

Contraceptive Sterilization in Canada:
A Reasonable Choice

By

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ABSTRACT

This study adopted event history analysis to examine timing and patterns of decision making of contractive sterilization by Canadian men and women of various marital statuses. Data was employed from the 15th General Social Survey by Statistics Canada. Based on Gary Becker's rational choice approach and Dorothy Smith's Institutional Ethnography, this research developed a new theoretical approach, reasonable choice, to frame decision making of contraceptive sterilization by Canadians. In general, women are more likely than men to use sterilization as a method of birth control. Single women and previously married women are more initiative to use the procedure, compared to their male counterparts. However, the institutions of marriage and religion differently structure men and women to practice sterilization for birth control. Marriage encourages men to use the procedure while exempting women from using the surgery. Religion has no effect on men's adoption of the procedure, but affects women to practice the method.

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Dedication

This thesis is dedicated to my father, the one who loved me most in the world, a humorous, sagacious, and erudite philanthropist. There is a picture always warming the coldest corner in my heart and lighting the darkest shadow on the road in front of me, in sadness or in happiness, in frustration or in satisfaction, and in night dream or in day time: my dearest father sitting before the window, reading a thick book in ancient Chinese through his black framed glasses.

I am a helpless child feeling my way ahead. I want you to be proud of me, Papa.

Contraceptive Sterilization in Canada:

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Chapter one

Introduction

1.1. Introduction

In 2002, Canada's crude birth rate dropped to a record low of 10.5 live births per 1,000 population since 1921. At the same time, the total fertility rate (TFR) fell from 1.51 in 2001 to 1.5, slightly more than the record low of 1.49 in 2000. After three decades of decline under the replacement level (2.1) since the 1970's, Canada now falls in the middle in terms of fertility among industrial nations (The Daily, April 19, 2004; Martin & Wu, 2000). Modern contraception has contributed significantly to the fertility decline in both developed and developing countries around the world, and Canada is no exception (Shah, 1994). Sterilization, the pill, and condoms have been the primary contraceptive options in Canada since the 1960s contraceptive revolution (Martin & Wu, 2000). However, contraceptive prevalence among Canadians has declined during the past few decades, which has left Canada with the lowest rate of contraceptive use among advanced nations. At the same time, Canadians' adoption of sterilization has been stabilized with a slight increase and is now the highest among all industrial countries (Krishnan & Martin, 2004).

Table 1. Contraceptive prevalence (percentage) among married women of reproductive age in selected industrial countries, United Nations, 2003

Country	Contraception	Sterilization	Year
United Kingdom	84.0	30	2002
Switzerland	82.0	22.1	1994/95
Belgium	78.4	17.9	1991/92
Denmark	78.0	10	1988
Sweden	78.0	3	1981
United States of America	76.4	37	1995
Australia	76.1	38.1	1986
Germany	74.7	0.9	1992
Canada	74.7	45.8	1995
France	74.6	8	1994
Italy	60.2	5.9	1995/96

Source: United Nations, 2004.

Note: Numbers are from the data that the United Nations publicized.

Unfortunately, virtually nothing is known about the present dynamic of sterilization and its associated factors in Canada. Little research attention has been paid to contraceptive practice in Canada, and still less to sterilization. With the very limited literature, few studies (see Balacrishnan, Krotki, Karol & Lapierre-Adamcyk, 1985; Balakrishnan, Lapierre-Adamcyk & Karol, 1993; De Wit & Rajulton, 1991; Krishnan & Martin, 2004; Martin & Wu 2000) have explored relevant socio-economic determinants behind individuals' contraceptive decisions. With the release of the 15th cycle of the General Social Survey (Statistics Canada, 2003), data are available to update the above research and capture the present prevalence and underlying mechanism of Canadians' use of sterilization.

Sterilization, an irreversible contraception permanently terminating childbearing, affects the population growth in a country where its citizens fail to replace themselves.

The pattern of national sterilization, therefore, has significant implications for both present and future population growth, consequent social issues, and relevant policies. The shortage of childbirth and an aging population accompanying declining fertility will unavoidably affect the supply of workers to the labor force as well as the sustainability of the social security system (Coal, 1986). The prevalence and dynamic of sterilization use might also create new needs and requirements for the healthcare system as well as increasing demands for counseling services before and after the procedure (Henshaw & Singh, 1986).

1.2. Statement of Research Problems

To explore trends and factors associated with sterilization as a method of contraception for Canadian men and women of all marital statuses, this research proposes to update existing analyses in the field of contraception, with particular emphasis on sterilization in Canada. Based on previous research, the proposed study will examine timing of Canadians' sterilization and relevant socioeconomic and demographic determinants associated with Canadians' decision-making regarding sterilization to identify the dynamics of Canada's unique national pattern of sterilization. The study will adopt the life event history model as the analysis tool. I will use a variant of Gary Becker's (1960, 1993) rational choice theory, the reasonable choice approach, to examine how individuals pursue utility maximization or conform to social norms when choosing sterilization.

Chapter Two

Literature Review of Empirical Research in Contraceptive Sterilization

Worldwide data on contraception were rarely collected before 1970. For the past several decades, the World Fertility Survey (WFS), conducted in the 1970s and 1980s, and the Demographic and Health Survey (DHS), conducted in the 1980s and 1990s, have been the major international programs that collect data on fertility and contraception worldwide (Feyisetan & Casterline, 2000). Since the 1980s, many developed countries have collected data focusing on fertility (Greene & Biddlecom, 1997). In Canada, the 1976 national survey on abortion also provided relevant information on contraception. It was not until 1984 that the Canadian Fertility Survey (CFS), the first and only in-depth national level fertility survey, was undertaken. The GSS, which focuses on family conducted by Statistics Canada, also includes valuable data on fertility (Balacrishnan, Krotki & Lapierre-Adamecyk, 1985; Martin & Wu, 2000).

2.1. Prevalence of Contraceptive Methods, With a Focus on Sterilization

Worldwide, among married women of reproductive age, 60.9 percent practice contraceptive methods and 54.0 percent use modern contraception, with 68.5 percent of contraceptive use occurring in developed countries and 59.4 percent in developing countries (United Nations, 2004). Female sterilization (20.2% among all contraceptive

methods women practice, and around 40% among modern methods women practice) is the leading form of contraception worldwide, followed by Intrauterine Devices (13.9%) and then the pill (7.2%), while male sterilization remains unpopular compared to female sterilization worldwide, especially among less developed countries, particularly in African and West Asian areas. The exceptions are the UK and New Zealand with the rate of male sterilization higher than that of female use. Specifically, tubal ligation is primarily adopted in the developing world, while developed countries commonly use the pill. Sterilization is highly geographically concentrated. Compared to other regions, North America has the highest prevalence of both female and male sterilization. Puerto Rico (49%) and Canada (45.8%) lead the highest use of sterilization along with a few other less developed countries: Dominican Republic (42.9%), Brazil (42.7%) and China (41.2%) (UN, 2004).

