A 'Natural Experiment' on the Economics of Storks: Evidence on the Impact of Differential Family Policy on Fertility Rates in Canada[1]

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1. Introduction

Do public financial incentives increase fertility rates? This question has been asked several times in the demographic and economic literature. However, the methodological problems associated with any empirical study seeking to find an appropriate answer to this question are complex and difficult. The most important of these problems is the endogenous nature of variations of family income (family income could increase because parents are working harder to prepare financially for the arrival of a new child creating a spurious correlation between fertility and income). In general, publicly funded financial support to families is based on the number of dependent children in the household. Therefore, in order to evaluate the impact of financial support, some exogenous variation of benefits aid must be observed in the sample used for the evaluation the impact of financial incentives on fertility.

This paper will present evidence that financial incentives do matter for fertility rates. Our quasi-experimental laboratory will be the country of Canada that is composed of 10 provinces one of which is the province of

1

Quebec. Canada is a federal nation that is extremely decentralized (similar to Germany). Therefore, the two levels of government in each province can set up their own social and fiscal policy including family policy.[2]

The province of Quebec will provide us with an experimental group of women been subjected to an exogenous changes in a publicly financed family benefits package from 1986 to 1997. No such development was observed in the remaining Canadian provinces. A set of changes made to the tax-transfer benefits for families were observed in federal family policy over the period we observe fertility behaviour, however these changes were effective for all Canadians families with dependent children. The substantial supplementary benefits that were enacted in favour of families over the 1986-1997 period in Quebec and their bias towards births of third or higher parity, provide a clear financial incentive for higher fertility rates.

To perform the analysis, the time series evidence for Quebec and the Rest of Canada (ROC) is examined across cohorts and birth orders by applying the *difference-in-differences* approach. Furthermore, fixed-effect regressions on several aggregated (grouped data) fertility transition rates for parities 1, 2 and 3 and for 4 different age groups estimate the effects of the policy. To construct these transition rates, information from Vital Statistics and repeated cross-section national surveys on the Canadian population are merged.

The results demonstrate that the increase in family benefits had a positive increase on the probability of having a first, second or third child. The strongest effects occurring for the third child. We cannot however confirm that these increases reflect timing issues or truly capture an increase in fertility rates.

The rest of the paper is structured as follows. Section 2 presents a brief literature survey on financial incentives and their impacts on fertility. Section 3 describes in detail family policy in Quebec and Canada for our sample period. Section 4 presents descriptive statistics on the evolution of total fertility rates. Section 5 presents the methodology and data used to evaluate the impact of the policy. Section 6 and 7 present difference-in-differences evidence and econometric results while section 8 summarizes the results and conclude the paper.

2. Literature Survey

There is considerable evidence that economic mechanisms play a role in the determination of parental fertility decisions births.[3] For example, in framework of a life-cycle model of the timing and spacing of births,

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[2] The provinces have the responsibility of the main social programs (health, education, welfare).
[3] See the review paper by Holtz et al. (1997).

papers by Heckman and Walker (1990), with Swedish data, and Merrigan and St-Pierre (1998), with Canadian data, show that the important increase in female wages over the last 40 years could explain an important fraction of the decline in fertility rates since 1960.[4] Although empirical models of fertility behaviour provide indirect evidence that publicly provided fertility incentives also play a role in the determination of the timing, spacing and number of births, we seldom find, in these models, a satisfactory modelling of the effects of public policies, in particular the ones related to personal taxation and transfer programs.[5,6] It is thus impossible to analyse the relative efficiency of public policy that aims specifically at promoting fertility.[7]

In the United States, the possible effects of public policy on fertility does not seem to be the subject of active research, except for the influences of some "particular prices"[8], like welfare benefits or abortion regulations, on marriage and out-of-wedlock fertility or teenage childbearing.[9] Studies in this strand exploit state level and time series variations in Aid to Families with Dependent Children (AFDC) benefits in an attempt to provide evidence that financial incentives can play a role in the determination of female headship. Because the headship decision is simultaneously a choice not to marry and to have children, it is interpreted both as a marriage and a fertility decision. While controlling for other effects, Moffitt (1994) and Hoynes (1995) estimate models with AFDC benefits as an explanatory variable, their hypothesis being that women potentially receiving high AFDC benefits will have a higher probability of being single mothers. They find that AFDC benefits have no impact on headship/fertility, or a slight positive impact when male as well as female wages are included (Moffitt, 2000).[10]

In Canada, the more explicit system of family benefits such as family allowances and tax provisions for dependent children should have generated more studies, but the absence of longitudinal micro-data has not allowed researchers to empirically implement explicit dynamic modelling of parental decisions. Some

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[4] Felteau et al. (1997) obtain similar results by estimating a markovian model with discrete dependent variables for marriage and fertility decisions of Canadian women from a cross sectional survey repeated over time (1975-1993).

[5] We do not take into account the strand of the literature that consists in using aggregate time series data (for example, Whittington et al. (1997), Gauthier and Hatzius (1997), Georgellis and Wall (1992), Blanchet and Ekert-Jaffé (1994), and in the Canadian context Hyatt and Milne (1991), and Zhang et al. (1994)). This approach precludes an accurate modelling of the effects of personal taxation and transfer parameters on fertility and labour supply.

[6] The paper by Walker (1995) analyses astutely these issues by estimating a time series profile of the shadow price of fertility in the framework of a neoclassical model.

[7] Some British studies, for example, Sprague (1988), and Ermisch and Cigno (1989) tried to take into consideration the effects of family allowances and used net wages. However, the "aggregate" nature of the variables used in these studies does not simplify the interpretation of the results.

[8] The effects of state maternity leave and child-care policies have been studied as a labour issue, the exception is the paper by Blau and Robins (1989).

[9] See the survey papers by Moffitt (1998), and Hoynes (1995).

[10] Rosenzweig (1999) also uses the same benefits in a different quasi-experimental design. He finds that higher benefits increase the probability that young women become single mothers.

researchers have made the best use of the existing micro-data.[11] Using micro-data from a series of cross sectional surveys repeated over time (1975-1987), Lefebvre et al. (1992, 1993, 1994) have estimated structural nested multinomial models where the fertility decision of couples, the decision relative to the number of children to have and the labour force participation decision of women are different discrete choices. The empirical estimation takes into account the parameters of the personal tax system and of the transfer programs that are conditional on the presence of dependent children, allowing the use of measures of net wages, net non-labour income and disposable incomes that change with the work and fertility option. Their results support the idea that an increase in monetary support (fiscal and direct) conditional on having at least on child has a significant effect on higher rank fertility. However, this kind of policy seems unable to convince childless couples to have children.

The pro-natalist policy in Quebec, in particular the Allowances for Newborn Children (the "Baby Bonus Program"), has stimulated the interest of several researchers. Bélanger and Dumas (1998), using retrospective data from a 1995 Survey on a representative sample of the population of women's fertility histories, analyze in the framework of a simple duration model the determinants of third-order births in Canada. Their results fail to show a significant increase in third-order fertility for Quebec's women.[12] Kearns (1996) using grouped data fertility transition rates for parities 1, 2 and 3 and distinguishing Quebec from the ROC, estimates the impact of financial incentives on fertility for the years 1975-1993 with a qualitative response model. Controlling for covariates (socio-economic characteristics of the families, earned and unearned income, a variety of child benefits and related tax measures), his results suggest that ROC fertility is more responsive to public support than Quebec is, and that the much higher benefits for third births in Quebec seem to have countered their steady decline in Quebec. Duclos (2000), using data from Vital Statistics and repeated national surveys on population for the years 1981 to 1996, estimates fixed-effects regressions on several aggregated (grouped data) fertility transition rates for parities 1, 2 and 3. This current paper is derived from the same methodology that is explained below. Her results show that fertility rates in Quebec have increased relatively to those of the ROC, which suggests that Quebec's pro-natalist public policy should be credited with some causal efficiency.

Finally, Milligan (2000), presents empirical support that the provincial financial incentives provided by the government of the province of Quebec did have a strong and statistically significant impact on fertility rates

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[11] Some, for example Robinson and Tomes (1982), have analysed completed fertility using census data. Merrigan and Saint-Pierre (1998) have used retrospective data collected in a cross section survey on family and friends.

[12] The effect was measured by a dichotomous variable indicating whether women aged 25 to 42 at the time of the survey lived in Quebec and were potentially exposed to the baby bonus program. Their specification suffers from the endogeneity of key variables.

4

in Quebec, particularly on the probability of giving birth to a third child. Since we are trying to identify the same effects as he is, we will describe in detail his methodology in order to differentiate his work from ours.

However, before doing this we will describe the nature and timing of one measure of the policy, the most visible one, the baby bonus package, implemented gradually over the years 1988 to1992 with no major changes in the structure of the program until the end of 1997 when Quebec's overall family policy was radically modified in September of 1997. As of May 1 1988, parents with a new child in their family, received a cash transfer from the government immediately after the child's birth (or adoption). For a first or second birth, parents received $500. For third births or higher parities, 8 quarterly payments of $375 were sent over 5 years, totalling $3000. As of May 1 1989, a second transfer totalling $500 was sent at the child's first birthday for second child. For third births and up, the quarterly payments were increased to 12. This last amount was gradually increased until 1992, when it reached $8000 (20 quarterly payments of $400). Milligan (2000) argues that these cash transfers represented a percentage subsidy to the direct costs of children of 1.3% for the first child, 3.2% for the second and 30.1% for the third child.[13] In order to estimate the effects of the policy on the probability of having a first, second or third birth, Milligan turns to a difference in differences approach.

To implement his strategy, which is based on the idea that Quebec women can be treated as an experimental group and women in the Rest of Canada as a control group, the author needed to compute the proportion of women who gave birth to a child amongst those who where at risk of giving birth before the change in policy and after the change in policy in both experimental and controls groups. Since there are no longitudinal data to compute these numbers, Milligan turns to the Canadian 1991 and 1996 Census Public Use Micro-data Files on Families and treats them as repeated cross-sections. Since the data do not provide the exact age of the children (and the number of children are top-coded), - in fact, it is only known whether the child is less than 6 years old (or older) - Milligan must construct two Census time windows of exactly 6 years. This permits him to compute whether a first, second or third child or more was born during that window. The first covers June 5, 1985 to June 4 1991, while the second is from May 15 1990 to May 14 1996. Therefore, he can compute how many women were childless on June 5 1985 and had a first child in the census window. The same can be done for the second window. Women between 15 and 34 were chosen because the Census does not inform on children ever born but only of children living in the household, therefore this strategy lessens the chance of observing women with children having left the household. Hence, according to Milligan's Census computations, 39.3% (39.8%) of women in Quebec (ROC) who did not have older children in the household in 1991, had a child in the first census window,

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[13] This calculation uses the equivalence scales estimated by Phipps (1998).

while 41.8 (40.7) percent of Quebec (ROC) women with no older children in 1996 had a child in the second window. The difference in differences shows that the proportion increased by .016 (4%) more in Quebec, and this difference is statistically significant. This same difference is 0.060 (9.7%) for women with one older child, and .052 for the third (17.2%).

The author then estimates simple Probits where the dependent variable is having a child during the census window. The explanatory variables are a constant, a 1996 year dummy, a Quebec dummy, an interaction effect between the Quebec dummy and the 1996 year dummy and several controls for education, age, marital status, family income, and aggregate provincial economic variables (e.g. migration rates, provincial GDP). He finds that the implied percentage increase in the probability of having of a child between the first and second census windows is 12%. He also computes the percentage increase of having a first child, a second child, and of having another child for families with more than 1, these are respectively, 10.7%, 12.6%, and 25%. Therefore, his results show strong support for the presence of incentive effects and the strongest effects (percentage wise) are observed for a third or higher parity.

However, there are some timing issues that are not addressed by the Census data since the first Census widow does not cover a period that occurs before the change in policy since it starts in June 5 1985, a full three years before the baby-bonus policy is announced and put in place. Also, the new births produced 9 months after the announcement occurred in 1989. Therefore, the new regime spans only 2.5 years out of the 6 of the census window. Our strategy will attempt to overcome these problems by building some time series of conditional transition probabilities over the whole time period covering the changes in policy.

3. Family policy in Quebec and Canada

This section describes the family policy environments in Quebec and Canada. It also presents some descriptive statistics and figures that concern fertility rates in Quebec and in the ROC. Some other figures describe the evolution of other key determinants of fertility in Quebec and in the ROC since these possible determinants will not be controlled for in the analysis.

Evolution of policy in Quebec

From the mid-80s to the mid-90s, the government of Quebec has decided to increase its financial support to families. The objective pursued was to "adequately compensate the costs associated with children …it is evident that financial compensation must be more important for the presence of children in families, and in

particular in the case of a large family".[14] The following table puts in perspective the financial effort relatively to the numbers of children in Quebec aged 17 or less. In real terms, benefits per child were increased by a factor of 2.4 from 1985 to mid-90s.

Evolution of Real ($1992) Financial Benefits of the Government of Quebec to Quebec's Families in Millions of Dollars, Number (000) of Children Aged 0-17 Years, and Benefits per Child

Years	1985	1987	1989	1990	1991	1992	1993	1994	1995	1996	1997
Benefits$	1,097	1,277	1,789	1,942	1,964	2,204	2,524	2,653	2,694	2,653	2,615
Children	1,634	1,617	1,624	1,642	1,658	1,668	1,671	1,670	1,664	1,650	1,627
$/Child	671	790	1,102	1,183	1,185	1,321	1,510	1,589	1,619	1,608	1,607

Source: For nominal benefits, Budget Documents, Department of Finance, Government of Quebec, various years; for number of children, Régie des rentes du Québec and Institut de la Statistique du Québec; for real benefits per child, author's calculation.
Note: Benefits are the sum of transfers paid to families for dependent children (including the portion of welfare assistance covering essential needs of the first two children) and all tax measures related to families with dependent children.

