Exploring the influence of socio-demographic factors on fertility decisions among women in Canada

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ABSTRACT

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The global decline in fertility rates has drawn the attention of economists, researchers, and policymakers in recent decades. Given the economic and social implications of population changes, it is important to analyze what underlying factors have influenced fertility decisions over time, and what is behind the sharp change in the decision-making process regarding family size, and hence, population growth. The present paper analyzes the influence of different socio-demographic factors on two main fertility decisions: the number of children and the age of women at first child. The analysis is done employing data from the Canadian Social Survey for the years 2006, 2011, and 2017, proposing an estimation with an ordered logit model framework and accounting for possible cohort effects by incorporating birth-control variables. Main findings suggest that higher levels of education, urbanity, certain regions, and being religiously unaffiliated are associated with a higher likelihood of reporting fewer amount of children. These results also contribute to reporting a first child at an older age, except for the variable that captures religious attendance, which is associated with a higher likelihood of reporting a first child at an older age despite the fact that attending religious events is linked to a higher amount of children.

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1 Introduction

Determinants of fertility began to attract the attention of economists when fertility rates did not behave as expected by recognized authors like Malthus (1798), who proposed that an increase in wealth levels contributes to population growth and lower standards of living. This theory was thought to be true, especially after the industrial revolution, where authors such as Brander and Dowrick (1994) highlight that the progress in technology levels, health care, and food availability, among others, made fertility rates increase dramatically, while decreasing per-capita income, such as most of the "Malthusian" theory suggested.

However, fertility rates started to decline sharply after the 1930s and even when levels of income increased, the population did not grow as predicted. According to data from the World Bank (2023), the global fertility rate in 1960 was 4.7 children per woman, dropping by 2021 to 2.3 children per woman, a noticeable decline of 2.4 children in 61 years. Canada has also experienced a similar decline in fertility rates, data from the World Bank (2023) and Statistics Canada (2021) reveal that in 1960 the Canadian total fertility rate was 3.8 children per woman, falling in 2021 to 1.4 children per woman. This decline has been accompanied by changes in some components of population dynamics, such as an increase in female participation in the labor market, a decrease in marriage rates, and a rise in the average age at childbearing. Statistics Canada (2021) indicates that the average age at childbearing increased from 27.8 years in 1991 to 31.4 years in 2021. These demographic changes give an insight into women's fertility decisions and how these not only encompass whether or not women remain childless but also relevant aspects such as the age they decide to give birth to their first child.

These transitions have sparked the attention of economists around the world to study population growth as a consequence of endogenous variables and analyze how these fertility decisions interact with other economic, social, and demographic factors within the family when they are introduced into the equation. Authors like Barro and Becker (1989) point out that fertility rates are closely related among other important variables, to the interest rate of children (i.e., the cost of children), highlighting that an increase in this cost decreases fertility rates given the existent dynamics between the number of children, the level of altruism of the parents, the productivity, and the investment in each child. This cost of children has been linked to different aspects of women's life that capture children's opportunity cost, for example, women's participation in the labor market. Authors like Brewster and Rindfuss (2000) describe that, especially in industrialized economies, women have to limit their fertility decisions to factors related to how friendly the labor environment is with family aspects.

While most empirical research has traditionally focused on the relation between socioeconomic factors (e.g., wages, education, marital status, and labor market characteristics) and fertility rates, a new perspective has emerged. This perspective seeks to analyze some underlying effects that have been studied and highlighted by notable authors such as Becker (1965), who point out the significant role of personal preferences in fertility decisions. Authors like Hirschman (1994) and Lancaster (1966) have extensively studied and summarized how various cultural theories propose that cultural values and different dimensions of religion, including secularism, play a significant role in shaping fertility preferences, and hence, decisions about family size and fertility timing.

It is widely acknowledged that the study of all these factors is fundamental in understanding not only family dynamics but also the impact of demographic transitions on the economy. New concerns about the sharp reduction of the youth population have arisen for its impact on economic variables such as labor productivity, economic growth, and the dependency ratio. Statistics Canada explains that the oldest and youngest population tend to depend socially and economically on the working-age population and that the level of dependency is measured through the dependency ratio. In the case of Canada, the World Bank shows that from 2008, the ratio has increased from 44 to 53 dependants per 100 people of working age in 2022. A higher dependency ratio is associated with a greater amount of people who require economic support in comparison with a lower amount of people who are working and generating economic growth, indicating a greater burden for the economically active population. Lee et al. (2014) explains that is important to maintain a medium decline in fertility to reduce the possible effects of a high dependency ratio on public policies such as taxation or pension plans.

This paper aims to contribute to the existing literature concerning the factors influencing fertility decisions, with a particular focus on the number of children and the age of women when they had their first child. In most empirical studies, these decisions are usually analyzed using binary regressions (i.e., where the outcome variable is usually the probability of having children versus the probability of remaining childless), or count data techniques such as Poisson regressions. However, certain difficulties can arise when data is limited or presented in a categorical format with responses falling within predefined categories (e.g., “three or more children”, or “20 - 30 years old”). In such cases, different statistical techniques are required to address the specific format of the data. For example, if these categories can be naturally ordered, approaches, like ordered logistic regressions may provide valuable insights into understanding the relationship between these decisions and other factors. By continuing to propose the use of different methods like ordered regressions, an evaluation of its advantages and disadvantages can be done, providing information for future research.

Additionally, the paper seeks to contribute to the existing body of literature related to the possible effects of cultural and religious variables on fertility. As mentioned previously, different authors have found that religion and cultural environment may play a significant role in family structures, or at the moment of individuals' decisions regarding family size, female labor, gender roles, etc. This paper is not the first one to include cultural and religious variables in the analysis, in fact, the selection of independent variables is similar to the one proposed by Adsera and Ferrer (2014), Fernandez and Fogli (2005), and Dilmaghani (2019) where education and a variety of cultural and social factors are analyzed. More specifically, for this paper, education, the region of residence, religiosity proxied with different religious variables, urbanity, and a possible cultural influence from the parents' international status are included to observe their effect on the number of children and the age of women at their first child.

To achieve this, two ordered logit models using data from the Canadian General Social Survey are employed to analyse the effect of these factors on fertility decisions among women in Canada for the years 2006, 2011, and 2017. In addition, to account for any potential cohort- effect (i.e., differences in fertility behavior for different generations of women), six birth-control variables are incorporated concerning the women's decade of birth. Main results suggest that higher levels of education, lower levels of engagement in religious aspects, certain regions, higher levels of urbanity, and for certain years having a mother or father that was born outside Canada, have a negative influence on the likelihood of reporting a higher amount of children. For the age of women at first child, results suggest that also higher levels of education, higher levels of urbanity, and for certain years having an international mother or father are associated with a higher likelihood of reporting a first child at an older age. Surprisingly, two relevant changes are observed to also contribute to having a child at an older age: 1. Only living in the Quebec region is found to be associated with a lower likelihood of having a first child at a younger age, and 2. For the level of religious engagement, while having a religious affiliation is linked to a higher probability of having a first child at a younger age, religious attendance on the other hand, is associated with an increase in the likelihood of having a first child at an older age.

The research is structured as follows: The next section presents the literature review, Section 3 describes the methodology and data employed in the analysis, followed by Section 4 which presents the estimation details about the statistical process. Section 5 presents the empirical results for both ordered logit models and finally, conclusions are presented in Section 6.

2 Literature Review

As mentioned previously, changes in fertility patterns have led researchers to explore and analyze which factors may influence this demographic transition and why the patterns did not behave as suggested by famous authors like Malthus (1798). Early statistical techniques tried to explain these shifts in fertility trends by relying on extrapolation methods, however, these techniques were not effective in estimating the specific effects of different social and economic factors and their complex interaction at the moment of fertility decisions.

Becker (1960) was one the pioneers in formulating an economic framework about what influences fertility rates. One of his early influential works in 1960 employed data from 1910 to 1950 to analyze fertility choices by applying economic principles. Becker (1960) finds that fertility can be mainly determined by income (pecuniary or nonpecuniary), cost of children, human capital, knowledge, personal tastes, and uncertainty. In addition, he establishes the basis of one of the most popular researched topics regarding fertility: the difference between the quality and quantity of children, pointing out that a high level of investment in each child (e.g., education, extracurricular activities, living standards, etc.) defines a high level of quality for children, affecting the quantity demanded given that a high number of children will require higher levels of investment in each child, increasing their overall "price".

A few years later, Mincer (1963) and Becker (1965) proposed an approach to link these "prices of children" with variables that may represent the value of women's time. The assumption for this is that the investment in having and raising children may represent an opportunity cost for women in terms of the time they can spend on other activities like employment or education. Under this theory of allocation of time, an increase in women's productivity can influence the perception of children's opportunity costs and in-home activities, having a direct effect on fertility decisions. Subsequently, some authors have proposed a variety of variables as proxies for this value of time in terms of investment in human capital (e.g., education) or remunerated activities (e.g., labor), while some others focused their analyses on understating the possible underlying effects that social and cultural factors can have on the specific preferences of women toward fertility.

The interest in these underlying cultural and social factors arises when authors like Westoff and Jones (1979) describe that religion was highly studied when countries like the United States reported high levels of fertility among the catholic population. However, fertility patterns of these communities became similar to the ones reported by other religious denominations once changes in the power of the catholic church and in catholic communities were present. For other countries like Canada, Carliner, Robinson, and Tomes (1980) also find that catholic women reported larger families. However, in addition to religion, the authors explored the influence of other variables like education, wages, region of residence, and urbanity in fertility rates for Canada in 1971 employing multiple regression techniques and a proposed one-period lifetime household production model for the joint decision of the number of children and female labor supply using data from the Canadian Census. Interestingly, results suggest that women's education and urbanity indeed had a strong negative effect on completed family size but a positive effect on women's labor supply, supporting the theory of allocation of time previously mentioned.

Relevant fertility literature like Heckman and Walker (1990) recognized the existent relationship between fertility, education, and other relevant socio-economic factors found by previous authors. However, the authors developed an approach to analyze not only if a correlation between these variables is found, but also to observe if there is a main influence of labor and economic components on specific stages in the fertility cycle. By using longitudinal data for married women in Sweden in 1970, the authors analyze the relationship between wages and fertility cycles, finding that the role of female wages and economic variables in fertility dynamics is observed mostly at the time and in the total number of desired conceptions. In particular, the impact of female and male wages was most observed in the decision of having a third child and not in the decision of remaining childless. On the other hand, economic variables indeed presented an effect on the decision of having a first child, suggesting that the economic environment at the moment of a first child had more influence than the level of income reported by women.

These findings unlocked a significant research opportunity for more recent authors to investigate the existence of a specific timing or number of children where factors like income and education have the strongest direct effect. Recent authors like Amin and Behrman (2014) contributed to the analysis of the effect of education by using data of monozygotic (i.e., identical) female twins in the United States. Main results indicate the existence of a strong negative correlation between school and fertility, but the authors did not find enough evidence to interpret it as a causal relationship. Surprisingly, the authors also find that more years of schooling are not related to a decline in the probability of being childless, instead, the effect is observed in the delay of childbearing, the decrease in the number of children desired, and in the marriage decision.