In Canada, the 1984 CFS (collecting data from women in their reproductive age of 15-49) showed a relatively high prevalence of contraceptive use among Canadian women. Sixty-eight percent reported using some forms of contraceptive control, among which currently married women had the highest level of use (73%), previously married women had a lower level of use (69%) and women who had never married had the lowest level of use (57%). As the primary method, sterilization was practiced by 48 percent of female contraceptive users, followed by the pill (28%), condoms (9%) and then IUDs (8%). Birth control pills were overwhelmingly popular among women under 25 and women who were never married; in contrast, married women and those who were 30 and over,

primarily used sterilization. Compared to their neighbors across the Southern border (1982 US data from the National Survey of Family growth, collected from women aged 15-44), Canadians seemed to have higher rates of contraception use and were more likely to choose to prevent pregnancy through sterilization (Balakrishnan, Krotki & Lapierre-Adamcyk, 1985).

Table 2. Contraceptive prevalence and rates of the three top contraceptive use among Canadian and American female contraceptive users, 1984 CFS and 1982 NSFG.

	Canadian	American
Using a method	68.4	55.7
Sterilization	48	34.1
Female	35.3	23.2
Male	12.7	10.9
Pill Use	28	28
Condom	9.1	12

Source: Balakrishnan, T. R., Krotki, K. J., & Lapierre-Adamcyk, E., 1985 and Piccinino, L. J., & Mosher, W. D., 1998.

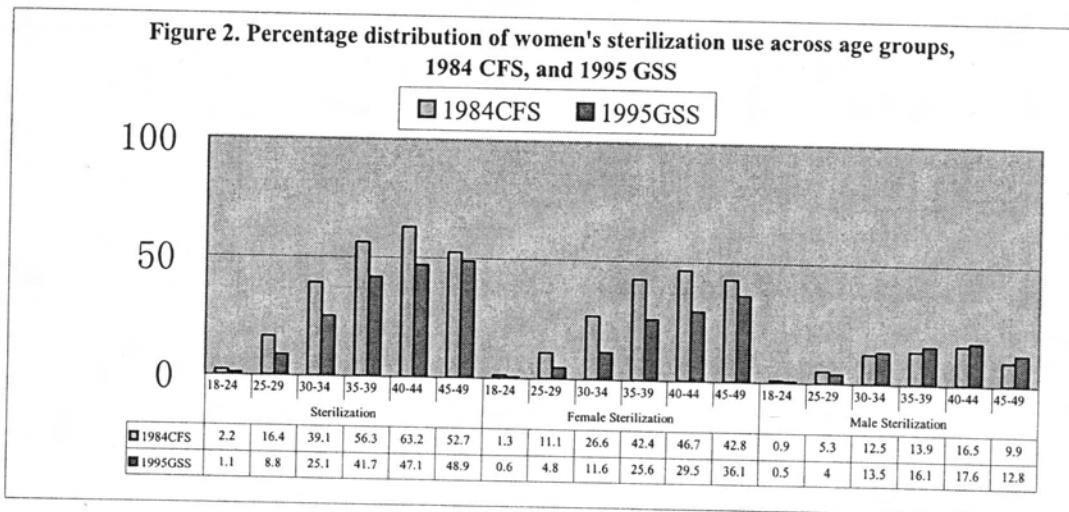
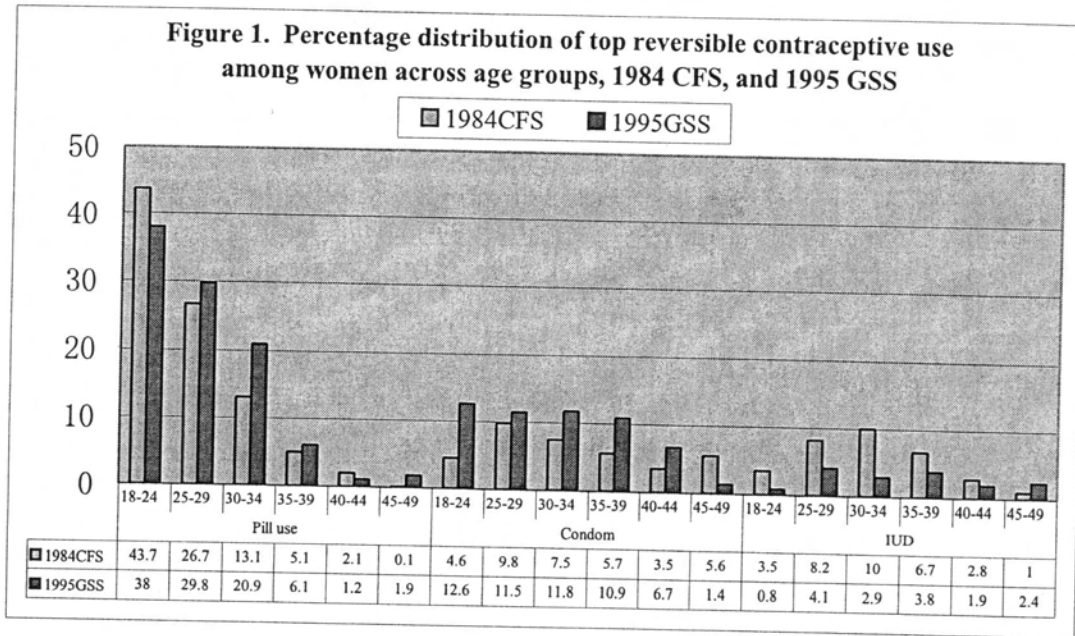
Note: Numbers drawn or calculated from data the research above reported which was based on the 10th GSS data by Statistics, Canada.

Comparing data collected by the 1984 CFS and the 1995 GSS, Martin and Wu (2000) found distinct changes in Canadians' contraceptive patterns, including sterilization behaviours, which is unique among industrialized nations (Martin & Wu, 2000; Krishnan & Martin, 2004). Overall contraceptive use dropped from 69 percent to 60 percent, with use of the pill declining from 19 percent to 17 percent and IUDs from six percent to three percent. However, recourse to condom use increased from six percent to 10 percent. At

the same time, women decreased their reliance on tubal ligation from 24 percent to 17 percent, while men's preference for getting a vasectomy increased from six percent to 10 percent. Though the overall use of sterilization remained at a similar level (39.9% in 1984 and 40.4% in 1995), tubal ligation decreased; meanwhile, vasectomies and sterilization for medical reasons both increased. Women still remained more reliant on sterilization than men (40% versus 31%). Sterilization remained the most popular contraceptive method used in Canada; pill and condom use were still the most common reversible forms of contraception among Canadians.

