. This potentially contaminates the experimental environment.

Was the subsidy provided by the ANC large or small? To gain insight into this question, I employ equivalence scales estimated by Phipps (1998). These scales measure the cost of children by the extra income necessary to return the household to its pre-child level of utility. So, this measure excludes the opportunity cost generated by any decrease in family labor supply. I apply these scales to an average level of family income and obtain costs of C$7,935 for a first child, $6,348 for a second child, and C$5,324 for a third child.[7] Evaluated over the first five years of a child's life, this implies that the ANC represented a percentage subsidy to the direct costs of 1.3 per cent for a first child, 3.2 per cent for a second child, and 30.1 per cent for a third child.

2.2 Identification

The difference in the fertility of women in Quebec before and after the introduction of the ANC can be compared to the difference in fertility of women outside Quebec during the same period to form the standard difference-in-differences estimator. Moreover, I can exploit the structure of the ANC to further refine the empirical strategy. Because families giving birth to higher parity children receive a larger allowance, their reaction to the program should be stronger than the reaction of families contemplating the birth of a first child. This permits the construction of a third difference — women entering the treatment period facing a first-rank birth can act as a control group for women considering a higher parity birth. This enhances the robustness of the identification strategy

[5]The raw number of children born in Quebec in 1996 was almost unchanged from 1988 at about 85,000, a fact which might underlie the government's claim. The analysis in section 3 demonstrates that when the number of babies is appropriately normalized for the number and ages of women, a different answer emerges.

[6]See Baril et al. (2000) for a description and analysis of the pre-1997 and post-1997 Quebec family benefit programs.

[7]The equivalence scales estimated by Phipps (1998) for a two parent family are 1.155 for one child, 1.279 for two children, and 1.383 for three children. The average total family income among married couples with children in the 1996 Census is C$51,191.

relative to the basic difference-in-differences strategy.[8]

This identification strategy may be compromised if other policy changes occurred contemporaneous with the introduction of the Allowance for Newborn Children. Two relevant major policy changes of which I am aware occurred during this time period. First, abortions were removed from the Criminal Code of Canada following the striking down of Section 251 by the Supreme Court of Canada in 1991 (*R. v. Morgentaler* 1991.) To the extent that this increased the availability of abortions, it may have influenced fertility. The rate of abortion per 100 live births, however, showed little change between 1986 and 1992.[9] Second, the Canada-Quebec Accord of 1991 gave to the province of Quebec constitutional power over immigration (Young (1998)). If the Accord resulted in a change in the fertility behavior of immigrants selected by Quebec compared to those selected by the rest of Canada, then my estimates will attribute to the ANC what should be attributed to the change in immigration laws. To investigate this hypothesis, I note later in the paper that I can reproduce my results with a subsample that excludes immigrants, with no significant change to the point estimates.

Besley and Case (2000) argue that the source of policy variation must be considered carefully in order to avoid erroneous inferences from endogenously adopted policy. If some change in Quebec society led to both the introduction of the program and the change in fertility, then estimates of the effect of the policy will be confounded. However, the newspaper accounts referred to above suggest that the ANC was introduced as a response to *declining* fertility, so the effect of policy endogoneity would work against finding a positive result.[10] Nonetheless, the empirical approach taken here addresses this important issue in two ways. First, even in the presence of a different attitude to fertility among Quebecers, the identification will be robust if this attitude is constant through this period. Second, even if there were some change in unobservable determinants of fertility in Quebec contemporaneous with the introduction of the ANC, the triple-difference comparison of first births

[8]For families facing the birth of a first child, the incentives provided by the ANC may be stronger than the benefit paid for that child alone. This arises because the birth of a first child also gives the family an option to have a second child. In this way, the incentives for higher parity births may influence families facing lower parity births. The use of families facing a first birth as a control group for families facing a third or higher birth is still informative, however, so long as the treatment for the two groups is different. I ran regressions attempting to account for this option value by including a measure of the incentives for the births of all potential higher parity children. The higher parity incentives were weighted by the probability that the family would have a child of a given parity, conditional on the family's current structure. These regressions produced results similar to those reported.

[9]See Statistics Canada (1994). The rate per 100 live births increased from 17.0 to 17.7 in all of Canada, and from 14.7 to 16.6 in Quebec. The rates per one thousand women exhibited a similar pattern.

[10]As noted above, other contemporaneous policy changes could confound the estimates of the effect of the ANC.

to higher-order births permits inferences about the effects of the policy. In other words, a social trend would have to have a differential impact on families of different sizes in order to hinder inferences.

2.3 Data Choices

There are several possible data sources available for analysis of this question. In order to examine aggregate trends, I use data drawn from vital statistics. The two advantages of the vital statistics are that it captures the entire universe of children born, and that it does so annually. However, the vital statistics do not allow analysis of other potentially confounding covariates. For this purpose, I examine data selected from the Canadian 1991 and 1996 Census Public Use Microdata Files on Families. The great advantage of the Census over other Canadian surveys is the ability to reconstruct the correct family structure and the greater sample size available in the Census. Alternative data sources produced results supportive of the Census results, but with less precision.[11]

3 Evidence from Vital Statistics

This section examines aggregate measures of fertility taken from vital statistics.[12] The goal of the vital statistics analysis in this paper is to document on an annual basis the trends in fertility to see if there is any evidence the ANC had impact. The measure for fertility used here is the total fertility rate, which summarizes lifetime fertility using the prevailing cross-section of age-specific fertility rates in a given year. I focus on the years from 1980 to 2000, comparing fertility across jurisdictions and by parity, before and after the introduction and cancellation of the ANC.

3.1 Graphing the trends

I construct annual total fertility rates for Quebec and for the rest of Canada excluding Quebec, as described in Appendix A.[13] I use not only the total fertility rate, but also parity-specific fertility rates for first, second, and third or more children. These data are graphed in Figure 1, with lines

[11] I also explored the Family Expenditure Survey, the Survey of Consumer Finance, and the General Social Survey as possible data sources. In all cases, the sample size for women in Quebec of different family types was insufficient to provide credible inferences. In addition, I produced some results using the Labour Force Survey. The Labour Force Survey has adequate sample size, but only reports the age of the youngest child rather than the ages of all children. Again, the trends in fertility in Quebec and the rest of Canada were consistent with the results I find for the Census.

[12] Vital statistics are collected by provincial governments. Statistics Canada assembles the vital statistics from the provincial offices to provide national aggregate statistics. More detail is provided in Appendix A.

[13] Hotz et al. (1997) provide a detailed description and comparison of different fertility measures.

between the 1988 and 1989 observations, as well as after the 1997 observation to indicate the starting and end points of the ANC.

From 1980 to 1987, the total fertility rates in Quebec and the rest of Canada diverged, reaching a maximum difference of 0.290 in 1987. In 1988, when births could not have been affected by the ANC, the total fertility rate begins to rise in Quebec, which may be troubling if this represents a pre-existing trend in Quebec fertility. In the regression analysis below I attempt to account for pre-existing trends in the data. As well, later with the Census data I take up several strategies to check for false policy effects. The years after the introduction of the ANC shows a quick narrowing of the gap between the total fertility rates of Quebec and the rest of Canada. By 1991 this gap reached 0.082, and then remained fairly constant through the duration of the program. This provides some preliminary evidence consistent with the ANC having affected fertility.

Following the cancellation of the program in 1997, the total fertility rate in Quebec fell from 1.601 in 1996 to 1.429 in 2000. In the rest of Canada, there was also a downward trend from 1996 to 1998, though not as sharp as in Quebec. Because of the introduction of the subsidized childcare program that may also have influenced fertility, caution should be taken in the interpretation of the data around the cancellation. However, the relative fall of third births to first births may still be informative because the child care program had no preference for higher birth rank.

