The Effect of Motherhood Timing on the size of the Family Gap

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Abstract

Previous research has found that women with children suffer from a wage penalty compared to women without children. The purpose of this study is to see if the timing of motherhood affects the size of this wage penalty, and more specifically whether this wage penalty can be reduced by delaying childbearing. Drawing on models from previous studies carried out in the U.S., the current study uses data from the 1984 Canadian Fertility Survey and the 2001 General Social Survey to measure the effect of delayed childbearing on earnings using both ordinary least squares and instrumental variable regressions. The results from the General Social Survey regressions suggest that women do benefit from delaying childbearing a few years; however the results for delaying childbearing beyond age thirty are inconclusive. The results from the Canadian Fertility Survey regression are inconclusive.

Introduction

Over the past few decades, Canada and other developed countries have experienced profound changes in fertility rates and trends. The Total Fertility Rate, i.e. "the average number of children that would be born to each woman if all women lived to the end of their childbearing years", has dropped from approximately 4 to 1.5 in the past 40 years (Health Canada 2005, p.2). Further, Canadian women are also choosing to have their children later in life. The average age at first birth has climbed from approximately 23 to 28 in the past 25 years (Health Canada 2005).

These changes in fertility rates and trends have important consequences for the size and age distribution of the Canadian population. There are also important health effects; many studies, such as MacNab, Macdonald and Tuk (1997) and Joseph et al. (2005), have shown that delayed childbearing leads to higher risks of complications for mothers and unfavorable birth outcomes for babies.

There are several explanations for these changes in fertility rates and trends. First, the average age of marriage has also been increasing. An important reason for this trend is the fact that more and more young Canadians are choosing to pursue post-secondary education. That choice can leave young people with large student debts and also delay entry into the labour market, both of which affect the age of marriage and subsequently, the age at which people choose to have children.

Secondly, the decrease in fertility and increase of delayed childbearing are also due in large part to women being more in control of their fertility (Bloom 1987). Over the past several decades, contraceptives have become more easily available and abortions have become not only legal, but also more socially acceptable. Consequently, "the number of children a women bears and the timing of those children are, more than ever before, the product of conscious decisions" (Bloom 1987, p. 49).

Finally, another important reason for the changes in fertility rates and trends is the increased participation of women in the labour market, which leads women to dedicate more time to work and less time to family life. As women enter the labour force they may quickly realize that there are important incentives for them to delay childbearing, or even to choose not to have children at all. Many previous economic studies have found the existence of an earnings gap between women with children and women without children. The difference in earnings between these two groups, after controlling for various factors which may affect earnings, has often been termed the "family gap".

Although many studies have focused on the existence and size of the family gap, relatively few studies have looked at how the size of the family gap varies with the timing of parenthood. Health Canada notes that "there are powerful economic incentives for many young women and men to delay childbirth and family formation" (2005, p.11). It is important to understand these incentives in order to understand the recent trend towards delayed childbearing, and to develop public policy which will lead to desirable outcomes.

The purpose of this study is to determine the effect of motherhood timing on the size of the family gap for the Canadian population. The size of the family gap will be estimated using ordinary least squares (OLS) and instrumental variable regressions, with data from the 1984 Canadian Fertility Survey and the 2001 General Social Survey.

This paper will begin by explaining the theory regarding the existence of the family gap and the importance of motherhood timing. Section 2 will explain how unobserved heterogeneity and simultaneity can cause problems in these models. Section

3 will review the existing literature on the subject. Section 4 will describe the models used for the current study while section 5 will describe the data used to estimate these models. Section 6 will present the results of the study. The paper will end with concluding remarks.

1) Theoretical Framework

There are many possible reasons why researchers have found that women who have children suffer from a family gap (the wage penalty associated with having children, after controlling for various personal characteristics). The existence of a family gap may be due to unobserved natural differences between mothers and women without children, such as differences in motivation, productivity or tastes (Taniguchi 1999). The family gap may also be the result of changes in work habits following the transition to parenthood, for example a decrease in productivity, dedication and effort in work activities due to the additional responsibilities of parenthood (Budig and England 2001). It is also possible that mothers are less able to take advantage of on-the-job opportunities (Taniguchi 1999) or that they purposely select "mother friendly" jobs that are more flexible and less demanding (Budig and England 2001). Another explanation is that the family gap is due to the depreciation of human capital which can occur during a prolonged absence from work (Miller 2005). On the other hand, it might be the case that employers simply discriminate against women with children, knowing that they are likely to have future work interruptions (Bloom 1987).

There are also several reasons to believe that the timing of childbearing could affect the relative size of the family gap. Most researchers expect women who delay childbearing to have a smaller family gap. Taniguchi (1999) and Blackburn, Bloom and Neumark (1993) argue that women who have children at a young age generally invest less in human capital and dedicate less time towards preparing for their careers, which leads to lower incomes when entering the workforce after childbirth. Furthermore, women who delay childbearing may reduce the size of their family gap because their work interruptions occur after the critical period of career development (Taniguchi 1999). The accumulation of training and experience before childbirth may help decrease the negative effects of motherhood on wages. Further, delayed childbearing gives women the opportunity to signal their productivity and dedication to their employers and gain seniority prior to work interruptions, which can affect post-birth wages for women who return to the same employer after their work interruption.

2) The Difficulty in Studying the Family Gap: Unobserved Heterogeneity & Simultaneity

When estimating the family gap, researchers would like to estimate the size of the direct causal effect that having children has on earnings, after accounting for indirect effects such as reduced work hours, productivity and effort. Researchers have difficulty, however, measuring only the direct causal effect, because there is no way to control for productivity or effort. Since researchers cannot control for preferences, motivation and productivity, the effect of these variables on earnings will be included in the family gap. This problem is a type of omitted variable bias referred to as unobserved heterogeneity. It is easy to see how women who have children may be systematically different from childless women. One can imagine the possibility that the type of women who choose not to have children are naturally more career oriented, and possibly also more motivated and productive (Taniguchi 1999). This situation is an example of negative heterogeneity bias, and such a bias would exaggerate the size of the family gap estimated by an ordinary least squares (OLS) model. On the other hand, it is also possible to imagine that mothers may be more motivated because they need to earn a high income to provide for their family (Taniguchi 1999). This is the case of a positive heterogeneity bias, and such a bias would cause an underestimation of the family gap when using an OLS model.

Similar arguments can also be used for motherhood timing. It is possible that mothers who choose to have their children early in life are more family oriented, while those who have their children later in life are more career oriented, which would cause a negative heterogeneity bias when estimating the effect of timing with an OLS model (Miller 2005).

A similar problem with the timing question is the problem of simultaneity (also known as endogeneity). It is possible that women are aware that they can reduce the size of the family gap by delaying childbearing, and that they choose to delay motherhood for this reason (Miller 2005). In this case, the causal relationship occurs in both directions (or in other words, the independent variable is not exogenous), from earnings towards motherhood delay and from motherhood delay to earnings. In the case of simultaneity, OLS estimates are unable to properly distinguish the magnitude of these affects. As a result, an OLS model would over-estimate the returns to delayed motherhood.

The problems of unobserved heterogeneity and simultaneity are closely linked, and can sometimes be corrected using the same techniques. In order to reduce or eliminate the biases of unobserved heterogeneity and simultaneity, most researchers use an instrumental variable model or a fixed effects model. An instrumental variable model, also known as two stage least squares, is a two step procedure which first uses another variable which is closely related to the problem explanatory variable, but which is exogenous in the regression, to estimate the coefficient of the problem explanatory variable. In the second step, the estimates are used in lieu of the problem explanatory variable. One important weakness of the instrumental variable approach is that the estimates are less precise than OLS estimates. Another problem with these models is the availability of variables which can be used as instruments.

Another possible solution to the unobserved heterogeneity problem is to use a fixed effects model. A fixed effects model uses panel data to express each variable as a deviation from its mean. However, "while the fixed effects absorb variation that is expressed through vertical shifts of the age-wage profile, the technique fails to account for other differences in wage profiles or for responsiveness of motherhood timing to career outcomes" (Miller 2005, p.6). Thus if simultaneity is an important problem, the fixed effects estimations may not be valid.