For both surveys, the pill was popular among single women, while married, cohabitating, and previously married women, and those with parity of two or more, were more likely to use sterilization. Compared to 1984, Canadian women 35 and older still used the pill as their most common choice, and use of the pill rose among women aged 25-40, especially those aged 30-34. IUD use decreased and condom use increased among all age groups except women aged 45 to 49. Single women tripled their condom use. Non-use of contraception increased from 21 percent to 25 percent. Prevalence of contraception use decreased among women of all age groups with the most dramatic decrease among women aged 30-44. In 1984 the national contraceptive pattern of Canadians' overall use was among the highest in the world and, the rate of the sterilization was also the highest among industrial nations. After one decade of changes, Canadians' recourse to contraception dropped to the lowest in the industrialized world, even lower than in the US, and sterilization remained the highest in the developed world

(Martin & Wu, 2000) (refer to Figure 1 & Figure 2).



Source: Martin, K., & Wu, Z., 2000.

Note: The figures are calculated from data Martin and Wu used which was based on the 10th GSS data by Statistics, Canada.

South of the border, the contraceptive pattern showed both similarity with and distinction from the pattern in Canada. Three cycles of the NSFG (1982, 1988 and 1995) showed a constant increase in contraception use reported by US women, 56%, 60% and 64%, in 1982, 1988 and 1995 respectively (Piccinino & Mosher, 1998). Sterilization increased from 34.1% in 1982 to 39.2% in 1988, and slightly decreased to 38.6% in 1995. The constant increase in condom use (12%, 14.6% and 20.4%, in 1982, 1988, and 1995 respectively), and remarkable decrease in use of IUDs and the diaphragm were the major changes throughout the three cycles. In 1995, American women age 30 and older, women who were formerly married, and those with the least amount of education and income were more likely to use sterilization.

Across the Atlantic, in 1984 and 1985 the International Health Foundation investigated the contraceptive practices of women aged 15 to 44 in Italy, Spain, France, Great Britain, and the Federal Republic of Germany (Riphagen & Lehert, 1989). The prevalence of contraceptive use among women exposed to the risk of unplanned pregnancy in these countries was 70 percent, 84 percent, 86 percent, 90 percent and 81 percent respectively. Barrier methods (mainly condom use) were relatively high in Italy, Spain and UK, 23 percent, 23 percent, and 17 percent respectively. IUDs had a relatively high rate in Southern countries: France (19%), Italy (15%) and Spain (13%). Use of the pill was common in the UK (38%), West Germany (33%), and France (31%). However, sterilization was generally at a low level (Italy 1%, Spain 3%, France 5%, and W. Germany 7%), with the exception of the UK (23%). Among all developed nations, the

contraceptive pattern is quite unique in France due to their high rate of pill use and IUD use, and extremely rare recourse to sterilization (Toulmon & Lerdon, 1998). Only around 4 percent of French women choose sterilization as their contraceptive method, while almost no men used sterilization in 1994.

It is established that Canada now falls in the relatively low level of overall contraceptive use among developed countries, while having an extremely high recourse to sterilization worldwide and also a relatively low fertility rate among industrialized nations. All of the literature mentioned prior to this point, except the UN data, was conducted before 1995. With the release of the 15th cycle of the GSS collecting data in 2001, it is now possible to explore and update recent trends and examine the factors that contribute to building Canada's unique national pattern of sterilization use.

2.2. Limitations of Previous Studies

With the introduction and spread of pill use since the 1960s, contraceptive practice has gradually become a women's domain. Women can practise certain methods without the knowledge of their partners, which has more or less alienated men from this field (Darroch, 2000). The limited methods (such as condom and male sterilization) available for men also count for the unequal responsibility between men and women in terms of contraception (Ringheim, 1993). Although much research admits contraception choice as a joint decision-making process by men and women, the man's part is seldom the focus. Most studies are generally based on data collected from women, especially married

women, even when the research examined male methods (Godecker, Thomson & Bumpass, 2001). Research focuses either on men or women in the choice of sterilization and seldom includes both men and women. (see *ibid*; Magnani et al., 1999; Forste, 1995; De Wit & Rajulton, 1991; etc.). In general, research on contraception is not as prevalent as other subjects in the field of fertility and concentrates mostly on developing countries. Studies on sterilization are even more rare. It is surprising that there has been no literature on sterilization based on the data collected by the most recent cycle of the GSS (15th) by Statistics Canada (2003). In order to begin filling the gap in the literature, this research examines the trends and dynamic of Canadian sterilization, including both men and women with all marital statuses, to update the existing literature. The study adopts the event history method to analyze relevant data collected by the 15th cycle of the GSS. A variant of the rational choice theory, the reasonable choice perspective, frames this study to explore how men and women balance costs and benefits in their decision making concerning sterilization.

Chapter Three Theoretical Framework:

The Reasonable Choice - A Variant of the Rational Choice Approach

As a subfield of fertility research, studies in the area of contraception, including sterilization, are generally empirical. Relevant fertility theories are always used to guide research on contraception including sterilization. As the approximate determinants of fertility, correlates affecting fertility also relate to contraception (Shah, 1994). Similarly, factors associated with contraception affect choices regarding sterilization as the prominent contraceptive method in general. Therefore, I will use an appropriate fertility theory to frame this study. The following section will compare several influential theories in fertility in recent decades: the New Home Economics, Easterlin's model, and cultural theory as well as the diffusion model. Further, I will discuss sociological application of Gary Becker's (1960) individual rational choice approach. Finally, I will explain why this study adopts Gary Becker's rational choice approach as the basic framework and why a variant of his perspective, the reasonable choice approach, is appropriate for this proposed study.

3.1. Rational Choice Theory and New Home Economics

The traditional theory of individual rational choice is a general theoretical perspective in economics with the basic assumption that the individual pursues utility maximization restricted by given social constraints (Becker, 1993; Hechter & Kanazawa,

1997). Rational choice theory has penetrated into many disciplines in social science in recent decades, such as philosophy, political science, law, demography as well as sociology (ibid). Gary Becker (1993), the 1992 Nobel Economics Prize winner, is one of the most important economists, who uses this economic approach to explore social phenomena beyond the traditional dimension that most economists usually engage, such as discrimination, crime, human capital and family. As Becker alleged, the power of this 'economic way of looking at behavior' lies in 'the assumption of individual rationality'.

Founded by Becker (1960, 1993), New Home Economics applies an individual rational choice approach to the area of family: divorce, marriage, fertility as well as relationships between family members. For decades, this approach has been the most cited explanatory paradigm in reproductive behaviours and family planning. Linking activities at the micro-economic (individual) level to trends at the macro (societal/group) level, the approach assumes that individuals, forward-looking and consistent in their behaviours, act to maximize their welfare. However, people are not completely free in their behaviours; actions are restricted by limited resources and capacity of calculation. Time is a finite resource running throughout one's life course. As the provision of goods in the market grows rapidly, time becomes more valuable during the limited life span. Thus, individuals balance costs and benefits when making decisions regarding the attainment of certain goals or preferences; meanwhile, information and opportunities restrict individuals' decision making.