The parity-specific lines in Figure 1 break down the total fertility rate by parity. First are the fertility rates of women having their first child. The rate for women in Quebec lies below the rate for women in the rest of Canada for the pre-reform period. The first-child fertility rate hits its minimum in 1985 and begins moving up before the introduction of the ANC. After the introduction of the ANC, the first-child rate in Quebec continues rises relative to women in the rest of Canada until 1991, when it overtakes the rate for the rest of Canada. The pre-existing trend may create some concern, but it is clear that average fertility before the policy change was lower than after the policy change.

For second children, a similar pattern emerges: a persistent gap before the reform followed by a period of convergence from the introduction of the ANC until 1991, and then finally a period with little difference between the rates from 1991 to 1997. The strongest results are found for third and higher births. The bottom two lines in Figure 1 compare the fertility rate for the two regions for births of third or higher parity. The gap between the rates before the introduction of the ANC was substantial. The rate was 0.217 in Quebec compared to 0.374 in the rest of Canada for 1987, for

example. After the introduction of the ANC, the fertility rate for third or higher births in Quebec increased rapidly. In 1995, the Quebec rate reached 0.305, which was 41 per cent above the rate observed in 1987. Over the same period, the fertility rate in the rest of Canada displayed a steady, slow downward trend.

Overall, this breakdown of the total fertility rate by parity provides two strong pieces of evidence. First, the ANC appears to have had an effect on fertility rates in Quebec, both on its introduction and its cancellation. Second, the movements in births of third or higher parity appear to be larger than those for births of first or second parity, consistent with the magnitude of the incentives.

3.2 Cohort Analysis

Do these observed changes in fertility represent a permanent or a transitory shift in fertility behavior?[14] For example, if woman reacted to the ANC by having more children earlier, followed by fewer children later in life, then there would be no effect of the ANC on completed fertility. However, the measured total fertility rate would reflect such behavior with a transitory upward shift. When completed fertility rates for the cohorts exposed to the ANC become available, this hypothesis may be testable. Still, with currently available data, some evidence can be gathered on this question.

Table 2 reports the number of children born to each one thousand women in Quebec and in the rest of Canada in different age ranges by cohort. The data are presented at five-year intervals between 1962 and 1997. The rates from 1992 and 1997 are shaded to indicate the presence of the ANC for those years. The top-left cell takes the women born in Quebec between 1943 and 1947 for the year 1962, when members of this cohort were between the ages of 15 and 19. For these women, there were 29.83 births per thousand women in 1962. The top row then follows this cohort through to 1987, when they had 2.59 children per thousand. Looking down the first column allows a comparison of different cohorts as they reach the 15 to 19 age range.

For the 1963-1967 cohort in Quebec, the women had 129.71 children per 1,000 women at ages 25-29 when observed in 1992, during the ANC. This reversed the downward trend across cohorts for fertility rates across ages. This reversal is not seen in the data for the rest of Canada below. When this cohort reached ages 30-34 in 1997, they had 79.61 children per 1,000 women. Again, this

[14] Parent and Wang (2002) finds evidence of a transitory response to the Canadian baby bonus program in the 1970s.

was an increase relative to previous cohorts, meaning that there is no observed offsetting decrease in future fertility following this cohort's increased fertility in 1992. The same pattern is repeated for other cohorts in Quebec (with the exception of the 1973-1977 cohort at age 20-24), providing some evidence against the response to the ANC being transitory. Better evidence on the transitory or permanent nature of the fertility effects must wait for completed fertility data on these cohorts of women.

3.3 Regression analysis

Using the data from 1980 to 1997 from Quebec and the rest of Canada, I form a data set from the aggregate vital statistics data comprising 36 observations. With these data I can quantify the trends visible in the graphs, as well as attempt to account for pre-existing trends in the data. The dependent variable for the regressions is the total fertility rate, along with the three parity-specific fertility rates. I include Quebec and year fixed effects, and form the key variable of interest by interacting the Quebec dummy with an indicator for years following the introduction of the ANC (1989 and later).[15] This policy variable indicates the difference in the time trend of fertility in Quebec versus the rest of Canada.

The results are reported in Table 3. Column (a) shows the results from the base specification described above. The estimated coefficient on the policy variable is 0.145, which is a nine per cent increase over the average value of the dependent variable. The coefficients for the three parity-specific fertility rates are also significant, with the largest percentage increase appearing for the third or higher fertility rate. In column (b), I repeat the regressions with the inclusion of a linear time trend interacted with the Quebec variable. This specification allows for a Quebec-specific linear trend in fertility, measuring the effect of the policy as a deviation from the Quebec-specific trend. The magnitudes of the estimated coefficients are similar, but the estimates are less precise.

This analysis with the vital statistics data provides evidence that the policy appears to have increased fertility in Quebec in a manner consistent with the pattern of incentives. Furthermore, the regression analysis shows the inference to be robust to a Quebec-specific linear trend in fertility.

[15] Regressions using a different cutoff year and excluding the transition years showed similar results.

4 Evidence from Census Data

The Census microdata files combine information on the family recorded on Census Day with income and labor force information from the previous calendar year. The 1991 file describes each family as of June 4, 1991 and provides income details for 1990. Similarly, the 1996 file describes the families as of May 14, 1996, and provides income details for the 1995 tax year. I select families in which the female spouse or lone-parent female is between 15 and 34, who have not changed provinces in the past five years, and who are residents of Canada. More detail on the construction of the data set is found in Appendix A.

The timing of the Censuses and the ANC is critical to the interpretation of the empirical results. The Census files do not provide the exact year of birth for each child, but do report the number of children in different age ranges. The first category is for children under the age of six. For the 1991 Census, a child born between June 5, 1985 and June 4, 1991 will appear as a child under the age of six. These dates define what I refer to as the 1991 Census window. Similarly, the 1996 Census window opens on May 15, 1990 and closes on May 14, 1996. The ANC was paid for children born between May 1, 1988 and September 30, 1997. The ANC window thus partially overlaps the 1991 Census window, but completely spans the 1996 Census window. Figure 4 displays the timing graphically.

Because of gestation and information lags, it is difficult to know exactly when the first births potentially influenced by the ANC took place. The degree to which births observed in the 1991 Census were influenced by the ANC changes the interpretation of the results. If no births observed in the 1991 Census were influenced by the ANC, then the research design is standard — one pre-treatment period followed by one full treatment period. Because of the overlap, however, the use of these two Censuses results in a comparison of fertility in a period of partial exposure to the ANC (the 1991 Census window) with fertility in a period with complete exposure to the ANC (the 1996 Census window). Later in the paper (in section 4.4) I report results from regressions using the dollar values of ANC benefits. These regressions will account for the intensity of treatment received by women through each Census window.

The experimental design requires knowledge of the family structure at the beginning of the Census window six years prior to Census day, as well as the exact number of children born to the family over the Census window. The Census reports the number of children in different age ranges

residing with the family on Census day. The category for children under age six is used to construct the binary variable *Had a child*, taking the value 1 when the family has at least one child under six, and 0 if no children under age six are present. From the other age categories, I construct three indicator variables to count the number of children age six or older in the family. The variables *Zero older children*, *One older child*, and *Two or more older children* take the value 1 when the corresponding number of children over six are present in the household, and 0 otherwise. These variables enable the reconstruction of the family structure at the beginning of the Census window. The number of older children is the number of children the family had as it entered the Census window.

Several other family characteristics observable in the data set may influence fertility. Controls for the age, highest education level, mother tongue, and immigration status of both the woman and her spouse are created from the reported categories in the Census. A measure of family income (before tax and transfers) is created that excludes female labor market earnings to avoid the endogeneity of female labor market participation to fertility. In addition, three controls for province-wide factors are created and attached to each family based on the province of residence. More detail on these variables appears in Appendix A.