3) Literature Review

Many studies have estimated the size of the family gap between women with children and women without children. Waldfogel (1998) points out that various researchers have estimated that mothers earn approximately 10-15% less than women without children, after controlling for different characteristics such as education and work experience. Using pooled cross-section data from the National Longitudinal Survey of Young Women 1968-1988 with an OLS model, Waldfogel (1997) finds a family gap of 6% for mothers with one child, and 13% for mothers with 2 or more children. When estimating a fixed effects model, the size of the family gap decreases slightly, to 5% for one child and 12% for 2 or more children. In another study, Waldfogel (1998) finds that the size of the family gap has been increasing over time. Using the National Longitudinal Surveys, the results of an OLS regression indicate that women with one child earned

4.5% less than women with no children in 1980 and 10% less in 1991, after controlling for various factors which influence earnings.

The size of the family gap was also estimated in a previous major paper presented to the Department of Economics at the University of Ottawa. Li (2004) uses data from the same source as the current study, the 2001 General Social Survey, and estimates the family gap to be between 7-8% for women with one or more children.

The question of how timing affects the size of the family gap has received much less attention. The effect of motherhood timing was first studied by Bloom (1987), followed by Blackburn, Bloom and Neumark (1993) and Chandler, Kamo and Werbel (1994). More recent studies were conducted by Taniguchi (1999), Amuedo-Dorantes and Kimmel (2003) and Miller (2005). Only one study of delayed childbearing has been conducted in Canada, that by Drolet (2002). These authors use many different models and estimation techniques. The way of defining motherhood timing also differs across authors. As a result, it is necessary to review each study individually to see the different ways of approaching this subject.

Bloom (1987) uses the 1985 Current Population Survey and analyzes separately the effect of delayed childbearing for pre-baby-boom and baby-boom women. Bloom focuses on the longer term effects of delayed childbearing by excluding women who did not give birth within the 3 years before the survey was conducted. The women were divided into four groups, one group for childless women and three groups divided by age at first birth: before 22, 22-27, and over 27.

This study controls for years of schooling, experience, race and marital status. A second specification also controls for occupation, and a third specification adds interaction terms for occupation and the four different groups of women (listed above).

Using the first specification and the sample of baby-boom women[1], Bloom finds that there is no statistically significant difference between the salaries of the two younger groups of childbearers and childless women; however women who delay childbearing until they are 27 years old earn 9.4%[2] more than early childbearers. The second specification which includes controls for occupation has similar results, although the benefit to delayed childbearing increases to 10.7% and is more statistically significant. The third specification which included interaction terms for occupation and the childless/age at first birth groups found that the returns to delayed childbearing are even greater for professional women. In fact the benefit is so great that professional women who delay childbearing have a positive family gap, i.e. they earn more than childless professional women. On the other hand, there is only a small wage effect associated with delayed childbearing for women working in administrative, service, and blue-color occupations. Bloom finds no statistically significant wage effects associated with delayed childbearing for the pre-baby-boom sample[3].

The study by Blackburn, Bloom and Neumark (1993) focuses on the relationship between delayed childbirth and human capital investment. Using the National Longitudinal Survey of Young Women 1982, the authors find that women who gave birth to their first child after age 27 earn 11% more than women who give birth to their first child before age 22, when controlling for education, marital status, residence in the South

[1] Those aged 30-39 at the time of the survey.
[2] This coefficient is significant at the 10% level, but not at the 5% level.
[3] Those aged 40-59 at the time of the survey.

and Standard Metropolitan Statistical Area only. However when these researchers included controls for experience and tenure, they found no statistically significant effect for delayed childbearing.

Chandler, Kamo and Werbel (1995) study the effect of both marriage and childbirth delays on income for both men and women.[4] They are the only researchers to study the effect of delayed childbearing for men. They expect the effect to differ between men and women, due to traditional role specialization. Women who delay childbirth have more time to focus on their career, thus the effect of delayed childbirth on women's wages should be positive. On the other hand, men who delay childbirth are also delaying their traditional role as breadwinner, and thus the effect of delayed childbirth on men's wages may actually be negative.

The authors use data from the National Survey of Families and Households, collected in 1987 and 1988. In order to specify a delay in childbearing, they first predict the age of childbirth using the variables education, race, and area of residence as predictors. In cases where the actual age of childbirth is greater than the predicted age, childbirth is said to have been delayed.

Chandler, Kamo and Werbel use an OLS regression to estimate the effect of delayed childbearing, while controlling for education, work experience, race, residence in the South, and residence in a metropolitan area. A second model is estimated by adding a control for hours spent on housework. A third model is also estimated which includes a variable for years with children as well as an interaction variable between childbirth delay and years with children. The rationale for including this interaction variable is that one

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[4] Only the details of their study on delayed childbirth will be discussed in the current paper.

would expect the wage effects of delayed childbirth to decrease as the number of years since the childbirth occurred increases.

The first two regressions for women suggest that there is a small wage benefit to delayed childbearing. In the first regression, a woman who delays childbirth increases her wage rate by 1.4% compared to those who do not delay childbirth. In the second regression, which includes an additional control for housework time, the effect of delayed childbearing is slightly smaller. In the third regression, which includes the additional variables for years with children, the effect of childbirth delay is no longer significant at the 5% level. The results of this regression do suggest, however, that wages increase by 0.7% for each year spent with the child. The coefficient of the interaction between years with children and delayed childbirth is not significant at the 5% level.

Interestingly, the regression results for men are the opposite. In the first two regressions, the effect of childbirth delay is not significant at the 5% level. In the third regression however, delayed childbirth increases wages by 2.2%. In this regression, the coefficient for years with children is not significant, but the coefficient for the interaction term between childbirth delay and years with children is 0.1% and significant.

Additional regressions are also used to see if there are differences in the effect of delayed childbirth for whites and nonwhites. These regressions find no difference in the effect of delayed childbirth between races.

Finally, Chandler, Kamo and Werbel use a two stage least squares regression to check for simultaneous equation bias. In the first stage, they regress age at childbirth on religious attendance, number of siblings and all the controls from the second regression described above except education. Chandler, Kamo and Werbel explain that religious attendance and number of siblings are proxies for traditional family values. The second stage results from this regression are similar to the results from the OLS regression discussed above.

A more recent study by Taniguchi (1999) uses the National Longitudinal Survey of Young Women 1968-1988 and estimates an OLS model and a fixed-effects model. Taniguchi explains that using a fixed-effects model "allows consideration of mothers' potential propensity for low-wage employment" (p.1010). Taniguchi first estimates the size of the family gap, then turns to the question of timing.

Women are placed into three groups depending on the age at which they had their first child: teenager, 20-27 years of age, 28 and older. Control variables were included for years of schooling, marital status, hours worked per week, cumulative work experience (divided into pre- and post-birth work experience), age, number of children and race.

After controlling for various factors which influence earnings, the family gap for all mothers, regardless of age at first birth, is estimated to be 2.5% per year with the OLS model and 3% with the fixed effects model. This suggests that unobserved heterogeneity does not have a large effect on the size of the family gap, but that the bias is positive rather than negative as expected.

The results from Taniguchi for the effect of motherhood timing suggest that delaying childbearing until age 27 may completely eliminate any negative wage penalty associated with having children. The results are obtained by comparing each group to the reference group of women with no children. The size of the family gap for women who gave birth to their first child between the ages of 20-27 is 3.7% according to the OLS model and 4% according to the fixed effects model. Teenage childbearers do not suffer from a family gap in the OLS model, but do in the fixed effects model. Women who delay childbirth beyond age 30 do not suffer from a family gap in either model. These results also suggest that unobserved heterogeneity and simultaneity do not have a large effect on the size of the family gap when focusing on motherhood timing, except for teenage childbearers.

Another study by Amuedo-Dorantes and Kimmel (2003) takes the unique approach of looking at the effect of motherhood and delayed childbearing among women with college degrees. Their motivation is to see if motherhood and delayed childbearing has a different effect on women who are more likely to be career-oriented. They believe this may help to understand why there is a correlation between education and delayed childbearing.