The prevalence and acceptance of contraception have greatly amplified the space of

individual decision making in terms of fertility control, which was previously arranged by social norms or cultural taboo more beyond conscious control by individuals (Becker, 1960). From an economic way of thinking, children are special goods giving 'utility' to parents, which cannot be purchased from the market, but produced and consumed in the household. Children are both durable 'consumption goods' (adding to parents' satisfaction) and 'production goods' (providing economic returns to parents). The demand for children is thus analogous to the demand for consumer durables, which suggests that the general economic theoretical framework also applies in the field of fertility. The family, therefore, pursues maximization of welfare by weighing costs and benefits of whether or not, when to start and when to stop, having children. The number of children a family would like to have is thus determined by family income and costs of children (Becker, 1960).

3.2. Easterlin's Model

Easterlin (Easterlin 1975; Easterlin & Crimmins, 1985) criticized the traditionally demand-oriented economic theory (New Home Economics) of fertility behaviour as a narrow approach of consumer behaviour. He thus built a general economic framework that integrates the restrictive economical demand approach with relative sociological perspectives, resulting in a three-factor framework including supply, demand, and cost. As Easterlin was concerned with changes from natural fertility to deliberate birth control by the household as the most significant feature of the fertility revolution, the

supply-demand theory focuses on the causes underlying individuals' conscious use of birth control. The balance between the demand for, and supply of children determines motivation for fertility control. Costs are subjective as well as monetary, including acceptability of and accessibility to family planning services. Fertility regulation costs combine with motivation to determine whether individuals will adopt birth control.

Compared to New Home Economics, Easterlin's model adds the factors of supply and psychological costs. It has been effective in cross-country comparison in developing societies. Contraception is not as prevalent in developing nations as in developed countries. Deliberate birth control is thus still relatively high cost in terms of psychological and monetary concerns. Supply of children is also a significant factor associated with fertility. In many developing societies, individuals have not yet achieved relatively universal birth control as in the industrial society; supply of children is more or less naturally controlled rather than efficiently and individually controlled, though there are variations across countries.

3.3. The Ideational Theory and the Diffusion Model

Traditional demographic transition theory (e.g., DTT, see Notestein, 1953) as well as the economic-approached demand theories (i.e. New home economics, and Esterlin's model) had failed to identify variations in fertility decline among European countries (Knodel & Walle, 1979). This prompted Ron Lesthaeghe to develop the ideational theory (Cleland & Wilson 1987; Lesthaeghe & Surkyn 1988). This perspective states that

variations in fertility behaviour of different social groups rest with correspondingly different cultural values. Consequently, women belonging to different social groups practice different fertility patterns in response to economic and structural changes; differences in religion, individualism and secularism accounted for variations of fertility behaviours.

Cultural theory is closely related to the diffusion model in that the diffusion of values and information as well as fertility patterns, are considered indicators of the effects of cultural values (Hirschman, 1994). Montgomery (1996) argued that individuals are not making their rational decisions alone; rather, they make their decisions through social learning and social influence based on their personal social networks, as well as in response to established institutions.

Compared to Becker's perspective, which emphasizes the underlying principle of utility maximization shaping individuals' motivation of decision making (i.e. the reason or motivation for individuals' behavior patterns), the diffusion model focuses on the process by which ideas and behavior patterns spread out across social-cultural groups.

3.4. Flaws of the Above Models and the Necessity of a Variant of the Rational Choice

Model

New Home Economics rigidly narrows down the decision of childbearing to a sole consumer choice, and sees no significant difference between the purchase of a car and the desire for a baby (Hirschman, 1994). However, it is robust in connecting macro

socio-economic changes to the micro dimensions that shape individuals' motivations behind their actual behaviour patterns. Easterlin's model that emphasizes supply and birth regulation cost is more powerful in the analysis of fertility behaviour in developing countries. In industrial countries, the nearly perfect contraception societies, especially in Canada with the implementation of national health care, monetary cost is generally not a concern. Supply of birth is also not a significant factor since fertility is roughly under individuals' conscious control. The psychological cost emphasized by Easterlin is a significant factor that the New Home Economic approach initially neglected and has gradually been incorporated. There is an urgency for a robust model mainly based on Becker's approach that also absorbs valuable factors from other perspectives, including Esterlin's model and diffusion model, to frame this specific research.

The economic approach and diffusion model do not conflict with each other. The diffusion model focuses on the social process during which ideas, information and behaviour of fertility limitation spread out across individuals and subgroups. This model is useful to explore the dynamics of how behavior modes are conveyed before a stable behavior pattern is formed. Therefore, this approach is powerful in examining the onset and tempo of fertility descent in developing countries where new ideas and new methods of birth control are spreading fast, even in advance of underlying structural changes. However, in Canada, a highly industrialized society, a long history and a universal prevalence of contraception have contributed to a relatively mature fertility pattern. Focusing on the dissemination of ideas and behaviour patterns, the diffusion model is not

powerful in identifying the underlying dynamics motivating individuals' sterilization patterns. The economic frame focuses on the underlying dynamic and determinants of fertility trends from the individual behaviour approach, which is essential in order to understand the underlying forces motivating individuals' decision making, and thus helps in understanding the aggregate pattern of fertility behaviour.

Since sterilization is an irreversible procedure permanently ceasing individuals' reproductive ability, the couple tends to collect more information, compare costs and gains deliberately, and also consider certain social norms. Therefore, to examine determinants of sterilization in Canada, it is more appropriate to explore factors shaping Canadians' sterilization pattern under the guidance of the rational choice model than other approaches. However, as analyzed above, the rational choice model is deficient in incorporating factors related to the sociological and psychological dimensions of the issue. I argue that a variant of this model considering the missing sociological and psychological perspectives will benefit this research.

3.5. Social Norm versus 'Utility Maximization': a Sociological Extension of the Rational Choice Approach

3.5.1. Social Norm Abidance

An economic way of looking at behavior, rational choice appears attractive due to the analysis power of the assumption of 'individual rationality'/'utility maximization', which is also the most controversial focus attacked by scholars in social science (Becker,

1960; Hechter & Kanazawa, 1997). Focusing on embeddedness of economic behaviors in social relationships (Granovetter, 1985), rational choice theorists regard it as the repeated prisoner's dilemma (PD) game (Montgomery, 1998). Each participant of the repeated PD expects the other to calculate to maximize his utility and keep doing so through the course. This 'calculative trust' maintains the interaction.

Montgomery argued that role theory can be a generalization of rational choice theory (ibid.). Based on Uzz's (1996, 1997) ethnographic description of embeddedness, Montgomery alleged that the repeated PD is operating at the unit of roles rather than individuals. As Montgomery denoted, according to role theory, roles are socially constructed, and contain rules of 'behavior appropriateness' (March, 1994)(social norms). Different situations evoke different roles, which allows room for 'role switching'. Therefore, extending what rational choice theory assumes, that individuals are motivated by utility maximization, Montgomery alleged they perform their roles either by rules derived from roles (social norms) or utility maximization. Some roles, thus, contain the rule following 'the logic of appropriateness' (March, 1994) (social norms), and others contain the preference to utility maximization following 'the logic of consequence'. For example, a friend is obligated to cooperate consistent with social norms, while a business person is motivated to maximize profit (Montgomery, 1998). Social norm abidance is, therefore, another principle motivating individuals' decision making as well as behavior patterns, in addition to utility maximization.