Table 4 presents some descriptive statistics for the sample. For each of 1991 and 1996, the mean values for variables are reported for all observations, for those residing in Quebec, and for those residing in the rest of Canada. If assignment to treatment were randomized, the expected value of all characteristics would be equal across the treatment and control groups. Because treatment was assigned by geography rather than by randomization, it is important to examine the differences between the treatment and control groups. The number of observations fell from 1991 to 1996, reflecting the smaller share of the population in the 15 to 34 age range in the later Census. The proportion of women with a child under six rose from 0.428 in 1991 to 0.444 in 1996. The increase in Quebec, however, was greater — from 0.418 to 0.451 compared to an increase of 0.432 to 0.441 in the rest of Canada. These comparisons are given a more thorough examination below.

4.1 Differences in Means

Table 5 presents a comparison of the means of the indicator variable *Had a child* across time, jurisdiction, and parity. The standard deviations appear below the corresponding means. The table first compares the means using the full sample, then breaks down the sample by parity. The

first two columns report the means from the 1991 and the 1996 sample. The third column takes the difference between these means across time to calculate the trend in the means, while the fourth column takes the difference in the trend differences. The fifth column then reports the percentage increase in fertility in Quebec from 1991 to 1996. This is calculated by comparing the observed difference-in-differences to a counterfactual case in which the Quebec trend was equal to the rest of Canada trend. The difference-in-differences is divided by the sum of the 1991 Quebec mean and the 1996 rest of Canada trend. Finally, the last column takes the difference between the result for first and third children to form the triple-difference.

Panel A analyzes the full sample. In Quebec, the proportion of women with a child under six increased by 0.033 from 1991 to 1996. The trend in the rest of Canada was 0.009. The difference in these differences is a significant 2.4 percentage points, which represents a 5.5 per cent increase over the counterfactual assumption that Quebec fertility followed the same trend as the rest of Canada. Panels B through D repeat these calculations for subsamples of women having zero, one, and two or more other children respectively. This approach leads to the triple-difference strategy described earlier. In panel B, the percentage increase in the proportion of women with zero older children who had a child is 4.0 per cent. For those with one, and two or more older children, this rises to 9.7 per cent and 17.2 per cent. These percentage increases change monotonically with parity, which is consistent with the benefit structure of the ANC. A more formal test of the triple-difference result is presented in the sixth column of the table. The difference-in-differences for families with no other children is subtracted from the difference-in-differences for families with two or more other children. This tests whether the percentage point change in the probability of having a child is equal across parities. Because the base probabilities are very different, the same percentage point change represents a different percentage change in the probability of having a first child versus the probability of having a third child. The calculated triple-difference is 0.036 percentage points. The corresponding p-value from the test of the hypothesis that this triple-difference mean is different from zero is 0.076.

The differences in means present compelling evidence of the effect of the ANC on fertility. These statistics show that fertility increased in Quebec between 1991 and 1996, and that this increase was stronger for births of higher parity. While this is consistent with the ANC having an effect on fertility, this preliminary evidence is insufficient to suggest causation. For example, other variables important for a family's fertility decisions may vary systematically across time, place, and parity.

A multivariate framework that features controls for observable characteristics therefore improves the credibility of causal inferences.

4.2 Basic Regressions

The sample statistics presented in Table 4 revealed several differences between Quebec and the rest of Canada for variables potentially affecting fertility. In this section, I report results from regressions controlling linearly for demographic and provincial variables. This improves on the simple mean differences of the previous section by removing from the estimated program effect the influence of other observable variables affecting fertility. I first run regressions looking for the existence of a differential fertility rate in Quebec in 1996. Following this, I explore how this response changes among families facing the birth of children of different parities. At the end of the section, I also discuss several robustness checks.

The equation to be estimated takes the following form:

$$Had\ a\ child_{ijt} = \beta_0 + \beta_1 Quebec_j * 1996\ dummy_t + \beta_2 Quebec_j + \beta_3 1996\ dummy_t + \beta_4 X_{ijt} + e_{ijt},$$

where i indexes individuals, j indexes jurisdictions, and t indexes time. All specifications share the same independent variable (*Had a child*), and include controls for 1996 time effects and Quebec fixed effects, as well as a constant. This corresponds to a typical difference-in-differences empirical specification by controlling for both jurisdictional and temporal fixed effects. The variable of interest is the interaction between *Quebec* and *1996 dummy*. This interaction picks up any differential trends in fertility among residents of Quebec relative to those in the rest of Canada. The variables included in X_{ijt} vary by specification. All models are estimated as probits, with standard errors derived from the Huber-White robust estimator for the variance-covariance matrix, with clustering on provinces. The reported estimates are marginal probabilities for each of the included independent variables. These estimates can be interpreted as the marginal change in the probability of having a child during the Census window for a change in the corresponding independent variable.

As mentioned in the discussion of the timing, the program was introduced in the middle of the 1991 Census window. This means that the interpretation of the coefficients should reflect the difference between a period when the program was fully in effect (the 1996 Census window) and one in which the program was partially in effect (the 1991 Census window). For this reason, the regression coefficients should not be interpreted as measuring the full impact of the ANC.

Regressions accounting for the intensity of the treatment in the two Census windows appear later in the paper in Section 4.4.

Table 6 presents regression results including different combinations of regressors. The first column displays the results from a regression including only *Quebec*, *1996 dummy*, and their interaction. Without other control variables, the interaction term provides a measure of the unconditional average difference in fertility in Quebec in 1996 compared to 1991. The marginal probability implied by the estimated coefficient on the interaction term is 0.024. As expected, this is the same as the difference-in-differences estimate of the treatment effect reported in Table 5. Given that the proportion of women with a child under six in Quebec in 1991 was 0.418, and the estimated marginal probability from the 1996 trend variable is 0.009, the 0.024 estimate therefore implies a 5.6 per cent increase in the probability of having a child for women in Quebec in 1996.

The second column expands the set of regressors to include controls for several characteristics of the mother. With these variables included, the implied percentage increase in the probability of having a child is 7.8 per cent. These estimates suggest that the increase in fertility in Quebec in the previous specifications was not due to differences in family structure, age, immigrant status, mother tongue, or education level of the women in the sample. I control for the number of children at the beginning of the Census window with dummy variables. The marginal probability of 0.205 reported for *One older child* suggests that families who have already had one child have a 20.5 percentage point higher probability of having another child, relative to families with no older children. (The dummy variable *No older children* is the excluded variable.) Families with two or more children already, however, are less likely to have another child, as indicated by the negative marginal probability reported for the corresponding indicator variable. Taken together, this reveals an average preference for two child families.

The demographic controls reveal no surprises. The excluded age category is for ages 15 to 24. Relative to the excluded category, the estimates suggest that females age 25 to 34 are 18.7 percentage points more likely to have a child. I include a dummy for immigrant status as well as dummies for the mother tongue spoken by the woman. These variables may capture cultural elements that vary across native-born and immigrant women, and across women of different language groups. The significant coefficient on being anglophone or francophone suggests that, relative to allophones, both anglophones and francophones are less likely to give birth in the Census window.[16]

[16]The higher fertility of immigrants and allophones does not drive the estimate of the effect of the ANC. Subsamples

Finally, three dummy variables indicate the effect of different levels of female education on fertility. The estimates decline monotonically with education. For a women with a university degree, the estimated coefficient implies a 19.2 percentage point drop in the probability of having a child. Women with more education have better labor market prospects, so this pattern is consistent with the predictions of the Willis (1973) framework in which women with a higher opportunity cost of time choose to have fewer children.