Amuedo-Dorantes and Kimmel estimate the effects of delayed childbearing using several different models, including a pooled OLS model, a fixed effects model, and an instrumental variable model. The instrumental variables used are: "mother's highest grade completed, father's highest grade completed, and a dummy variable indicative of whether the respondent lived with her parents by age 18" (p. 20). They confirm that these instruments are correlated with motherhood and delayed childbearing, and are not correlated with the error term in the wage equation.

Their regressions are carried out using the 2000 wave of the National Longitudinal Survey of Youth, which began collecting data in 1979. They define delayed childbirth as occurring when the age at first birth is 30 or over. They justify their choice of age by the fact that the mean age at first birth is 26 with a standard deviation of 4.

All regressions include variables to control for age, age squared, education, race, marital status, presence of adults in the household, work experience, work experience squared, tenure, tenure squared, occupation, residence in an urban, areas of high unemployment, and region of residence. In order to estimate the effect of motherhood and childbearing delay specifically for women with college degrees, interaction variables were added between college and motherhood, as well as college and delayed childbearing.

The simple pooled OLS regression reveals that mothers who delay childbearing earn 14% more than other mothers, which is large compared to the other results just discussed. What is most surprising is that mothers who delay childbearing earn 7 % more than women with no children, i.e. they have a positive family gap. For mothers with college degrees specifically, the returns to delayed childbearing are much higher. They earn 21% higher wages than other mothers with college degrees.

When a fixed effects model is used, the effect of delayed childbearing is considerable smaller. In this model, mothers who delayed childbearing earned 7% more income than other mothers, compared to 14% in the pooled OLS model. Mothers with college degrees who delayed childbearing earned 13% more than other mothers with college degrees.

Finally, when a model with fixed effects and instrumental variables is used, the family gap and the effect of delayed childbearing is no longer significant. However, when looking specifically at mothers with college degrees, the result remains significant; mothers with college diplomas who delay childbearing earn 21% more than other mothers with college diplomas.

It is interesting to note that in every case but one, the family gap associated with having children was negative, but the effect of delayed childbearing on earnings was great enough to result in a positive family gap. On the other hand, for mothers with college degrees, the family gap was positive in each case but one, regardless of age at first birth. The wage effect of delayed childbearing was considerably larger for this group. Amuedo-Dorantes and Kimmel find no effect of delayed childbearing for mothers with less than a college education.

The authors explain the important difference in motherhood and delayed motherhood wage effects between women with college degrees and those without as likely being due to a difference in unobserved job quality. They believe women with college degrees have a better chance of finding employment with family-friendly benefits such as flexible work hours and the option of work from home, as well as job training and flexibility. These benefits may help women diminish the effect of childbearing.

In the most recent study on the effect of delayed childbearing, Miller (2005) criticizes Chandler, Kamo and Werbel's (1993) and Amuendo-Dorantes and Kimmel's (2003) choice of instrumental variables. She argues that there is no reason to believe that variables indicating socioeconomic background and "beliefs" influence fertility but not earnings. "Since women are generally aware of these factors early in life, they may respond to fertility timing expectations through career choice or unobservable investments that in turn influence wages" (Miller 2005, p. 6). Miller's instrumental variable approach distinguishes itself from the others by using biological fertility shocks which affect fertility timing as instrumental variables. These fertility shocks are: (1) First pregnancy ending in miscarriage; (2) Use of contraceptives at the time of conception of first child; and (3) Delay between first conception attempt and pregnancy of first child. Miller argues that the first and third variable represent an unexpected delay of first birth with respect to desired timing, while the second variable represents an unexpected advance of first birth with respect to desired timing. Thus, these variables result in a gap between a women's optimal or desired fertility timing, and her actually fertility timing. Miller does admit however that her instrumental variables are not without fault. She notes that since female fecundity declines with age, the miscarriage and time to conception variables may be correlated with earnings. She points out however that the decline in female fecundity is highly nonlinear and generally occurs after age 33, and that the study limits its analysis to women who gave birth before that age. She also notes that the "accidental pregnancy" variable may also be correlated with earnings, since women differ in the type of contraceptives they use, and also the ways in which they use them.

Like Amuedo-Dorantes and Kimmel, Miller uses data from the National Longitudinal Survey of Youth 1979 - 2000. Rather than divide women into groups, this study uses a linear variable for age at first birth. Control variables are included for birth year cohort, education, race, ability (Armed Forces Qualification Test) and number of children.

The first step of the two step least squares regression reveals that a miscarriage will delay the birth of a first child by an average of 6 months, while a delay between first conception attempt and pregnancy will delay the birth of a first child by an average of 9 months, with respect to desired timing. On the other hand, unplanned pregnancies (pregnancies which occur while using contraceptive) advance first birth by an average of 8.5 months with respect to desired timing (Miller 2005).

Regression results estimate that wages increase by 3.2% (OLS model) or 3.3% (IV model) per year of fertility delay. The fact that the results are nearly the same suggests once again that unobserved heterogeneity and simultaneity do not have a large effect on estimates of the effects of delayed motherhood. Estimates using "terminal" wages, that is wages at age 34, as the dependent variable find that each year of delay increases terminal wages by 3.7% (OLS model) or 2.6%[5] (IV model).

Miller (2005) also estimates the inverse equation, that is an equation with age at first birth as the dependent variable and (log) earnings as the dependant variable, in order to determine whether there is simultaneity[6]. The purpose is to see if women with higher earnings are more likely to delay childbirth. The results of this regression indicate that a 67% increase in earnings leads to a one year delay of childbearing. It is interesting to note that such results suggest that simultaneity should be causing a bias in the regression results, although the results presented above do not indicate a bias.

Finally, the only study on this subject carried out in Canada is a recent study by Drolet (2002) which uses the 1998 Survey of Labour and Income Dynamics and an OLS model to estimate the effect of motherhood timing. Drolet (2002) uses a preliminary regression to help divide the sample into groups according to age at first birth. The preliminary regression predicts age at first birth by education, field of study and urban size. Subsequently, mothers are classified as delayed childbearers, early childbearers, or on time childbearers depeding on whether their actual age at first birth is greater, smaller, or equal to their predicted age at first birth.

[5] only significant at 0.10 level.
[6] Simultaneity occurs in this situation if earnings affects age at first birth while age at first also affects earnings.

The results indicate that delayed childbearers earn an hourly wage that is 6% higher than early childbearers. Drolet (2002) also separates the sample into three subsamples by cohort. The effect of delayed childbearing is much larger for the most recent cohort compared to the two older cohorts: the difference in hourly wages for "delayed childbearers" compared to "early childbearers" is 13% for woman born after 1960, compared to 4-5% for women in the before 1948 and 1948-1960 cohorts. This suggests that the effects of delayed childbearing on the size of the family gap have increased over time. When the regressions were repeated with a second specification which added controls for industry, occupation and job responsibility, the size of the coefficients decreased for all groups.

Drolet (2002) also estimates the effects of motherhood timing on wages in the long run by adding an interaction variable between childbirth timing and the number of years since birth. She finds that although the effect of delayed childbearing persists for a few years, it eventually disappears with time. She notes however to be cautious when using this result to draw conclusion because the result was estimated using cross-section data and thus may simply represent a cohort effect.

The results of these studies suggest that delaying childbearing, either by giving birth after age 27 or 30, or by giving birth after the predicted age at first birth, can have a positive effect on a mother's earnings. Of the studies discussed, three used estimation techniques to control for endogeneity and unobserved heterogeneity, and all three found that these issues have little or no effect on estimating the effect of delayed childbearing. Finally, this brief literature review underlines the importance of undertaking more research on the subject, especially in Canada since only one of the studies discussed above used Canadian data.