While research on the relationship between economic variables and fertility continues to evolve, recent authors have also continued to focus their research on the possible underlying influence of social and cultural factors on fertility decisions mentioned previously. Theoretical works like McQuillan (2004), which develops an extension of Goldscheider's approach to understanding religion's role in fertility behavior, find that religion indeed influences fertility when three main aspects are present: 1. The religion has direct norms or laws about fertility, 2. The religious group has the way and power to communicate these norms and teachings to its members, and 3. There exists a strong feeling of attachment from individuals to the religious group. Interestingly, the author highlights that this influence is not equal across religious denominations, such that certain religions may have stronger norms about fertility than others. This has been supported by authors like Dilmaghani (2019), who finds evidence that suggests that increasing levels of secularization have influenced the reconfiguration of religion's role in social and private lives. The author employs multivariate regression methods using data from the Canadian General Social Survey for cohorts from the 1980s to the 1990s and a variety of proxies for religious engagement, to differentiate some types of secularization among women and compare them to women actively religious. Results indicate that Canadian Roman Catholics used to have higher fertility rates than Protestants, however, this difference has decreased, no longer differing significantly. Regarding religious attendance as a proxy of the level of religiosity, this variable was the strongest predictor of fertility. When differentiating the level of secularism for non-religious women, the strictly secular group had the lowest levels of fertility, providing strong support for the role of religious engagement as a determinant of fertility preferences in Canada.

Strongly related to the present analysis, other recent authors have decided to combine economic and cultural factors to observe their interaction at the moment of fertility decisions. One example is Fernandez and Fogli (2005), which describe how cultural norms not necessarily related to religion can affect women's decisions about diverse aspects of life given the specific cultural beliefs about the role of women in the family and society. The authors point out that even though women might share the same country, institutions, and markets if their parent's country of origin differs, differences in cultures can be transmitted and be one explanation for the unobserved differences in fertility preferences. To analyze this, the authors employ the General Social Survey (GSS) for US-born women with different ethnic backgrounds. Fertility outcomes are taken as a function of education, age, husband's characteristics, number of siblings as a proxy of family experience, and lagged values of total fertility rate in the parent's country of origin as a proxy of culture. Main findings show that culture was significant in explaining differences in the number of children that women decided to have, even when personal experience was considered.

Another example of this is Adsera and Ferrer (2014), who studied cultural influence but proxied with the immigrant status of women in Canada. The authors highlight that Canada is considered among researchers one of the best countries to analyze fertility differences among immigrants and native-born women given that the country has one of the largest shares of immigrants and an increasing number of policies that aim to attract foreigners to the country to maintain population growth. In light of this, Adsera and Ferrer (2014) employ data from Canadian Censuses from 1991 to 2006 to analyze the influence of factors such as education, age at migration, country of origin, and the official language, on the fertility of women who migrated to Canada before 19 years old. In addition, the authors also test the three hypotheses proposed by Goldstein and Goldstein (1981) about three main factors that can affect the fertility behavior of immigrants: selection (linked to how individuals who migrate differ from those ones who don't migrate), disruption (linked to how fertility is disturbed at the time of migration), and adaptation (linked to how immigrants adopt fertility norms of the host country). Main results suggest that age at migration has a positive and increasing influence on fertility regardless of the country of origin and mother language. However, fertility for those who speak the official languages of Canada was lower than one for those who do not. Among the three hypotheses tested, the adaptation hypothesis was supported, implying that when women migrate before the age of 19, they have enough time to be influenced by the fertility norms and practices of the host country, which might impact their own preferences.

Fertility decisions have been a topic of debate over time given the relevant and different effects that a demographic change causes on an economy. The literature briefly reviewed previously shows the diverse factors that can influence this choice and the complexity of an accurate analysis of them, especially when trying to observe and incorporate subjective and challenging components like religion or cultural heritage. Similar to what has been done by Fernandez and Fogli (2005) and Adsera and Ferrer (2014), the present research incorporates socio-demographic factors like education, religion, cultural influence, urbanity, and region of residence to analyze if these have an effect on the number of children and the time at first child when these variables are reported in a categorical ordered format. Like Adsera and Ferrer (2014), cultural influence is represented by immigrant status. However, it is important to describe that this immigrant status is reported by women's parents (i.e., parent's country of origin) rather than by women themselves. Religion variables are also proposed in a similar way to Dilmaghani (2019), which considers aspects like religious attendance as a measure of the possible level of religious engagement and hence, the possible feeling of attachment to the specific religious fertility norms. The use of diverse statistical tools and the incorporation of new proxy variables that represent the economic, cultural, and social changes around the world can provide a good insight into how these factors and their influence have evolved over time and the extent of their impact on fertility patterns in order to contribute to the existent literature of this controversial but fundamental topic.

3 Methodology and Data

3.1 Ordered Logit Model

Davidson and MacKinnon (2004) highlight that the commonly employed Ordinary Least Squares regression is not always suitable to estimate models when the response variable is a discrete variable. Specifically, the authors describe that when the independent variable is discrete and can take more than two values or categories that can be naturally ordered, these models are commonly known as discrete choice models with ordered responses that require alternative approaches to estimate this type of data that is non-continuous and commonly not normally distributed.

In this context, an ordered response estimation can be proposed to model the influence of different factors on the number of children and the age of a woman at the birth of her first child, especially if these response variables are reported as categorical variables with more than two distinct categories that can be ranked naturally from lowest to highest. In such cases, the decision to have an additional child or to have the first child at an older age may provide varying levels of satisfaction that influence the individual choice.

Davidson and MacKinnon (2004) also explain that the latent model of an ordered response model can be defined in the following way:

$$y_i^* = X_i\beta + u_i \tag{1}$$

Where y_t^* is the latent underlying unobservable variable or factor that has an influence on the fertility choice and the timing of this one, $X_t\beta$ is the vector of explanatory variables and their corresponding coefficients, and u_t is the error term. This latent variable is thought to move across certain thresholds that correspond to each category, once a threshold is crossed, the response variable takes a different value and with this, the unobserved underlying factor can be linked to an observed response, giving insight into the possible preferences behind the variable of interest. This can be observed in the following equation:

$$y_i = j \text{ if } \alpha_{j-1} < y_i^* \leq \alpha_j \tag{2}$$

Where y_i is the observed response variable, α_j represents the threshold corresponding to category j, and y_i^* as mentioned previously represents the latent variable. Given that the latest one moves across categories by crossing their respective thresholds, and as Greene (2003) points out, this can reveal some of the underlying preferences of each individual with respect to each category, questions as what is the probability that this latent variable crosses each threshold or which factors influence the probability of selecting category j, arise in order to provide a better understanding of these underlying preferences.

Ordered response models involve estimating the probability that an individual selects a particular category, given a set of explanatory variables. As previously discussed, this implies that the latent variable is moving and falling across predetermined thresholds, thus requiring the use of the cumulative distribution function (CDF). Authors like Johnston and DiNardo (1997) describe that the constraint that the probability lies between 0 and 1, and the functional form of the CDF are key elements when estimating discrete models. The following equation shows what was stated before,

$$\begin{aligned} &Pr(y_i = j|X_i\beta) = Pr(\alpha_{j-1} < y_i^* \leq \alpha_j) \\ &= Pr(\alpha_{j-1} < X_i\beta + u_i \leq \alpha_j) \\ &= 0 \leq F(\alpha_j - X_i\beta) - F(\alpha_{j-1} - X_i\beta) \leq 1 \end{aligned} \tag{3}$$

Where $Pr(y_i = j|X_i\beta)$ is the probability that individual i selects category j, and $F(.)$ is the CDF that assumes a specific distribution form for the latent variable y^* that leads to the specific empirical model. Authors like Amemiya (1981) highlight that the commonly two bounded forms that this distribution usually takes are: (1) where $F(.)$ is assumed to follow a standard normal distribution, which leads to the well-known ordered probit model, and (2) where $F(.)$ is assumed to follow a logistic distribution, which leads to the ordered logit model. The author acknowledges the challenge of determining which distribution is the most suitable due to their similarities, and authors like Greene (2003) describe that the choice of the distribution depends on several factors, such as the specific research question and the interpretability of the coefficients. For the present research, the assumption made for the distribution of $F(.)$ is that of a logistic distribution, such that,

$$F(\alpha_j - X_i\beta) = \frac{\exp(\alpha_j - X_i\beta)}{(1 + \exp(\alpha_j - X_i\beta))} = \Lambda(X_i\beta) \tag{4}$$

To estimate the effect of a particular predictor variable, the first derivative of equation 3 is taken with respect to the explanatory variable of interest, leading to the following marginal equation:

$$
\begin{aligned}
\frac{\delta Pr(y_i = j)}{\delta X_i} &= \frac{\delta F(\alpha_j - X_i\beta)}{\delta X_i} - \frac{\delta F(\alpha_{j-1} - X_i\beta)}{\delta X_i} \\
&= F'(\alpha_j - X_i\beta) - F'(\alpha_j - X_i\beta) * \beta
\end{aligned} \tag{5}
$$

As Myung (2003) points out, after a model is specified and its parameters are identified, parameter estimation can be conducted. In the case of an ordered model, estimation involves determining the value of the threshold parameters α_j and the regression coefficients β. As the author emphasizes, two general methods are usually employed, Least Squares Estimation (LSE) and Maximum Likelihood Estimation (MLE). However, as mentioned previously, LSE is not appropriate for estimating an ordered logit model, primarily due to the discrete nature of the response variable, the focus on the estimation of probabilities, and the specific assumptions about the distribution of the latent variable which deviate from the general assumptions of LSE.

3.2 Maximum Likelihood Estimation

Davidson and MacKinnon (2004) describe that the maximum likelihood estimation requires the model to be fully parametric (i.e., models with distribution assumptions, parameters, and functional form of the model completely specified). By this, once the parameters are estimated it is possible to simulate the response variable given that all the relevant information of the model is already provided. As the authors describe, if the response variable can be simulated, the probability density function (PDF) or in this case, the probability mass function (PMF) given the discrete nature of the dependent variable, should be known.