In order to pinpoint the important changes in the family policy and their timing, Table A1, in the appendix, summarizes the main features of this tax-transfer policy and its parameters from 1981 to 2000. In 1981, a non-taxable (at both levels of government) allowance corresponding to a yearly amount per child less than 18 years was attributed to all families with children. Allowances increased with the number of children in the family. A tax deduction was also available but only for children aged more than 15 years.[15] An amount of $690 dollars could be deducted for each child aged 16 or 17, while an amount of $1,090 could be deducted for children over 17 attending school.[16] In 1982, the amounts were indexed for inflation on the Consumer Price Index (CPI), while an availability allowance was introduced for families with the mother out of the labour force.[17] No changes were observed until 1986, when a tax deduction was reintroduced for children less than 16 years of age. The deduction for the first child was of $1,830 and $1,370 for each succeeding child.[18] However, allowances were clawed back to finance the deduction. Therefore, this change can be considered as modest in financial terms. The important changes were announced in the spring Budget of 1988. First, family non-taxable allowances for newborns were introduced in this budget. At the birth (or adoption) of a first or second child each family received $500. For third births or more, each family would receive 8 quarterly payments of $375 ($3,000). Significant fiscal measures were also implemented in this budget. A family tax reduction was now available for families with children under 18. The maximum reduction was $965 and was clawed back at a rate of 4 percent for families with income higher than

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[14] Minister of Finance, Budgetary Speech, May 12th 1988.
[15] The tax deduction for dependent children aged less than 16 years was abolished when the government of Quebec introduced its own family allowances in 1967.
[16] The fiscal value of this deduction depended on the taxable income of the family and its tax rate.
[17] Technically those who did not claim a deduction for child care expenses.
[18] The government announced that the amount of the deduction would increase for the next two years.

$26,000. The clawback of allowances started in 1986 was abolished in 1988. Finally, the tax deduction for dependent children was transformed into a non-refundable tax credit.[19] This credit was $446 for the first child and $374 for each succeeding child. These benefits were increased according to the CPI for the following 5 years. Indexation for inflation was suspended from 1993.

In 1989, the availability allowance is transformed into a universal non-taxable child allowance for children under 6.[20] Moreover, an additional $500 is attributed for a second birth (for a total of $1,000) at the child's first birthday, and for third births (or adoption) or more, the 8 quarterly payments of $375 are increased to 12 quarterly payments ($4,500). All successive important changes concern third births or higher. In 1990, the newborn allowance for third births and up becomes 16 quarterly payments of $375 ($6,000); in 1991, 20 quarterly payments of $375 ($7,500), and finally in 1992, 20 quarterly payments of $400 ($8,000). From 1993 on, none of the amounts are indexed, so that fiscal benefits and transfers are reduced due to inflation, however inflation was very low for the years 1993 to 1996, which is the final sample year in our econometric analysis.

Table 1A presents the evolution of average real income of families (by type of families), before and after income taxes,[21] from 1985 to 1997, while Table 1B characterizes the average and median incomes of families, by type of families and number of dependent children in 1997.

Table 2 presents total financial support (fiscal and net transfers) of both federal and provincial governments for two-parent families of different income levels (low-modest and mid-level earned income). Table 3 presents the same information for a larger range of income levels and for the 1990s.[22] From Table 2, we observe a modest change in support between 1985 and 1987 for all families because of the introduction of the family deduction. The increase in support from Quebec is approximately $300 for one child, $400 for two and $600 for three. The 1988 reform substantially increased the level of support for lower income groups and for all families with three children. In 1989, compared to 1987; for families with $30,000 of earned income, support for one child increased by $707, for two children, by $864 and for three children, by $2,757; for families with $40,000, the numbers are $275, $421, and $2,309 while for those with $50,000 dollars, we

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[19] This last change was the consequence of a major tax reform at both levels of government which increased the personal tax base, transformed all personal tax deduction in non-refundable tax credits, and reduced the number of tax rates.

[20] The amounts of the availability allowance were changed in 1998 from $300 ($100) for 1st child (3rd child) to $100 for 1st child and $300 for 3rd child and up. In 1991, the rules for young children allowances were changed: these allowances were paid according to the number of children in the family if there was at least one child less than 6 years.

[21] Both levels of government in Canada rely heavily on personal income taxation for financing, and the province of Quebec has the higher income taxes of all the provinces.

[22] Few two-parent families earn $20,000 or less, such families would be more likely be welfare recipients.

find $78, $158, and $2,014[23] Because of indexation and some others minor changes, to these nominal amounts, support for one child further increased on average by $700 from 1989 to 1994, by $1,100 for two children, and by $1,800 for three children. Hence, the financial incentives to have more children were much stronger for lower income families for all children[24], while they were considerably high for all families giving birth to a third child.

To summarize, the major changes in incentives to have children were introduced in the spring of 1988 and are stronger for lower income families and for third births and up, so that the effects on these incentives should be observed in 1989. Second, other major increases in transfers are observed in 1990 and 1991 for the third and up births, so that effects on fertility should be observed in the 1990s because of the timing and the spacing of children.

Finally, the government of Quebec decided in 1997 that from 1998 the system of universal family allowances would be abolished and replaced by an "Integrated Child Allowance" sharply targeted (income-tested) on family income (see Table A1), and that it would be complementary with the federal child tax credit (more on this credit below).[25] To "compensate" families, the government undertook a policy to increase childcare services and to assume the extra cost of additional daycare spaces which would be largely subsidized (the "$5-a-day" per child childcare policy) and offered irrespective of family income. As these new expenditures would be spread out over time, the new family policy still implied, in the short term, a decrease in financial assistance to families.[26] The government estimated that from its introduction to the year 2002 or 2003, when more childcare spaces would be added for the 0-4 years, the new family policy would require additional funding. The policy radically changed the picture of government support as family: monetary assistance would be reduced and targeted more selectively and in favour of assistance in the form of services, universal in principle, but for the most part benefiting to families where the parents were participating in the labour market. The motivation was to help better low-income families ("to help prevent and reduce the depth of child poverty"; and "to promote attachment of families to the work force").[27]

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[23] For families with $25,000 dollars in income, support for one child increased by $922, for two children, by $1,100 dollars and for three children by $3,002.

[24] The policy was implemented in a period of stagnant real family income in Quebec and in ROC (see Table 1A).

[25] The allowance, whose cost was estimated at $840 millions, replaced the three family allowance ($677 millions), the portion of social assistance that covered the essential needs of the first two children that were not covered by other allowances ($476 millions), in effect "taking children out of welfare"; and the scope of the tax reduction for families was decreased (by 75 millions) as well as small program of parental wage supplement. The non-refundable tax credit for dependent children and for the single-parent family, claimed by families with a tax liability were maintained.

[26] See Baril et al. (2000) for an evaluation.

[27] For a critical assessment see Lefebvre et al. (2001). The elected government in Quebec that put in place the pro-fertility policy over the years 1988-1993, was defeated in 1994. The new government considered that the family policy had no effect on fertility.

Evolution of policy in Canada

Table A2 present the past developments relating to the tax and transfer treatment of all dependent children in Canada by the federal government. Fiscal deductions for children were introduced in 1918 and Family Allowances in 1945. These two measures were the two pillars of family policy from 1945 to the 1970's. In the 1970's, Family Allowances were doubled, indexed for inflation but made subject to personal income taxation. In 1978 they were cut back to finance a refundable Child Tax Credit based on family income. Successive governments have frozen or cut back from time to time the Family Allowances and the Child Tax Deduction; and the refundable Child Tax Credit has been increased relative to the other two measures. In 1988, the tax deductions for children were replaced by a non-refundable child tax credit less beneficial to higher income families. From 1989, until their abolition in 1993, Family Allowances were subject to a "claw-back" provision, thus higher-income families (with income higher than $50,000) no longer received benefits.

In 1993, the Canadian government radically altered its benefit package to families with dependent children. The Family Allowances and the Non-refundable Tax Credit were abolished, while the Refundable Tax Credit was improved by increasing the benefits paid under it, and by changing its name to the Child Tax Benefit.[28] The benefit is paid to families on a monthly basis. The basic benefit is $1,020 per year for the first and second child ($1,095 for the third child and succeeding children) and is reduced for the first (the second child and succeeding children) by 2.5 percent (5 percent) of the amount of family income in excess of $25,921. A family with one or two children does not receive any benefits when its income is over $66,721 ($88,621 for three children). Since inflation, measured by the CPI, did not exceeded the 3 percent mark, the benefits remained at their 1993 levels until 1997. In 1998, the government decided to provide additional amounts according to the parity of the child. In 1999 and 2000, the benefits were enriched, and the benefits and the thresholds of family income for the purpose of calculating benefits would be fully indexed as of January 2000.

A province could take advantage of a clause allowing them to ask the federal government to vary the federal payments according to the age of the child or the number of children in family, but average payment in each province had to be the same (of the same cost for the federal government). Quebec and Alberta chose for a different arrangement than the others provinces. The federal Family Allowances and the succeeding Child Tax Benefit were lower for a first child and higher for the third child and each additional child (with a supplement for each child between the ages of 12 and 17). Table A3 presents this particular scheme of

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[28] The new tax benefit scheme included a small supplement for earned income by low-income families. The other tax measures (refundable general sale tax credit, child care expense tax deduction and the non-refundable tax credit for single-parent families) were not modified.

federal benefits in Quebec. In 1998 and thereafter, Quebec decided that federal benefits would be the same as in other provinces. The arrangement over the 1981-1997 observation period increased the financial incentives to have a third child (or a child of higher parity), taking into account the structure of Quebec's own family allowances.

4. Descriptive Statistics

Total fertility rates

Figure 1, plots total historical fertility rates for Quebec, Canada and the ROC.[29] In Quebec, the total fertility rate (TFR) dropped below the 2.1 level in 1970 whereas in Canada (including Quebec) this drop occurred around 1973. During the 1970's and 1980's, there is a distinct downward trend for the fertility rates in Quebec that lasts until 1987. From 1980, the fertility rate drops from 1.63 child per woman, to 1.36 in 1987. During the same period, the fertility rate is quite stable for the ROC at 1.68. From 1987 to 1990, both Quebec and ROC experience an increase in fertility rates, the ROC moving up to 1.7 while the Quebec rate moves up to 1.63 (1.67 in 1992). Until 1997, the ROC drops back to 1.6 while Quebec remains stable at 1.63. Since 1997, the rate has dipped back again to 1.45 (for 2000) in Quebec.

Figures 2-6 plot TFR for Quebec (1980-1999) and ROC (1980-1997) respectively for the first births, second births, third births, fourth births and up and for all births. The same patterns are observed with some differences in timing. Therefore, these simple graphs display a convincing argument that the policies introduced in 1988 did have a substantial effect on fertility rates.

We also display the proportion of women at risk of giving birth who actually gave birth to a child for each parity in Figure 7. The same pattern of a downward followed by an upward trend starting in 1987 is observed for these proportions. For births of parity 1, we observe a downward trend for Quebec until 1987, this is reversed and an upward trend starts until 1993 when both regions experience a downturn. For second births, the gap between both regions starts to diminish in 1990, until both rates are almost the same. The figure shows the largest discrepancy between both proportions in 1987 is for parity 3, then a strong upward trend starts in Quebec as both proportions are quite close from 1991 to 1997. Again, this graph provide evidence for an effect of policy on fertility rates.

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[29] To this date (May 2001), Statistics Canada has not made available the fertility rates in Canada and ROC for the years 1998-2000. The Institut de la statistique du Québec which provides to the federal agency the province's vital statistics publishes each year information on fertility on its web site.

Any increase in fertility rates can also be the result in changes in the tempo of fertility, i.e. the rate at which women postpone births. If women stop postponing births, the fertility rate will increase at a specific time but will not increase for a particular cohort of women. Bongaarts and Feeney (BF)(1998) propose an adjusted TFR that takes into consideration increases in the mean age women have births of different parities. It is conceived as the fertility rate if women did not postpone births and it assumes that there are no generation effects acting on fertility rates.[30] Figures 8-12 plot for parities 1, 2, 3, 4 and up, and aggregated parties the Quebec Observed-TFR, the Adjusted-TFR (BF) as well as the mean age of women giving birth.

Figure 8 presents the case of first births. We notice that the mean age moves from 25 to 27 over 25 years. This explains why the adjusted rate is almost always higher than the observed rate. From our perspective, the important period is from 1987 to 1997. There is an increase in the unadjusted rate between 1986 and 1988. Over the same period, the adjusted rate increases by much less. In fact, it is practically identical, this is evidence that women are not postponing births. The increase from 1988 to 1992 must be considered as a quantum effect. The same observation is true of second births as can be seen in figure 9. However, for third births the adjusted rate follows closely the adjusted rate until 1993 as mean age varies little. From 1993 to 1994 the unadjusted rate shows no increase while the adjusted rate shows a significant increase. In general, changes for third births reflect changes in the quantum of fertility.

Evolution of other variables

In this section, we present a series of figures of other factors that could impact the fertility rates and that differ for the ROC and Quebec. We focus on labour market variables and education rates. Figure 14 shows that women labour force participation rates (for the age groups) rates have progressed almost identically in both regions over the period 1976-2000. In fact, in the latter years, it has increased faster in Quebec, which should slowdown fertility rates. Figure 13 shows the same trends for unemployment rates. Finally, post-secondary education rates have increased more in Quebec than in the rest of Canada between 1971 and 1996. This would be another factor postponing births. Therefore, when we do observe changes they should be postponing births, and consequently our results of the effects of policy could be biased downwards.