4) Model

The current study will analyze the effect of delayed childbirth on women's wages using two different estimation techniques and data sets. First, an Ordinary Least Squares (OLS) regression will be used with the 2001 General Social Survey (GSS) data set. As explained above, using an OLS regression for this particular analysis may overestimate the effect of delayed childbearing due to the presence of unobserved heterogeneity as well as simultaneity of the regression equation. However, most studies just discussed which use an OLS regression and another method have found that the bias is quite small or non-existent (or in fact underestimates the results), and there is no reason to believe that this is not also the case for the GSS data. The OLS model estimated is as follows:

$$Ln(Y) = \alpha + \beta X + \delta\, A1B + \varepsilon$$

where: A1B = age of mother at first birth

Y = income / salary

X = control variables: age, age squared, hours/weeks worked, marital status, born in Canada, level of education, number of children and province of residence

ε = error term

In this equation, δ is the coefficient of interest. It represents the effect of motherhood timing on earnings.

Next, the same model and estimation technique will be used with the 1984 Canadian Fertility Survey (CFS) data set for comparative purposes. Then, this data set will be used again with the two-stage least squares (2SLS) estimation technique. The 2SLS model is as follows:

(1) $A1B = \lambda + \partial\, MS + \rho\, C + \sigma X + \mu$

(2) $Ln\,(Y) = \alpha + \beta\, X + \delta\, P\_A1B + \varepsilon$

where: MS = Miscarriage or stillbirth of first pregnancy

C = use of contraceptives during conception of first child

P_A1B = predicted age at first birth from step one

and all other variables are as defined above. The miscarriage/stillborn and contraceptive variables are used as instrumental variables, as in Miller (2005). Miller argued that a first pregnancy which ends in miscarriage or stillbirth would delay age at first birth while the use of contraceptives during conception of first child is an indication of an unplanned pregnancy, which represents an advance of age at first birth. In the first step, the instrumental variables are used to predict age at first birth. In the second step, the predicted age at first birth is used in lieu of actual age at first birth in the earnings regression. In this model, the coefficient δ from the second equation is of greatest interest. It represents the effect of motherhood timing on earnings

The models described above are estimated with two different ways of defining age at first birth. The first specification of each model is estimated with dichotomous variables for age at first birth, as in Bloom (1987) and Taniguchi (1999). The second specification of each model uses a linear variable for age at first birth, as in Miller (2005). For the first stage of the instrumental variables model (equation (1) above), the specification with dichotomous variables for age at first birth will be a linear probability model which estimates the probability of age at first birth falling within the specified age group.

5) Data

The current study estimates the effects of motherhood timing on wages in Canada using two sets of data, one from the 1984 Canadian Fertility Survey (CFS), and another from the 2001 General Social Survey (GSS). Both of these data sets include information which allows the calculation of age at first birth, something which is not available with the Canadian census data. Since no single data set is available which can adequately meet all the objectives of this paper, two separate analyses are conducted using these two different data sets.

The data set from the CFS has the advantage of having the necessary variables to replicate partly the instrumental variable study conducted by Miller (2005). Unfortunately, the sample size of the data set is quite small (although similar in size to the data set used by Miller) and more importantly, the survey was conducted in 1983, and thus the data are quite old. Since delayed childbearing is a trend which has been most evident in the past 25 years, and female participation in the labour force is also a recent trend, although to a lesser extent, it is possible that the effects of delayed childbearing were much smaller, or non-existent, in 1983. For these reasons, it is important to use a more recent data set. The GSS 2001 has the advantage of being a much more recent data set, but unfortunately, the instrumental variables were not available to estimate a two stage least squares regression. Thus this paper will present two separate analyses: first, an ordinary least squares regression using the General Social Survey 2001, and second both ordinary least squares and instrumental variables regressions using the Canadian Fertility Survey 1984.

(a) Data from the General Social Survey

The sample from the General Social Survey includes 2611 observations, and is limited to mothers who were between the ages of 18-49 at the time of the survey. The sample was further limited to women who were over the age of 18 when they had their first child, in order to eliminate teenage pregnancies. Women who reported no personal income or who worked zero weeks in the survey year or an average of zero hours per week were deleted. Finally, observations with missing information,[7] (with the exception of age at first maternity leave) were also excluded.

The dependant variable in this study is the logarithm of personal income of the respondent. This variable contains income other than income from work activities, however, income from work activities represents the largest portion of this income. Since personal income is reported in categories, midpoint values are used for each category.[8]

The key independent variable in this study is age at first birth. Since this information is not directly available in the GSS, age at first maternity leave is considered as a proxy for age at first birth. Although this variable may not be an accurate measure of age at first birth for all observations,[9] in the large majority of cases it will represent an

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[7] including marital status, income, total children, education, place of birth, weeks worked and hours worked per week.

[8] For the category 100 000$ and up, the value of 120 000$ is arbitrarily chosen as the midpoint.

[9] For example, one can imagine a woman who does not report a maternity leave for first birth because she was not working at the time, and who reports her first maternity leave with her 2nd or any subsequent child. In this case, the age at first maternity variable will overestimate the actual age at first birth.

adequate estimate. Unfortunately, for 836 observations in our data set, the question "age at first maternity leave" was not asked because the respondents did not report having any maternity leaves. It is rational to assume that any mother that did not report a maternity leave did not work prior to having children, otherwise the maternity leave should have been reported, no matter how brief. For these observations, the age at first birth is completely unknown. Rather than deleting these observations from the sample, a dummy variable was defined for "age at first birth unknown"[10]. The model is first estimated with dichotomous variables for age at first birth variables. These variables are defined as follows: 18-24, 25-29, 30+, and unknown (as described above). The distribution of the first and last age groups is fairly similar, although there are considerably more observations in the middle group. The average age at first birth is 27, which falls in the middle of the 25-29 group.

Several other independent variables are used to control for differences among individuals which may affect earnings. In the first regression, the control variables are: age, age squared, weeks worked in the year, average hours worked per week, dummy variables for level of education, dummy variables for number of children, a dummy variable for Canadian which equals one only if the respondent is born in Canada, dummy variables for marital status, and dummy variables for province of residence[11]. There is no

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[10] Although these observations are not useful for estimating the effect of delayed childbearing, including them in the regression gives more precise estimates for the coefficients of the control variables.

[11] For the education dummy variables, the categories community college, cegep, nursing school were combined, as were some trade school and technical college, but all other categories remained as in the data set. For the number of children dummy variables, the categories are 1, 2, 3, 4, and 5 or more. For marital status, the categories are married/common law, was married, and never married. The variable "was married" represents individual who are widowed, divorced or separated.

control for experience[12]. Finally, the weights given in the data set were used by multiplying each observation by its weight and dividing by the average weight of all observations.

(b) Data from the Canadian Fertility Survey

The sample from the Canadian Fertility Survey is made up of 1607 mothers between the ages of 18-49. Women who were less than 18 when they had their first child were deleted. Women with zero salary, women who answered they were not currently working, and women who answered they were working zero hours per week were all deleted. Finally, observations with missing information[13] were also excluded.

The key variable, age at first birth, was indirectly available in this study. This variable was obtained by subtracting the year of birth of the first child from the year of birth of the respondent. When estimating the specifications with the dichotomous age at first birth variables, only two age groups will be used: 18-24 and 25+. There were not enough observations who had their first child at age 30 or older to justify a separate category, as with the GSS.

The variables from the CFS which are used as instrumental variables are "miscarriage or stillbirth of first birth" and "use of contraceptives during conception of first birth". The miscarriage/stillbirth instrumental variable is very similar to the one used by Miller, although here stillbirths are also included (Miller used only miscarriages). In the CFS, the question asks whether the "other" first pregnancy ended in miscarriage or

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[12] Detailed information regarding work history (including information about work interruptions) was available in the General Social Survey data, and this could have been used to calculate experience. However, such a detailed measure was used since experience was not the focus of the present study.

[13] including country of birth, years of education, level of education, actual marital status, first child year of birth, year of other pregnancy one, and use of contraceptive during conception of first birth.

stillbirth. In order to make sure the "other" first pregnancy occurred before the first birth, the miscarriage/stillbirth variable is positive only for women who report their first other pregnancy ending in miscarriage or stillbirth, and who state that the year of "other" first pregnancy is before the year of first birth. The contraceptives instrumental variable is the same as that used by Miller. This variable did not require any manipulation. Miller also used a third instrumental variable, duration of conception attempt, but this variable was not available in the CFS.