Assuming a vector of response variables denoted by y and a corresponding vector of parameters denoted by θ, which in the case of an ordered model encompasses both, the regression coefficients and the threshold parameters, such that,

$$
\theta = [\beta, \alpha_j] \tag{6}
$$

The joint density function can be defined as the function that describes the probability that y and θ take specific values simultaneously. As Johnston and DiNardo (1997) mention, the joint density function defined as $f(y, \theta)$, may be interpreted in two ways: 1. When θ is given, the density represents the probability of observing y given the fixed value of θ, and 2. when $f(y, \theta)$ is evaluated at y, the function is interpreted as the well-known likelihood function defined in the following way,

$$L = (\theta, y) = f(y, \theta) \tag{7}$$

Where $L = (\theta, y)$ captures the likelihood of observing the given data y under different sets of parameter values θ. As Davidson and MacKinnon (2004) and Johnston and DiNardo (1997) point out, the method of maximum likelihood aims to find the vector of parameters $\hat{\theta}$ that maximizes the probability of obtaining the real observed data. More specifically, considering that y and θ are vectors of response variables and parameter values, respectively, and assuming that the individual observations are statistically independent and identically distributed, the likelihood function can be defined as the product of the individual density functions, such that,

$$f(y, \theta) = L(\theta, y) = \prod_{i=1}^{n} f(y_i, \theta_i) \tag{8}$$

Applying a monotonic transformation of equation 8 (i.e.,a mathematical transformation that preserves the original maximum) by taking its logarithm, equation 8 can be expressed as follows,

$$\ln L(\theta, y) = l\,(\theta) = \sum_{i=1}^{n} \ln f(y_i, \theta_i) \tag{9}$$

Where $l\,(\theta)$ is referred to as the log-likelihood function. As Myung (2003) describes, this transformation is helpful to facilitate the computational estimations and simplify the likelihood equation by transforming the product into the sum of the density functions. Once this is done, the process of maximization can be performed by taking the first derivative of the log-likelihood, as the following equation suggests:

$$\frac{\delta l\,(\theta)}{\delta\theta} = \frac{\delta \ln L(\theta, y)}{\delta\theta} = g\,(\theta) \tag{10}$$

The function $g\,(\theta)$ is commonly known as the “score function”. To find the maximum likelihood estimator $\hat{\theta}$, the score function is set to zero (i.e., $g\,(\theta) = 0$) to identify the location where the slope of the function is neither decreasing nor increasing, indicating, in this case, the presence of a maximum. Linking the maximum likelihood estimation framework with the functional form and specification of the ordered logit model, equation 9 and equation 3 can be combined and rewritten as

$$l(\theta) = \sum_{i=1}^{n} \ln\ f(y_i, \theta) = \sum_{i=1}^{n} \ln[F(\alpha_j - X_i\beta) - F(\alpha_{j-1} - X_i\beta)] \tag{11}$$

Where the probability mass function $f(y_i, \theta_i)$ that is, the probability that y takes on a specific value or category j conditional on the vector of explanatory variables is equal to the difference between the cumulative distribution function evaluated at two different thresholds for categories j and $j-1$, and where $F(.)$ is assumed to follow a logistic distribution, such that

$$\begin{aligned} l(\theta) &= \sum_{i=1}^{n} \ln\left[F(\alpha_j - X_i\beta) - F(\alpha_{j-1} - X_i\beta)\right] \\ &= \sum_{i=1}^{n} \ln\left[\Lambda(\alpha_j - X_i\beta) - \Lambda(\alpha_{j-1} - X_i\beta)\right] \end{aligned} \tag{12}$$

In the context of the present research, two ordered logit models for each year (i.e., 2006, 2011, and 2017), are proposed to estimate the impact of different sociodemographic factors on the likelihood of a particular category within two response variables. The first one is related to the number of children divided into seven categories, while the second one relates to the age of the women when they had their first child divided into four categories.

The vector of sociodemographic variables includes factors previously analyzed and that were found to be correlated in different ways to fertility decisions. The vector includes the level of education, the region of residence, the parent's country of origin as a proxy of the possible cultural influence, an indicator of the urban/rural zone, two religious proxies to measure the influence of religiosity, and six birth-control variables to account for possibles cohort-effects. Specifically,

$$\begin{aligned} X_i = [&Educ_i, Region_i, Internatfath_i, Internatmoth_i, \\ &Religaf_i, Religatten_i, Urban_i, Decadebirth_{t,i}] \end{aligned} \tag{13}$$

Where $Educ_i$ corresponds to the highest level of education achieved, $Region_i$ denotes the residential region, $Internatfath_i$ represents the international status of the father, and $Internatmoth_i$ indicates the international status of the mother. $Religaf_i$ represents the religious affiliation of the woman, while $Religatten_i$ quantifies the woman's attendance at religious events. Lastly, $Urban_i$ denotes if the woman resides in an urban or rural zone, and $Decadebirth_{t,i}$ represents the six binary variables that reflect the decade of birth for each woman.

3.3 Data

3.3.1 Dependent variables

As mentioned in the previous section, the present research seeks to examine the impact of diverse socio-demographic factors on the number of children and the age of women at the birth of their first child. This is performed by employing two ordered logit models with data from the Canadian General Social Survey for the years 2006, 2011, and 2017 respectively. The data includes only the female population who reported data for both the dependent and independent variables. Those women with missing data for a variable are not included in the analysis. The final number of observations for each dataset in the first model is as follows: 2006 (N=12,244), 2011 (N=11,373), and 2017 (N=9,973). Given that the second model estimates the age of women when their first child is born, only those women who reported at least one child are included in the estimation. The final number of observations for each dataset in the second model is as follows: 2006 (N=8,494), 2011 (N=8,418), and 2017 (N=7,117).

The first response variable (i.e., the number of children) is created from the original variable that reports the number of children the respondent has given birth to or fathered, $NO\_BRTCHDC$ for 2006 and $TOTALCHDC$ for 2011 and 2017. A new variable labeled "*numberofchild*" was created from the original variable with seven categories labeled "None" if the woman reported zero children, "One child" if one child was reported, "Two children" if two children were reported, "Three children" is three children were reported, "Four children" and "Five children" if the woman reported four or five children respectively, and "Six or more" if the woman reported six or more children.

To create the second response variable, an initial variable named "*children*" was generated. The variable "*children*" serves as a binary indicator, assuming a value of 1 if the woman has one or more children and 0 if the woman does not have any children. Subsequently, the response variable, denoted as "$ageatchild1$", was derived from the reported age at birth of child one, captured by the original variable, $AGE\_CHDBORN\_1$ for 2006, $AGE\_CHDBORN\_1C$ for 2011, and $ACHB1C$ for 2017. To categorize $ageatchild1$, the variable was divided into four categories: "Less or equal to 20" for ages equal or below 20 years, “21 - 30” for ages ranging between 21 and 30 years, “31 - 40”, for ages between 31 and 40 years, and “More than 40” if the woman had a first child after the age of 40 years. The creation “$ageatchild1$” involved extracting information from the original continuous variable and conditioned on the fact that the women reported having at least one child (i.e., $children = 1$) to make sure $ageatchild1$ was capturing the information only from those who had children.

3.3.2 Independent variables

The variable *Educ* is disaggregated into four separate variables based on the original reported variable $EDU5$ for the datasets of 2006 and 2011, and the variable $EHG3\_01B$ for 2017, which indicates the woman's highest level of education attained. The first variable, referred to as “*Lesshs*”, represents whether the woman's highest level of education achieved is less than high school (i.e.,*Lesshs*=1). The second variable, named “HS”, indicates whether the woman's highest degree obtained is high school education, taking the value 1 if it is and 0 if it is not. The third variable, denoted as “*College*”, captures whether the woman's highest level of education attained is a college degree or diploma (i.e., *College*=1). Finally, the fourth variable, labeled as “$University$”, indicates whether the woman's highest level of education attained is a bachelor's, master's or doctorate degree. Given that the original variables in the dataset report the highest level of education achieved by each woman, the process of creating each binary education indicator ensures that each woman reports a value of 1 for only one of these variables.

The variable *Region* is disaggregated into five separate variables based on the original variable $REGION$ that reports the region of residence of the respondent. The first variable, referred to as “*Atlantic*” is a binary indicator that represents whether the woman was a resident of the Atlantic region (i.e., $Atlantic = 1$) which includes the provinces of Newfoundland and Labrador, Prince Edward Island, Nova Scotia, and New Brunswick. The second variable denoted as “*Prairie*” represents whether the woman was a resident of the Prairie region, which includes the provinces of Manitoba, Saskatchewan, and Alberta (i.e., $Prairie = 1$). The third variable is labeled as “$Westcoast$” which captures if the woman was a resident of the Westcoast region, which includes the province of British Columbia. Lastly, for the Central Canada region, given that this region includes the provinces of Quebec and Ontario which are the two most populated provinces, the region was disaggregated into one variable denoted “*Quebec*” which captures if the woman was a resident of the province of Quebec (i.e., $Quebec = 1$) and “*Ontario*” that captures if the woman was a resident of the province of Ontario (i.e., $Ontario = 1$). In the case of the North region, the datasets for the three years lacked reported data for the specific provinces and territories within it, namely Nunavut, Northwest Territories, and Yukon Territory.

For the variables regarding the international status of the woman's parents, two binary variables are created from the original variables reported in the datasets, $BRTHMCAN$, and $BRTHFCAN$. The first one is labeled "*internathmoth*" and reports if the country of birth of the respondent's mother was outside Canada (i.e., $internatmoth = 1$) or within it (i.e., $internatmoth = 0$). The second one denoted as "$internatfath$", reports if the woman's father's country of birth was outside Canada ($internathfath = 1$) or within it (i.e., $internatfath = 0$). An important aspect to note is the elimination of empty values from the original variable, resulting in the analysis exclusively of women who reported information for both parents. Consequently, individuals who were raised in single-parent households are not accounted for. Specifically, this resulted in the removal of a total of 497 observations from the original datasets (i.e., before any modification or removal of missing data) across the three years (i.e., 2006, 2011, and 2017 combined) for *internatmoth* and 48 observations for $internafath$.

To examine the impact of religious factors on fertility decisions, two variables were created. The first variable pertains to the religious affiliation of the women, based on the original variables $RELIG6$ (for the years 2006, and 2011) and $RELIGFLG$ (for 2017). For 2006 and 2011 these variables contain specific information about the religion of the woman, such as whether she identifies as having no religion, Roman Catholic, or Protestant, among others. However, this information is not available for 2017, where $RELIGFLG$ only reports whether the woman has a religious affiliation or not. For this reason, the present paper only analyzes if being religiously affiliated has an effect on fertility choices in comparison with reporting no affiliation for the years previously mentioned, without considering the specific effects of different religious denominations. For this, a binary variable denoted as "$religionaff$" is created to indicate whether the woman reported having a religious affiliation (i.e., $religionaff = 1$) or not (i.e., $religionaff = 0$) .

The second variable derived from the original variable $RELIGATT$ (for 2006 and 2011), and REE_02 (for 2017), consists of three binary variables that capture the woman's attendance at religious events. The first variable, denoted as "*nonattendance*", takes the value 1 if the woman reported never attending a religious event. The second variable, labeled "*attendanceweek*" indicates if the woman reported attending at least once a week (*attendanceweek* = 1). The third variable, named "*attendancemonth* takes the value 1 if the woman reported attending a religious event at least once a month, and lastly, the fourth variable labeled as "*attendanceyear*, captures if the woman reported attending a couple of times a year (i.e., *attendanceyear*=1). It is important to highlight that during the creation of these religious variables, it was ensured that each woman was categorized only within one of the variables. For example, women who reported having no religious affiliation were assigned a value of 1 for the variable *nonattendance* and a value of 0 for all other binary indicators.