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[30] Kohler and Philipov (1999), and Kohler (1999) show that the assumption of "no cohort effects" is violated in some countries. The use of the Bongaarts-Feeney formula here does not take into account these "variance effects" (the changes in the variance of the fertility schedule by parity over time).

5. Data and methodology

Our strategy is based on the construction of conditional transition probabilities for women of different age groups. Hence, for parities 1, 2 and 3 we compute the ratio of annual first, second and third births to the number of women who are at risk of giving birth to a first, second or third child. These ratios give us the proportion of women who transited from having no (one, two) children to having one (two, three) child (children). To construct these conditional probabilities we need for each year (before and after the application of the policy), the number of births by parity for women of each age and the number of women of the same age at risk of giving birth for those with no children, with one child, and with two children.

The number of births per parity, per year and per age is given by the Vital Statistics for Canada and Quebec. The number of births for Quebec and the ROC is simply the difference between the number of births in Canada and the number of births in Quebec.[31] As for the computation of the number of women at risk, we turn to Statistics Canada's Survey of Consumer Finances (SCF), the file on household income individuals, a survey comparable to the United States March Current Population Survey (CPS). These surveys are available for each year, from 1981 to 1997 (except 1983).[32] For each individual, we know whether children are present in the household and whether the woman is head of a census family or economic family. Also, for each woman in the sample, we observe a frequency weight, representing the number of women of that type in the population. We use these weights to compute an estimate of the number of women by age at risk of giving birth to a first, second or third child. These weights are very precise. When we use them to compute the number of children in the population and compare them to those found in the Vital Statistics, they are extremely close.

However, we could not construct the conditional probabilities for each age. First, we choose women between 17 and 36. For women over 35, it is possible that children have left the household and would not be counted (as in Milligan 2000). We also believe that there is a stronger probability of misreporting the number of children for females who are less than 18. Also, we could not construct the conditional probabilities for women of each age for the province of Quebec since there are not enough individual observations for certain ages of each parity in the SCF to compute reliable proportions for women of each age. Thus, we construct probabilities for 4 age groups for women at risk of giving birth to a first child, (18-22,

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[31] There is an inaccuracy in birth statistics since Statistics Canada did not record births for the province of Newfoundland and Labrador before 1990. Since this province is small in terms of population and in the 1990s represented 3 percent or less of total births for ROC, we have eliminated the province from the sample of ROC.
[32] The Survey was replaced after 1997 by the new Survey on Labour and Income Dynamic. Statistics Canada has not yet released the public data set for the years 1998 and 1999.

23-25, 26-29, 30-35), for the second and third births we use three age groups, (18-26, 27-30, 31-35; and 18-29, 30-32 and 33-35). We compute these numbers for both Quebec and ROC for 15 years of data. We therefore work with 60 cells for the first birth and 45 for the second and third births.

Our empirical model is based on the following linear probability model:

$$Y_{ijt}=a+\sum_{k=1}^{4}b_k{}^*age_{ik}+\sum_{t=1982}^{1996}c_t{}^*D_t+e_{ijt} \qquad (1)$$

where Y_{ijt} is a dummy variable that takes the value of 1 if the women who are at risk of giving a child of rank j gave birth to a child, 0 otherwise; a is a constant; b_k is a parameter, and age_{ik} are dummy variables taking the value of 1 if the women are in age group k, and 0 otherwise. The C_t is a parameter while D_t is a time dummy. We suppose the age effects to be invariant. We estimate the aggregate version of this equation based on the means of the variables in the model. Hence, the only variable changing is the dependent variable that becomes the percentage of women at risk of giving birth to a child of rank j giving birth to a child of rank j.

We estimate this model for Quebec and ROC. We also estimate a model where we constrain the age effects to be identical for both regions. We add a dummy variable for the province of Quebec, time dummies and interaction terms that are the product of the time dummies and the regional dummy. Therefore, for each year and each region we can estimate the expected value of the conditional probabilities and we can construct a difference-in-differences estimator of the effect of the policy. Since the change in policy is in 1988, we can compute the differences between the predicted conditional probabilities in 1987 and those in 1989, and take the difference between these differences and observe whether it is statistically different.

6. Difference-in-differences evidence

Before presenting the econometric evidence, we present simple difference-in-differences estimators of fertility rates between Quebec and the ROC for different age groups. We compute the mean fertility rates for each groups and birth order for the periods of 1981 to 1987 and of 1988 to 1997. All rates are computed in logs. This estimator is given by:[33]

$$\hat{E}_{ij} = (\underline{Y}_{TP} - \underline{Y}_{TA}) - (\underline{Y}_{CP} - \underline{Y}_{CA}) \qquad (2)$$

[33] See Meyer (1995) and Mullahy (1999).

where Y_{ij} represents the sample mean of the fertility rates (in logarithm) of group i for the period j; index T represents the treatment group; index C represents the control group; index P correspond to the post-program period, and A correspond to the pre-program period. The first right term of equation (2) gives the initial estimator while the second term measures the effect of common factors for the two groups. The difference between the two terms gives the impact of the policy changes. Table 4 presents the results of the calculation using equation (2).

First, for all three birth orders and for the first 4 age groups we compute, we find a positive impact of the change in policy. Second, the size of the impact, decreases with age. Third, the impact for all women is strongest for the third birth which is consistent with our analysis of the policy change in 1988.

7. Econometric evidence

We turn now to the multivariate regression analysis. The first two columns of Table 5 presents results from a regression of the proportion of women giving birth to a first child amongst those who were at risk of giving birth to a first child for the ROC and for the province of Quebec with age and year effects. We observe these proportions to be extremely stable in the ROC, only from 1993 do we observe a slight decline as compared to 1981, the excluded dummy. For Quebec, the picture is very different as the year dummies decrease in value from 1982 to 1987, then in 1988 until 1996 (except for 1995) the year dummies are not statistically significant.

We then constrain the age effects to be identical, and estimate equation (1) of section 5. To compute the estimated difference between these proportions for a particular year, we add the qc dummy to the year-Quebec interaction dummies. In order to obtain a difference-in-differences estimator between two years, we simply subtract one year dummy from the other. From 1984 to 1987, Quebec's estimated probabilities are lower than in the ROC, and these differences are statistically significant. The largest difference is in 1987 being .023 lower. In 1989 it is .013 higher, making a difference-in-difference estimate of .03., or an increase of 21% evaluated at the mean. None of the Quebec-year interaction dummies are significant after 1987.

For second births, the analysis is slightly different. The probabilities in the ROC rise from 1982 to 1987, they are then relatively stable until 1992 and then decline back to their 1981 levels. In Quebec, the probabilities are quite stable until 1990, when they start rising until 1994, where they decline again. When we constrain the age effects to be the same, if we compute the difference-in-differences using 1989 and 1987, we

15

observe no effects of the policy. However, if we use 1990 and 1987, we compute a very large effect of the policy as the difference-in-differences is .025, an increase of about 15% evaluated at the mean.

Moving on to third births, the scenario is similar to first births. Analyzing the regressions by region, we observe an increase in 1985 in the ROC and then the probabilities are quite stable until 1996. For Quebec, the probabilities are quite stable until 1990 when they start to increase and remain quite constant until 1996. When we constrain the age effects, and compute the difference-in-differences with 1987 and 1989, we find .016, which is a 26% increase of the mean value. If we use 1990 rather than 1989, we find a difference-in-differences of .021, or a 35% increase of the mean value. However, we find no evidence for an impact of the increase of the newborn allowance in 1991 and in 1993 as none of the year-Quebec interaction terms are statistically significant.

Then, we performed regressions restricting to zero the year-Quebec interaction coefficients after 1987 that were not statistically significant. In this case, for parity 1, the difference-in-differences estimate between 1987 and 1989 is .031 with a p-value of .0042; for parity 2, the difference-in-differences estimate between 1990 and 1987 is .04 with a p-value of .0227; and, for parity 3, the difference-in-differences estimate between 1990 and 1987 is .024 with a p-value of .0001. These are strong effects because the means for the dependent variables are respectively .12, .18 and .06. These results confirm the potency of public policy if financial incentives for fertility are sufficiently high. What the policy may have done is simply return the conditional probabilities to their Canadian levels.

8. Conclusions

This paper presents graphical and statistical evidence that financial incentives do matter for the probability of giving birth to children. It also shows that stronger incentives cause larger changes of these probabilities. Also, we document very precisely the nature of the changes in policy for the province of Quebec and for federal policy. We conclude that these policies led to very strong additional incentives to give birth to a third child in Quebec. Our statistical evidence supports the hypothesis that these additional incentives had a strong impact on the number of third births.

Some important questions remain however. First, for first births we observe a reversal in the downward trend in Quebec in 1988, the year the policy is implemented and we should start observing effects the year after the policy change given the time for gestation. However, the adjusted fertility rate shows no such

increase in 1988. Second, although we observe very strong effects of the policy for third births after 1988, we do not observe any effects of the additional large incentives of 1991 and 1992 on third births.

To conclude, in order to give a final answer to the question whether the policy did not simply accelerate the arrival of children or simply had timing effects, we will need to compare cohorts of women in Quebec and the ROC with completed fertility and who experienced their fertility years between 1980 and 2000. Such a retrospective data set will soon be available at Statistics Canada.

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Table 1A: Evolution of average real income ($1996) of families with dependent children aged less than 18, by type of family, before and after personal income taxes, Quebec, 1985-1997

Years	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Income						Two-parent Families							
Before	55,681	55,296	58,113	58,395	59,656	59,949	57,122	58,787	56,264	57,626	57,837	59,078	58,949
After	45,321	44,872	46,256	46,400	47,261	47,100	45,069	46,675	44,239	45,287	45,491	45,684	45,170
Income						Single-parent Families							
Before	17 516	20 013	18 993	19 375	21 625	24 011	24 554	25 609	24 303	23 999	27 649	26 693	26 987
After	15 409	17 427	16 487	17 090	19 002	20 436	21 081	21 956	21 096	20 938	23 574	22 446	22 800

Source : Statistics Canada, Survey on Consumer Finances and calculation by the Institut de la statistique du Québec.
Notes: Before income taxes income is equal to gross income and includes taxable and non-taxable transfers; personal income taxes (federal and provincial) excludes employees contribution to social insurance on earned income.

Table 1B: Average and Median Income of Families by Type of Families, Before and After Incomes Taxes, and Number of Children, Quebec, 1997

Type of Families	Number of Families		Number of children		Average income		Median income	
					Before taxes	After taxes	Before taxes	After Taxes
	N	%	N	%	$		$	
All Families	**910,704**	**100.0**	**1,553,084**	**100.0**	**51,790**	**40,159**	**47,048**	**37,368**
Two-parent								
All	706,707	77.6	1,249,711	80.5	59,949	45,170	53,371	42,838
1 Child	301,159	33.1	301,519	19.4	58,383	44,433	52,347	40,747
2 Children	291,325	32.0	582,650	37.5	60,095	45,708	55,957	43,654
3 Children and up	113,863	12.5	365,542	23.5	57,518	45,745	53,370	43,749
Single-parent								
All	203,997	22.4	303,373	19.5	26,987	22,800	23,467	21,530
1 Child	121,891	13.4	121,891	7.8	27,099	22,528	24,700	22,724
2 Children and up	82,106	9.0	181,482	11.7	26,821	23,204	22,108	20,757

Source : Statistics Canada, Survey on Consumer Finances and calculation by the Institut de la statistique du Québec.
Notes: Before income taxes income is equal to gross income and includes taxable and non-taxable transfers; personal income taxes (federal and provincial) excludes employees contribution to social insurance on earned income.

Table 2: Support for Children in Two-parent Families from the Government of Quebec and the Federal Government, Current Dollars, 1985-1995

Years	1985	1987	1989	1990	1991	1992	1993	1994	1995
Two-parent family earned income of $30,000									
Quebec									
1 Child	95	392	1,099	1,380	n.a	1,722	1,744	1,971	1,971
2 Children	521	938	1,802	2,127		2,545	2,693	2,968	2,968
3 Children	880	1,431	4,188	4,571		5,168	5,637	5,959	5,959
Federal									
1 Child	580	552	523	558	n.a	652	767	767	767
2 Children	1,371	1,427	1,616	1,670		1,817	1,878	1,878	1,878
3 Children	2,551	2,701	3,181	3,259		3,474	3,763	3,763	3,763
Total									
1 Child	674	944	1,622	1,937	n.a	2,375	2,511	2,738	2,738
2 Children	1,893	2,365	3,418	3,797		4,361	4,571	4,846	4,846
3 Children	3,431	4,132	7,368	7,830		8,642	9,400	9,722	9,722
Two-parent family earned income of $40,000									
Quebec									
1 Child	95	425	700	982	1,130	n.a	1,358	1,604	1,605
2 Children	521	982	1,403	1,729	1,916		2,307	2,601	2,601
3 Children	880	1,480	3,789	4,172	4,412		5,251	5,592	5,593
Federal									
1 Child	342	313	252	257	261	n.a	517	517	517
2 Children	911	936	1,116	1,172	1,220		1,378	1,378	1,378
3 Children	2,084	2,204	2,681	2,761	2,830		3,263	3,263	3,263
Total									
1 Child	436	738	953	1,240	1,392	n.a	1,875	2,121	2,122
2 Children	1,433	1,918	2,529	2,901	3,135		3,685	3,979	3,979
3 Children	2,963	3,684	6,470	6,934	7,243		8,514	8,856	8,856
Two-parent family earned income of $50,000									
Quebec									
1 Child	95	425	503	583	n.a	933	958	1,224	1,227
2 Children	521	991	1,149	1,330		1,755	1,907	2,249	2,252
3 Children	880	1,494	3,508	3,794		4,378	4,851	5,270	5,273
Federal									
1 Child	350	327	243	257	n.a	269	267	267	267
2. Children	799	742	594	670		817	878	878	878
3 Children	1,628	1,712	2,124	2,205		2,474	2,763	2,763	2,763
Total									
1 Child	445	752	745	840	n.a	1,201	1,225	1,491	1,494
2 Children	1,320	1,733	1,743	2,000		2,572	2,785	3,127	3,130
3 Children	2,508	3,206	5,632	5,999		6,852	7,614	8,033	8,036

Source: Budget Documents, Department of Finances, Quebec Government, various years.