The dependent variable in this analysis is gross annual salary[14]. The control variables are very similar to those used with the GSS data set, namely age, age squared, average hours worked per week, dummy variables for level of education[15], dummy variables for number of children (total number of children is calculated by adding number of birth children and number of adopted children), a dummy variable for Canadian which equals one only if the respondent is born in Canada, dummy variables for marital status (same categories as the GSS), and dummy variables for province of residence (in this case, the Altantic provinces were grouped as one due to a small number of respondents in

[14]The author determined that this variable was expressed in hundred of dollars, although no information about the data is directly available to confirm this belief. The reason for this conclusion are the following: The responses for salary among working individuals ranges from 3 to 840, which when multiplied by 100 gives 300 to 84 000. Further, the top value was 996, and the variable definitions provided with the survey specify that this value represents 99 600.

[15] For the education dummy variables, data for "years of education" and "level of education" needed to be combined, because the question "level of education" was only asked to respondents who reported 12 or more years of education. Therefore elementary school was defined as less than 9 years of education, and some high school as 9-11 years. High school diploma was one of the categories in the level of education variable. Many other categories needed to be aggregated due to the small number of observations. The category "technical school/college" contains respondents that reported having any technical school or college education (either general, technical or no specification). The category "university – bachelor's" contains respondents who reported having a B.A. specifically, or a bachelor's degree. The category "university – postgraduate" contains respondents who reported having a professional doctorate, a master's degree or a doctorate degree. The category "university – other" contains respondents who reported a teacher's school diploma, a university certificate, or another unspecified university degree. The category "other education" contains respondents who reported a trades certificate, other non-university certificate or diploma, unspecified certificate, unclassifiable, registered nurse or secretary/commercial diploma.

each individual province). Once again there is no control for experience. In this data set, there is no control for the number of weeks worked per year, because this information was not available.

(c) Comparison of the two data sets

Although efforts were made to keep both data sets as similar as possible to ease the interpretation of regression results, in some cases this was not possible. The most obvious differences are the fact that the GSS was conducted in 2001, while the CFS was conducted in 1984, and the fact that the CFS has additional variables useful for the instrumental variables procedures. Other differences, which are mentioned in sections (a) and (b) above are reiterated here in order to reduce possible confusion between the two samples.

First, although a precise estimate of age at first birth is available from the CFS, the analysis using the GSS has to rely on "age at first maternity leave" as a proxy for age at first birth. Also concerning the age at first birth variable, there are only two dichotomous variables for age at first birth in the CFS, although there are three for the GSS. The reason for having only two variables for the CFS is that the average age at first birth is lower, and has a smaller variance. This is not surprising considering that the CFS survey was conducted in 1984, and the trend towards delayed childbearing was only beginning.

The dependent variable is also different between the two data sets: the GSS uses "personal income" because there was no variable available for salary, while the CFS uses salary. The control variables are largely the same between the two data sets. One variable is missing from the CFS data set, and that is the number of weeks worked in the year. The remaining control variables are the same or very similar, although the dichotomous variables for education are slightly different, due to the way they were defined in the surveys. Also, in the CFS the Atlantic provinces were aggregated due to the small number of observations in each province.

6) Descriptive Statistics

Descriptive statistics for some of these variables are presented in the following table. A complete list of descriptive statistics for both surveys can be found in Tables 1b and 1c in the appendix.

Table 1a: Descriptive statistics for some variables

	General Social Survey 2001		**Canadian Fertility Survey 1984**	
Variable	**Mean (standard deviation)**	**Frequency**	**Mean (standard deviation)**	**Frequency**
Age	27.1 (4.5)	-	35.7 (7.1)	-
Personal income (GSS) / Salary (CFS)	31 468$ (20 596)	-	15 097$ (9 969)	-
Weeks worked per year	46.2 (11.97)	-	N/A	N/A
Hours worked per week	35.9 (10.7)	-	32.5 (13.5)	-
Age at first birth:	27.1 (4.5)	-	23.7 (3.8)	-
18-24	-	22.6%	-	63.7%
25-29	-	28.6%	-	36.3%
30+	-	17.4%	-	
unknown	-	32.0%	N/A	N/A
Number of children:	2.0 (0.9)	-	2.2 (1.1)	-
one child	-	31.1%	-	28.3%
two children	-	45.3%	-	41.9%
three children	-	17.4%	-	20.3%
four children	-	5.1%	-	6.4%

five or more children	-	1.1%	-	3.11%
Miscarriage / stillbirth	N/A	N/A	-	8.8%
Contraceptive	N/A	N/A	-	11.8%
Sample size	2611		1607	

The average age of the samples is 27 for the General Social Survey and 36 for the Canadian Fertility Survey. This large difference in average age implies that we can expect to see large differences in the descriptive statistics of other variables that are age dependent, such as income, education, number of children and age at first birth.

The mean income is 31 468$ for the GSS data and the mean salary is 15 097$ for the CFS data. The large difference between these two figures is not surprising, given that the CFS data are 17 years older and thus most of the difference is likely due to inflation. The average hours worked per week are also higher for the GSS sample (36 versus 32) which may account in part for the higher average income in that sample. Further, the GSS measure of earnings includes some income other than salary.

The average age at first birth is 27 for the GSS data, and 24 for the CFS data. Although we have noted above that the age distribution of the sample would affect variables such as age at first birth, it is nonetheless interesting to note that the mean age at first birth is lower for the CFS data. This supports the trends discussed in the introduction, where it was noted that delayed childbearing is a fairly recent phenomenon, and that the average age at first birth in Canada has been on the rise over the past 25 years. The average number of children per mother is 2.0 for the GSS sample, and 2.2 for the CFS sample, which is also in line with the trend of decreased fertility discussed in the introduction.

For the instrumental variables in the CFS, the frequencies are lower than those reported in Miller. In Miller's sample, 13.7% of respondents report that their first pregnancy ended in miscarriage, while the current CFS sample has 8.8% reporting either a miscarriage or stillbirth for their first pregnancy. Miller had 29.5% of respondents report using contraceptives during the conception of their first child, versus 11.8% for the current CFS sample.

The following table reports average income/salary separately for the different categories of age at first birth, in order to compare the uncontrolled income differences between these groups. Only women over the age of 30 are included in this table in order to control somewhat for the influence of age on earnings.

Table 2: Average earnings by age at first birth (respondents over age 30 only)

<table>
<tr><th></th><th colspan="2">General Social Survey</th><th colspan="2">Canadian Fertility Survey</th></tr>
<tr><th>Age at first birth</th><th>Number of observations</th><th>Mean Income</th><th>Number of observations</th><th>Mean Salary</th></tr>
<tr><td>18-24</td><td>450</td><td>30 550</td><td>734</td><td>14 889</td></tr>
<tr><td>25-29</td><td>646</td><td>35 023</td><td rowspan="2">454</td><td rowspan="2">17 198</td></tr>
<tr><td>30 and over</td><td>454</td><td>39 840</td></tr>
</table>

The results show that income increases with age at first birth for all groups in both samples. This shows that women who delay childbearing generally earn a higher income. This evidence, however, cannot be used to support the theory of the family gap, because it is possible that there are other factors which are the cause of the earnings difference. For example, women who delay childbearing may be more educated or work more hours.

In order to understand the differences in earnings between these categories, it is useful to compare the education levels and number of hours worked of women in each category. The following tables present these results. Given the large number of categories for education, only comparisons for university education with bachelor's degree are given. Once again, only women over the age of 30 are included in this table in order to control somewhat for age.

Table 3: Education by Age at First Birth (respondents over age 30 only)

<table>
<tr><th></th><th>General Social Survey</th><th>Canadian Fertility Survey</th></tr>
<tr><th>Age at first birth</th><th>Proportion with a Bachelor's degree</th><th>Proportion with a Bachelor's degree</th></tr>
<tr><td>18-24</td><td>7.4%</td><td>5.5%</td></tr>
<tr><td>25-29</td><td>20.8%</td><td rowspan="2">19.6%</td></tr>
<tr><td>30 and over</td><td>26.3%</td></tr>
</table>

The table shows the number of people with a university bachelor's degree increases sharply with age at first birth. Only 8% of mothers in the GSS sample and 6% of mothers in the CFS sample who gave birth to their first child between the ages of 18-24 have a university bachelor's degree. These statistics are not surprising because these women had children at the time in their lives when post secondary education would usually be pursued. The variation in education between the different age at first birth groups may explain a large part of the differences in incomes observed among the different groups.