To measure the impact of urbanity, a binary variable derived from the original variable reported on the datasets, *LUC_RST* is created. The variable denoted as "*urban*" reports whether the woman resides in an urban zone (*urban*=1) or in a rural zone (*urban*=0).

There are two important considerations to note to ensure clarity in the interpretation of the urban indicator variable. Firstly, for the 2006 dataset, the variable *LUC_RST* only provided data for the provinces of Quebec, Ontario, and British Columbia. In addition, the 2006 dataset encompasses three categories: 1) larger urban, 2) rural/small towns, and 3) other provinces. Given the proportions of the data in comparison with the other two datasets (i.e., 2011 and 2017), and that most of the rural provinces were already considered within the rural category, the third category "Other provinces" was combined with the "Larger urban" category. Secondly, for the 2011 and 2017 datasets, after removing the "not stated" and empty values, the variable *LUC_RST* encompasses three categories: 1)larger urban, 2) rural/small town, and 3) Province of Edward Island. Since the province of Edward Island is predominantly rural, it was combined with the rural/small town category.

Finally, to control for any possible cohort effect resulting from being born in a specific time period, during which social, political, or cultural norms might have differed from those in other periods, birth-control variables regarding the decade of birth are incorporated into the analysis. To do this, it was necessary to create a variable that reports the year of birth for each woman in the sample. For each dataset, the specific time period (i.e., 2006, 2011, and 2017) was subtracted from the original variable *AGEC*, which reports the age of women at the time of the interview. Using the variable *yearborn*, six binary variables were created to identify whether women were born in specific decades. These variables are denoted as "$befon30s$", which reports whether women were born before or during the 1930s (i.e., $befon30s$=1), "$on40s$" for those who were born during the 1940s, "$on50s$","$on60s$", and "$on70s$" for those women born in the 1950s, 1960s, and 1970s, respectively, and finally "$onaf80s$" for those who were born during the 1980s or after.

Table 1 presents the distribution of women by dependent variable for the years 2006, 2011, and 2017. Interestingly, it is observed that with the exception of the "Two children" and "Three children" categories, all other categories experienced a decrease from 2006 to 2017. The "Two children" category is the only one that presents a consistent increase from 2006 to 2011, and from 2011 to 2017. The highest increase from 2006 to 2017 is observed in the category "Two children", raising from 20.08 percent in 2006 to 31.79 percent in 2017, while the highest decrease from 2006 to 2019 is found in categories "None" from 30.63 percent in 2006 to 28.69 percent in 2017, and "Six children or more" with 2.72 in 2006 and 1.67 in 2017. For the age at which women had their first child, two noteworthy observations arise: The first one is a decline in the proportion of women who reported having their first child before or at the age of 20, decreasing from 18.10 percent in 2006 to 14.19 percent in 2017, and the second one is that there is an observable increase in the proportion of women that reported having their first child between the ages of 31 to 40 years old, increasing from 14.52 percent in 2006 to 19.04 in 2017, as well as in the proportion of women who reported a first child older than 40 years old, increasing from 0.60 percent in 2006 to 1.32 percent in 2017.

Table 2 presents the distribution of women by independent variable for the aforementioned years. Significant insights can be also highlighted in Table 2. Firstly, there is a decline in the proportion of women reporting less than high school education, declining from 19.52 percent in 2006 to 14.27 percent in 2017. Simultaneously, there is a significant increase in the proportion of women reporting university education, rising from 22.31 percent in 2006 to 32.18 in 2017. Lastly, an increase in the proportion of women that report no attendance at any religious event is also observed, rising from 36.18 percent in 2006 to 44.76 percent in 2017.

4 Estimation

4.1 Statistical Software and Built-in Functions

All the manipulation of the data obtained from the Canadian Social Survey for 2006, 2011, and 2017, as well as the creation of the variables required for the data analysis, visualization, and estimation of the models described in the previous sections are done employing the statistical software STATA 14. The creation of new variables is mostly done by employing built-in functions such as "*generate*", and "*replace*". The conditional function "*if*" is highly employed in the creation of new variables or the disaggregation of one variable into different binary indicators to create a variable that includes a certain proportion of women based on a specified condition. Once the required variables were included and modified for the analysis, the descriptive statistics are done by employing built-in functions and commands, such as "*tab*", "*sum*", and "*histogram*" for data visualization of the discrete variables.

For the estimation of the models, the function "*ologit*", which is the designed function in

STATA to model an ordered model with logistic distribution is employed. It is important to highlight that to account for each person's weight in the sample, within the "*ologit*" function, the specification of "*pweight*" (i.e., sampling weights) is set to be equal to the person's weight in the dataset (i.e., "$WGHT\_PER$"). To obtain the average marginal results of each independent variable in each category of the dependent variables, the command "$margins, dydx(*)$" is employed.

Lastly, the predicted probabilities of each model are calculated to observe how much the predicted probabilities of belonging to each category of the dependent variable are close to the real distribution of the data presented in Table 1 and Table 2. This is done by employing the command "*predict*" after obtaining the outcome for the function "*ologit*" in each model.

4.2 Goodness of Fit

As mentioned previously, the predicted probabilities are calculated to compare how well the models align with the original distribution of the data. It is important to highlight that further examination of ordered logit models for fertility decisions may provide more accuracy in the results. However, comparing how much of the real distribution of women in each category of the dependent variables can be predicted from the models provide valuable information about how well the models behave.

Table 3 shows the predicted probabilities derived from the ordered logit model for the number of children. The estimated likelihoods closely align with the observed distribution for most of the categories. However, there are specific cases where the difference between predicted probabilities and the observed distribution of the data is more noticeable. Specifically, categories "None" and "Three children" for 2006, and categories "None", "Two children", and "Three children" for 2011. It's worth noting that these differences while present, are not substantially large. Overall, while the model's predictions don't match the observed proportions completely, they are reasonably accurate.

For the predicted probabilities derived from the second model, Table 4 shows that the estimated likelihoods of belonging to each category closely correspond to the observed distribution of the data. The biggest differences observed are reported in the categories "Older than 40 years old" in 2006 and 2011, "21-30 years old" in 2011 and 2017, and "20 years old or younger" in 2017. However, as in the model for the number of children, these differences are not substantially large. When comparing how accurately the predicted probabilities for both models align with the observed distribution of the data, the model for the age of women at first child reports more accurate estimations than the model for the number of children.

5 Empirical results

5.1 Number of Children

The marginal effects from the ordered logit model for the number of children in 2006 are presented in Table 6. As Table 6 indicates, the highest level of education attained plays a significant role in the number of children women reported. More specifically, compared to women who reported college as their highest degree (i.e., the reference category), women who reported less than a high school education have a lower likelihood of remaining childless or having only one child, but a higher likelihood of having two or more children. In contrast, women who reported university as their highest degree of education achieved have a lower likelihood of reporting two or more children, while having higher probabilities of remaining childless or having only one child compared to those with a college education. Only these education variables are found statistically significant for the seven categories, and the strongest negative effects are found in category 1 (i.e., "None" children) with a coefficient of -0.0609 for less than high school, and category 4 (i.e., three children) with a coefficient of -0.0298 for university, while the highest positive effects are found in category 3 with a coefficient of 0.0331 for less than high school, and category 1 with a coefficient of 0.0547 for university.

For 2011, as Table 7 indicates, only university is found to be statistically significant with the same effect as in 2006, a positive impact on the likelihood of reporting fewer children (i.e., categories "None", and "One Child"), and decreasing the likelihood of reporting a higher category corresponding to a higher number of children in comparison with those with a college education. The highest positive effect is also found on the likelihood of reporting "None" children (i.e., category 1) but with a magnitude of 0.0445, while the highest negative effect is found on category 3 (i.e., two children) with a coefficient of -0.0046. Surprisingly, as Table 8 illustrates, none of the education variables were found to be statistically significant in 2017.

For the region of residence in 2006, only Quebec and Prairie show statistically significant results. Compared to residing on West Coast (i.e., the reference category), living in Quebec increases the probability of belonging to the first two categories (i.e., "None" and "One child"), while reducing the likelihood of falling into categories that report two or more children. Opposite effects are observed in the Prairie region, where in contrast to residing on the West Coast, living in Prairie was associated with a lower likelihood of remaining childless or reporting only one child, and a higher likelihood of belonging to categories that report two or more children. In the case of Quebec the highest positive effect is found in the likelihood of category 1 (i.e., "None" children) with a coefficient of 0.0334, and the highest negative effect is found in the likelihood of category 4 (i.e., Three children) with a coefficient of -0.0045. For Prairie, the highest effects are found in the same categories but with a positive effect for category 4 (i.e., 0.0160) and a negative effect for category 1 (-0.0294).

For 2011, as Table 7 indicates, Quebec and Prairie remained the only region variables found statistically significant. The effects also remain the same but with decreasing coefficients. For Quebec, the highest positive effect is found again in the likelihood of belonging to category 1 (i.e., "None" children"), but the effect decreased from 0.0334 in 2006 to 0.0226 in 2011. In the case of Prairie, as was the case in 2006, the highest positive effect is found in category 4, however, this effect slightly decreased from 0.0160 to 0.0155. The highest negative effect for Prairie also decreased from -0.0294 to -0.0287 and is also found in the likelihood of reporting no children (i.e., category 1). The effect of living in the Prairie region remained the same in 2017 as Table 8 illustrates. However, the negative effect in category 1 increased from -0.0287 to -0.0559, while the highest positive effect found in category 4 also increased from 0.0155 in 2011 to 0.0257 in 2017. Interestingly, for 2017 Ontario is found to be statistically significant, however, results suggest that residing in Ontario in 2017 is associated with a lower likelihood of being childless or reporting only one child, while increasing the likelihood of belonging to categories that report two or more children. The highest effects are also found in categories 1 and 3, with a negative coefficient of -0.0294 for the first one, and a positive coefficient of 0.0135 for the latest one.

Regarding the factor of religious affiliation, Table 6 indicates that in contrast to those who reported no religious affiliation, in 2006 being religiously affiliated was associated with a negative likelihood of belonging to a lower category of number of children, more specifically, lower probabilities of reporting none or only one child while increasing the likelihood of reporting two or more children. This effect remains statistically significant in 2011 and 2017, and for the three years, the highest negative effect is found on the likelihood of belonging to category one (i.e., reporting no children) with an increasing negative influence of -0.0264 in 2006, -0.0336 in 2011, and -0.0449 in 2017. In the same way, the highest positive magnitudes are found in the likelihood of reporting specifically three children, increasing from 0.0144 in 2006 to 0.0281 in 2011, and 0.0207 in 2017.

For the variables regarding religious attendance, weekly, monthly, and annual attendance are found statistically significant in 2006, while only weekly and monthly attendance are found significant in 2011 and 2017. For those women who attend religious events on a weekly basis compared to those who do not attend religious events at all, Table 6, Table 7, and Table 8 indicate that in 2006, 2011, and 2017, respectively, weekly attendance is associated with a lower likelihood of reporting being childless or only one child, while increasing the likelihood of belonging to higher categories of number of children. More specifically, the highest positive effect for the three years is found in the likelihood of reporting three children (i.e., category 4) with a magnitude that decreased from 0.0348 in 2006, to 0.0287 in 2011, but increased from 0.0287 in 2011 to 0.0363 in 2017. In terms of the highest negative effect, it is found in the likelihood of reporting no children with -0.0640 for 2006, -0.0531 in 2011, and -0.0788 in 2017.