Notes:

1. The financial support is calculated for a couple with one earned income and without child care expenses. The first child is aged 7 years; in the case of two children their ages are 2 and 7; the couple with three children has a newborn and 2 children aged 2 and 7.

2. Quebec's support includes the income tax reductions, the family allowances and the others allocations. Federal support includes before 1993 the non-refundable and refundable tax credits for dependent children and family allowance, and since 1993 the child tax benefit.

Table 3: Support for Children from the Government of Quebec and the Federal Government, Current Dollars, Two-parent Families by Earned Income Level, Current Dollars, 1990-1995

	20,000	25,000	30,000	40,000	50,000	60,000	75,000	100,000
Quebec: 1 Child								
1990	1,990	1,572	1,380	982	582	563	563	563
1991	2,945	1,716	1,525	1,130	730	611	611	611
1993	3,879	1,933	1,744	1,358	958	651	651	651
1994	3,862	2,149	1,971	1,604	1,224	801	703	703
1995	3,862	2,149	1,971	1,604	1,224	801	703	703
Quebec: 2 Children								
1990	3,047	2,318	2,126	1,729	1,331	1,301	1,301	1,301
1991	4,075	2,501	2,310	1,916	1,516	1,417	1,417	1,417
1993	5,080	4,088	2,693	2,307	1,907	1,510	1,510	1,510
1994	5,128	4,295	2,968	2,601	2,249	1,827	1,640	1,640
1995	5,128	4,295	2,968	2,601	2,249	1,827	1,640	1,640
Quebec: 3 Children								
1990	5,266	4,762	4,570	4,172	3,797	3,847	3,847	3,847
1991	6,339	4,931	4,807	4,412	4,012	4,058	4,093	4,093
1993	7,484	6,492	5,637	5,251	4,851	4,451	4,364	4,364
1994	7,532	6,699	5,959	5,592	5,270	4,847	4,572	4,572
1995	7,532	6,699	5,959	5,592	5,270	4,847	4,572	4,572
Federal Government: 1 Child								
1990	854	832	561	257	257	124	125	125
1991	867	865	594	261	261	61	65	65
1993	1,369	961	767	517	267	17	0	0
1994	1,369	961	767	517	267	17	0	0
1995	1,369	961	767	517	267	17	0	0
Federal Government: 2 Children								
1990	2,014	1,973	1,672	1,172	666	278	280	280
1991	2,043	2,021	1,720	1,220	720	122	129	129
1993	2,582	2,174	1,878	1,378	878	378	0	0
1994	2,582	2,174	1,878	1,378	878	378	0	0
1995	2,582	2,174	1,878	1,378	878	378	0	0
Federal Government: 3 Children								
1990	3,728	3,639	3,261	2,761	2,186	979	640	640
1991	3,780	3,710	3,330	2,830	2,330	762	258	258
1993	4,467	4,059	3,763	3,263	2,763	2,263	1,513	263
1994	4,467	4,059	3,763	3,263	2,763	2,263	1,513	263
1995	4,467	4,059	3,763	3,263	2,763	2,263	1,513	263

Source: Budget Document, Department of Finances, Quebec Government, various years.

Notes:

1: The financial support is calculated for a couple with one earned income and without child care expenses. The first child is aged 7 years; in the case of two children their ages are 2 and 7; the couple with three children has a newborn and 2 children aged 2 and 7.

2. Quebec's support includes the income tax reductions, the family allowances and the others allocations. Federal support includes before 1993 the non-refundable and refundable tax credits for dependent children and family allowance, and since 1993 the child tax benefit.

Table 4: Difference in Differences Estimators of the Impact of Quebec's Programs on Birth rates (in logarithm) by Mothers' Age Group and Birth Parity

Ages and Birth Order	Treatment Group: Quebec: Mean Birth Rate (in ln)		Control Group: Rest of Canada: Mean Birth Rate (in ln)		Differences		Difference in Differences	Triple Difference
	Post Programs (1)	Pre Programs (2)	Post Programs (3)	Pre Programs (4)	[(1)-(2)] (5)	[(3)-(4)] (6)	[(5)-(6)] (7)	III(7)-I(7) III(7)-II(7) (8)
I-First Birth								
15-19	2.68 (0.06)	2.51 (0.05)	3.07 (0.09)	3.12 (0.08)	0.17 (0.00)	-0.05 (0.00)	0.22 (0.00)	0.364
20-24	3.86 (0.06)	3.90 (0.08)	3.73 (0.09)	3.89 (0.08)	-0.04 (0.00)	-0.17 (0.00)	0.13 (0.00)	0.205
25-29	4.04 (0.06)	3.91 (0.04)	3.91 (0.04)	3.88 (0.01)	0.13 (0.00)	0.03 (0.00)	0.10 (0.00)	0.107
30-34	3.16 (0.10)	2.79 (0.06)	3.27 (0.09)	2.97 (0.08)	0.37 (0.00)	0.29 (0.00)	0.08 (0.00)	-0.004
35-39	1.78 (0.14)	1.32 (0.10)	2.01 (0.13)	1.51 (0.14)	0.46 (0.00)	0.50 (0.00)	-0.04 (0.00)	0.030
40-44	-0.23(0.18)	-0.76(0.16)	0.08 (0.18)	-0.50(0.17)	0.51 (0.00)	0.58 (0.00)	-0.07 (0.00)	0.019
15-44	5.01 (0.05)	4.88 (0.04)	5.00 (0.04)	4.98 (0.03)	0.12 (0.00)	0.02 (0.00)	0.10 (0.00)	0.033
20-39	4.90 (0.05)	4.78 (0.05)	4.83 (0.03)	4.80 (0.02)	0.12 (0.00)	0.03 (0.00)	0.09 (0.00)	0.056
20-44	4.90 (0.05)	4.78 (0.05)	4.84 (0.03)	4.81 (0.02)	0.12 (0.00)	0.04 (0.00)	0.09 (0.00)	0.053
II-Second Birth								
15-19	0.78 (0.09)	0.50 (0.10)	1.41 (0.10)	1.44 (0.06)	0.28 (0.00)	-0.02 (0.00)	0.30 (0.00)	0.279
20-24	3.05 (0.05)	3.07 (0.10)	3.15 (0.08)	3.37 (0.07)	-0.02 (0.00)	-0.21 (0.00)	0.20 (0.00)	0.140
25-29	3.84 (0.06)	3.89 (0.06)	3.74 (0.07)	3.85 (0.01)	-0.05 (0.00)	-0.11 (0.00)	0.06 (0.00)	0.143
30-34	3.48 (0.09)	3.27 (0.04)	3.53 (0.04)	3.35 (0.08)	0.22 (0.00)	0.18 (0.00)	0.04 (0.00)	0.036
35-39	2.13 (0.15)	1.75 (0.05)	2.40 (0.11)	1.87 (0.15)	0.38 (0.00)	0.43 (0.00)	-0.05 (0.00)	0.143
40-44	-0.24 (0.18)	-0.49 (0.11)	0.33 (0.18)	-0.29(0.15)	0.47 (0.00)	0.62 (0.00)	-0.15 (0.00)	0.099
15-44	4.72 (0.06)	4.65 (0.05)	4.76 (0.02)	4.76 (0.01)	0.07 (0.00)	-0.00 (0.00)	0.07 (0.00)	0.064
20-39	4.69 (0.06)	4.63 (0.05)	4.71 (0.02)	4.72 (0.02)	0.06 (0.00)	-0.01 (0.00)	0.07 (0.00)	0.073
20-44	4.70 (0.06)	4.68 (0.05)	4.72 (0.02)	4.72 (0.02)	0.07 (0.00)	-0.00 (0.00)	0.07 (0.00)	0.077
III-Third Birth								
15-19	-1.45 (0.21)	-2.10 (0.03)	-0.65 (0.09)	-0.80 (0.05)	0.66 (0.00)	0.15 (0.00)	0.58 (0.00)	
20-24	1.55 (0.13)	1.34 (0.10)	1.93 (0.06)	2.06 (0.05)	0.21 (0.00)	-0.13 (0.00)	0.34 (0.00)	
25-29	2.67 (0.07)	2.68 (0.11)	2.76 (0.12)	2.96 (0.02)	-0.01 (0.00)	-0.21 (0.00)	0.20 (0.00)	
30-34	2.72 (0.09)	2.62 (0.12)	2.86 (0.06)	2.83 (0.04)	0.11 (0.00)	0.03 (0.00)	0.08 (0.00)	
35-39	1.67 (0.13)	1.44 (0.05)	1.98 (0.03)	1.74 (0.09)	0.23 (0.00)	0.24 (0.00)	-0.01 (0.00)	
40-44	-0.37 (0.16)	-0.69(0.01)	-0.01 (0.10)	-0.39(0.09)	0.33 (0.00)	0.38 (0.00)	-0.05 (0.00)	
15-44	3.71 (0.09)	3.61 (0.10)	3.89 (0.06)	3.93 (0.01)	0.10 (0.00)	-0.04 (0.00)	0.14 (0.00)	
20-39	3.68 (0.09)	3.59 (0.10)	3.86 (0.07)	3.91 (0.01)	0.09 (0.00)	-0.05 (0.00)	0.14 (0.00)	
20-44	3.70 (0.09)	3.61 (0.10)	3.88 (0.06)	3.92 (0.01)	0.09 (0.00)	-0.04 (0.00)	0.14 (0.00)	
All Birth Orders								
15-19	2.84 (0.06)	2.65 (0.05)	3.27 (0.09)	3.31 (0.07)	0.19 (0.00)	-0.04 (0.00)	0.23 (0.00)	
20-24	4.31 (0.05)	4.32 (0.09)	4.30 (0.08)	4.48 (0.07)	-0.01 (0.00)	-0.17 (0.00)	0.16 (0.00)	
25-29	4.80 (0.05)	4.76 (0.05)	4.74 (0.06)	4.80 (0.01)	0.43 (0.00)	-0.06 (0.00)	0.11 (0.00)	
30-34	4.35 (0.10)	4.11 (0.04)	4.59 (0.03)	4.30 (0.06)	0.23 (0.00)	0.16 (0.00)	0.07 (0.00)	
35-39	3.15 (0.13)	2.82 (0.03)	3.44 (0.08)	3.11 (0.09)	0.33 (0.00)	0.33 (0.00)	0.00 (0.00)	
40-44	1.19 (0.15)	0.87 (0.07)	1.54 (0.13)	1.18 (0.06)	0.32 (0.00)	0.36 (0.00)	-0.04 (0.00)	
15-44	5.71 (0.05)	5.66 (0.05)	5.82 (0.03)	5.82 (0.01)	0.10 (0.00)	0.00 (0.00)	0.10 (0.00)	
20-39	5.69 (0.05)	5.60 (0.05)	5.72 (0.03)	5.72 (0.01)	0.01 (0.00)	0.00 (0.00)	0.10 (0.00)	
20-44	5.70 (0.05)	5.61 (0.05)	5.74 (0.03)	5.73 (0.01)	0.01 (0.00)	0.01 (0.00)	0.09 (0.00)	

Notes: Standard deviations in parentheses. Mean pre-programs birth rate is the average of the birth rates (in ln) over years 1981 to 1987 while mean post-programs birth rate is based on the years 1988 to 1997

Table 5 : OLS Estimates of Equation (1) for Parity 1, 2 and 3, Rest of Canada (ROC) and Quebec.