Rosenzweig and Schultz (1985) and Rosenzweig (1999) have argued that human capital accumulation decisions are made jointly with fertility decisions. For example, if a young woman has little desire to bear children, then this may increase her propensity to make investments in human capital. In addition, this may increase her desire to get married. This suggests caution in interpreting the coefficients on these potentially endogenous variables. How might this effect the estimate of the program's impact on fertility? If women changed their human capital and marital decisions in response to the introduction of the ANC, then interpreting these variables separately from the *Quebec - 1996 dummy* interaction becomes difficult. However, because many of the women in this data set were older when the program was introduced, it seems plausible to assume their marital and education choices were fixed before they were exposed to the program.[17]

The third column adds further control variables for the male partners of the women in the sample.[18] The estimated coefficient on the *Quebec - 1996 dummy* interaction increases to 3.9 percentage points with the male controls included. The estimated coefficients on the education variables show a distinctly opposite pattern for the males. If males do not take time out of the labor force upon the birth of a child, then male earning potential has an income effect on fertility. Therefore, these estimates suggest a positive income effect on fertility. Additional evidence on the income effect on fertility is found in the estimated coefficient on *Family income*, a measure which excludes the labor market earnings of the female. This coefficient is positive, suggesting that a ten thousand dollar increase in family income increases the probability of having a child by 1.75 percentage points. In the Becker and Lewis (1973) quality-quantity model, more income leads to a higher demand for both child quality and child quantity, which leaves the sign of the overall

chosen by language or by excluding immigrants showed similar point estimates for the policy variable.

[17]Regressions on the subsample of women between the ages of 25 and 34, for whom this assumption may be more reasonable, show similar results to the full sample.

[18]For single women, the male variables take the value zero. The interpretation of the male variables is therefore joint with the effect of being married.

income effect theoretically ambiguous.[19] In these data, the estimates suggest that, on average, the direct effect of higher income on the quantity of children dominates the indirect effect through child quality.

The fourth column of Table 6 supplements the controls from column (c) with three additional provincial control variables, as well as provincial fixed effects. The interpretation of the *Quebec* and *1996 dummy* interaction as a program effect relies on the assumed absence of other provincial trends in variables affecting fertility. *Provincial GDP growth*, *Provincial migration rate*, and *Provincial education spending* attempt to control for province-level macroeconomic, demographic, or fiscal shocks that may confound the measurement of the effect of the ANC. Only two of these estimates are statistically significant by themselves, the three are strongly significant when tested jointly, with a calculated chi-squared test statistic of 15.51 for the exclusion of these three variables. These controls have a large impact on the estimate of the *Quebec - 1996 dummy* interaction term, which rises from 3.9 to 5.3 percentage points.

The empirical strategy I use depends critically on the choice of control group. In further results available from the author, I test the robustness of results using alternative choices for the control group and for the selection criteria. The point estimates change little using no immigrants, only immigrants, just Ontario and Quebec, at least one parent French, and neither parent French.

In the discussion of identification in Section 2, the possibility of finding "false" treatment effects was raised. To investigate this issue, I conducted a number of falsification checks by looking for fertility effects in provinces and in time periods when there was no ANC program. These results revealed no spuriously-arising situations with fertility patterns across family types such as those experienced by Quebec during this period. The results are not reported here but are available upon request from the author.

Finally, with the Census data I can once more address the potential problem of intertemporal shifting of births. I take the total number of children in the 1991 sample of women in the age range 25 to 34 and compare it to the same calculation in 1996, for both Quebec and the rest of Canada. If women in Quebec reacted to the ANC by having more babies sooner, followed by fewer later, then the total number of children observed in 1996 should not have changed relative to the rest of Canada. In 1991, the average number of children in the rest of Canada among women between 25

[19]The increase in desired child quality induced by the increase in income leads to an increase in the expenditure per child. This increases the cost of a child, which leads to a decreases in the desired quantity. Thus, higher income has a positive direct effect on quantity, but a negative indirect effect on quantity through child quality.

and 34 was 1.220, and in Quebec it was 1.097 (a difference of 0.124). By 1996, the average in the rest of Canada had fallen to 1.187 while it rose in Quebec to 1.132 (a difference of 0.054). Using this difference in differences, the number of children in Quebec rose by 0.069 or 6.3 per cent between 1991 and 1996. This provides some further evidence in favor of the ANC having a permanent rather than a transitory impact on fertility.

4.3 Results for Different Family Structures

The evidence presented in Table 6 shows a strong increase in fertility in Quebec following the introduction of the ANC. In order to provide more convincing evidence of a causal link, I present results that compare the fertility of families facing the birth of children of different parities. With the higher payment made to births of third or higher parity, a stronger response by these families is expected.

Table 7 reports the results of regressions on three subsamples comprised of families with zero, one, and two or more older children. These results appear in the first three columns of the table. These regressions use the empirical specification from Table 6 including the full set of control variables. For families who entered the Census window with no children, the estimated increase in the probability of having a child is 4.1 percentage points, which implies a 9.8 per cent increase in probability over the counterfactual assumption that Quebec followed the same trend as the rest of Canada. For second children, the percentage increase in probability is 13.1 per cent, and for third or higher parity children, the probability is estimated to increase by 24.7 per cent over its counterfactual level. All three estimates are statistically significant at conventional levels. The point estimates across the parities show a pattern consistent with the incentives of the ANC. However, it must be noted that the confidence intervals of the estimates for different parities overlap so the statistical significance of any inference about the ranking of the results by parity remains imprecise.

Families facing the birth of a third child may differ systematically from other families in observable ways. For example, women who already have at least two children are older and have higher family income. To see if these differences, rather than the ANC, underlie the stronger response among families facing higher-parity births, I pool together all family types, but now interact the *Quebec* and *1996 dummy* variable with each of *Zero older children*, *One older child*, and *Two or more older children*. As well, I include interactions of *Quebec* with each family type, and interactions of *1996 dummy* with each family type. This controls for any Quebec-specific effects for

children of different parities, and common trends in fertility for families with children of different parities. This specification frees different family types to have different responses to the program, while controlling for observable differences across family types. The resulting estimates are quite similar to those from the regressions on family-type subsamples. The implied percentage increase in the probability ranges from 10.7 per cent for families with zero older children to 25.0 per cent for families with two or more older children. While the point estimates across parities again line up with the incentives of the ANC, a formal test of the homogeneity of the three coefficients cannot be rejected at the 95 per cent confidence level, with a calculated p-value of 0.053.

4.4 Results Using Dollar Value of ANC Benefits

This section discusses results from regressions that replace the *Quebec - 1996 dummy* interaction with the dollar values of ANC benefits received by families. With this specification, I attempt to account for the intensity of treatment received by different families across family types and in the two census windows. The analysis is made difficult, however, by the frequency of receipt of payments. Estimates from the existing literature tend to use annual benefit flows rather than lump-sum payments. For this reason, to try and maintain comparability I report results from regressions using two measures of the benefit — the flow of benefits over the first year and the total over the first *five* years of the child's life (discounted by a three percent real interest rate).[20] If the policy commitment to make the payments is credible and families are forward looking and rational, the reaction to C$1,000 of one year benefits should be around one fifth of the size of the reaction to C$1,000 of five year benefits.

Table 8 presents the coefficients from regressions using the same control variables as Table 6 column (d) along with the first-year and the five-year ANC benefit amounts. The first column contains the results for the first-year benefit regression. This regression provides a useful comparison with results from the literature which focus on annual benefits. The estimated coefficient on the benefit variable is 0.073. This coefficient implies that a C$1,000 increase in the benefits received in the first year would increase the probability of having a child by 16.9 per cent. When this responsiveness is combined with the average benefit received by Quebecers, the benefit elasticity of fertility can be calculated. The elasticity here is 0.107, which is similar to the range of estimates

[20] To attribute the dollar values to data in the Census, I average over the years in the corresponding Census window.

in time-series studies.[21]

The second column of the table displays the five-year benefit results. This measure better captures the change in the family's financial position because of the differing number of periods over which payments were made for the ANC. Here, the estimate suggests that a C$1,000 increase in the total five-year sum of the benefits would increase fertility by 2.6 per cent. This is only slightly less than one fifth of the first-year benefit result, which suggests that using the first-year benefits proxies satisfactorily for future benefit flows.