For the monthly and annual attendance, as Table 6, Table 7, and Table 8 illustrate, compared to those women that report not attending any religious event, those who attend on a monthly or annual basis are also associated with a lower likelihood of reporting fewer amount of children, specifically reporting category 1 (i.e., "None" children) and category 2 (i.e., one child), while having a higher likelihood of reporting two or more children for 2006. As mentioned previously, for 2011 and 2017 only the monthly attendance remains statistically significant with the same effect but different magnitudes. The highest negative effects are also found in the likelihood of reporting no children (i.e., category 1), while the highest positive effects are found in the likelihood of reporting three children (i.e., category 4). Interestingly, as results for religious variables suggest the fact that a woman has any religious affiliation and a certain level of religious engagement measured through her attendance to any religious events has an effect on the fact that women decide to have more children. However, important differences across denominations or specific fertility beliefs may provide more accurate information about what is behind this relationship.

For the type of zone, as Table 6, Table 7, and Table 8 indicate, the fact that a woman resides in an urban zone in contrast to those who reside in a rural zone, is associated with higher probabilities of having fewer children, more specifically, higher probabilities of belonging to categories "None" or "One child", while decreasing the likelihood of falling into categories that report a higher amount of children. The variable is found to be statistically significant for the three years, and its highest positive effect is also found on the likelihood of reporting category one (i.e., "None") with an increasing magnitude of 0.0388 in 2006, 0.0616 in 2011, and 0.0782 in 2017. The highest negative effects are found in the likelihood of reporting three children (i.e., belonging to category 4) with an increasing negative effect of -0.0211 in 2006, -0.0333 in 2011, and -0.0360 in 2017.

Concerning the parental international status, in 2006 neither the maternal, nor paternal international status are statistically significant. However, this changed in 2011 and 2017. As Table 7 indicates, for 2011 only the fact that a woman's father was born outside Canada is associated with a higher likelihood of belonging to categories that report fewer amount of children, more specifically categories 1 and 2, while decreasing the likelihood of reporting two or more children. However, as Table 8 illustrates, in 2017 is only the fact that a woman's mother was born outside Canada that is found to be statistically significant but with the same effect that was found for international fathers. The fact that a woman's mother is international is associated with lower a likelihood of reporting two or more children (i.e., categories 3 - 7) and a higher likelihood of belonging to categories that report being childless or having only one child. An interesting observation is that between these two effects, the biggest one in terms of magnitudes is the one reported by having an international father in 2011, with the highest positive effect found in the likelihood of remaining childless (0.0350) and the highest negative effect found in the likelihood of reporting three children with a coefficient of -0.0189.

Lastly, for the birth-control variables, it can be observed that most of them in 2006 and all of them in 2011 and 2017 are found statistically significant exhibiting different effects on the number of children. Taking being born during the 1940s as the reference, being born before and during the 1930s is associated with a lower likelihood of belonging to lower categories of the number of children while increasing the likelihood of reporting two or more children. However, being born after the 1940s is associated with the opposite effect, having a higher likelihood of reporting being childless or having only one child and reducing the likelihood of reporting two or more children. It is important to highlight that the variable that encompasses being born during the 1980s or after has the highest effects in terms of magnitudes among these variables either for the positive effect of belonging to category 1 (0.5511) or the negative effect of belonging to category 4 (-0.3001). This may suggest the existence of a cohort effect on the decision of having a certain number of children possibly due to some specific social, economic, labor, or cultural conditions that prevailed during those time periods.

5.2 Age at First Child

For the second model regarding the age of women at the time their first child is born, education maintains a significant effect on this fertility choice. Table 10, Table 11, and Table 12 present the marginal effects for 2006, 2011, and 2017 respectively, and they are derived from the ordered logit model estimated for those women who reported having at least one child. As the results suggest, for this model the three levels of education are found to be statistically significant for all categories except category 2 (i.e., having a first child between 21 - 30 years old) in 2006. Compared to those women who reported having college as their highest degree attained, having less than high school and high school degrees are associated with higher likelihoods of reporting a first child at a younger age, specifically belonging to category 1 (i.e., at 20 years old or younger), while increasing the likelihood of belonging to categories 3 and 4 that report having a first child at an older age. The opposite effect is found for those who reported having a university degree as the highest level attained, which is associated with a lower likelihood of reporting a first child at a younger age (specifically categories 1) and a higher likelihood of belonging to category 3 (i.e., having a first child at 31 - 40 years old) and category 4 (i.e., having a first child older than 40 years old). These effects remain the same for 2011 and 2017 as Table 9 and Table 12 indicate.

Regarding the magnitude of the variables' effect, for less than high school and high school education, the highest positive effects are found in the likelihood of belonging to category 1 (i.e., having a child at 20 years old or younger), while the highest negative effects are found in the likelihood of reporting a first child between 31 to 40 years old (i.e., category 3). For university education, the highest effect are found on the same categories but with opposite effects, having the highest positive influence in the likelihood of category 1 and the highest negative influence in the likelihood of belonging to category 3.

For the region of residence, Table 8 shows that for 2006 only Quebec, Prairie, and Atlantic are statistically significant, however, this is only for categories 1, 3, and 4. For 2011, Table 11 indicates that only Quebec is statistically significant for all categories, and for 2017, Table 12 shows that only Prairie and Atlantic are statistically significant for all categories. In comparison to residing on West Coast, in 2006 living in Quebec is associated with a lower likelihood of belonging to categories 1 and 2, which are the lowest categories in terms of age at child one, while increasing the likelihood of falling into higher categories, specifically into categories 3 and 4 (i.e., reporting a first child between 31 - 40 years old or older). These effects remain the same for 2011 but with different magnitudes.

The opposite effect is found in Prairie and Atlantic, where in 2006 residing in these regions is associated with a higher likelihood of reporting a first child at a younger age, specifically belonging to categories 1 and 2, and a lower likelihood of reporting a first child between 31 to 40 years old or older (i.e., categories 3 and 4). These effects also remained the same for 2017 but with different magnitudes. Two noteworthy aspects can be highlighted, 1) Among the statistically significant region variables, Quebec is the only one that has a positive impact on having a first child at an older age, and 2) As in the case of the previous results, the highest effects of these region variables are found on the marginal coefficients of category 1 (20 years or younger), and category 3 (between 31 and 40 years) for the three years.

Regarding the factor of religious affiliation, the results are found statistically significant in 2006 for categories 1, 3, and 4. As Table 10 shows, in comparison to reporting no religious affiliation, being religiously affiliated is associated with a higher likelihood of belonging to category 1, which means reporting a first child at 20 years old or younger, and a lower likelihood of belonging to categories 3 and 4, which report a first child between 31 - 40 years or older than 40 years old. Surprisingly, the variable is not found statistically significant for 2011 and 2017.

For the level of religious involvement proxied with religious attendance variables, for 2006, Table 10 indicates that only weekly and monthly attendance are statistically significant, however, this is only for categories 1, 3, and 4. In comparison with not attending any religious events, in 2006 attending on a weekly and monthly basis is associated with a higher likelihood of falling into higher categories of age (i.e., categories 3 and 4), while reducing the likelihood of category 1 (i.e., reporting a first child at 20 years old or younger). For 2011, no coefficient is found statistically significant, while for 2017, only annual assistance is found statistically significant, with the same effect as weekly and monthly attendance, that is a higher likelihood for higher categories of age and a lower likelihood of falling into categories 1 and 2 (i.e., reporting a first child at a younger age) as Table 12 illustrates. Once again, the highest effects (both positive and negative) are found in the likelihood of reporting categories 1 and 3.

For the effect of urbanity, as Table 10, Table 11, and Table 12 indicate, the variable is found statistically significant for the three years, except for category 2 in 2006. Results suggest that in 2006, 2011, and 2017, in comparison to residing in a rural zone, living in an urban area is associated with a higher likelihood of reporting a first child between 31 to 40 years old or older (i.e., belonging to categories 3 and 4), and a lower likelihood of belonging to categories 1 and 2, which report a first child at a younger age. The highest positive effect is found in the likelihood of belonging specifically to category 3 with an increasing coefficient of 0.0239 in 2006, 0.0440 in 2011, and 0.0509 in 2017. For the highest negative effect, it is found in the likelihood of belonging to category 1 with a coefficient of -0.0249 in 2006, -0.0390 in 2011, and -0.0339 in 2017.

Regarding the parental international status, as Table 10 reports, in 2006 both having an international mother and an international father are found statistically significant. However, this is only for categories 1, 3, and 4 for international mothers and categories 1 and 3 for international fathers. Interestingly, compared to those who reported having a mother and/or a father born in Canada, having an international mother is associated with a lower probability of reporting a first child at a younger age while increasing the likelihood of belonging to categories 3 and 4 that report a first child between 31 to 40 years old or older. Different magnitudes but the same effect is found in 2006 for those who reported having an international father. As Table 11 indicates, only international mother is found to be statistically significant for 2011 with the same effect as in 2006. Surprisingly, neither having an international mother and/or father are found statistically significant in 2017.

Lastly, for the birth-control variables, it can be observed in Table 10, Table 11, and Table 12 that most of them are found statistically significant, except for category 2 and the variable that reports if women were born during the 1970s in 2006, and for the variables that report if women were born before or during 1930s, 1950s and 1980s or after, in 2017. Interestingly, for 2006 compared to those who were born during the 1940s, only being born during and after the 1980s is associated with a higher likelihood of reporting a first child at 20 years old or younger, and between 31 to 40 years old (i.e., belonging to categories 1 and 3), while decreasing the likelihood of belonging to category 4 which reports a first child at 40 years old or older. This effect continues in 2011, however, the positive effect is only found in the likelihood of category 1 and category 2 and the effect changes in 2017 to be positive only in categories 3 and 4. However, this last year's effect is not statistically significant.

6 Conclusions

In the present research, two ordered logit models estimated with maximum likelihood (MLE) are proposed to analyze the influence of different socio-demographic factors on two relevant fertility decisions: the number of children and the age of women when they have their first child. The analysis is done for Canada for the years 2006, 2011, and 2017 employing data from the Canadian Social Survey and accounting for a potential cohort effect through the incorporation of birth-control variables. Main results suggest that as has been found by previous literature, higher levels of education are associated with lower probabilities of reporting a higher category of number of children, and lower probabilities of reporting having a first child at a younger age.

The results regarding the region of residence show more inconsistency in terms of statistical significance. Specifically, Quebec is the only region that is associated with a lower likelihood of reporting higher categories of the number of children, while regions like Prairie and surprisingly, Ontario in 2017 are found to be associated with a likelihood of reporting a higher amount of children. Additionally, these regions also report having an impact on the age of women when they have a first child. However, only Quebec is found to be associated with a higher probability of reporting a first child at an older age, while the rest of the statistically significant regions are linked to higher probabilities to report a first child at a younger age.