Table 4: Hours Worked by Age at First Birth (respondents over age 30 only)

<table>
<tr><th></th><th colspan="2">General Social Survey</th><th colspan="2">Canadian Fertility Survey</th></tr>
<tr><th>Age at first birth</th><th>Number of observations</th><th>Mean hours worked per week</th><th>Number of observations</th><th>Mean hours worked per week</th></tr>
<tr><td>18-24</td><td>450</td><td>37.4</td><td>734</td><td>33.5</td></tr>
<tr><td>25-29</td><td>646</td><td>35.4</td><td rowspan="2">454</td><td rowspan="2">31.7</td></tr>
<tr><td>30 and over</td><td>454</td><td>35.5</td></tr>
</table>

The results for number of hours worked are surprising, because they reveal that the number of hours worked actually decreases with age at first birth. This means the hours worked variable actually increases the earnings of those who gave birth at an early age. This variable is thus counter-productive in helping us understand why women who delay childbearing have higher earnings.

7) Regression Results

The reference groups for both samples have the following characteristics: one child, high school diploma and resident of Ontario. For the GSS sample, the age at first birth of the reference group is 25 – 29, while for the CFS sample it is 18-24.

(a) Results for the General Social Survey Sample

Regression results from the GSS data which are of greatest interest for the purpose of this study are presented in Table 5a. A complete list of regression results for the GSS data can be found in Table 5b in the appendix.

Table 5a: Regression results for age at first birth variables, General Social Survey

Variable name	1st specification: dichotomous age at first birth		2nd specification: linear age at first birth[16]	
	Coefficient estimate	t value	Coefficient estimate	t value
AGE AT FIRST BIRTH	N/A	N/A	0.011	3.18
20-24	-0.099	-3.13	N/A	N/A
25-29 *reference*	N/A	N/A	N/A	N/A
30 and over	0.019	0.55	N/A	N/A
unknown	-0.253	-8.68	0.061	0.67

The regression results for the first specification indicate that women who have their first child between the ages of 20-24 earn 9% less per year than women who have their first child between the ages of 25-29. These results imply that there are positive benefits to delaying childbearing until 25-29. The coefficient estimate for the 30 and over age group is not statistically significant. This means that we cannot conclude that delayed childbearing beyond age 29 has any effects on earnings. The fact that this estimate is insignificant may reflect that delayed childbearing beyond age 29 does not in reality have any effect on the size of the family gap, but it is also possible that the sample size was too small to achieve significant results. The regression results for the second specification indicate that women earn 1.1% more income for each year that they delay motherhood. This supports the hypothesis that delayed childbearing reduces the size of the family gap.

(b) Canadian Fertility Survey

Partial OLS results from the CFS data are presented in Table 6a. A complete list of regression results for the CFS data can be found in Table 6b in the appendix.

[16] the linear age at first birth variable does not include those whose age at first birth is unknown.

Table 6a: OLS Regression results for age at first birth variables, Canadian Fertility Survey

Variable name	1st specification dichotomous age at first birth		2nd specification: linear age at first birth	
	Coefficient estimate	t value	Coefficient estimate	t value
AGE AT FIRST BIRTH:	N/A	N/A	$-0.06x10^{-2}$	-0.14
18-24 *reference*	N/A	N/A	N/A	N/A
25 and over	0.000	0.01	N/A	N/A

In the first specification of the model, the coefficient for the 25 and over age group is virtually zero and not statistically significant. In the second specification, the coefficient for the linear age at first birth category is 0.06%, which is also statistically insignificant. These results suggest that either delayed childbearing had no effect on the size of the family gap in 1983, or the sample size is too small to measure this effect.

In order to control for the unobserved heterogeneity bias, the CFS data were also used to estimate a two stage least squares regression model. Partial regression results from the two stage least squares estimation procedure with the CFS data are presented in Tables 7a and 8a. A complete list of regression results for the two stage least squares regression can be found in Table 7b and 8b in the appendix.

Table 7a: First Stage regression results for instrumental variables, Canadian Fertility Survey

Variable name	1st specification dichotomous age at first birth		2nd specification: linear age at first birth	
	Coefficient estimate	t value	Coefficient estimate	t value
Miscarriage or stillbirth	0.151	4.00	1.713	6.17
Contraceptive	-0.036	-1.11	-0.393	-1.66

The first stage regression results are mixed. For the miscarriage/stillbirth variable, the estimates in both specifications are significant; however the coefficient does not have the proper sign in the first specification. In the first specification, where age at first birth is measured with dichotomous variables for 20-24 and 25 and over, the presence of a miscarriage or stillbirth increases the probability of giving birth to the first child between the age of 18-24 by 15%. We would have expected the sign of this coefficient to be negative, suggesting that a first pregnancy ending in a miscarriage or stillbirth decreases the probability of giving birth to the first child in the younger age group, and increases the probability of delayed childbearing. In the second specification, where are at first birth is a linear variable, the sign of the miscarriage/stillbirth variable is as expected. The coefficient estimate of 1.713 for this variable suggests that the presence of a miscarriage or stillbirth delays age at first birth by a year and 8 months. In comparison, Miller (2005) finds that miscarriage delays age at first birth by approximately 6 months.

The estimates for the contraceptive variable are not significant in either specification. This suggests that this variable does not affect age at first birth, and thus is not an appropriate instrumental variable. As discussed previously, Miller pointed out that contraceptive practices may differ among women in a way that is correlated with earnings. It is also possible that women with higher incomes are more likely to use them, in a deliberate effort to delay childbearing and reduce the size of the family gap associated with having children.

Table 8a gives some regression results for the second stage of this model. Given the mixed results just discussed for the first stage, it is not surprising that the results of the second stage are not statistically significant. These results suggest that either there is a problem with the specification of the model (the choice of instrumental variables) or that the sample size is too small. Given that both the OLS and two stage least squares estimates using the Canadian Fertility Survey are insignificant it is also possible that delayed childbearing simply had no effect on earnings in the early eighties.

Table 7a: Second stage regression results for age at first birth variables, Canadian Fertility Survey

Variable name	1st specification dichotomous age at first birth		2nd specification: linear age at first birth	
	Coefficient estimate	**t value**	**Coefficient estimate**	**t value**
AGE AT FIRST BIRTH:	-	-	0.012	0.41
20-24 *reference*	N/A	N/A	N/A	N/A
25 and over	0.127	0.38	N/A	N/A

Conclusion

The regression results from the current study using data from the 2001 General Social Survey in Canada indicate that women who give birth to their first child between the ages of 20-24 earn 8% less than women who give birth to their first child between the ages of 25-29. The results do not, however, suggest any gains for women who delayed childbearing beyond age 29. The regression results from the 1984 Canadian Fertility Survey do not demonstrate any significant difference in the earnings of women who delayed childbearing after age 25, compared with women who first gave birth between the ages of 18-24.

It is difficult to compare the results of the present study with past studies, given the different estimation methods, samples used, independent variables and ways of defining the key variable, age at first birth. For example the results from Taniguchi (1999) estimate the effect of childbirth timing relative to women without children, whereas here the results are estimated among mothers only. Although the magnitude of the effects cannot be compared, and the age groups are slightly different, the general conclusion is the same: recent data show that women who are early child bearers (18-25 in the current study and 20-27 in Taniguchi 1999) suffer from a larger family gap than women who delayed childbearing to a later age.

Results can also be compared between the current GSS OLS regression with linear age at first birth (1st model, 2nd specification) and Miller's OLS regression. Miller (2005) finds that earnings increase by 3% for each year of motherhood delay, while the current OLS regression of GSS data finds that earnings increase by 1% for each year of motherhood delay.