Table 8 also reports the results of the benefit regressions broken down by parity. In the first column, the estimated coefficients on the first year of benefits imply percentage increases between 19.7 per cent and 24.3 per cent. The relatively tight range for these estimates may suggest a very similar underlying responsiveness across family types to a C$1,000 increase in benefits. However, the five-year benefits results in the second column cloud the picture somewhat. Here, the responsiveness among families with zero older children is necessarily the same as for the first-year benefits, since no payments are made past the first year. For families with two or more older children, however, the responsiveness is much lower. This may be the result of an 'option value' calculation by the parents — the larger payoff to a third child increases the likelihood of having a first or second child because it preserves the option of reaching the large payoff with a third child. These results suggests that the greater response to the ANC among those facing a third or higher order birth was not due to higher responsiveness, but instead to the higher dollar value assigned to third births.

5 Reconciliation with AFDC Findings

Aggregate time series studies mostly find some responsiveness of fertility to tax incentives. In contrast, the US literature on welfare has found inconsistent results. In this section, I attempt to reconcile the strong fertility effects of the ANC found here with findings from the rest of the literature. I do this by selecting subsamples from my Census data set that resemble the samples used in other studies. This permits some insight into the differences between the results found here and those from other studies.

I focus on three recent papers that study fertility and payments under Aid to Families with

[21] Gauthier and Hatzius (1997) find a long run benefit elasticity of 0.16 for family allowances across countries. Zhang et al. (1994) find elasticities of 0.05 to 0.11 for child benefits in Canada. Whittington et al. (1990) find elasticities between 0.127 and 0.248 for the personal exemption in the United States.

Dependent Children (AFDC).[22] First, Rosenzweig (1999) employs the National Longitudinal Survey of Youth (NLSY) on young women through the age range 14 to 22. I replicate this data set by selecting women who are under age 25. Second, Fairlie and London (1997) use a sample of single mothers with at least one child from the Survey of Income and Program Participation (SIPP). I replicate their data set by using the same selection criteria. Finally, Acs (1996) uses the NLSY on a sample of single women under age 23. I replicate this data set by selecting single women under age 25.

The results from these regressions appear in Table 9. The regression specification used is the same as Table 6 column (d). The point estimates from the first and third regression show a very small and statistically insignificant effect. The second specification shows a large effect, but it is imprecisely estimated and so it is also statistically indistinguishable from zero. These results suggest that, in general, women who are single and who are younger may be less responsive to the ANC than other women. These types of systematic differences between women likely to collect AFDC and all women may explain the different results found in AFDC studies and the ANC results presented above.

To look more closely at heterogeneity in the response to the ANC, I present in Table 10 results from regressions incorporating interactions of *Quebec* and *1996 dummy* with several characteristics.[23] Column (a) shows the coefficient on the interaction of *Quebec* and *1996 dummy* with *Married*. This interaction term is not significant, which suggests that any differences in the responsiveness of single and married women to the policy is not attributable to their marital status, but to other characteristics that differ between the two groups of women.[24] Column (b) reports the results from a regression including an interaction of *Quebec* and *1996 dummy* with *Female age 25-34*. The coefficient is positive, but not significant. Again, this provides no evidence that age alone leads older women in the sample to be more responsive to the policy than younger women. The next column shows the results from a regression with interactions between *Quebec* and *1996*

[22] Other papers in the AFDC literature focus on the female headship decision, which combines marital and fertility choices. The studies chosen here for replication focus more directly on the fertility decision.

[23] In each case separate interactions of the characteristic with both *Quebec* and *1996 dummy* are included in order to isolate the response of the policy from Quebec and period specific effects.

[24] It is conceivable that these results are driven not by differences in responsiveness across groups of women, but by differences in the incentives they faced under the parity-based structure of the ANC. I also ran regressions interacting the same set of characteristics with the ANC benefit amounts, rather than the *Quebec - 1996 dummy* interaction. These regressions account for the intensity of the incentive faced by different families, and showed similar results to the regressions using the simple *Quebec - 1996 dummy* interaction.

dummy and the female education variables. The excluded category is women with less than high school education. Again, none of the coefficients is significant.

Column (d) displays the estimated coefficient for a regression that includes an interaction between *Quebec* and *1996 dummy* and *Family income.* The estimate of 0.078 implies that an increase in family income of C$100,000 increases the policy responsiveness from 0.036 to 0.114 percentage points. This suggests a strong income effect in policy responsiveness. The final column in the table includes all the interaction terms from the first four specifications. This specification also shows a strong income effect in the responsiveness of policy. Women with access to less non-labor income are not as responsive to the ANC as women with more non-labor income. This effect persists on the subsample of women with positive non-labor income, suggesting that this result is not driven by difference between women with no non-labor income and those with positive non-labor income.[25]

There are many possible interpretations of the observed increase in responsiveness with income. For example, this could be evidence of unobserved heterogeneity in the responsiveness of women to these incentives. If high income women differ in some unobserved way from low income women, then the higher responsiveness of high income women may be reflecting this unobserved characteristic. For example, it might be that higher income women have more 'planned' pregnancies, and so are more responsive to price signals. As well, the income measure used here may not be exogenous. If there is positive assortative matching among spouses, then the income measure may be related to wife's earnings capacity, and so be related to the cost of children. This would complicate the interpretation of any income effects using this measure of family income.

Another potential explanation can be drawn from the model developed by Becker and Tomes (1976). Their model implies a U-shaped path for the desired number of children as income rises.[26] This means that at low income levels, the overall income elasticity of demand for children is negative, whereas at high income levels it is positive. This produces a useful prediction that may help in understanding the effect of an exogenous change in the price of children. At low income levels, this model predicts that the substitution and the income effects work in opposite directions, while at high income levels the income effect will reinforce the substitution effect. This occurs in the model

[25] I thank Hilary Hoynes for this suggestion.

[26] They generate this result by adding heritable endowments of child quality to the Becker and Lewis (1973) model. With heritable quality endowments, the income elasticity of the own-contribution to quality is relatively large at low levels of income, and declines as income rises. This means that, at low levels of income, the child quality income effect will dominate but at higher levels of income the child quantity income effect will dominate. So, at low levels of income the overall income effect is negative, but then becomes positive at higher levels of income.

because low income women given more income prefer to spend more on the children they already have rather than increasing the size of the family. This may explain the weak price response among low income women.

This section has looked at the responsiveness of subsamples of women chosen to resemble the data sets constructed in the AFDC literature. Among these women, the hypothesis that the policy response is zero cannot be rejected. This is consistent with researchers who have found only insignificant effects of welfare on fertility. Furthermore, this suggests that the results from the AFDC literature do not generalize from the 'welfare-at-risk' population to all women.

6 Conclusion

This paper presents new evidence on the relationship between tax incentives and fertility, using a policy experiment that requires weaker identifying assumptions than in other papers in the existing literature. There are two major findings. First, the responsiveness of fertility to a birth subsidy is estimated to be large — up to a 25 per cent increase in fertility for families eligible for the full amount. A C$1,000 increase in first-year benefits is estimated to increase the probability of having a child by 16.9 per cent. Second, there is evidence of heterogeneity in the response to the policy. This heterogeneity may help to reconcile the results with evidence on AFDC and fertility, and suggests that earlier findings do not generalize to all women.

There are several limitations to the empirical approach I implement. First, underlying trends unrelated to the introduction of the ANC may account for the differential change in fertility in Quebec. The use of different family structures as control groups alleviates this concern to some extent. However, if underlying trends varied by the parity of birth, then they may still confound the estimates. Second, the observed response may be transitory rather than permanent; women may have changed the timing of children rather than the eventual size of their families. While the available evidence looking across cohorts does not reveal a transitory response, a more complete answer cannot be addressed until the affected cohorts of women complete their fertile years.

A Data Construction

I first describe the sample selection criteria, then describe the construction of selected variables.