Regarding one of the most controversial variables, religious engagement proxied with religious affiliation and the attendance to religious events, main findings are similar to those reported by Dilmaghani (2019), where reporting a religious affiliation, and a weekly, monthly, or annual attendance to religious events are associated with higher probabilities of reporting higher categories of number of children. This supports previous hypotheses that highlight a possible influence of religion on fertility through the strong feeling of attachment of women to religious fertility norms. However, for the age of women at first child, religious attendance presented the opposite effect, reporting a higher likelihood of having a first child at an older age. A possible explanation for this could be the difference in fertility teachings and beliefs concerning aspects like contraceptives, marriage, sex, and related topics among religious denominations.

Other factors such as urbanity presented a consistently negative effect on the likelihood of reporting a category with a higher number of children, and a positive effect on the likelihood of reporting the first child at an older age. This may be due to the fact that urban zones can be associated with different economic environments, better access to education and career opportunities, and different lifestyles compared to rural zones, which makes the effect of urban zones to be consistent across years. In contrast, this consistency is not found for the possible cultural influence proxied with parental immigration status, where the fact that the father or mother was born outside of Canada has different effects depending on the dependent variable, year, and specific marginal category, which suggest that this type of proxy can not be very helpful to obtain reliable and consistent results. A possible suggestion may be the use of a variable that includes the specific continent, country, or region of origin and observe detailed differences.

Accounting for possible cohort effects through the incorporation of birth-control variables that account for possible differences among generations of women, also provides valuable information about how the decade of birth may affect these fertility decisions. It is found that women born after the 1930s and 1940s are more likely to have fewer amount of children. However, when concerning the age of women when they had their first child, being born during the 1930s, 1940s, 1950s, or 1960s, is found to be associated with reporting a first child at an older age, while being born in the last decades appears to increase the likelihood of having a first child at a younger age. It is important to highlight that birth-control variables can account for any possible underlying effect of a specific social, economic, or cultural environment in a time period, but the interpretation of these variables requires further analysis of other factors such as the average age of marriage during these years, which can affect the age of women when they had a first child, among other important and relevant factors that influence these cohort effects.

Considerable attention should be given to the underlying assumptions of ordered models. In particular, this type of model assumes that the relationship between independent and dependent variables remains consistent across all categories of the response variable. Further examination can be helpful to assess the validity of this assumption and to improve the structure of the model and the selection of variables. However, the present research offers valuable insights into the potential influences of different socio-demographic factors on fertility decisions. Extensive analyses have been conducted on these factors, particularly the impact of education levels, which as the results suggest, continues to have a significant effect on women's fertility preferences, specifically on the decision of having few children at an older age. The same attempt is observed for subjective variables such as religion or culture, where different authors have tried to measure or quantified these effects on fertility preferences. However, observing the real nature of this relationship is challenging given the underlying endogenous aspects that are unobserved at the moment of the decision.

The development of analyses with datasets or statistical techniques focused exclusively in these areas can help to develop and improve strategies and models that allow a better understanding of the real effect and magnitude of the influence of these aspects on choices regarding fertility and their complex interaction. This, in turn, can provide valuable information for the creation of policies that aim to maintain a balanced population growth to maintain economic equilibrium and avoid potential difficulties pertaining to demographic changes.

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7 Appendix

Table 1: Distribution of Women by Dependent Variable

Number of children	2006		2011		2017	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
None	3,750	30.63	2,956	25.99	2,856	28.64
One child	1,874	15.31	1,608	14.14	1,444	14.48
Two children	3,438	28.08	3,509	30.85	3,170	31.79
Three children	1,818	14.85	1,900	16.70	1,542	15.46
Four children	742	6.06	788	6.93	588	5.90
Five children	289	2.36	304	2.67	206	2.07
Six children or more	333	2.72	309	2.72	167	1.67
Total	12,244	100	11,374	100	9,973	100
Age at first child						
Less or equal to 20	1,537	18.10	1,422	16.89	1,010	14.19
21 - 30	5,673	66.79	5,601	66.54	4,658	65.45
31 - 40	1,233	14.52	1,311	15.57	1,355	19.04
More than 40	51	0.60	84	1.00	94	1.32
Total	8,494	100	8,418	100	7,117	100

Note: Table 1 shows the frequency and percentage distribution of each category for the variables "Number of children" and "Age of woman at the first child" for the years 2006, 2011, and 2017. For the age of women at child one, the total number of observations corresponds to the total number of observations in the sample for the "Number of children", excluding the number of women in the "None" category.

Table 2: Distribution of Women by Independent Variable

Independent variable	2006		2011		2017	
Education	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Lesshs	2,390	19.52	2,235	19.65	1,423	14.27
HS	3,451	28.19	3,230	28.4	2,741	27.48
College	3,671	29.98	3,263	28.69	2,600	26.07
University	2,732	22.31	2,646	23.26	3,209	32.18
Total	**12,244**	**100**	**11,374**	**100**	**9,973**	**100**
Region						
Quebec	2,356	19.24	2,046	17.99	1,842	18.47
Ontario	3,799	31.03	3,101	27.26	2,794	28.02
Prairie	2,247	18.35	2,779	24.43	1,880	18.85
Atlantic	2,457	20.07	2,134	18.76	2,288	22.94
West Coast	1,385	11.31	1,314	11.55	1,169	11.72
Total	**12,244**	**100**	**11,374**	**100**	**9,973**	**100**
Religion Affiliation						
Affiliated	10,271	83.89	9,496	83.49	8,254	82.76
Non-affiliated	1,973	16.11	1,878	16.51	1,719	17.24
Total	**12,244**	**100**	**11,374**	**100**	**9,973**	**100**
Religion Attendance						
Nonattendance	4,430	36.18	4,442	39.05	4,464	44.76
Attendanceyear	3,658	29.88	3,296	28.98	2,632	26.39
Attendanceweek	2,840	23.20	2,442	21.47	1,859	18.64
Attendancemonth	1,316	10.75	1,194	10.50	1,018	10.21
Total	**12,244**	**100**	**11,374**	**100**	**9,973**	**100**
International mother						
International	3,295	26.91	3,190	28.05	2,905	29.13
Canadian	8,949	73.09	8,184	71.95	7,068	70.87
Total	**12,244**	**100**	**11,374**	**100**	**9,973**	**100**
International father						
International	3,508	28.65	3,444	30.28	6,916	30.65
Canadian	8,736	71.35	7,930	69.72	3,057	69.35
Total	**12,244**	**100**	**11,374**	**100**	**9,973**	**100**
Urban Zone						
Urban	11,006	89.89	8,505	74.78	7,753	77.74
Rural	1,238	10.11	2,869	25.22	2,220	22.26
Total	**12,244**	**100**	**11,374**	**100**	**9,973**	**100**
Birth-control variables						
befon30s	2,144	17.51	1,789	15.73	865	8.67
on40s	1,902	15.53	1,828	16.07	1,514	15.18
on50s	2,254	18.41	2,299	20.21	2,024	20.29
on60s	2,348	19.18	1,917	16.85	1,603	16.07
on70s	1,989	16.24	1,701	14.96	1,426	14.30
onaf80s	1,607	13.13	1,840	16.18	2,541	25.48
Total	**12,244**	**100**	**11,374**	**100**	**9,973**	**100**

Note: Table 2 shows the frequency and percentage distribution of women by each independent variable for the years 2006, 2011, and 2017.

Table 3: Number of Children - Predicted Probabilities for 2006, 2011, and 2017

Categories	2006		2011		2017	
	Predicted	**Actual percent**	**Predicted**	**Actual percent**	**Predicted**	**Actual percent**
None	27.874	30.63	23.696	25.99	28.353	28.64
One child	14.182	15.31	12.910	14.14	13.125	14.48
Two children	29.211	28.08	32.070	30.85	31.428	31.79
Three children	17.103	14.85	18.686	16.70	16.768	15.46
Four children	6.530	6.06	7.559	6.93	6.270	5.90
Five children	2.600	2.36	2.713	2.67	2.046	2.07
Six children or more	2.500	2.72	2.366	2.72	2.010	1.67
Number of Obs.	12,244		11,374		9,973	

Note: Table 3 presents the predicted probabilities derived from the ordered logit model for the number of children for the years 2006, 2011, and 2017. The "Predicted" section displays the calculated probabilities. On the other hand, the "Actual percent", section displays the actual percentage distribution observed when analyzing the descriptive statistics of the dependent variable in Table 1. The values for the predicted probabilities have been rounded to three decimal places for simplicity.

Table 4: Age at Child One - Predicted Probabilities for 2006, 2011, and 2017

Categories	2006		2011		2017	
	Predicted	**Actual percent**	**Predicted**	**Actual percent**	**Predicted**	**Actual percent**
≤ 20	18.988	18.10	16.678	16.89	13.035	14.19
21-30	66.318	66.79	67.454	66.54	66.595	65.45
31-40	14.111	14.52	15.073	15.57	19.113	19.04
> 40	0.0581	0.60	0.079	1.00	1.255	1.32
Number of obs.	8,494		8,418		7,117	

Note: Table 4 presents the predicted probabilities derived from the ordered logit model for the age of women at child one for the years 2006, 2011, and 2017. The "Predicted" section displays the calculated probabilities. On the other hand, the "Actual percent", section displays the actual percentage distribution observed when analyzing the descriptive statistics of the dependent variable in Table 1. The values for the predicted probabilities have been rounded to three decimal places for simplicity.

Table 5: Number of Children - Ordered Logit Estimations for 2006, 2011, and 2017

	Dependent variable: **numberofchild**					
	2006		**2011**		**2017**	
	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
Education						
Lesshs	.4564	0.000	.0137	0.844	.0205	0.817
HS	.0795	0.120	-.0723	0.215	-.0109	0.869
University	-.4106	0.000	-.3197	0.000	-.0767	0.224
Region						
Quebec	-.2510	0.001	-.1625	0.044	.0214	0.801
Ontario	-.0918	0.164	-.0014	0.984	.1820	0.015
Prairie	.2204	0.003	.2063	0.005	.3460	0.000
Atlantic	.1312	0.092	-.1255	0.133	-.0193	0.829
Religion						
religionaff	.1983	0.001	.2411	0.000	.2782	0.000
attendanceweek	.4799	0.000	.3815	0.000	.4875	0.000
attendancemonth	.3851	0.000	.2264	0.000	.3013	0.000
attendanceyear	.1625	0.001	.0396	0.455	.0310	0.604
Type of zone						
urban	-.2909	0.000	-.4420	0.000	-.4840	0.000
Parental international status						
internatmoth	-.0895	0.193	.0512	0.470	-.1792	0.036
internathfath	-.0215	0.751	-.2513	0.000	.0245	0.771
Birth-control variables						
befon30s	.7309	0.000	.7526	0.000	1.1892	0.000
on50s	-.1110	0.084	-.4025	0.000	-.2967	0.000
on60s	-.3015	0.000	-.4768	0.000	-.3570	0.000
on70s	-1.0558	0.000	-.5897	0.000	-.3378	0.000
onaf80s	-4.1304	0.000	-3.2155	0.000	-2.4930	0.000
cut1	-1.7366		-2.2918		-1.8549	
cut2	-.8208		-1.4220		-1.0619	
cut3	.7565		.2621		.6361	
cut4	2.0439		1.5703		1.9910	
cut5	3.0038		2.6314		3.0742	
cut6	3.7700		3.4482		3.8264	
Number of observations	**12,244**		**11,374**		**9,973**	

Note: Table 5 shows the estimated results of the ordered logit model for the number of children for the years 2006, 2011, and 2017. The estimates are presented with a precision of up to four decimal places without rounding. In addition, the table includes the coefficients corresponding to the thresholds denoted as "cuts", which indicate the impact of the independent variable on the transition between categories. Given that there are four categories of the dependent variable, three cuts are presented given that one category is selected as the reference. The variables that are disaggregated into more than two indicator variables (i.e., Education, Region, Religion, and the Birth-control) have one variable designated as the reference. These references are, "College" for Education, "West Coast" for Region, "Non-attendance" for Religion, and "on40s" for Birth-control variables.