Variables (t-statistics)	Parity 1			Parity 2		
	ROC	Quebec	ROC and Quebec	ROC	Quebec	ROC and Quebec
Constant	**0,090419**	**0,089746**	**0,084933**	**0,121864**	**0,109281**	**0,115786**
	(21,466)	(9,752)	(10,894)	(10,157)	(9,223)	(9,804)
A_{18-22}	**0,053986**	**0,051325**	**0,052656**			
	(19,225)	(8,366)	(13,718)			
A_{23-25}	**0,025281**	**0,053179**	**0,039230**			
	(9,003)	(8,668)	(10,220)			
A_{26-29}	**0,043910**	**0,062556**	**0,053233**			
	(15,636)	(10,196)	(13,868)			
A_{18-26}				**0,121864**	**0,109281**	**0,115786**
				(10,157)	(9,223)	(9,804)
A_{27-30}				**0,121864**	**0,109281**	**0,115786**
				(10,157)	(9,223)	(9,804)
d_{1982}	-0,001633	-0,007041	-0,001633	0,015961	-0,010609	0,015961
	(-0,300)	(-0,593)	(-0,155)	(1,001)	(-0,674)	(0,987)
d_{1984}	0,008844	**-0,021527**	0,008844	0,016193	-0,003179	0,016193
	(1,626)	(-1,812)	(0,841)	(1,016)	(-0,202)	(1,001)
d_{1985}	-0,000477	**-0,027081**	-0,000477	**0,030911**	-0,001518	**0,030911**
	(-0,088)	(-2,279)	(-0,045)	(1,939)	(-0,096)	(1,911)
d_{1986}	-0,002013	**-0,025025**	-0,002013	**0,028006**	0,003694	**0,028006**
	(-0,370)	(-2,106)	(-0,192)	(1,757)	(0,235)	(1,732)
d_{1987}	0,007390	**-0,026244**	0,007390	**0,063398**	0,013249	**0,063398**
	(1,359)	(-2,209)	(0,703)	(3,978)	(0,842)	(3,920)
d_{1988}	-0,007034	-0,016505	-0,007034	**0,033917**	0,002635	**0,033917**
	(-1,294)	(-1,389)	(-0,669)	(2,128)	(0,167)	(2,097)
d_{1989}	-0,001602	-0,005185	-0,001602	**0,047219**	0,005460	**0,047219**
	(-0,295)	(-0,436)	(-0,152)	(2,962)	(0,347)	(2,920)
d_{1990}	0,004363	0,003396	0,004363	**0,050071**	0,024638	**0,050071**
	(0,802)	(0,286)	(0,415)	(3,141)	(1,565)	(3,096)
d_{1991}	0,006696	0,002656	0,006696	**0,043168**	0,021277	**0,043168**
	(1,231)	(0,224)	(0,637)	(2,708)	(1,352)	(2,669)
d_{1992}	0,007638	0,016049	0,007638	**0,035243**	0,009696	**0,035243**
	(1,404)	(1,351)	(0,727)	(2,211)	(0,616)	(2,179)
d_{1993}	**0,011628**	0,019146	0,011628	0,023011	**0,043936**	0,023011
	(2,138)	(1,611)	(1,106)	(1,444)	(2,791)	(1,423)
d_{1994}	**-0,013094**	-0,016524	-0,013094	0,010364	0,008716	0,010364
	(-2,408)	(-1,391)	(-1,246)	(0,650)	(0,554)	(0,641)
d_{1995}	**-0,012525**	**-0,024272**	-0,012525	0,023795	0,014610	0,023795
	(-2,303)	(-2,043)	(-1,192)	(1,493)	(0,928)	(1,471)
d_{1996}	**-0,009908**	-0,014980	-0,009908	0,009230	-0,009027	0,009230
	(-1,822)	(-1,261)	(-0,942)	(0,579)	(-0,573)	(0,571)
Qc			0,010298			-0,000426
			(0,980)			(-0,026)
d_{1982}^{qc}			-0,005408			-0,026570
			(-0,364)			(-1,162)
d_{1984}^{qc}			**-0,030370**			-0,019371
			(-2,043)			(-0,847)
d_{1985}^{qc}			**-0,026604**			-0,032429
			(-1,790)			(-1,418)
d_{1986}^{qc}			-0,023012			-0,024312
			(-1,548)			(-1,063)
d_{1987}^{qc}			**-0,033634**			**-0,050149**
			(-2,262)			(-2,193)

d^{qc}_{1988}			-0,009471 (-0,637)		-0,031282 (-1,368)
d^{qc}_{1989}			-0,003583 (-0,241)		**-0,041759** (-1,826)
d^{qc}_{1990}			-0,000967 (-0,065)		-0,025433 (-1,112)
d^{qc}_{1991}			-0,004039 (-0,272)		-0,021891 (-0,957)
d^{qc}_{1992}			0,008412 (0,566)		-0,025547 (-1,117)
d^{qc}_{1993}			0,007518 (0,506)		0,020925 (0,915)
d^{qc}_{1994}			-0,003430 (-0,231)		-0,001648 (-0,072)
d^{qc}_{1995}			-0,011746 (-0,790)		-0,009185 (-0,402)
d^{qc}_{1996}			-0,005072 (-0,341)		-0,018256 (-0,798)
R^2 ajusted	0,8886	0,7257	0,7143		0,7421
F-statistic	28,674	10,183	10,299		9,262

Coefficients in bold are statistically significant at the 10% level.

Table 5 (Concluded)

Variables (t-statistics)	Parity 3		
	ROC	Quebec	ROC and Quebec
Constant	**0,023892**	**0,025618**	**0,025042**
	(8,736)	(5,597)	(6,588)
A_{18-29}	**0,062588**	**0,055577**	**0,059082**
	(38,520)	(20,438)	(35,897)
A_{30-32}	**0,023025**	**0,023134**	**0,023080**
	(14,171)	(8,508)	(14,023)
d_{1982}	0,003316	-0,004863	0,003316
	(0,913)	(-0,800)	(0,637)
d_{1984}	0,005505	-0,002783	0,005505
	(1,515)	(-0,458)	(1,058)
d_{1985}	0,006053	-0,005795	0,006053
	(1,666)	(-0,953)	(1,163)
d_{1986}	**0,012292**	-0,005572	**0,012292**
	(3,383)	(-0,916)	(2,362)
d_{1987}	**0,022623**	-0,006870	**0,022623**
	(6,227)	(-1,130)	(4,347)
d_{1988}	**0,013737**	-0,005883	**0,013737**
	(3,781)	(-0,967)	(2,639)
d_{1989}	**0,015388**	0,002169	**0,015388**
	(4,235)	(0,357)	(2,956)
d_{1990}	**0,019338**	0,010764	**0,019338**
	(5,323)	(1,770)	(3,715)
d_{1991}	**0,020805**	**0,015647**	**0,020805**
	(5,726)	(2,573)	(3,997)
d_{1992}	**0,019528**	**0,012932**	**0,019528**
	(5,375)	(2,127)	(3,752)
d_{1993}	**0,017679**	0,006233	**0,017679**
	(4,866)	(1,025)	(3,397)
d_{1994}	**0,016748**	**0,013626**	**0,016748**
	(4,610)	(2,241)	(3,218)
d_{1995}	**0,016088**	0,011277	**0,016088**
	(4,428)	(1,855)	(3,091)
d_{1996}	**0,016980**	**0,014797**	**0,016980**
	(4,674)	(2,434)	(3,262)
Qc			-0,000575
			(-0,110)
d_{1982}^{qc}			-0,008179
			(-1,111)
d_{1984}^{qc}			-0,008288
			(-1,126)
d_{1985}^{qc}			-0,011848
			(-2,427)
d_{1986}^{qc}			**-0,017864**
			(-2,427)
d_{1987}^{qc}			**-0,029493**
			(-4,007)
d_{1988}^{qc}			**-0,019620**
			(-2,666)
d_{1989}^{qc}			**-0,013218**
			(-1,796)
d_{1990}^{qc}			-0,008574
			(-1,165)

27

d_{1991}^{qc}			-0,005158 (-0,701)
d_{1992}^{qc}			-0,006596 (-0,896)
d_{1993}^{qc}			-0,011446 (-1,555)
d_{1994}^{qc}			-0,003122 (-0,424)
d_{1995}^{qc}			-0,004811 (-0,654)
d_{1996}^{qc}			-0,002183 (-0,297)
R^2 ajusted	0,9733	0,9133	0,9429
F statistic	101,175	29,985	48,376

Table A1: Quebec Government's Income Tax Treatment and Transfer Benefits for Dependent Children, in current dollars, Quebec, 1981-2000

Years	Basic Family Allowances				Young children Allowances			Newborn Allowances			New family Allowance per child: Max/Min[1]	Tax Deduction 16-17/18+ (1st Child/Others Children)	Maximum Tax Credit 1st Child/Others Children	Quebec's Personal Income Tax Rate: Min/max[2]	Low-income Income Tax Reduction per Family/Sales Tax Credit per Child
	1st Child	2nd Child	3rd Child	4th Child	1st Child	2nd Child	3rd Child and Up	1st Child	2nd Child	3rd Child and Up					
1981	85	114	142	170	-	-	-	-	-	-		670/1,090	-	13/32	-
1982	85	114	142	170	300	200	100	-	-	-		720/1,170	-	13/32	-
1983	90	121	151	181	300	200	100	-	-	-		770/1,260	-	13/32	-
1984	95	127	158	190	300	200	100	-	-	-		810/1,320	-	13/32	-
1985	95	127	158	190	300	200	100	-	-	-		810/1,320	-	13/33	-
1986	99	132	165	197	300	200	100	-	-	-		(1,830/1,370)	-	13/28	-
1987	103	137	171	205	100	200	300	-	-	-		(1,930/1,420)	-	13/28	-
1988	107	143	179	214	100	200	300	500	500	8x375		-	446/374	16/24	965/22
1989	112	149	186	223	100	200	500	500	500+500	12x375		-	446/374	16/24	970/23
1990	117	156	195	234	105	210	525	500	500+500	16x375		-	466/403	16/24	1,180/24
1991	123	163	204	245	110	220	550	500	500+500	20x375		-	488/422	16/24	1,260/25
1992	128	171	213	256	115	230	574	500	500+500	20x400		-	510/441	16/24	1,380/28
1993	131	174	218	261	117	234	586	500	500+500	20x400		-	520/450	16/26,4	1,310/31
1994	131	174	218	261	117	234	586	500	500+500	20x400		-	520/480	16/26,4	1,500/31
1995	131	174	218	261	117	234	586	500	500+500	20x400		-	520/480	16/26,4	1,500/31
1996	131	174	218	261	117	234	586	500	500+500	20x400		-	520/480	16/26,4	1,500/31
1997	131	174	218	261	117	234	586	500	500+500	20x400		-	520/480	16/26,4	1,500/31
1998	These allowances were abolished and replaced by a new allowance targeted on family income										975/131(1st); 174 (2nd); 218(3rd); 261(4th)	-	598/552	20/26	1,500/31
2000											-	-	598/552	19/25	1,500/31

Sources: Budget Document, Department of Finance, Government of Quebec and Régie des rentes du Québec, various years.

Notes:

1. The Quebec Family Allowances provides maximum benefits of $975 per child and a supplement of $1,300 for lone-parent families. The schedule of reduction rates varies with brackets of family income. For lone-parent families, benefits are reduced at a rate of 50 per cent of family income in excess of $15,332, up to an income of $19,620. In the $19,620 to $50,000 bracket of income, benefits are constant: $131 for the first child, $174 for the second child and $975 for the third and each subsequent child. For two-parent families, benefits are reduced at a rate of 30 per cent of family income in excess of $21,825, up to an income of $24,638. In the $24,638 to $50,000 bracket of income, benefits are constant at the same levels as for lone-parent families. For all families, benefits are reduced at a rate of 5 per cent of family income in excess of $50,000.

2. Quebec has remained outside the tax collection agreements entered into by all provinces and levies a personal income tax under its own statute. Quebec taxpayers file separate federal and provincial personal income tax return.

Table A2: Federal Government's Income Tax Treatment and Transfer Benefits for Dependent Children, current dollars, Canada, 1981-2000

Years	Gross[1] Family Allowances per child	Refundable Tax Credit per child + Supplement[2] for Children under 7	Family Income Threshold for maximum credit[3]	GST credit per child[4]	Family Income Threshold for maximum GST credit	Fiscal Deduction for Dependent Children: under 18 years/18 and over	Income Tax rate: Min/max: Federal/ (Federal+ Provinces)	Non Refundable Tax Credit for First Two Children /Others	Child Tax Benefit per Child[5]+ Supplement 3rd Child and Up + (Supplements)[6]	Family Income Threshold for Maximum Child Tax Benefit
1981	288	261	23,470	-	-	590/1,090	16/43 (25/62)	-	-	-
1982	323	343	26,330	-	-	670/1,220	16/34 (25/50)	-	-	-
1983	341	343	26,330	-	-	710/1,300	16/34 (25/50)	-	-	-
1984	353	367	26,330	-	-	710/1,360	16/34 (25/50)	-	-	-
1985	373	384	26,330	-	-	710/1,420	16/36 (25/52)	-	-	-
1986	379	454	23,500	25	15,000	710/1,200	17/38 (24/53)	-	-	-
1987	383	489	23,760	25	15,000	560/1,200	17/35 (24/51)	-	-	-
1988	389	559+100	24,000	35	16,000	-	17/29 (26/44)	65/130	-	-
1989	393	565+200	24,335	50	16,000	-	17/29 (26/45)	67/133	-	-
1990	400	575+203	24,769	70	18,000	-	17/29 (27/47)	68/136	-	-
1991	407	585+203	25,215	100	24,800	-	17/29 (27/47)	69/138	-	-
1992	419	601+213	25,921	103	25,478	-	17/29 (27/47)	71/142	-	-
1993	-	-	-	105	25,921	-	17/29 (26/46)	-	1,020+75	25,921
1994	-	-	-	105	25,921	-	17/29 (26/46)	-	1,020+75	25,921
1995	-	-	-	105	25,921	-	17/29 (26/46)	-	1,020+75	25,921
1996	-	-	-	105	25,921	-	17/29 (26/46)	-	1,020+75	25,921
1997	-	-	-	105	25,921	-	17/29 (26/46)	-	1,020+75	25,921
1998	-	-	-	105	25,921	-	17/29 (26/46)	-	1,020+ 75+ (605/405/330)	25,921
2000	-	-	-			-	17/29 (27/47)	-	1,104+77+ (977/771/694)	30,004

Sources: The National Finances, Canadian Tax Foundation, various years. Budget Document, Department of Finance, Government of Quebec and Régie des rentes du Québec, various years.

Notes:

1. Family allowances are taxable income. 2. This supplementary credit is reduced by 25 percent of child care expenses claimed. 3. Based on previous year family income; the credit is reduced by 5% over the income threshold. 4. The credit is reduced by 5% over the income threshold. 5. A 2.5 (5) percent reduction rate is applied for one child (2 children and up) family over the income threshold. 6. A supplement of $213 ($219 in 2000) is available for each child under the age of seven. This supplement is reduced by 25 per cent of all child care expenses claimed as a deduction.