The 1991 and 1996 Census files report information on a sample of 345,351 and 342,231 families respectively. Each is roughly a three per cent sample of the population. To create the data set used in the analysis, I first select only families in which the female spouse or lone-parent female is between age 15 and 34. Women older than 34 are increasingly likely to have children who have left the household, which makes the family structure difficult to reconstruct. This left 160,901 families in the data set. Additionally, there are 20,749 families who moved between provinces in the five years prior to Census day. These families are removed to improve accuracy in assigning the province of residence at the time the family had their children. In some cases, the reported number of children is censored, so the exact family structure could not be constructed. Three hundred and sixteen such families are identified and removed from the data set. Finally, 2,951 families in the remaining sample are non-residents, making them ineligible for the receipt of the ANC or other family tax benefits. The final data set contains 136,885 observations.

The reconstruction of the family structure is inexact. Children present at the beginning of the Census window may not be with the family on Census day. Similarly, children present on Census day may not have been present during the Census window. These discrepancies may result from events such as the death of a child, divorce, remarriage, or the adoption of an older child. The 1991 Census provides an opportunity to evaluate the accuracy of this reconstruction, since the file in that year reports how many children had ever been born to the female. Of the 74,400 families in the 1991 sample, 92.9 per cent show no difference between the number of children ever born to the female and the number of children currently in the household. The family reconstruction for the excluded women in the age range 35 to 44 was successful in only 76.4 per cent of the cases.

Measured against the vital statistics, the recording of births in the Census appears very accurate, with an estimated 2,146,284 zero to five year old children matching up well against the 2,197,534 children born between 1991 and 1996 in the vital statistics.

Total Fertility Rate: For each year in a given jurisdiction the number of births for women in seven five-year age groups covering women from age 15 to 49 is divided by the population of women in the corresponding age group. These seven birth rates are summed, then multiplied by five to get the total fertility rate. The birth data come from Statistics Canada catalogues 84-204 and 84-210. The population data come from CANSIM series C894142 and C892552. Along with these national statistics, I use data collected from unpublished tables provided by the Ontario Office of the Registrar General, and a set of published tables from Québec (1999).

Married: Takes the value 1 if female is legally married or in common-law relationship; otherwise equal to 0. For single women, variables for the male partner are set to zero.

Live in urban area: Takes the value 1 if family lives in a community of population 100,000 or greater; otherwise equal to 0.

Family income: The sum of male wages and salaries, male self-employment income, male investment income, and female investment income; in 1995 Canadian dollars.

Provincial GDP growth: Constructed as the average rate of real provincial GDP growth over the six years in the Census window; data from CANSIM, various series.

Provincial migration rate: Constructed as the net number of inter-provincial migrants divided by provincial population, averaged over the six years in the Census window; data from CANSIM, various series.

Provincial education spending: Constructed as the total provincial government spending on elementary and secondary education divided by the population in the age range 0 to 17; data from CANSIM, various series; in 1995 Canadian dollars.

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Figure 1: Fertility Rates: Quebec and Rest of Canada

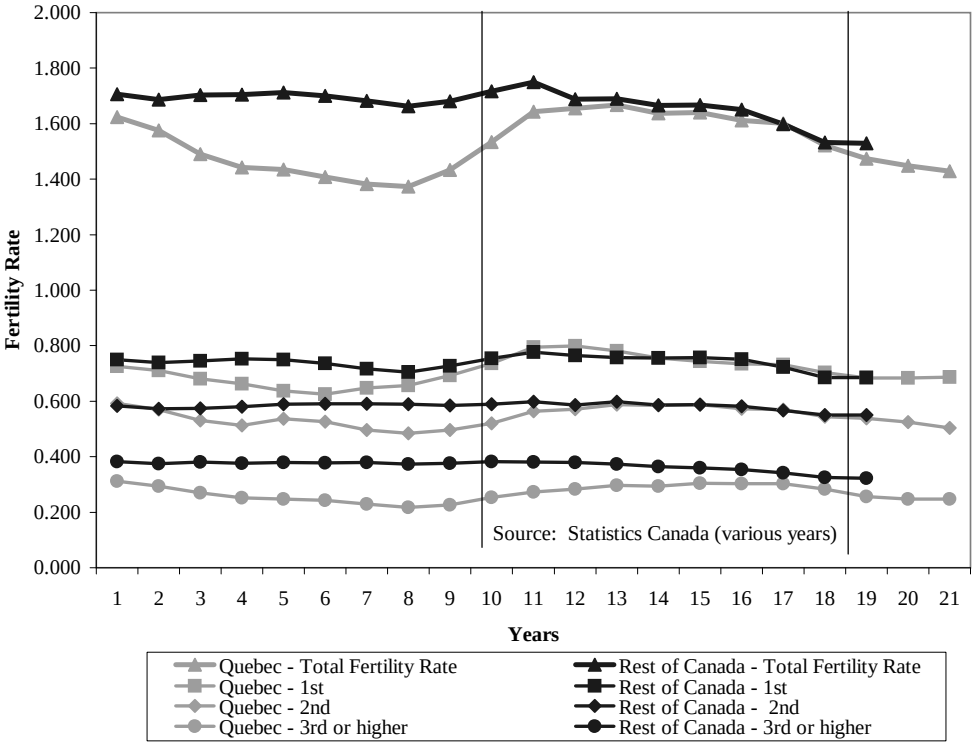

Figure 2: Timing

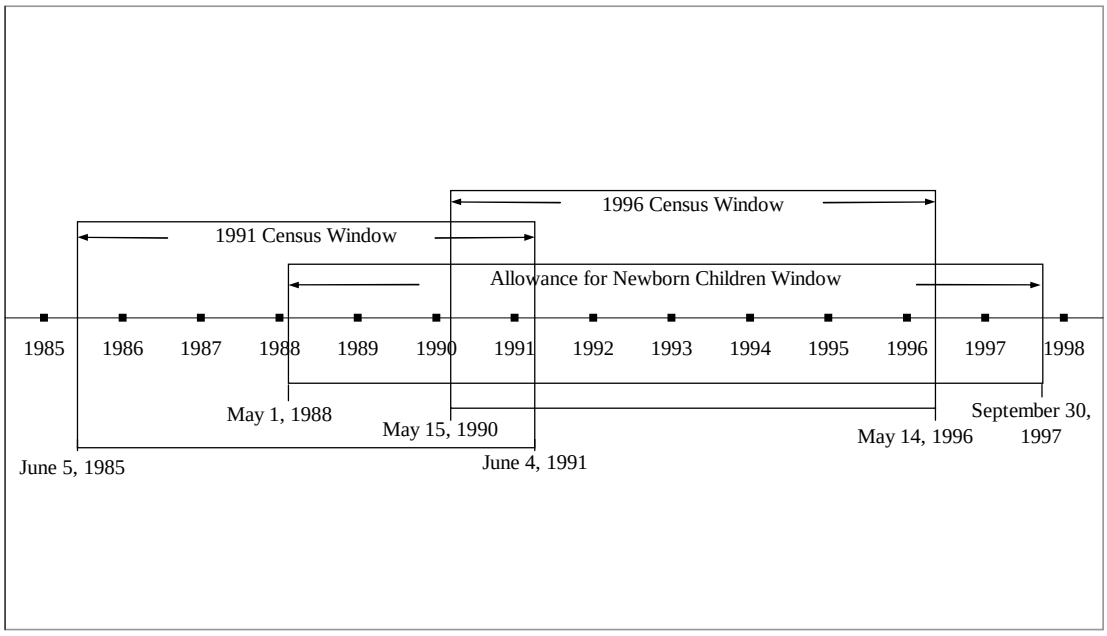

Table 1: Benefit Payments under the Allowance for Newborn Children

	First child	Second child	Third or higher child
May 1988 to April 1989	C$500 at birth	C$500 at birth	8 quarterly payments of C$375 = C$3000
May 1989 to April 1990	C$500 at birth	C$500 at birth, C$500 on 1st birthday	12 quarterly payments of C$375 = C$4500
May 1990 to April 1991	C$500 at birth	C$500 at birth, C$500 on 1st birthday	16 quarterly payments of C$375 = C$6000
May 1991 to April 1992	C$500 at birth	C$500 at birth, C$500 on 1st birthday	20 quarterly payments of C$375 = C$7500
May 1992 to September 1997	C$500 at birth	C$500 at birth, C$500 on 1st birthday	20 quarterly payments of C$400 = C$8000

Notes: Each cell reports the payments made for a child born within the specified time period.