Table 6: Number of Children - Marginal effects for 2006

	2006						
	(1) **None**	(2) **One**	(3) **Two**	(4) **Three**	(5) **Four**	(6) **Five**	(7) **Six or more**
Education							
Lesshs	-.0609	-.0172	.0081	.0331	.0189	.0087	.0091
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
HS	-.0106	-.0030	.0014	.0057	.0033	.0015	.0015
	(0.119)	(0.120)	(0.125)	(0.119)	(0.120)	(0.123)	(0.122)
University	.0547	.0155	-.0073	-.0298	-.0170	-.0078	-.0082
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Region							
Quebec	.0334	.0095	-.0045	-.0182	-.0104	-.0048	-.0050
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Ontario	.0122	.0034	-.0016	-.0066	-.0038	-.0017	-.0018
	(0.164)	(0.164)	(0.167)	(0.164)	(0.165)	(0.165)	(0.166)
Prairie	-.0294	-.0083	.0039	.0160	.0091	.0042	.0044
	(0.003)	(0.003)	(0.006)	(0.003)	(0.003)	(0.004)	(0.004)
Atlantic	-.0175	-.0049	.0023	.0095	.0054	.0025	.0026
	(0.092)	(0.092)	(0.107)	(0.092)	(0.091)	(0.093)	(0.092)
Religion							
religionaff	-.0264	-.0075	.0035	.0144	.0082	.0037	.0039
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
attendanceweek	-.0640	-.0181	.0086	.0348	.0199	.0091	.0095
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
attendancemonth	-.0513	-.0145	.0069	.0279	.0160	.0073	.0076
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
attendanceyear	-.0216	-.0061	.0029	.0118	.0067	.0031	.0032
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
Type of zone							
urban	.0388	.0110	-.0052	-.0211	-.0120	-.0055	-.0058
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Parental international status							
internatmoth	.0119	.0033	-.0016	-.0065	-.0037	-.0017	-.0017
	(0.193)	(0.193)	(0.197)	(0.193)	(0.194)	(0.193)	(0.194)
internathfath	.0028	.0008	-.0003	-.0015	-.0008	-.0004	-.0004
	(0.751)	(0.751)	(0.751)	(0.751)	(0.751)	(0.751)	(0.751)
Birth-control variables							
befon30s	-.0975	-.0276	.0131	.0531	.0303	.0139	.0145
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
on50s	.0148	.0042	-.0019	-.0080	-.0046	-.0021	-.0022
	(0.084)	(0.083)	(0.091)	(0.083)	(0.085)	(0.085)	(0.086)
on60s	.0402	.0114	-.0054	-.0219	-.0125	-.0057	-.0060
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
on70s	.1408	.0399	-.0189	-.0767	-.0438	-.0201	-.0210
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
onaf80s	.5511	.1563	-.0741	-.3001	-.1716	-.0790	-.0824
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Note: Effects are reported with a precision of up to four decimal places without rounding. Values inside "()" represent the corresponding p-value for each coefficient. The reference categories for the variables that are dissagregated into more than two indicators are "College" for Education, "West Coast" for Region, "Non-attendance" for Religion, and "on40s" for Birth-control variables.

Table 7: Number of Children - Marginal effects for 2011

	2011						
	(1) **None**	(2) **One**	(3) **Two**	(4) **Three**	(5) **Four**	(6) **Five**	(7) **Six or more**
Education							
Lesshs	-.0019	-.0004	.0002	.0010	.0006	.0002	.0002
	(0.844)	(0.844)	(0.844)	(0.844)	(0.844)	(0.844)	(0.844)
HS	.0100	.0021	-.0010	-.0054	-.0032	-.0013	-.0012
	(0.215)	(0.214)	(0.227)	(0.215)	(0.214)	(0.214)	(0.217)
University	.0445	.0095	-.0046	-.0240	-.0141	-.0057	-.0053
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Region							
Quebec	.0226	.0048	-.0023	-.0122	-.0072	-.0029	-.0027
	(0.044)	(0.044)	(0.058)	(0.044)	(0.044)	(0.046)	(0.046)
Ontario	.0001	.00004	-.00002	-.0001	-.00006	-.00002	-.00002
	(0.984)	(0.984)	(0.984)	(0.984)	(0.984)	(0.984)	(0.984)
Prairie	-.0287	-.0061	.0030	.0155	.0091	.0037	.0034
	(0.005)	(0.005)	(0.014)	(0.005)	(0.005)	(0.006)	(0.006)
Atlantic	.0174	.0037	-.0018	-.0094	-.0055	-.0022	-.0021
	(0.133)	(0.133)	(0.136)	(0.134)	(0.135)	(0.136)	(0.137)
Religion							
religionaff	-.0336	-.0072	.0035	.0181	.0107	.0043	.0040
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
attendanceweek	-.0531	-.0114	.0055	.0287	.0169	.0069	.0064
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
attendancemonth	-.0315	-.0067	.0033	.0170	.0100	.0040	.0038
	(0.004)	(0.004)	(0.008)	(0.004)	(0.004)	(0.004)	(0.004)
attendanceyear	-.0055	-.0011	.0005	.0029	.0017	.0007	.0006
	(0.455)	(0.455)	(0.458)	(0.455)	(0.455)	(0.455)	(0.456)
Type of zone							
urban	.0616	.0132	-.0064	-.0333	-.0196	-.0080	-.0074
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Parental international status							
internatmoth	-.0071	-.0015	.0007	.0038	.0022	.0009	.0008
	(0.470)	(0.470)	(0.474)	(0.470)	(0.470)	(0.470)	(0.472)
internathfath	.0350	.0075	-.0036	-.0189	-.0111	-.0045	-.0042
	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.001)
Birth-control variables							
befon30s	-.1048	-.0225	.0109	.0567	.0334	.0136	.0126
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
on50s	.0560	.0120	-.0058	-.0303	-.0178	-.0072	-.0067
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
on60s	.0664	.0142	-.0069	-.0359	-.0211	-.0086	-.0080
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
on70s	.0821	.0176	-.0086	-.0444	-.0261	-.0106	-.0099
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
onaf80s	.4480	.0962	-.0469	-.2423	-.1427	-.0582	-.0541
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Note: Effects are reported with a precision of up to four decimal places without rounding. Values inside "()" represent the corresponding p-value for each coefficient. The reference categories for the variables that are dissagregated into more than two indicators are "College" for Education, "West Coast" for Region, "Non-attendance" for Religion, and "on40s" for Birth-control variables.

Table 8: Number of Children - Marginal effects for 2017

	2017						
	(1) **None**	(2) **One**	(3) **Two**	(4) **Three**	(5) **Four**	(6) **Five**	(7) **Six or more**
Education							
Lesshs	-.0033	-.0003	.0007	.0015	.0008	.0003	.0003
	(0.817)	(0.817)	(0.817)	(0.817)	(0.817)	(0.817)	(0.818)
HS	.0017	.0001	-.0003	-.0008	-.0004	-.0001	-.0001
	(0.869)	(0.869)	(0.869)	(0.869)	(0.869)	(0.869)	(0.869)
University	.0124	.0013	-.0026	-.0057	-.0030	-.0011	-.0011
	(0.224)	(0.224)	(0.225)	(0.225)	(0.224)	(0.226)	(0.227)
Region							
Quebec	-.0034	-.0003	.0007	.0015	.0008	.0003	.0003
	(0.801)	(0.801)	(0.801)	(0.801)	(0.801)	(0.801)	(0.801)
Ontario	-.0294	-.0031	.0063	.0135	.0071	.0026	.0028
	(0.015)	(0.015)	(0.015)	(0.016)	(0.017)	(0.017)	(0.019)
Prairie	-.0559	-.0059	.0120	.0257	.0136	.0050	.0053
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Atlantic	.0031	.0033	-.0006	-.0014	-.0007	-.0002	-.0002
	(0.829)	(0.829)	(0.829)	(0.829)	(0.829)	(0.829)	(0.830)
Religion							
religionaff	-.0449	-.0047	.0096	.0207	.0109	.0040	.0043
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
attendanceweek	-.0788	-.0083	.0169	.0363	.0192	.0071	.0075
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
attendancemonth	-.0487	-.0051	.0104	.0224	.0118	.0044	.0046
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)
attendanceyear	-.0050	-.0005	.0010	.0023	.0012	.0004	.0004
	(0.604)	(0.604)	(0.604)	(0.604)	(0.604)	(0.604)	(0.603)
Type of zone							
urban	.0782	.0082	-.0168	-.0360	-.0190	-.0070	-.0075
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Parental international status							
internatmoth	.0289	.0030	-.0062	-.0133	-.0070	-.0026	-.0027
	(0.035)	(0.036)	(0.039)	(0.035)	(0.037)	(0.039)	(0.041)
internathfath	-.0039	-.0004	.0008	.0018	.0009	.0003	.0003
	(0.771)	(0.771)	(0.771)	(0.771)	(0.771)	(0.771)	(0.771)
Birth-control variables							
befon30s	-.1923	-.0203	.0413	.0886	.0469	.0174	.0184
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
on50s	.0479	.0050	-.0103	-.0221	-.0117	-.0043	-.0045
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
on60s	.0577	.0061	-.0124	-.0266	-.0140	-.0052	-.0055
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
on70s	.0546	.0057	-.0117	-.0251	-.0133	-.0049	-.0052
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
onaf80s	.4031	.0427	-.0866	-.1857	-.0983	-.0365	-.0386
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Note: Effects are reported with a precision of up to four decimal places without rounding. Values inside "()" represent the corresponding p-value for each coefficient. The reference categories for the variables that are dissagregated into more than two indicators are "College" for Education, "West Coast" for Region, "Non-attendance" for Religion, and "on40s" for Birth-control variables.