Table A3: Federal Government's Income Tax Treatment and Transfer Benefits for Dependent Children in Quebec, 1981-2000

Years	Federal Family Allowances in Quebec before income tax[1]			Refundable Tax Credit per child + Supplement[2] for Children under seven	Family Income Threshold for maximum credit[3]	Federal Child Tax Benefit in Quebec + Supplement for each child aged 12 years and over+ Supplement for 3rd child and subsequent children[4]			Family Income Threshold for Maximum Child Tax Benefit[5]	Federal Income Tax Rate in Quebec: Min/max[6]
	1st Child	2nd Child	3rd Child			1st Child	2nd Child	3rd Child and up		
1981	171/244	259/331	531/603	261	23,470	-	-	-	-	13,4/35,9
1982	194/275	308/389	749/830	343	26,330	-	-	-	-	13,4/28,4
1983	205/291	326/412	794/892	343	26,330	-	-	-	-	13,4/28,4
1984	216/301	343/428	834/919	367	26,330	-	-	-	-	13,3/28,4
1985	225/317	358/450	871/963	384	26,330	-	-	-	-	13,4/29,8
1986	242/335	361/454	879/972	454	23,500	-	-	-	-	13,4/32,3
1987	245/339	365/459	898/992	489	23,760	-	-	-	-	13,4/29,4
1988	248/344	370/466	925/1020	559+100	24,000	-	-	-	-	13,4/25,8
1989	252/348	375/471	945/1042	565+200	24,335	-	-	-	-	14,9/25,8
1990	256/354	381/479	960/1058	575+203	24,769	-	-	-	-	15/26,5
1991	260/360	388/488	969/1069	585+203	25,215	-	-	-	-	15/27,1
1992	268/371	399/502	996/1099	601+213	25,921	-	-	-	-	15/27,1
1993	-	-	-	-	-	869+103	1,000+103	1,597+103+75	25,921	12/26,5
1994	-	-	-	-	-	869+103	1,000+103	1,597+103+75	25,921	12/26,5
1995	-	-	-	-	-	869+103	1,000+103	1,597+103+75	25,921	12/26,5
1996	-	-	-	-	-	869+103	1,000+103	1,597+103+75	25,921	12/26,5
1997	-	-	-	-	-	869+103	1,000+103	1,597+103+75	25,921	12/26,5
1998	-	-	-	-	-	1,020+605	1,020+405	1,020+330+75	25,921	13,9/26,5
2000	-	-	-	-	-	1,104+977	1,104+771	1,104+694+77	30,004	

Sources: The National Finances, Canadian Tax Foundation, various years.
Notes:
1. A province could vary the federal payments according to the age of the child or the number of children in family, but average payment in each province had to be the same. Quebec and Alberta choose for a different arrangement than the others provinces (see Table A2 for payments in the rest of Canada). 3-5: see Table A2. 6. Quebec taxpayers receive a refundable tax abatement of 16,5 percent of basic federal tax payable. This measure reflects Quebec's opting out of the programs under the Federal-Provincial Fiscal Arrangement Act.

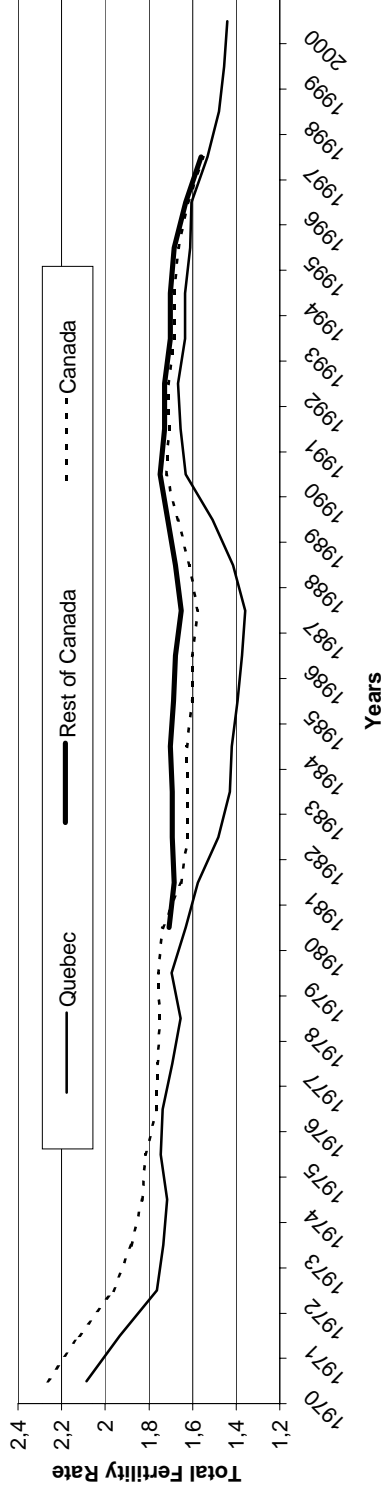**Figure 1: Total Fertility Rates - Historical**

Legend: Quebec | Rest of Canada | ---- Canada

Y-axis: Total Fertility Rate (2,4 — 2,2 — 2 — 1,8 — 1,6 — 1,4 — 1,2)

X-axis: Years (1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000)

Figure 2: Total Fertility Rate - First Birth
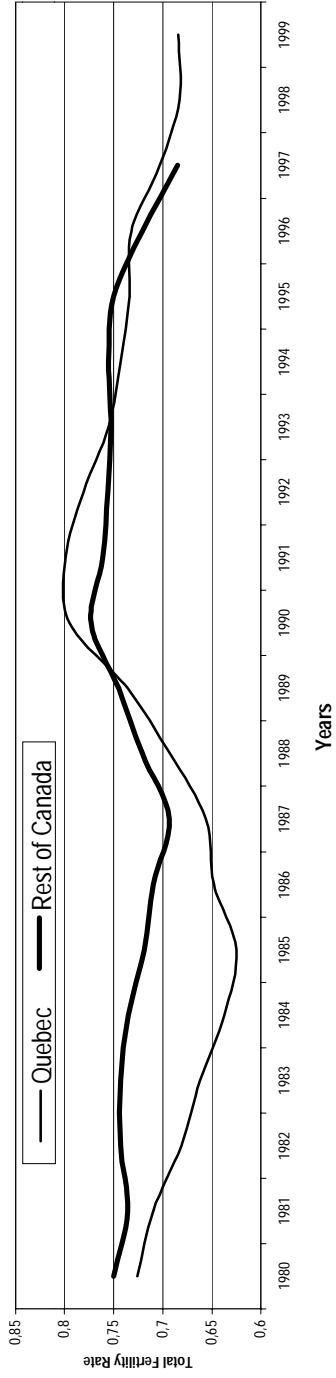
Figure 3: Total Fertility Rate - Second Birth

Quebec

Rest of Canada

Years

Total Fertility Rate

0,65   0,6   0,55   0,5   0,45

1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999
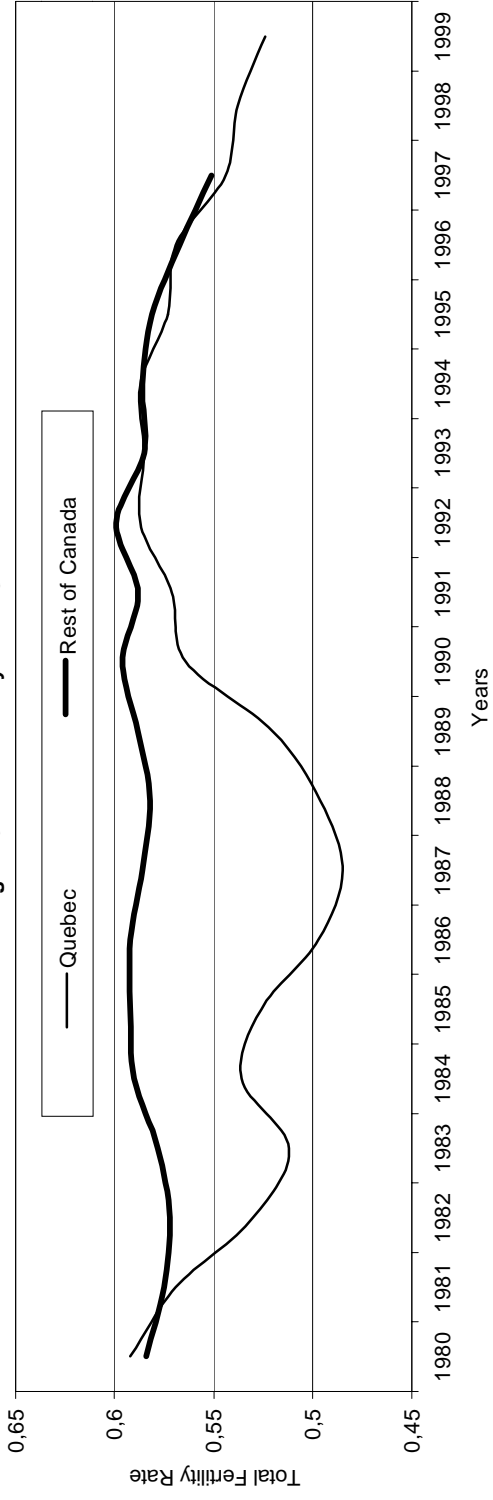
Figure 4: Total Fertility Rate - Third Birth

Total Fertility Rate

Years

0,27
0,25
0,23
0,21
0,19
0,17
0,15

1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999

Quebec —— Rest of Canada
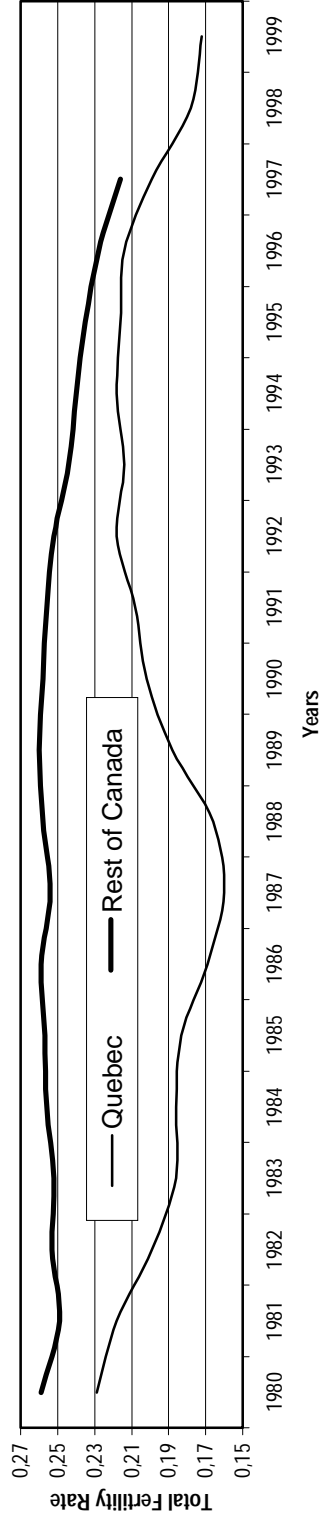
Figure 5: Total Fertility Rate - Fourth Birth and Up