Utility maximization can incorporate the component of social norms in addition to

economic gains and losses. Even in the situation of following utility maximization, individuals don't consider just economic gains and losses; social components participate in this factor-weighting process. Here the principle is still utility maximization. However, as Montgomery indicated (1998), while 'the logic of appropriateness' guides individuals' decision making, social norm regulation ('behavior acceptability') ascends to a prime principle parallel to utility maximization, guiding individuals' decision making as well as behavior patterns. It is possible that people make decisions based on utility maximization in some situations, while abiding by social norms in other situations. One significant thing that requires clarification here is that social norms not only operate in the course of utility maximization calculations, but also can ascend to the prime status guiding individuals' decisions as the basic principle parallel to utility maximization. We don't deny the two principles can combine to function for a specific incidence. Individuals thus either follow utility logic or acceptability logic, or balance utility and social rules to make a reasonable choice rather than an absolute rational (pure utilitarian) choice.

3.5.2. Backward-looking and Sideward-looking versus Forward-looking

The other basic assumption of rational choice theory is that individuals are forward-looking and consistent with regard to values and behavior. However, Macy (1993) argued that individuals tend to be backward-looking, while Heckathorn (1996) considered individuals as sideward-looking. It is possible that individuals adjust their behavior due to social encouragement or pressure or cost/benefit calculation based on the

results of previous action. However, either forward-looking or backward-looking can be cognitively too demanding for individuals facing an overwhelming world. A convenient and safe way is to imitate others through social learning from a reference group/social network. It is still doubtful that individuals are totally automatic acting entities. They could make a decision due to social pressure from the reference group/social network. Either way, individuals abide by certain or vague social norms more or less to behave in an acceptable way both to themselves and to the broad society. It is possible that they combine forward-looking, backward-looking and sideward-looking in their actual decision making process, consciously or unconsciously.

3.5.3. Subordination of Personal Motivation to Social Norms

Either utility maximization or social norm abidance still needs a great initiative of individuals. It is doubtful that individuals can be automatic in their decision making located in social relations. As Dorothy Smith's Institutional Ethnography (IE) (1987, 1990a & 1990b) denoted that the everyday world is essentially social, individuals are located in social relations. Individuals' decision making as well as behavior and interactions with each other are parts of social relations. It is social relations that coordinate people's decision making and behavior in their everyday world, which constitutes 'social organization' (Smith, 1990a).

However, people's decision making as well as action is socially organized beyond their personal will by ruling relations extending beyond their lived experience at local

cites (Smith, 1990b). The ruling relation is not a conception related to class oppression as Marx proposed (Campbell & Gregor, 2002). During the operation of social relations power of extra-local interest or will is discursively exercised to coordinate individuals' everyday life in local cites. In modern highly disciplined society, text as well as discourse is constituent of social relations, which coordinates individuals' lived experience in their everyday life in different local sites at the same time or different time. Personal motivation or interest is thus subordinated to the ruling relations.

Discourse is circulated social relations that individuals produce and within the framework of which they practice their experience (Smith, 1999; DeVault and McCoy, 2002). However, discourse always carries the ruling ideas or interests and the participation of discourse by individuals is always consistent with the ruling ideas. Activation or practice of discourse is social organization of individuals' everyday world by the ruling relations. (Campbell and Gregor, 2002). Power of ruling relations is thus discursively exercised by the social organization of discourse in the everyday world, and discourse frames individuals to live their everyday experience.

Social norms are developed by generations in their everyday experiences in society, which is similar to the discourse in IE and can be regarded as a good constituent of ruling relations as Smith proposed. For example the traditional social norm that claims women take care of the family dimension, such as fertility control (contraceptive sterilization in this study), indicates the unequal relation or division between men and women. Organized by this social norm, men and women have an expectation of themselves and of

the other, although some men may take it for granted for women to fulfill the birth control responsibility, and some women may take it as natural, while other women feel more or less obliged to do so.

The operation of social norms is more or less out of individuals' control though they may be conscious or not conscious of that. Mostly, it functions unconsciously. It is not a motivation underlying decision making, but actually dictates the decision making. Individuals do not undergo their lived experience in a vacuum or on a desert. There can be many social norms functioning in decision making: some are consistent and others can be in conflict. Furthermore, individuals are located in their local sites, embedded in different social institutions, such as marriage or religion. There are correspondent social norms that operate under the social institution of marriage. Social norms can be moderated under certain social institutions. For example, organized by the traditional social norm of women's roles (traditional gender discourse), women are required to use sterilization to fulfill their birth control responsibility; however, marriage encourages men to undertake it as a contribution to the family commitment. Therefore, the social norm of traditional gender discourse is moderated in the social institution of marriage to dictate individuals' decision making on sterilization for birth control.

Both institutional ethnography and the rational choice approach start from the standpoint of individuals. However, for IE, the individual is located in social relations, while for the rational choice, the individual is more isolated and economically oriented. Both approaches try to connect the individual from the micro level to the macro societal

level. However, IE is interested in how individuals are socially organized by the ruling relations from outside or upside. Rational choice is more interested in incorporating the social factors into the personal motivation as an underlying force. Therefore, though starting from the individual standpoint, IE is societally-oriented, while the rational choice approach is individually-oriented. The puzzle lies in how to balance the individual and the societal approach. However, while focusing on subordination and problematics of ordinary people in their everyday life, IE somewhat ignores automatic responses of these individuals; in contrast, the rational choice approach packs social relations into pure personal motivations such as economic cost and benefit calculation.

In the very personal arena of voluntary contraceptive sterilization, I argue that individuals are motivated by both utility maximization and social norm abidance, however, this personal decision making is coordinated or subordinated by the ruling relations, social norms in my approach.

3.5.4. The Reasonable Choice: A Variant of Rational Choice Theory

As an individually-oriented decision making perspective, the rational choice model frames fertility patterns in terms of consumer behaviour (Becker, 1960). First, it is doubtful that people are absolutely rational in terms of utility maximization. The unwanted births in nearly perfectly contraceptive societies, the observed birth falling short of intended fertility, as well as regrets after sterilization (see Mosher & Bachrach, 1996; Bongaarts, 2001; Hollander, 1999, etc.), allow plenty of space for factors as well as

principles other than rational calculations to function in individuals' actual decision making. It is reasonable that individuals choose to pursue maximum utility in some situations (Gary Becker's perspective), while attempting to conform to the appropriateness of social norms in other situations (Montgomery's perspective). The former expresses utility-oriented aspects of life, whereas the latter, conforming to social norms, could provide individuals with a sense that their behavior is viewed as "safe" or "acceptable" within the context of society. This can also produce an inner world harmony between individuals and their society. Second, according to the diffusion model, individuals are not absolutely isolated in their decision making in regard to the market. They have their own reference groups and social networks, through which social learning, social pressure and other social effects operate during the decision making process (the diffusion model's perspective and other sociological perspectives mentioned above). This shows the dynamics of how social norms function through the course of individuals' decision making. The individual is not an automatic utility calculator in a vacuum at a distance from the market. Individuals are socially structured human beings embedded in their everyday life; they interact with other individuals/groups and agency, abiding by social norms.