Table 9: Age at Child One - Ordered Logit Estimations for 2006, 2011, and 2017

	Dependent variable: **ageatchild1**					
	2006		**2011**		**2017**	
	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
Education						
Lesshs	-.9117	0.000	-1.1662	0.000	-1.2385	0.000
HS	-.1573	0.029	-.2785	0.001	-.6413	0.000
University	.9964	0.000	1.0660	0.000	.7616	0.000
Region						
Quebec	.3122	0.004	.2869	0.007	.0360	0.771
Ontario	-.0477	0.626	.0472	0.637	-.1318	0.243
Prairie	-.3011	0.005	-.0743	0.470	-.2865	0.025
Atlantic	-.4340	0.000	-.2021	0.074	-.4389	0.001
Religion						
religionaff	-.2369	0.013	-.1136	0.224	-.2012	0.063
attendanceweek	.2767	0.001	.0011	0.989	.1512	0.105
attendancemonth	.3731	0.000	.1901	0.067	.1421	0.236
attendanceyear	.0897	0.217	-.0072	0.923	.2110	0.013
Type of zone						
urban	.1998	0.024	.3576	0.000	.3635	0.000
Parental international status						
internatmoth	.2838	0.002	.2954	0.007	.1414	0.215
internathfath	.1843	0.046	.0336	0.758	.0813	0.474
Birth-control variables						
befon30s	.4132	0.000	.5501	0.000	.2188	0.051
on50s	.2803	0.001	.2345	0.009	.1408	0.170
on60s	.5686	0.000	.6976	0.000	.5564	0.000
on70s	.0215	0.816	.4796	0.000	.8697	0.000
onaf80s	-.6671	0.000	-.5565	0.000	.0375	0.735
cut1	-1.3646		-1.4220		-1.9307	
cut2	2.2925		2.4218		1.8549	
cut3	5.7908		5.7309		5.0150	
Number of observations	**8,494**		**8,418**		**7,117**	

Note: Table 9 shows the estimated coefficients of the ordered logit model for the age of women at child one, for the years 2006, 2011, and 2017. The estimates are presented with a precision of up to four decimal places without rounding. In addition, the table includes the coefficients corresponding to the thresholds denoted as "cuts", which indicate the impact of the independent variable on the transition between categories. Given that there are four categories of the dependent variable, three cuts are presented given that one category is selected as the reference. The variables that are disaggregated into more than two indicator variables (i.e., Education, Region, Religion, and Birth-control variables) have one variable designated as the reference. These references are, "College" for Education, "West Coast" for Region,"Non-attendance" for Religion, and "on40s" for Birth-control variables.

Table 10: Age at Child One - Marginal effects for 2006

	2006			
	(1)	(2)	(3)	(4)
	≤20	**21 - 30**	**31-40**	**> 40**
Education				
Lesshs	.1135	.0018	-.1094	-.0060
	(0.000)	(0.624)	(0.000)	(0.000)
HS	.0196	.0003	-.0188	-.0010
	(0.029)	(0.634)	(0.029)	(0.037)
University	-.1241	-.0020	.1196	.0065
	(0.000)	(0.620)	(0.000)	(0.000)
Region				
Quebec	-.0389	-.0006	.0374	.0020
	(0.004)	(0.623)	(0.004)	(0.007)
Ontario	.0059	.00009	-.0057	-.0003
	(0.626)	(0.734)	(0.626)	(0.628)
Prairie	.0375	.0006	-.0361	-.0019
	(0.004)	(0.635)	(0.005)	(0.010)
Atlantic	.0540	.0008	-.0521	-.0028
	(0.000)	(0.635)	(0.000)	(0.001)
Religion				
religionaff	.0295	.0004	-.0284	-.0015
	(0.013)	(0.631)	(0.013)	(0.017)
attendanceweek	-.0344	-.0005	.0332	.0018
	(0.000)	(0.625)	(0.001)	(0.002)
attendancemonth	-.0464	-.0007	.0447	.0024
	(0.000)	(0.625)	(0.000)	(0.001)
attendanceyear	-.0111	-.0001	.0107	.0005
	(0.217)	(0.642)	(0.216)	(0.226)
Type of zone				
urban	-.0249	-.0004	.0239	.0013
	(0.024)	(0.632)	(0.025)	(0.033)
Parental international status				
internatmoth	-.0353	-.0005	.0340	.0018
	(0.002)	(0.628)	(0.002)	(0.006)
internathfath	-.0229	-.0003	.0221	.0012
	(0.046)	(0.631)	(0.046)	(0.057)
Birth-control variables				
befon30s	-.0514	-.0008	.0496	.0027
	(0.000)	(0.626)	(0.000)	(0.000)
on50s	-.0349	-.0005	.0336	.0018
	(0.001)	(0.634)	(0.002)	(0.004)
on60s	-.0708	-.0011	.0682	.0037
	(0.000)	(0.626)	(0.000)	(0.000)
on70s	-.0026	-.00004	.0025	.00010
	(0.816)	(0.839)	(0.816)	(0.816)
onaf80s	.0831	.0013	.0800	-.0044
	(0.000)	(0.627)	(0.000)	(0.000)

Note: Effects are reported with a precision of up to four decimal places without rounding. Values inside "()" represent the corresponding p-value for each coefficient. The reference categories for the variables that are dissagregated into more than two indicators are "College" for Education, "West Coast" for Region, "Non-attendance" for Religion, and "on40s" for Birth-control variables.

Table 11: Age at Child One - Marginal effects for 2011

	2011			
	(1)	(2)	(3)	(4)
	≤20	**21 - 30**	**31-40**	**> 40**
Education				
Lesshs	.1273	.0269	-.1435	-.0107
	(0.000)	(0.000)	(0.000)	(0.000)
HS	.0304	.0064	-.0342	-.0025
	(0.001)	(0.003)	(0.001)	(0.001)
University	-.1163	-.0246	.1312	.0097
	(0.000)	(0.000)	(0.000)	(0.000)
Region				
Quebec	-.0313	-.0066	.0353	.0026
	(0.008)	(0.014)	(0.007)	(0.012)
Ontario	-.0051	-.0010	.0058	.0004
	(0.637)	(0.640)	(0.637)	(0.638)
Prairie	.0081	.0017	-.0091	-.0006
	(0.469)	(0.480)	(0.470)	(0.472)
Atlantic	.0220	.0046	-.0248	-.0018
	(0.072)	(0.101)	(0.075)	(0.082)
Religion				
religionaff	.0124	.0026	-.0139	-.0010
	(0.223)	(0.236)	(0.224)	(0.228)
attendanceweek	-.0001	-.00002	.0001	.00001
	(0.989)	(0.989)	(0.989)	(0.989)
attendancemonth	-.0207	-.0043	.0233	.0017
	(0.068)	(0.082)	(0.068)	(0.075)
attendanceyear	.0007	.0001	-.0008	-.00006
	(0.923)	(0.923)	(0.923)	(0.923)
Type of zone				
urban	-.0390	-.0082	.0440	.0032
	(0.000)	(0.000)	(0.000)	(0.000)
Parental international status				
internatmoth	-.0322	-.0068	.0363	.0027
	(0.007)	(0.015)	(0.007)	(0.012)
internathfath	-.0036	-.0007	.0041	.0003
	(0.758)	(0.759)	(0.758)	(0.759)
Birth-control variables				
befon30s	-.0600	-.0127	.0677	.0050
	(0.000)	(0.000)	(0.000)	(0.000)
on50s	-.0256	-.0054	.0288	.0021
	(0.009)	(0.022)	(0.009)	(0.014)
on60s	-.0761	-.0161	.0858	.0064
	(0.000)	(0.000)	(0.000)	(0.000)
on70s	-.0523	-.0110	.0590	.0044
	(0.000)	(0.001)	(0.000)	(0.000)
onaf80s	.0607	.0128	-.0684	-.0051
	(0.000)	(0.000)	(0.000)	(0.000)

Note: Effects are reported with a precision of up to four decimal places without rounding. Values inside "()" represent the corresponding p-value for each coefficient. The reference categories for the variables that are disaggregated into more than two indicators are "College" for Education, "West Coast" for Region, "Non-attendance" for Religion, and "on40s" for Birth-control variables.

Table 12: Age at Child One - Marginal effects for 2017

	2017			
	(1)	(2)	(3)	(4)
	≤20	**21 - 30**	**31-40**	**> 40**
Education				
Lesshs	.1157	.0752	-.1734	-.0174
	(0.000)	(0.000)	(0.000)	(0.000)
HS	.0599	.0389	-.0898	-.0090
	(0.000)	(0.000)	(0.000)	(0.000)
University	-.0711	-.0462	.1066	.0107
	(0.000)	(0.000)	(0.000)	(0.000)
Region				
Quebec	-.0033	-.0021	.0050	.0005
	(0.771)	(0.770)	(0.770)	(0.771)
Ontario	.0123	.0080	-.0184	-.0018
	(0.244)	(0.243)	(0.243)	(0.245)
Prairie	.0267	.0174	-.0401	-.0040
	(0.025)	(0.028)	(0.026)	(0.029)
Atlantic	.0410	.0266	-.0614	-.0061
	(0.000)	(0.001)	(0.001)	(0.002)
Religion				
religionaff	.0187	.0122	-.0281	-.0028
	(0.063)	(0.067)	(0.063)	(0.074)
attendanceweek	-.0141	-.0091	.0211	.0021
	(0.105)	(0.107)	(0.104)	(0.117)
attendancemonth	-.0132	-.0086	.0199	.0020
	(0.236)	(0.238)	(0.235)	(0.252)
attendanceyear	-.0197	-.0128	.0295	.0029
	(0.013)	(0.015)	(0.013)	(0.020)
Type of zone				
urban	-.0339	-.0220	.0509	.0051
	(0.000)	(0.000)	(0.000)	(0.000)
Parental international status				
internatmoth	-.0132	-.0085	.0198	.0019
	(0.216)	(0.215)	(0.215)	(0.217)
internathfath	-.0075	-.0049	.0113	.0011
	(0.474)	(0.475)	(0.474)	(0.477)
Birth-control variables				
befon30s	-.0204	-.0132	.0306	.0030
	(0.051)	(0.052)	(0.050)	(0.062)
on50s	-.0131	-.0085	.0197	.0019
	(0.169)	(0.177)	(0.171)	(0.185)
on60s	-.0519	-.0338	.0779	.0078
	(0.000)	(0.000)	(0.000)	(0.000)
on70s	-.0812	-.0528	.1218	.0122
	(0.000)	(0.001)	(0.000)	(0.000)
onaf80s	-.0035	-.0022	.0052	.0005
	(0.735)	(0.736)	(0.735)	(0.735)

Note: Effects are reported with a precision of up to four decimal places without rounding. Values inside "()" represent the corresponding p-value for each coefficient. The reference categories for the variables that are dissagregated into more than two indicators are "College" for Education, "West Coast" for Region, "Non-attendance" for Religion, and "on40s" for Birth-control variables.