Table 2: Cohort Fertility Rates

Years of Birth	Age Groups					
	age 15-19	age 20-24	age 25-29	age 30-34	age 35-39	age 40-44
	Quebec					
1943-1947	29.83	139.20	119.14	68.13	17.56	2.59
1948-1952	23.27	92.29	132.26	62.06	17.01	3.33
1953-1957	17.47	92.20	119.07	59.95	23.94	3.88
1958-1962	19.06	81.43	110.12	80.89	26.58	
1963-1967	15.05	69.07	129.71	79.61		
1968-1972	15.67	77.60	111.72			
1973-1977	17.89	66.95				
1978-1982	15.60					
	Rest of Canada					
1943-1947	64.63	165.71	130.77	62.57	20.82	3.61
1948-1952	52.93	125.40	119.43	69.57	25.59	4.50
1953-1957	44.51	104.54	121.62	78.45	30.30	5.58
1958-1962	35.33	94.82	119.93	86.32	34.10	
1963-1967	30.41	79.48	115.57	84.62		
1968-1972	25.32	73.61	99.33			
1973-1977	27.37	61.47				
1978-1982	21.01					

Note: Reported is the average rate of births per one thousand women in the cell. Years in which the ANC is active are shaded.

Table 3: Regressions on Vital Statistics Data

Dependent variables:	Mean of dependent variable	(a) Base Specification		(b) Add Quebec X linear time trends	
Total fertility rate	1.616	0.145	*	0.195	*
		(0.030)		(0.061)	
First child fertility rate	0.727	0.071	*	0.083	*
		(0.013)		(0.027)	
Second child fertility rate	0.565	0.041	*	0.071	*
		(0.015)		(0.030)	
Third or higher fertility rate	0.321	0.049	*	0.047	
		(0.015)		(0.030)	

Notes: All regressions have 36 observations, comprising 1980 to 1997 for Quebec and the rest of Canada. Reported is the coefficient on the interaction of the Quebec dummy with a variable for years after and including 1989. Significance at the 95 per cent level is indicated with an asterisk. The base specification in (a) includes Quebec and year fixed effects. The specification in (b) adds a linear time trend, and its interaction with the Quebec dummy. The specification in (c) adds a quadratic time trend and an interaction of the quadratic with the Quebec dummy.

Table 4: Sample Characteristics

	1991			1996		
	All Observations	Quebec	Rest of Canada	All Observations	Quebec	Rest of Canada
Observations	74400	20285	54115	62485	16453	46302
Had a child	0.428	0.418	0.432	0.444	0.451	0.441
Zero older children	0.723	0.740	0.716	0.732	0.754	0.724
One older child	0.154	0.158	0.153	0.153	0.150	0.154
Two or more older children	0.123	0.102	0.131	0.115	0.096	0.122
Quebec	0.273	1.000	0.000	0.263	1.000	0.000
Rest of Canada	0.727	0.000	1.000	0.737	0.000	1.000
Female age 15-24	0.224	0.215	0.227	0.218	0.218	0.218
Female age 25-34	0.776	0.785	0.773	0.782	0.782	0.782
Male age 15-24	0.084	0.086	0.083	0.083	0.088	0.081
Male age 25-34	0.656	0.658	0.655	0.625	0.628	0.624
Male age 35-44	0.239	0.233	0.242	0.269	0.260	0.272
Male age 45+	0.021	0.022	0.020	0.024	0.024	0.023
Female less than high school	0.238	0.237	0.238	0.200	0.195	0.202
Female high school	0.184	0.183	0.184	0.155	0.154	0.155
Female post high school	0.455	0.463	0.453	0.489	0.485	0.491
Female university degree	0.172	0.160	0.177	0.229	0.238	0.225
Male less than high school	0.260	0.260	0.260	0.226	0.227	0.225
Male high school	0.153	0.163	0.149	0.148	0.148	0.148
Male post high school	0.459	0.451	0.462	0.484	0.473	0.488
Male university degree	0.128	0.126	0.128	0.143	0.153	0.139
Married	0.713	0.735	0.705	0.683	0.697	0.678
Live in urban area	0.598	0.626	0.588	0.602	0.649	0.585
Female immigrant	0.095	0.046	0.113	0.110	0.054	0.130
Male immigrant	0.119	0.064	0.140	0.127	0.068	0.148
Female allophone	0.096	0.055	0.111	0.111	0.070	0.125
Female anglophone	0.630	0.070	0.839	0.630	0.066	0.831
Female francophone	0.274	0.875	0.049	0.260	0.864	0.043
Male allophone	0.114	0.069	0.132	0.125	0.080	0.142
Male anglophone	0.605	0.063	0.817	0.611	0.066	0.811
Male francophone	0.281	0.869	0.052	0.264	0.854	0.047
Family income	24749	23242	25314	21593	20196	22092
Provincial GDP growth	3.22	2.85	3.36	1.25	0.91	1.37
Provincial net migration rate	0.34	0.17	0.40	0.64	0.35	0.74
Provincial education spending	6306	6142	6367	6689	6183	6870

Note: Reported are means over all observations in the relevant subsample. Male variables are averaged over families with a husband.

Table 5: Comparing Fertility by Time, Jurisdiction, and Parity

	Mean		Trend difference in means	Difference in differences	Percentage increase	Triple difference
	1991	1996	(2) - (1) =			
	(1)	(2)	(3)	(4)	(5)	(6)
A. All Parities						
Quebec	0.418	0.451	0.033			
	(0.003)	(0.004)	(0.005)			
n	20,285	16,453				
Rest of Canada	0.432	0.441	0.009	0.024	5.5%	
	(0.002)	(0.002)	(0.003)	(0.006)		
n	54,115	46,032				
B. Zero older children						
Quebec	0.393	0.418	0.025			
	(0.004)	(0.004)	(0.006)			
n	15,017	12,399				
Rest of Canada	0.398	0.407	0.009	0.016	4.0%	
	(0.002)	(0.003)	(0.003)	(0.007)		
n	38,754	33,338				
C. One older child						
Quebec	0.627	0.677	0.050			
	(0.009)	(0.009)	(0.013)			
n	3,207	2,475				
Rest of Canada	0.691	0.681	-0.010	0.060	9.7%	
	(0.005)	(0.006)	(0.008)	(0.015)		
n	8,262	7,088				
D. Two or more older children						
Quebec	0.278	0.353	0.075			
	(0.010)	(0.012)	(0.015)			
n	2,061	1,579				
Rest of Canada	0.321	0.344	0.023	0.052	17.2%	0.036
	(0.006)	(0.006)	(0.008)	(0.018)		(0.020)
n	7,099	5,606				

Notes: Reported in the first two columns are the means of the variable *Had a child*. Standard deviations appear below in parentheses. The percentage increase is calculated by dividing the difference-in-differences by the sum of the 1991 Quebec mean and the 1991 to 1996 rest of Canada trend.