Individuals have autonomy. They make their own decisions at local sites at certain times embedded in social relations considering utility maximization, consistent with social norms or influences from social factors or processes (social pressure, and social learning). However, individuals are not totally free and automatic in their decision

making. Their personal motivation including utility maximization as well as social norm abidance is subordinated to the ruling relations, social norms in my framework.

Traditional research of IE is interested in the specific social organization such as a government agent, a hospital or a corporation where the power of ruling relations is exercised in institutional text form (such as forms, reports and so on), to organize individuals' behavior in the everyday world. My proposed framework of reasonable choice in this study is not interested in the specific social institution. I am interested in social norms such as the general gender discourse and the general social institution such as marriage or religion.

Therefore, a reasonable choice perspective is that not only do individuals balance social norm abidance and utility maximization in their decision making but also, social norms regulate their actual decision making at their local site.

Although, in principle, social norm abidance and utility maximization are distinct from each other, it is likely that the two rules overlap and co-operate with each other in the actual decision making process. There could be a compromise between utility maximization and social norm abidance, which motivates individuals to make a reasonable choice acceptable both to themselves and to the broader society. The challenge lies in identifying how an individual makes the actual decision when the two conflict with each other. In this situation, either one outweighs the other, which facilitates the decision making process, or the two run a close race, which can make the decision very painstaking and inconsistent through the course. The calculation of costs and benefits

should consider the perceived costs and benefits by individuals belonging to different groups. Social-cultural factors could also contribute to shaping the variations in perceived costs and benefits. In short, in their actuality of everyday life, individuals, as autonomous social beings surrounded by the overwhelming world rather than pure consumers confronting the utility-oriented market, struggle to make a reasonable choice in a relatively acceptable way, balancing gains and losses through utility maximization as well as social norms; however, their decision making is subordinated to social norms which are beyond their personal motivation. One thing that requires clarification is that costs and benefits calculation does not equal utility maximization. It is just a dynamic decision making process through which both principles of utility maximization and social norm abidance apply. To be consistent with social norms, individuals still calculate disadvantages and advantages to figure out an acceptable way.

3.6. Application of the Reasonable Choice Approach to the Decision making of Contraceptive Sterilization

To make a reasonable choice, men and women weigh utility and acceptability of sterilization before deciding whether or not and when to choose it as their preferred method of contraception; their balancing process is socially organized by corresponding social norms. These individuals' calculations contribute to the aggregate sterilization pattern nationwide. Considering advantages versus disadvantages, sterilization is the most efficient form of contraception, compared to other commonly used methods

(Henshaw & Singh, 1986). The main disadvantage of sterilization is that it is usually irreversible, and it ends an individual's reproductive career permanently. This can push those who conform to traditional pronatal social norms to perceive an extraordinarily high cost of sterilization. In other words, these people would rather choose reversible contraceptive methods, which is acceptable according to pronatalism, than take the high risk of choosing sterilization, even if they could have benefited economically and have more time for other activities as a result of using this procedure. One important point to understand about contraceptive sterilization is that it occurs after people reach their desired family size (Balakrishnan, Lapierre-Adamcyk & Krotki, 1993). As an irreversible form of contraception that permanently ceases human reproduction, the cost of sterilization decreases dramatically after individuals accomplish their desired family size; accordingly, an unwanted pregnancy becomes much more costly after that. Thus, the following hypotheses are guided by the perspective of reasonable choice, and include socio-economic and family-demographic determinants, discussed as follows.

3.7. Determinants of Contraceptive Sterilization and Hypotheses

Sterilization is an irreversible procedure terminating fertility in individuals' reproductive career. Identifying the motivation of individuals choosing sterilization is complicated and elusive: why do people choose such a permanent procedure that results in the inability to give birth to children in the future? Parity and health have been considered as two basic motivations, whereas more research considered parity related

perspectives (De Wit & Rajulton, 1991; Shapiro, Fisher & Diana, 1983; Westoff & McCarthy, 1979; Hunt & Annandale, 1990; Murphy, 1995). Since this research study only examines contraceptive sterilization, I will develop the discussion focusing on parity motivation. Decision making regarding contraceptive sterilization thus is considered only after individuals have arrived at their desired family size (De Wit & Rajulton, 1991). Forste et al.'s (1995) research focusing on married men's role in the choice of sterilization identified age, marital status, parity, ethnicity, education, religion and residence as explanatory variables. Kaufman (1998) compared husband versus wife sterilization examining covariates of number of children, education, religion and race/ethnicity and so on. De Wit and Rajulton's (1991) study on voluntary sterilization among Canadian women associated the risk of sterilization with several factors: age, marital status, education, parity, religion, and residence. They claimed education and parity to be the best predictors of sterilization while religion and marital status are in the process of becoming less effective predictors.

Turning to a determinant of specific prediction, gender has arisen in past research. Previous research generally showed that recourse to tubal ligation was more popular than having a vasectomy (Forste, Tanfer & Tedrow, 1995; Godecker, Thomson & Bumpass, 2001; Ross, 1991). Between 1982 and 1988, the US female sterilization rate grew from 13 percent in 1982 to 17 percent in 1988, and in the same period, male sterilization leveled off around six to seven percent (Kaufman, 1998). The most recent Canadian research by Krishnan and Martin (2004) reported a decrease in female sterilization and an

inverse trend in male sterilization, although the rates of female sterilization still overrun that of male sterilization. The inverse move of female versus male sterilization is probably due to health concerns by women while research suggested that vasectomy is more reliable in terms of health consequences (see Rind, 1989). In their analysis of the marital history of US women who were at risk of sterilization, Godecker et al. (2001) claimed that the gender gap in sterilization will increase and sterilization will remain the primary female choice in the US; he suggested that more women are now out of marriage or in a less stable relationship, which has pushed them to pursue prevention of pregnancy by sterilization on their own.

Contraception is traditionally assumed to be the woman's responsibility (Goldscheider & Gayle, 1996). Some men regard contraceptive sterilization as 'women's business; some women also think male vasectomy as 'unnatural' and even take sterilization as 'their right' (Thompson, MacGillivray & Fraser, 1991). Furthermore, some men have misunderstandings of male surgery and are afraid of the loss of 'masculinity' (Thompson, MacGillivray & Fraser, 1991; Marcil-Gratton & Lapierre-Adamcyk, 1983); therefore, men might confirm to themselves as well as encourage women that sterilization is the woman's job. Women, therefore, can be more obliged to take charge of sterilization than men under the pressure of the social norms, which take for granted contraception as the woman's responsibility. Traditional gender roles or gender discourse can also interact with this social norm to strengthen sterilization as the women's responsibility. Furthermore, the practice of other women in the reference

group who have practiced or intend to practice sterilization can help to legitimate this taken-for-granted social norm.