Comparing the current results with those from the only other Canadian study is also difficult because Drolet (2002) defines age at first birth groups using a preliminary regression to estimate predicted age at first birth. However a comparison can be made if one considers that, in the current study, observations in the 18-25 age group are "early child bearers" compared to the sample mean. Thus, a general observation from the current study with 2001 GSS data and the study from Drolet using the 1998 Survey of Labour and Income Dynamics would be that early child bearers suffer from a larger family gap than other child bearers.

Having analyzed each study in detail, it is probably safe to make the very general conclusion from all studies on this topic that delayed childbearing decreases the size of the family gap for some age groups. It appears as though the benefits to delayed childbearing end when the mother is around 30 years of age, although further research is necessary to be more confident of this result.

These results from the current study, as well as the results of other studies discussed in this paper, can help us to understand the reasons for the important changes in fertility trends. As women become more and more active in the labour market, they face important market incentives to act in ways which will allow them to increase their current and lifelong earnings. The results discussed herein may confirm theories that the early years of work experience are the most important for lifelong career development and will affect earnings for many years into the future. Some of the results do suggest that women can reduce the size of the family gap by choosing to delay childbearing.

Unfortunately, no research papers have perfect methods and perfect results. In the current case, there are many ways the results could be improved. First, the study using

GSS data could be improved by a more precise estimate of the key independent variable: age at first birth. It is already been mentioned that the proxy variable used, although a good estimate for most individuals, does not take into account the first birth of women who were not working before having their first child and thus did not report a maternity leave at that time. Also for the GSS data, a more precise variable for earnings would also be useful, as the current measure includes other sources of income. For both data sets, a larger sample size would also be helpful in order to achieve more precise estimates. Finally, it would be desirable to have a more recent data set available for undertaking an instrumental variables approach to estimating the effects of delayed childbearing.

There are many options for expanding the research on this topic. Some ideas include adding interaction terms for timing and education, and timing and occupation. Additional results from Miller (2005) which were not discussed above as well as those from Bloom (1987), suggest that the benefits to delayed childbearing may be larger for women with certain levels of education, and women working in certain occupations.

The results from the current and previous studies have important implications for public policy interested in slowing or reversing current trends of delayed childbearing. As discussed earlier, the costs of delayed childbearing include higher health risks, which thus lead to higher public expenditures on health care. The results suggest that women may choose to delay motherhood, even though this decision may have high personal costs, due, at least in part, to economic incentives. Further, some women end up childless, even though their preference may have been to have children, as a result of delaying childbearing for too long. This only contributes to the overall decline in fertility. Policy makers interested in slowing or reversing the trend of delayed childbearing must focus on ways to reduce the economic benefits associated with this decision. This may include policy directed at ensuring women's earnings do not suffer for taking maternity related work interruptions. This may be achieved by the implementation of programs which help women re-enter the labour force after maternity related work interruptions and reduce human capital depreciation that occurred during the interruption. This may also include policy which restrict employers from discriminating unfairly against mothers, for example by ensuring mothers and women without children with similar abilities, experience and education earn equal wages for equal work and have the same opportunities for advancement and promotions.

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Appendix

Table 1b: Descriptive Statistics for General Social Survey

Variable name	Mean (standard deviation)	Frequency
Age	27.1 (4.5)	-
personal income	31 468$ (20 596)	-
Weeks worked per year	46.2 (11.97)	-
Hours worked per week	35.9 (10.7)	-
AGE AT FIRST BIRTH	27.1 (4.5)	-
20-24	-	22.6%
25-29 *reference*	-	28.6%
30-34	-	17.4%
unknown	-	32.0%
NUMBER OF CHILDREN	2.0 (0.9)	-
one child	-	31.1%
two children	-	45.3%
three children	-	17.4%
four children	-	5.1%
five or more children	-	1.1%
EDUCATION	-	-
none or elementary	-	0.7%
high school : incomplete	-	9.4%
high school : diploma	-	19.9%
cegep, college, technical school : incomplete	-	6.3%
university : incomplete	-	6.4%
technical school : diploma	-	8.0%
college : diploma	-	28.7%
university : bachelors degree	-	16.5%
university : post graduate studies	-	4.0%
MARITAL STATUS:	-	-
Married or common law	-	70.9%
Was married	-	18.4%
Never married	-	10.7%
Canadian	-	86.4%

PROVINCE OF RESIDENCE	-	-
Newfoundland and Labrador	-	5.6%
Prince Edward Island	-	3.2%
Nova Scotia	-	6.1%
New Brunswick	-	6.4%
Quebec	-	22.6%
Ontario	-	27.4%
Manitoba	-	5.1%
Saskatchewan	-	5.0%
Alberta	-	9.1%
British Columbia	-	9.6%
Sample size	2611	

Table 1c: Descriptive Statistics for Canadian Fertility Survey

Variable name	Mean (standard deviation)	Frequency (%)
Age	35.7 (7.1%)	-
Salary	15 097$ (9 969)	-
Hours worked per week	32.5 (13.5)	-
AGE AT FIRST BIRTH:	23.7 (3.8)	-
20-24	-	63.7%
25+ *reference*	-	36.3%
NUMBER OF CHILDREN:	2.2 (1.1)	-
one child	-	28.3%
two children	-	41.9%
three children	-	20.3%
four children	-	6.4%
five or more children	-	3.11%
Miscarriage / Stillbirth	-	8.8%
Contraceptive	-	11.8%
EDUCATION:	-	-
none or elementary	-	5.7%
high school : incomplete	-	24.1%
high school diploma *reference*	-	28.7%
technical school or college	-	7.7%
university : other	-	5.0%
university : bachelor's degree	-	9.9%
university: post graduate	-	2.2%
other education	-	16.5%
MARITAL STATUS:	-	-
Married or Common law	-	86.3%
Was married	-	11.6%
Never married	-	2.1%
Canadian	-	84%
PROVINCE OF RESIDENCE	-	-
Atlantic provinces	-	9.2%
Quebec	-	27.3%
Ontario *reference*	-	36.3%
Manitoba	-	4.7%

Saskatchewan	-	3.9%
Alberta	-	8.3%
British Columbia	-	10.3%
Sample size	1607	

Table 5b: OLS Regression Results General Social Survey

Dependent variable: log personal income

Variable name	1st specification: dichotomous age at first birth		2nd specification: linear age at first birth	
	Coefficient estimate	t value	Coefficient estimate	t value
Intercept	5.329	17.55	5.013	16.52
Age	0.035	2.16	0.035	2.16
Age^2	-0.000	-1.32	-0.000	-1.34
Log weeks worked per year	0.381	14.38	0.382	14.43
Log hours worked per week	0.707	24.48	0.706	24.47
AGE AT FIRST BIRTH	N/A	N/A	0.011	3.18
18-24	-0.099	-3.13	N/A	N/A
25-29 *reference*	N/A	N/A	N/A	N/A
30 and over	0.019	0.55	N/A	N/A
unknown	-0.253	-8.68	0.061	0.67
NUMBER OF CHILDREN	-	-	-	-
one child *reference*	N/A	N/A	N/A	N/A
two children	-0.013	-0.48	-0.011	-0.38
three children	-0.089	-2.59	-0.085	-2.45
four children	-0.104	-2.03	-0.107	-2.10
five or more children	-0.120	-1.11	-0.118	-1.09
EDUCATION	-	-	-	-
none or elementary	-0.381	-3.08	-0.376	-3.04
high school : incomplete	-0.139	-3.22	-0.139	-3.23
high school : diploma *reference*	N/A	N/A	N/A	N/A
cegep, college : incomplete, technical school : incomplete	0.090	1.83	0.086	1.74
university : incomplete	0.318	6.44	0.316	6.38
technical school : diploma	0.053	1.12	0.053	1.13
college : diploma	0.151	4.70	0.152	4.76
university : bachelors degree	0.441	11.83	0.443	11.88
university : post graduate studies	0.608	9.97	0.604	9.86
MARITAL STATUS:	-	-	-	-
Married or common law *reference*	N/A	N/A	N/A	N/A
Was married	0.117	3.55	0.114	3.46
Never married	-0.004	-0.10	-0.007	-0.16
Canadian born	0.087	2.84	0.088	2.89
PROVINCE OF RESIDENCE	-	-	-	-