Table 6: Regression Results

Dependent Variable: *Had a Child*

Independent Variables	(a)	(b)	(c)	(d)
Pseudo R-squared	0.0003	0.058	0.131	0.132
1996 dummy X Quebec	0.024 * (0.005)	0.034 * (0.006)	0.039 * (0.007)	0.053 * (0.010)
1996 dummy	0.009 (0.005)	0.013 * (0.006)	0.031 * (0.008)	0.028 * (0.010)
Implied percentage increase in probability of having a child	5.6%	7.8%	8.7%	12.0%
Quebec	-0.014 * (0.007)	-0.021 * (0.007)	-0.005 (0.009)	0.023 (0.020)
One older child	-	0.205 * (0.016)	0.193 * (0.017)	0.192 * (0.017)
Two or more older children	-	-0.163 * (0.011)	-0.203 * (0.008)	-0.205 * (0.007)
Female age 25-34	-	0.187 * (0.009)	0.107 * (0.013)	0.107 * (0.013)
Female immigrant	-	0.032 * (0.007)	0.052 * (0.012)	0.055 * (0.009)
Female francophone	-	-0.047 * (0.010)	-0.037 * (0.017)	-0.035 * (0.015)
Female anglophone	-	-0.049 * (0.012)	-0.009 (0.017)	-0.007 (0.016)
Female high school	-	-0.015 * (0.006)	-0.055 * (0.007)	-0.054 * (0.007)
Female post high school	-	-0.086 * (0.004)	-0.118 * (0.008)	-0.118 * (0.008)
Female university degree	-	-0.192 * (0.005)	-0.235 * (0.011)	-0.236 * (0.010)
Male age 25-34	-	-	0.148 * (0.018)	0.148 * (0.018)
Male age 35-44	-	-	0.089 * (0.013)	0.090 * (0.013)
Male age 45+	-	-	-0.114 * (0.010)	-0.114 * (0.010)
Male immigrant	-	-	0.014 * (0.005)	0.017 * (0.005)
Male francophone	-	-	-0.054 * (0.012)	-0.051 * (0.011)
Male anglophone	-	-	-0.066 * (0.007)	-0.064 * (0.006)
Male high school	-	-	0.004 (0.006)	0.004 (0.005)
Male post high school	-	-	0.015 * (0.008)	0.016 * (0.007)
Male university degree	-	-	0.031 * (0.006)	0.032 * (0.006)
Married	-	-	0.206 * (0.020)	0.202 * (0.019)
lives in urban area	-	-	-0.068 * (0.006)	-0.073 * (0.009)
Family income (C$10,000)	-	-	0.175 * (0.018)	0.177 * (0.015)
Provincial GDP growth	-	-	-	0.005 (0.006)
Provincial migration rate	-	-	-	-0.015 * (0.006)
Provincial education spending	-	-	-	0.037 * (0.018)

Notes: Reported coefficients are marginal probabilities from probit regressions using the full sample of 136,885 observations. A constant term was included but is not reported. Robust standard errors with clustering on provinces are reported beside the corresponding estimates. Coefficients significant at the five per cent level are indicated with an asterisk. The implied percentage increase in the probability of having a child is calculated as described in the text.

Table 7: Impact of Allowance for Newborn Children on Different Family Types

Dependent Variable: *Had a Child*

	Older Children			
	Zero	One	Two or more	Pooled
Observations	99508	21032	16345	136885
Pseudo R-Squared	0.1361	0.083	0.028	0.132
Zero older children x				
Quebec x 1996 dummy	0.041 *	-	-	0.045 *
	(0.008)			(0.010)
Implied percentage increase in				
probability of having a child	9.8%	-	-	10.7%
One older child x				
Quebec x 1996 dummy	-	0.080 *	-	0.080 *
		(0.017)		(0.014)
Implied percentage increase in				
probability of having a child	-	13.1%	-	12.6%
Two or more older children x				
Quebec x 1996 dummy	-	-	0.082 *	0.082 *
			(0.018)	(0.014)
Implied percentage increase in				
probability of having a child	-	-	24.7%	25.0%
Quebec	0.009	0.036	0.080	0.035
	(0.015)	(0.045)	(0.044)	(0.022)
1996 dummy	0.027 *	-0.015	0.054 *	0.027 *
	(0.006)	(0.018)	(0.027)	(0.009)
One older child	-	-	-	0.209 *
				(0.013)
Two or more older children	-	-	-	-0.212 *
				(0.008)
One older child x Quebec	-	-	-	-0.054 *
				(0.013)
Two or more other children x Quebec	-	-	-	-0.026 *
				(0.010)
One other child x 1996 dummy	-	-	-	-0.013
				(0.006)
Two or more other children x 1996 dummy	-	-	-	0.023 *
				(0.009)
Other control variables	yes	yes	yes	yes

Notes: Reported coefficients are marginal probabilities from probit regressions on the relevant subsample. Control variables as in Table 6 specification (d) are included, but not reported. Robust standard errors with clustering on provinces are reported below the corresponding estimates. Coefficients significant at the five per cent level are indicated with an asterisk. The implied percentage increase in the probability of having a child is calculated as described in the text.

Table 8: Regressions Using the Dollar Value of Allowance for Newborn Children Benefits

Dependent Variable: *Had a Child*

	Average fertility	First-year benefits	Five-Year benefits
All family types	0.435		
Coefficient on benefit		0.073 *	0.011 *
		(0.015)	(0.003)
Implied percentage increase in fertility rate for C$1000 increase in benefits		16.9%	2.6%
Zero older children	0.403		
Coefficient on benefit		0.098 *	0.098 *
		(0.029)	(0.029)
implied percentage increase in fertility rate for C$1000 increase in benefits		0.243	0.243
One older child	0.676		
coefficient on benefit		0.213 *	0.109 *
		(0.058)	(0.023)
implied percentage increase in fertility rate for C$1000 increase in benefits		0.316	0.162
Two or more older children	0.326		
coefficient on benefit		0.064 *	0.013 *
		(0.021)	(0.003)
implied percentage increase in fertility rate for C$1000 increase in benefits		19.7%	4.1%

Notes: Control variables as in Table 6 specification (d) are included, but not reported. Coefficients significant at the five per cent level are indicated with an asterisk.

Table 9: Results Using Replications of AFDC Data Sets

Dependent Variable: *Had a Child*

	(a)	(b)	(c)
AFDC Study	Rosenzweig (1999)	Fairlie and London (1997)	Acs (1996)
Selection Criteria	Age 15-24	Single At least one child	Single Age 15-24
Observations	30271	7102	14292
Pseudo R-squared	0.131	0.044	0.114
Quebec x 1996 Dummy	0.003 (0.014)	0.077 (0.048)	0.004 (0.022)

Notes: Reported coefficients are marginal probabilities from probit regressions. Control variables as in Table 6 specification (d) are included, but not reported. Robust standard errors with clustering on provinces are reported below the corresponding estimates. Coefficients significant at the five per cent level are indicated with an asterisk.

Table 10: Heterogeneity in Response to Allowance for Newborn Children

Dependent Variable: *Had a Child*

	(a)	(b)	(c)	(d)	(e)
Quebec x 1996 dummy	0.034 *	0.036 *	0.074 *	0.036 *	0.054 *
	(0.012)	(0.014)	(0.012)	(0.012)	(0.015)
Interactions of Quebec x 1996 dummy with:					
Married	0.028 *				0.003
	(0.007)				(0.010)
Female age 25-34		0.025 *			0.017 *
		(0.010)			(0.008)
Female high school			-0.030 *		-0.040 *
			(0.005)		(0.005)
Female post high school			-0.027 *		-0.039 *
			(0.009)		(0.007)
Female university degree			-0.013		-0.035 *
			(0.009)		(0.007)
Family Income				0.078 *	0.074 *
				(0.008)	(0.012)

Notes: Reported coefficients are marginal probabilities from probit regressions. Control variables as in Table 6 specification (d) are included, but not reported. Also included are main effect interactions of each characteristic (*Married*, *Female age 25-34* etc.) with *Quebec* and with *1996 dummy*. Robust standard errors with clustering on provinces are reported below the corresponding estimates. Coefficients significant at the five per cent level are indicated with an asterisk.