Women suffer directly and widely from giving birth in terms of physiology, psychology and economy, which makes sterilization more attractive to women than men, once women have decided not to have any or any more children. Thus the benefits of sterilization are higher for women than for men while the costs of unwanted children are higher for women than for men. Driven by utility maximization and behavior acceptability regulated by social norms, women may be more likely to choose sterilization as a method of birth control.

Therefore hypothesis 1: Canadian women are more likely than men to choose sterilization for birth control.

Single women are less likely to be sterilized than are married women; married and cohabitating couples share a similar proportion (Belanger, 1998). Previously married women had a higher rate of tubal ligation than currently married or unmarried women, and those unmarried are more likely than others to use hysterectomies (Krishnan & Martin, 2004). Forste et al. (1995) reported that couples where both spouses have had previous marriages were 3.4 times more likely to choose sterilization than those with neither partner being previously married. Single women were 25 percent lower than married women of being at risk of sterilization; women who have never married were at a less than 50 percent risk of sterilization as those in their first marriage; cohabitating

women were at a similar risk of sterilization as married women (Godecker, Thomson & Bumpass, 2001). However, De Wit and Rajulton (1991) claimed that marital status seemed to be losing its effect in women's choice of sterilization, which is not surprising because marital status has reduced its explanatory power in broad fertility behavior.

The transition to marriage usually means an agreement by both partners on great commitment and a relatively predictable and stable living arrangement in one's life course. However, there could be more variations of possible changes in the life course for single people. The cost of sterilization as an irreversible procedure is, thus, much higher for a less predictable future. For example, a single woman would like to adopt sterilization, but considering that the future partner might like to have children can prevent her from using this procedure. The social norms of procreation and family commitment may cause single people to be hesitant to use sterilization even if she/he does not want any children in the future. The cost for these people might, therefore, be relatively high. As an irreversible procedure, the cost of sterilization may be much higher for a less predictable future. However, though previously married people do not have a marriage as the protection, they can also have a relatively high probability of using the procedure for birth control compared to single people. The reason is that the relatively high rate of sterilization among married people has already exerted its reference function among those previously married people during their previous marriage.

Therefore hypothesis 2: Married and previously married people are more likely than single people to choose sterilization for birth control.

Research on sterilization among married people suggests that sterilization is a joint decision (Cochrane & Bean, 1976). However, wives are more likely than husbands to be sterilized for birth control and recent increases of sterilization among married people are due to increases in wives' use of the surgery (Kaufman, 1998). Godecker et al. (1998) suggested that married men are the most likely while common-law men are the least likely to use male vasectomy. Also, sterilization as an alternative choice among the couple, either part takes the procedure will relieve the other from the burden. Marriage thus seems to structure men's and women's sterilization pattern in different ways, though sterilization is traditionally considered as the woman's job. The social norm that regards contraceptive sterilization as the woman's job can operate through the social institution of marriage and thus differently affects men and women in the decision making of sterilization as a method of birth control. Marriage may encourage men to use sterilization as taking responsibility to the family. With the social norm regarding birth control as women's job, single women may already practice sterilization for birth control compared to single men; however, married women can be exempted from using the method as they have male sterilization as the alternative in the marriage. Therefore, the difference between single women and married women in terms of using contraceptive sterilization can be smaller than the difference between married men and single men.

Therefore hypothesis 3: There is an interaction between gender and marital status in terms of the use of contraceptive sterilization: married men are more

likely to use contraceptive sterilization than single men, whereas, the disparity between married women and single women are much smaller than the disparity between married men and single men, if married women are more likely to use the procedure than single women.

Godecker et al (1998) alleged that stability of union is a basic consideration in terms of using sterilization for birth control. A relatively stable union will thus increase the likelihood of the couple to decide to use sterilization as a method of birth control. Family responsibility may be increased as the marriage endures longer. As analyzed above, a stable future can decrease the cost of sterilization as an irreversible method that terminates birth giving. Furthermore, family responsibility related to marriage as a social institution may also encourage individuals to take responsibility for birth control. Forste and colleagues' study (1995) on married men found that likelihood of male vasectomy increases as duration of marriage becomes longer, whereas women are more likely to have been sterilized in a short duration of marriage. Kaufman (1998)'s study of couples in their first marriage found that probabilities of sterilization of husbands and wives diverge as duration of marriage increases: wives are more likely to experience sterilization at short duration of marriage. Murphy's (1995) research has a similar finding. Long marriage can be an approximate index of stability of marriage, whereas the more stable a marriage is, the more both parts of the couple might commit to the marriage. The more commitment to marriage makes sterilization as a procedure that permanently stops

birth giving a more reasonable choice. Furthermore, men's commitment to family can motivate men to undergo sterilization for birth control that is traditionally regarded as woman's job. The social norm of woman's job can function on individuals' decision making on contraceptive sterilization, which is moderated through the institution of marriage that is related to marriage commitment or family responsibility.

Therefore hypothesis 4: Length of marriage increases the likelihood of using sterilization as a method of birth control.

Hypothesis 5: There is an interaction between gender and length of marriage in terms of the use of contraceptive sterilization: men are more likely to use the procedure as length of marriage increases while women are less likely to practice it as length of marriage increases.

As the two-child family is still the norm in Canada, the proportion of sterilization by one spouse increased dramatically for couples with two children and leveled off for couples with three or more children (Belanger, 1995). Forste et al (1995) posited that the likelihood of sterilization increases with higher parity. Before individuals attain the desired family size, the possibility for them to use sterilization is very limited. Some other research found that women are hesitant to be sterilized before having three or four children, such as three or four, and after that they are more likely to choose sterilization (De Wit & Rajulton, 1991; Kaufman, 1998; Taneerananon, 1988). Generally, contraceptive sterilization occurs after people reach their desired family size

(Balakrishnan, Lapierre-Adamcyk & Krotki, 1993). Before individuals attain their desired family size, sterilization is too expensive to be a reasonable contraceptive option; whereas, upon the achievement of family planning, unwanted pregnancy or unplanned birth becomes so expensive that sterilization changes from an unbearably high cost to a guaranteed protection. It is possible that with an increase in parity, individuals are more likely to be protected by sterilization. However, it merits further attention in regards to people with extremely high parity. This group of people can either be with high fertility intention or approaching the end of their reproductive span. Sterilization neither benefits them too much nor exerts a big cost upon them. There is thus no strong incentive for them to use sterilization.

Therefore hypothesis 6: The rate of sterilization increases as the number of children increases, and levels off when the parity arrives at 3 and 4.