Newfoundland and Labrador	-0.290	-3.40	-0.289	-3.38
Prince Edward Island	-0.177	-1.16	-0.182	-1.20
Nova Scotia	-0.260	-4.28	-0.262	-4.30
New Brunswick	-0.199	-2.70	-0.204	-2.75
Quebec	-0.177	-6.23	-0.176	-6.21
Ontario *reference*	N/A	N/A	N/A	N/A
Manitoba	-0.315	-5.11	-0.319	-5.18
Saskatchewan	-0.255	-4.06	-0.255	-4.05
Alberta	-0.226	-5.63	-0.228	-5.67
British Columbia	-0.108	-2.74	-0.108	-2.76
R^2	0.44		0.44	
Sample Size	2611			

Table 6b: OLS Regression Results for Canadian Fertility Survey

Dependent variable: log gross annual salary

Variable name	1st specification dichotomous age at first birth		2nd specification: linear age at first birth	
	Coefficient estimate	t value	Coefficient estimate	t value
Intercept	0.542	1.51	0.550	1.52
Age	0.072	3.57	0.072	3.58
Age^2	-0.001	-3.22	-0.001	-3.24
Log hours worked per week	0.861	32.31	0.861	32.33
AGE AT FIRST BIRTH:	N/A	N/A	-0.06×10^{-2}	-0.14
20-24 *reference*	N/A	N/A	N/A	N/A
25 and over	0.000	0.01	N/A	N/A
NUMBER OF CHILDREN:	-	-	-	-
one child *reference*	N/A	N/A	N/A	N/A
two children	-0.061	-1.57	-0.062	-1.58
three children	-0.147	-3.08	-0.149	-3.05
four children	-0.162	-2.40	-0.165	-2.39
five or more children	-0.214	-2.43	-0.218	-2.41
EDUCATION:	-	-	-	-
none or elementary	-0.377	-5.79	-0.378	-5.79
high school : incomplete	-0.210	-5.25	-0.211	-5.25
high school diploma *reference*	N/A	N/A	N/A	N/A
technical school or college	0.101	1.71	0.101	1.72
university : other	0.227	3.20	0.228	3.22
university : bachelor's degree	0.457	8.28	0.458	8.35
university: post graduate	0.627	6.29	0.630	6.27
other education	0.171	3.75	0.171	3.77
MARITAL STATUS:	-	-	-	-
Married or common-law *reference*	N/A	N/A	N/A	N/A
Was married	0.141	3.20	0.140	3.16
Never married	-0.271	-2.70	-0.272	-2.70
Canadian born	-0.009	-0.23	-0.010	-0.25
PROVINCE OF RESIDENCE	-	-	-	-
Atlantic provinces	-0.078	-1.41	-0.078	-1.41
Quebec	-0.000	0.00	0.000	0.01
Ontario *reference*	N/A	N/A	N/A	N/A
Manitoba	-0.01	-0.16	-0.012	-0.17
Saskatchewan	-0.099	-1.23	-0.100	-1.23

Alberta	-0.055	-0.99	-0.55	-1.00
British Columbia	-0.006	-0.13	-0.007	-0.13
R^2	0.49		0.49	
Sample size	1607			

Table 7b: First Stage Regression Results for Canadian Fertility Survey

Dependent variable: age at first birth[17]

Variable name	1st specification dichotomous age at first birth		2nd specification: linear age at first birth	
	Coefficient estimate	t value	Coefficient estimate	t value
Intercept	-0.742	-2.81	13.400	6.91
Miscarriage or stillbirth	0.151	4.00	1.713	6.17
Contraceptive	-0.036	-1.11	-0.393	-1.66
Age	0.0764	5.19	0.640	5.91
Age^2	-0.001	-4.36	-0.006	-4.33
Log hours worked per week	-0.078	-3.99	-0.525	-3.66
NUMBER OF CHILDREN:	-	-	-	-
one child *reference*	N/A	N/A	N/A	N/A
two children	-0.162	-5.75	-1.95	-9.42
three children	-0.340	-9.95	-3.379	-13.46
four children	-0.429	-8.85	-4.462	-12.53
five or more children	-0.458	-7.17	-5.364	-11.43
EDUCATION:	-	-	-	-
none or elementary	-0.111	-2.31	-1.243	-3.53
high school : incomplete	-0.05	-1.78	-0.883	-4.07
high school diploma *reference*	N/A	N/A	N/A	N/A
technical school or college	0.202	4.67	1.075	3.39
university : other	0.227	4.35	1.436	3.75
university : bachelor's degree	0.370	9.35	2.505	8.62
university: post graduate	0.390	5.36	3.982	7.44
other education	0.119	3.56	0.895	3.65
MARITAL STATUS:	-	-	-	-
Married or common-law *reference*	N/A	N/A	N/A	N/A
Was married	-0.124	-3.82	-1.445	-6.08
Never married	-0.092	-1.25	-0.993	-1.83
Canadian born	-0.110	-3.76	-0.847	-3.94
PROVINCE OF RESIDENCE	-	-	-	-
Atlantic provinces	0.056	1.39	0.121	0.41
Quebec	0.056	1.39	0.538	2.61
Ontario *reference*	N/A	N/A	N/A	N/A
Manitoba	-0.055	-0.98	-0.257	-0.63
Saskatchewan	-0.110	-1.85	-0.268	-0.61

[17] For specification 1, the dependent variable is age at first birth 18-24

Alberta	-0085	-2.10	-0.687	-2.30
British Columbia	0.004	0.10	-0.049	-0.18
R^2	0.24		0.34	
Sample size	1607			

Table 8b: Second Stage Regression Results for Canadian Fertility Survey

Dependent variable: log gross annual salary

Variable name	1st specification dichotomous age at first birth		2nd specification: linear age at first birth	
	Coefficient estimate	t value	Coefficient estimate	t value
Intercept	0.637	1.46	0.383	0.72
Age	0.062	1.91	0.064	2.33
Age^2	-0.001	-1.93	-0.001	-2.43
Log hours worked per week	0.871	23.39	0.868	28.17
AGE AT FIRST BIRTH:	-	-	0.012	0.41
18-24 *reference*	N/A	N/A	N/A	N/A
25 and over	0.127	0.38	N/A	N/A
NUMBER OF CHILDREN:	-	-	-	-
one child *reference*	N/A	N/A	N/A	N/A
two children	-0.040	-0.59	-0.037	-0.53
three children	-0.103	-0.84	-0.106	-0.96
four children	-0.106	-0.66	-0.107	-0.72
five or more children	-0.153	-0.85	-0.148	-0.80
EDUCATION:	-	-	-	-
none or elementary	-0.364	-4.92	-0.363	-4.92
high school : incomplete	-0.204	-4.70	-0.200	-4.42
high school diploma *reference*	N/A	N/A	N/A	N/A
technical school or college	0.074	0.82	0.087	1.29
university : other	0.199	1.92	0.210	2.55
university : bachelor's degree	0.409	3.01	0.426	4.61
university: post graduate	0.577	3.51	0.579	3.76
other education	0.155	2.53	0.159	3.00
MARITAL STATUS:	-	-	-	-
Married or common-law *reference*	N/A	N/A	N/A	N/A
Was married	0.158	2.53	0.159	2.52
Never married	-0.258	-2.43	-0.258	-2.45
Canadian born	0.004	0.08	0.001	0.01
PROVINCE OF RESIDENCE	-	-	-	-
Atlantic provinces	-0.08	-1.46	-0.079	-1.43
Quebec	-0.007	-0.16	-0.006	-0.16
Ontario *reference*	N/A	N/A	N/A	N/A
Manitoba	-0.004	-0.06	-0.008	-0.11
Saskatchewan	-0.084	-0.94	-0.095	-1.17

Alberta	-0.045	-0.73	-0.047	-0.81
British Columbia	-0.007	-0.13	-0.006	-0.11
R^2	0.49		0.49	
Sample size	1607			