Total Fertility Rate

Years

—— Quebec   —— Rest of Canada

0,13
0,12
0,11
0,1
0,09
0,08
0,07
0,06
0,05

1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999
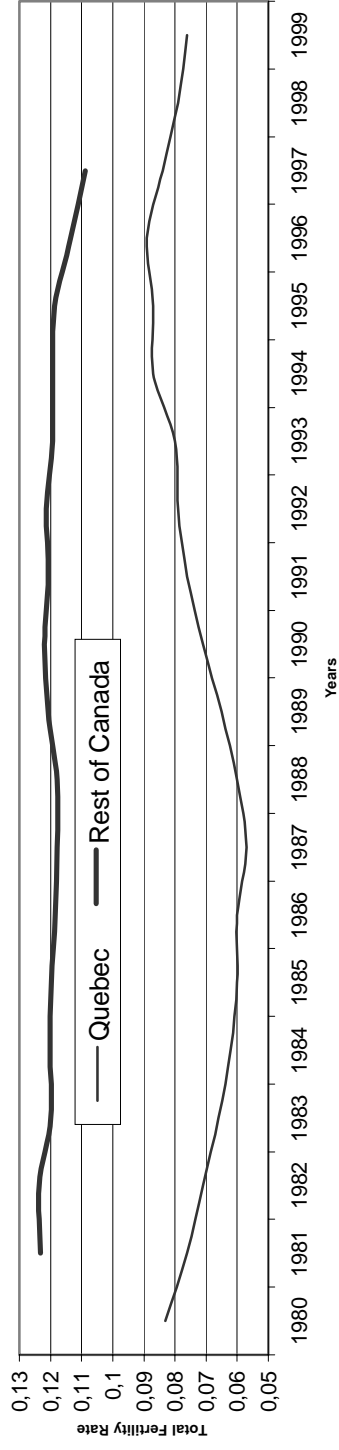
Figure 6: Total Fertility Rate - All Births
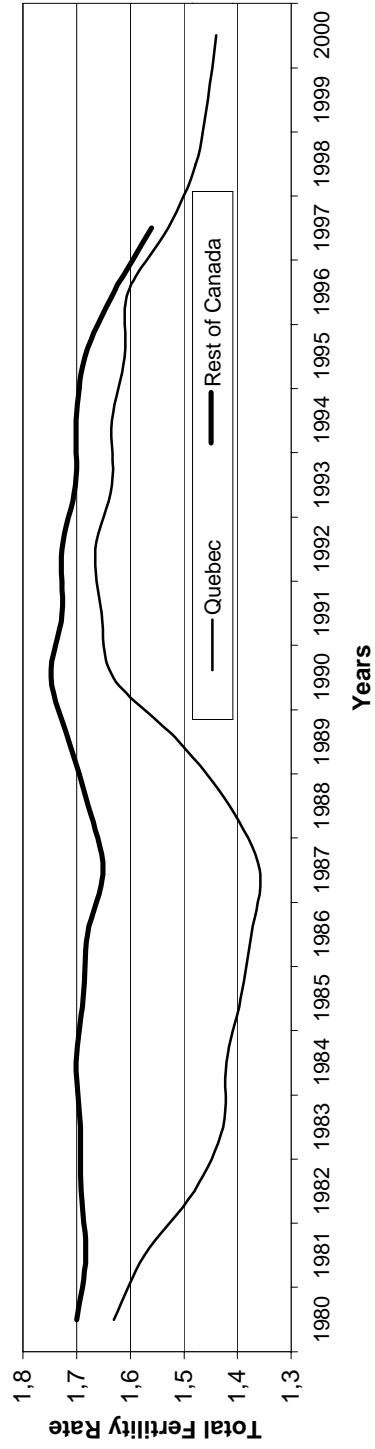
Figure 7: Observed probabilities of births by parity, all age groups, ROC and Quebec
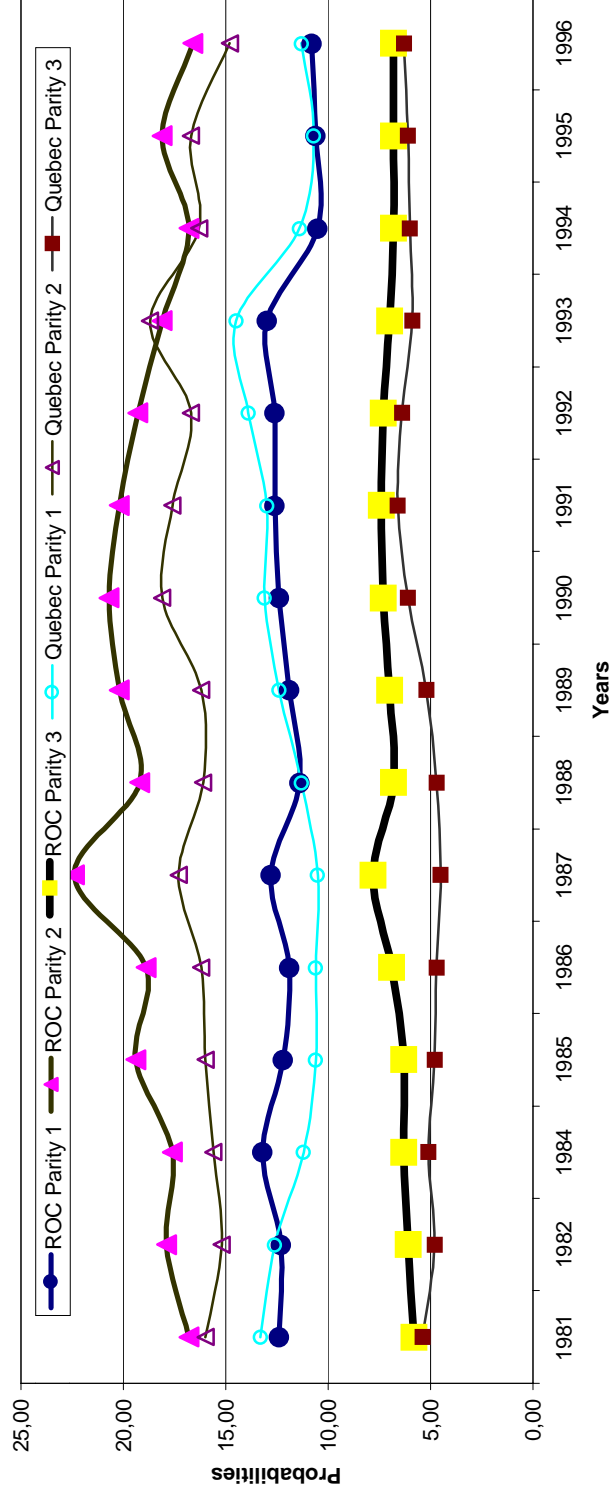
Figure 8: First Births: TFRs and Mean Age

Legend: Observed TFR; Adjusted TFR (BF); Mean age at birth

Axes: TFR (0,5 – 0,95); Age (25 – 27); Years (1975 – 1999)
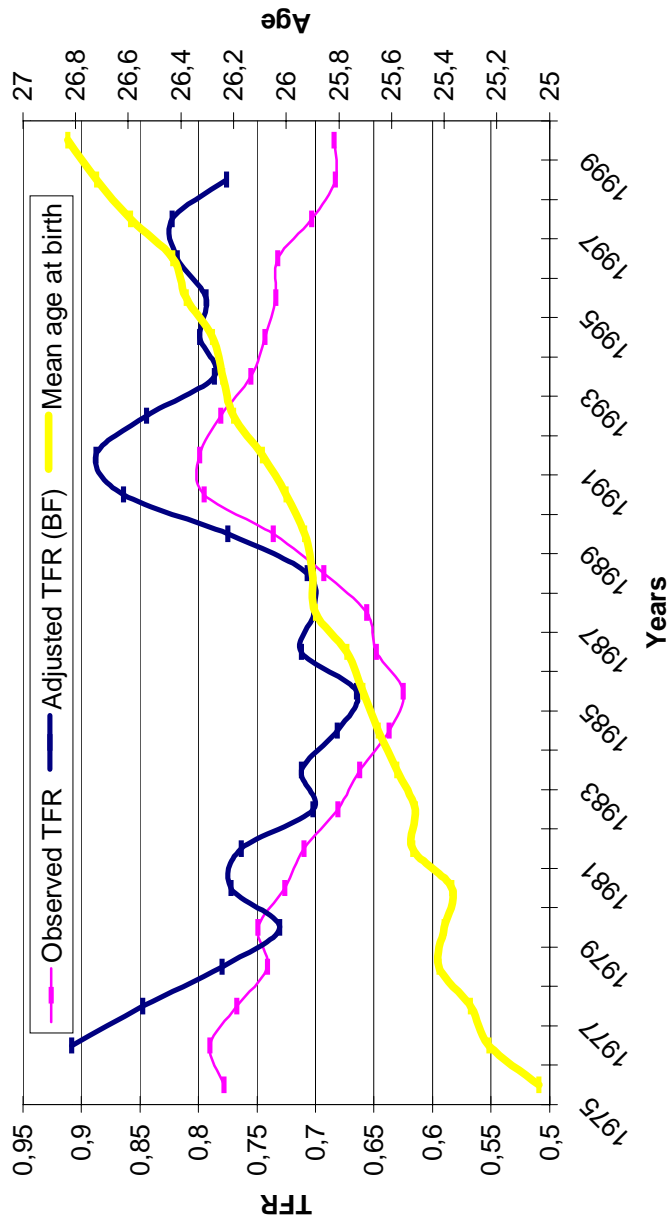
Figure 9: Second Births: TFRs and Mean Age
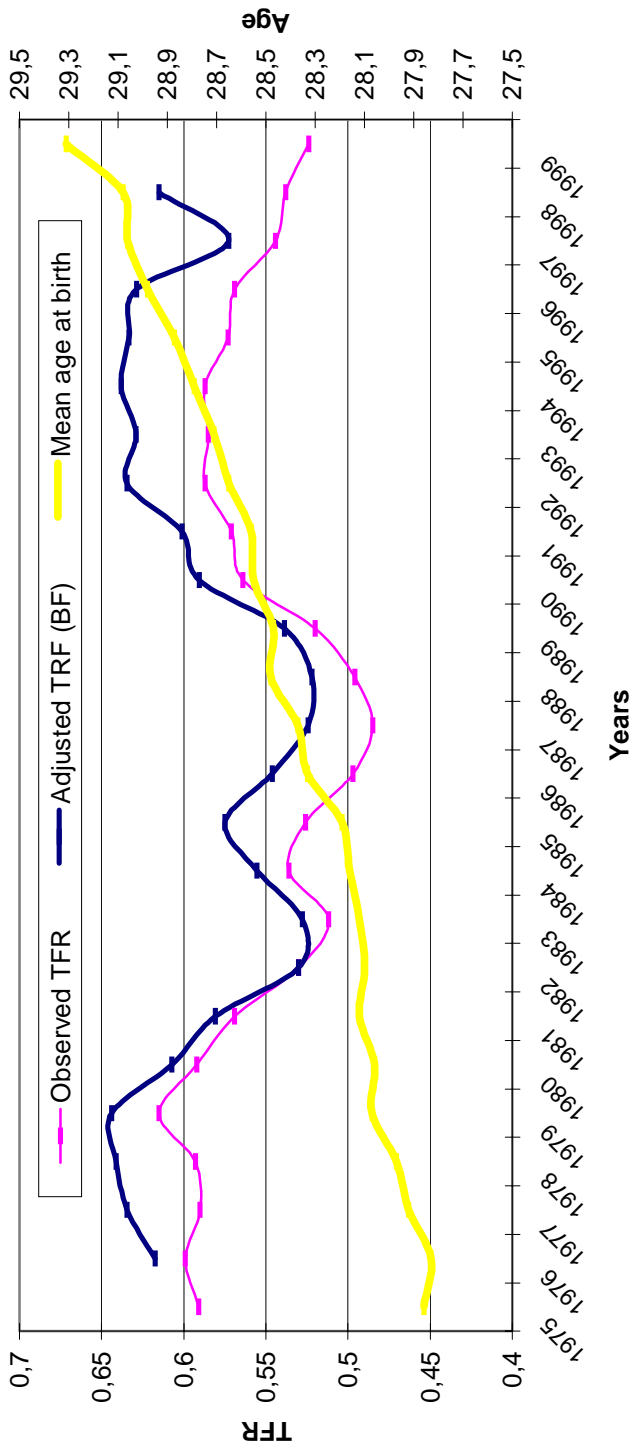
Figure10: Third Births: TFRs and Mean Age

Legend:
- Observed TFR
- Adjusted TFR (BF)
- Mean age at birth

TFR axis: 0,15 0,17 0,19 0,21 0,23 0,25 0,27

Age axis: 30 30,1 30,2 30,3 30,4 30,5 30,6 30,7 30,8

Years: 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999
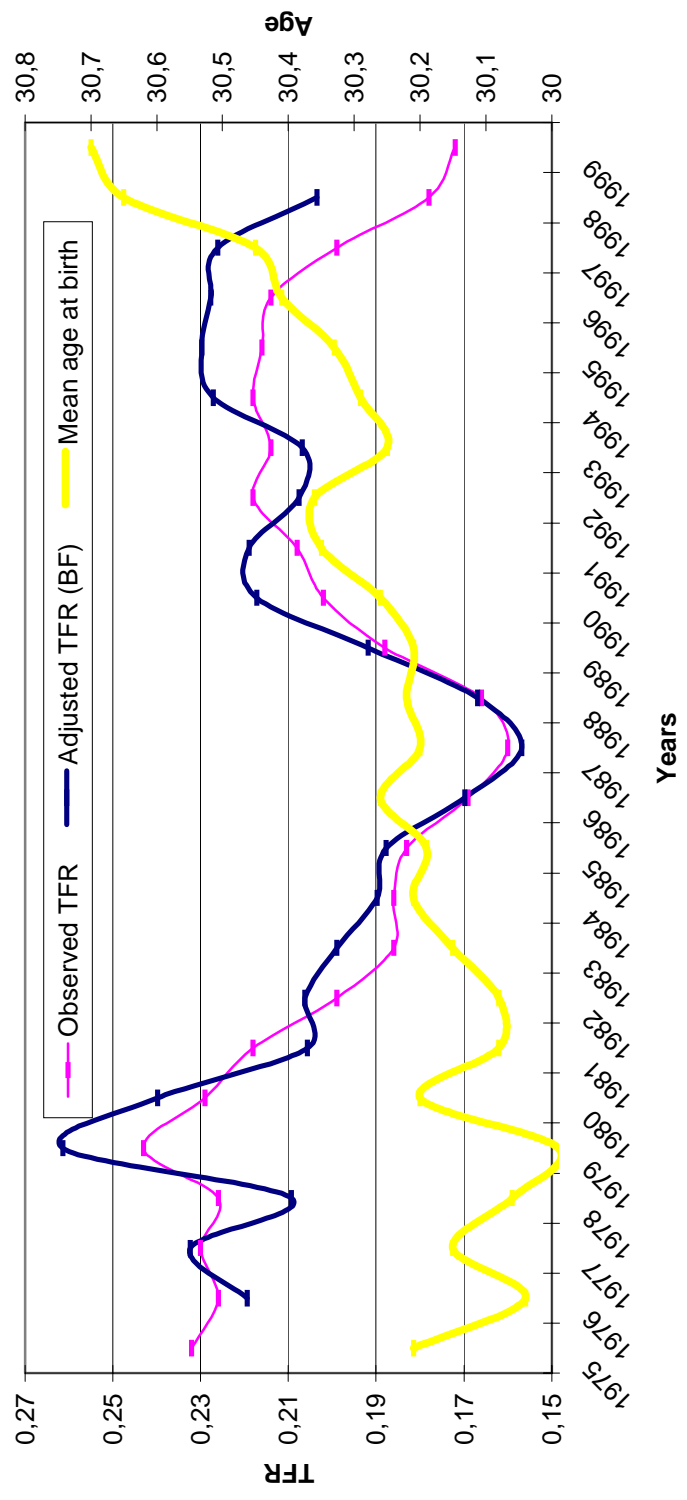
Figure 11: Fourth Births and Up: TFRs and Mean Age

Observed TFR — Adjusted TFR (BF) — Mean Age at birth
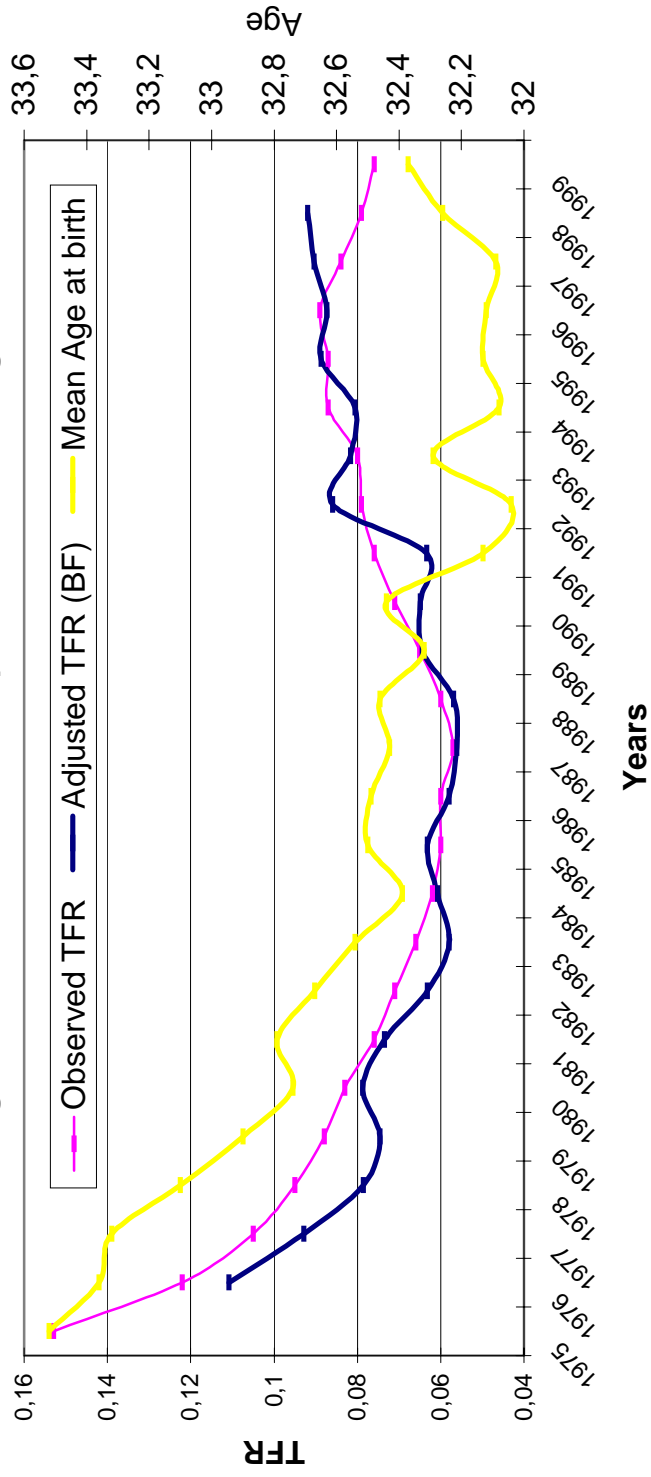
Figure 12: All Births: TFRs and Mean Age
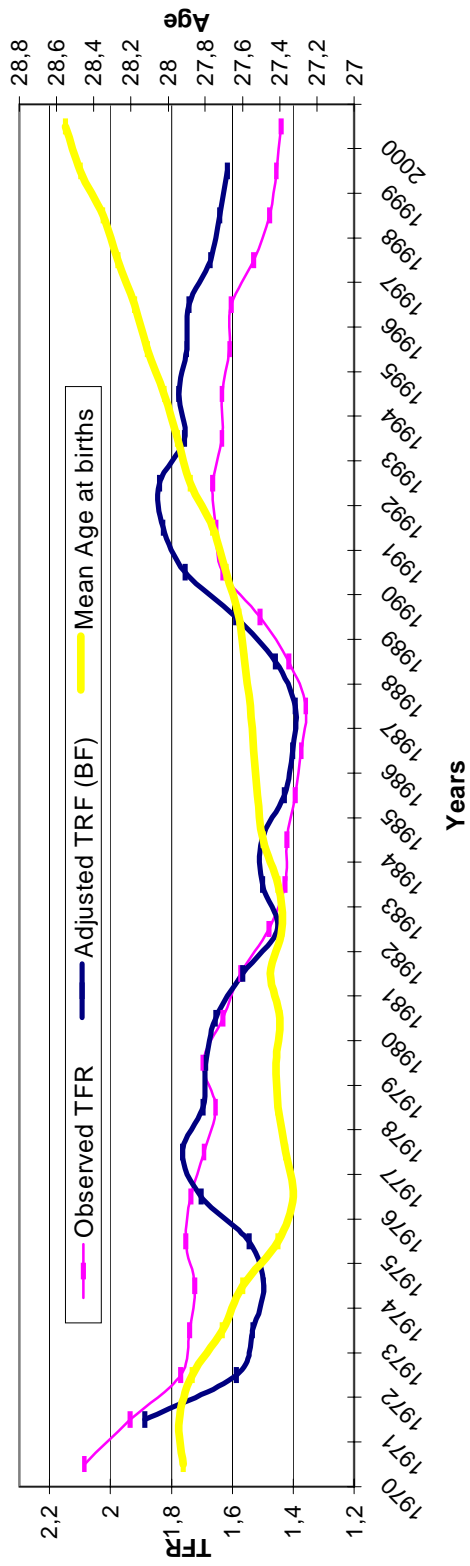
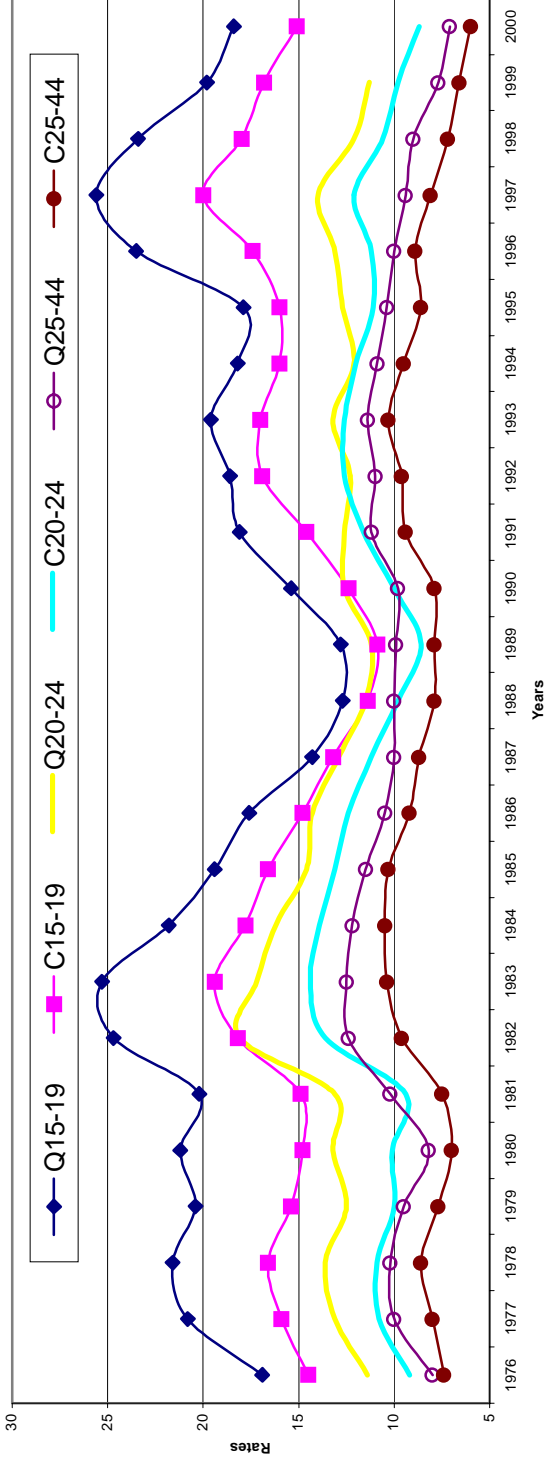Figure 13: Women Unemployment Rates in Quebec and Canada

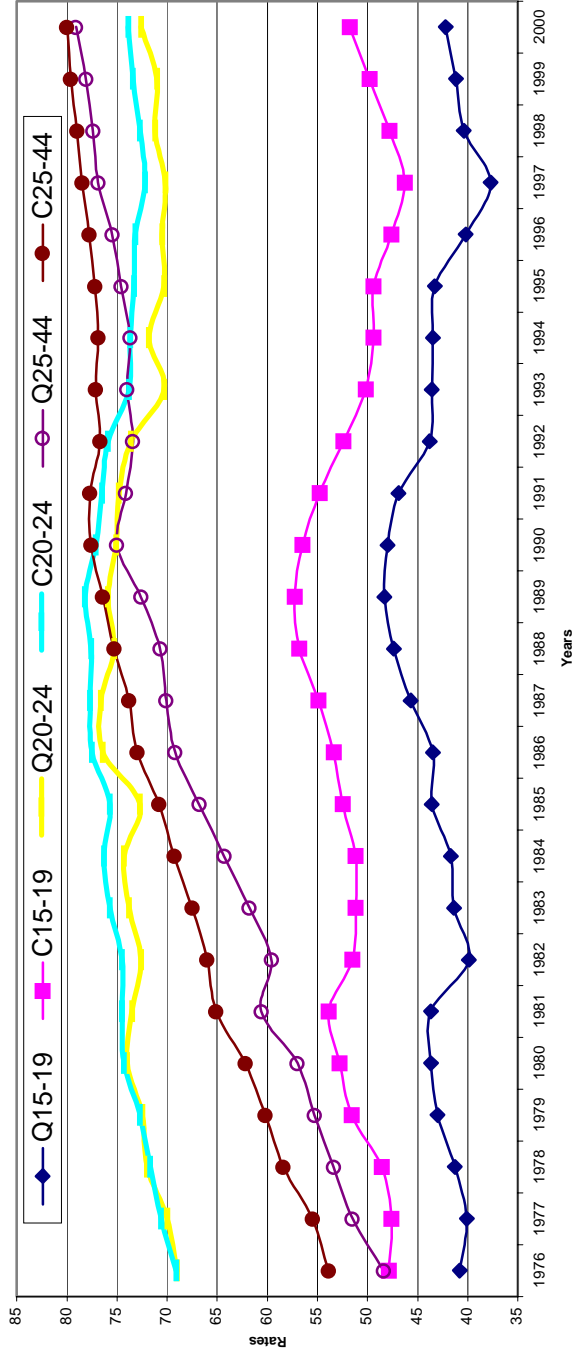Figure 14: Women Labour Force Participation Rates in Quebec and Canada

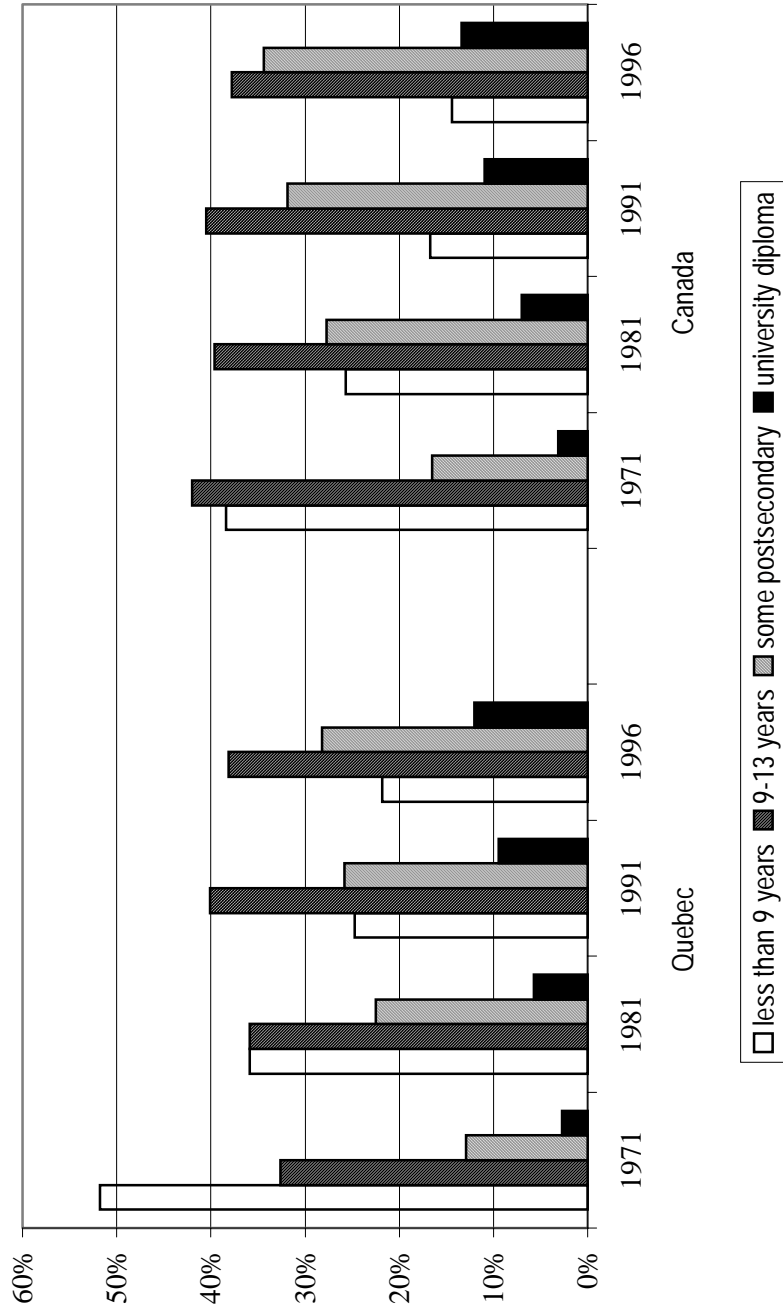**Figure 15: Percentage of women aged 25 or more by level of education, Quebec and Canada, 1971, 1981, 1991 et 1996**

Legend: □ less than 9 years ▨ 9-13 years ▨ some postsecondary ■ university diploma

Source : Statistics Canada, Census of Canada