Men with a high school education, compared to men with more or less than high school education, are the most likely to use sterilization (Bumpass, 1987; Forste, Tanfer & Tedrow, 1995), while there was no effect of women's education (Forste, Tanfer & Tedrow, 1995). Others argue that women's education is negatively associated with sterilization (Balakrishnan, Krotki & Lapierre-Adamcyk, 1985; De Wit & Rajulton, 1991; Kaufman 1998; Krishnan & Martin, 2004), while men's education is positively related with it (Kaufman, 1998). These studies suggest a complication of the effect of education, which seems to diverge for men and women. However, studies report that a vasectomy is

as effective as tubal ligation while being less invasive and having fewer long-term health risks (Smith, Taylor & Smith, 1985; Giovannucci, Rimm, Colditz, Stampfer & Willett, 1993). Better-educated men may have more access to relevant information. They can then have a full knowledge of the option of vasectomy in terms of its advantages and disadvantages, and thus have a relatively objective attitude toward sterilization. They, therefore, might be more willing to accept sterilization as a permanent and irreversible procedure than their less educated counterparts who might have a distorted idea of consequences of sterilization due to lack of information (see Forste et al., 1995). Less educated women may also be economically disadvantaged, and may have less access to, or be less skilled with other reversible contraceptives, pushing them to use permanent tubal ligation (De Wit et al., 1991). The benefits of sterilization, thus, outweigh its essentially high cost as an irreversible procedure. As a result, highly educated women are more likely to have a sterilized partner, which reduces their risk of using sterilization (Forste et al., 1995).

Therefore hypothesis 7: There is an interaction between education and gender.

Well-educated men and less educated women are more likely to pursue prevention of pregnancy by sterilization.

Balakrishnan et al. (1985) found that religious affiliation has no effect on contraception, including sterilization, but regular church attendance is related to greater use of sterilization. De Wit and Rajulton (1991) reported that church attendance shows a

negative association with sterilization, especially among women aged 35 and over, but seems irrelevant for younger women. Combining data from the 1984 CFS and 1995 GSS, Krishnan and Martin (2004) argued that neither religious affiliation nor church attendance is influential on the issue of sterilization. With the process of secularization by modernization, the authority of religion has declined remarkably (Chaves, 1994). Effects of religion on values and behaviour patterns have correspondently decreased. The secularization of religion as well as mass communication could have dramatically decreased the psychological cost of sterilization and legitimated appropriateness of contraception, including sterilization. However, the unacceptability and undesirability of sterilization advocated by some religious doctrines could still be a high psychological cost for people with a strong religious commitment. The relatively conservative Catholic tradition encourages reproduction and opposes fertility restriction (De Wit & Rajulton, 1991). It is possible that Catholics who go to church frequently are less likely than others to choose sterilization. The doctrine of religion can regulate individuals with various degree of religious devoutness

Therefore hypothesis 8: More devout Catholics are less likely than less devout Catholics to choose sterilization for birth control.

Chapter Four Research Design and Procedures

4.1. Data

Data used in this research were obtained from the 2001 General Social Survey (GSS), Cycle 15: Family History by the Housing, Family and Social Statistics Division of Statistics Canada 2001, released in 2003. The GSS, established in 1985, conducted telephone surveys every several years to collect cross-sectional data reflecting social changes of living situations of Canadians and provides information to inform social policy issues. The 15th GSS was the third GSS cycle focusing on family issues following GSS Cycle 5 (1990) and GSS Cycle 10 (1995) (Statistics Canada, 2003).

The target sample in the 15th cycle included 24,310 Canadians, men and women, 15 years of age and older. It used Computer-Assisted-Telephone- Interviewing (CATI) techniques to collect data (Statistics Canada, 2003). First the target population was divided into geographic strata; second, the Random Digit Dialing method (RDD) chose the telephone numbers of households in a stratum; third, an individual aged 15 or older was randomly selected from the household to answer the questionnaire. Proxy was not allowed. Questions were asked regarding the respondent as well as his/her family: demographic characteristics (such as gender, age, and marital status), parents (family origin), brothers and sisters, marital status of respondent, common-law union of respondent, fertility and family intentions, values and attitudes, education history, work history, main activity, and other characteristics (background demographic characteristics

and some information about household partnerships).

Since the prevalence of telephones is very high in Canada, the RDD technique covered more than 98% of the target population (Statistics Canada, 2003). The responding rate was 78%. The target population excluded 1) residents of the Yukon, Northwest Territories, and Nunavut; and 2) full-time residents of institutions. The survey estimates were weighted to represent those without telephones. The concern was that estimates may have been biased to underrepresent households with lowest income having lower telephone rates than other socio-economic groups.

The sample design divided the whole country into separate Census Metropolitan Areas (CMAs) and non-CMA areas of each of the ten provinces, resulting in 27 strata in all (Statistics Canada, 2003).

The GSS data file is divided into three subsets of data files: the main file, the child file and the union file. The main file contained 669 variables, based on 24,310 records per respondent (24,310 respondents). The child file has 41,461 records (41,461 children by these respondents). Each record represented one child raised by the respondent and contained 97 variables. The union file is composed of all unions reported by the respondents with a union as a record. When a common-law union was followed by a marriage with the same partner in the union, this created one record. In all, 21 variables and 24,497 records were included in this file (24,497 times of unionships by respondents who had ever had a unionship). This research will merge all the three files together to create time-variant variables: marital status, length of marriage and number of children

(Statistics Canada, 2003).

4.2. Study Sample

The study sample constituted of 14,917 respondents who answered 'yes' or 'no' to the sterilization question in the GSS 15: 'Have you had an operation that makes it impossible for you to have a/another child?' The sterilization question was only asked to the following categories: first, those who were less than or equal to 49 years of age and older than or equal to 15 years of age; second, respondents who were males in a unionship at the time of the survey with a female partner aged not older than 49. Those who or whose partners were pregnant at the time of survey were excluded (Statistics Canada, 2003). Therefore, the respondents above composed the study sample.

4.3. Dependent Variables

There are two dependent variables in the survival model that is fitted: the time variable and the status variable. Time was sliced into the intervals of 0.1 year from the beginning till the end of the observation. The status variable indicates whether this individual had undergone the event or was censored during the observation time. Censoring means that the event had not occurred to a case during the observation time (Allison, 2001). The time variable and the status variable are, therefore, correspondent to each other in defining the respondent's status of contraceptive sterilization at each time interval. Each time interval indicates whether the respondents either had experienced the

event (contraceptive sterilization) or had not experienced the event (not having contraceptive sterilization yet). The time-variant covariates are assigned values compared to the time dependent variable to measure characteristics of the variable at each time interval (0.1 year).

At the very beginning of the observation time (age 15 in this study), all the respondents were in the risk set, and exposed to the risk of contraceptive sterilization from then on. If a respondent had used contraceptive sterilization during a certain time interval, the status was coded as one. From the perspective of time, his/her status changed from a case at risk to an uncensored case, and he/she was taken out of the risk set for ever because they had undergone the risk already; the status would not change anymore, and he/she ended as an uncensored case at the time of the event (the time of contraceptive sterilization surgery). For those who had not used sterilization until the time of the survey, status was coded as zero. They ended as censored cases at the time of the survey. From the perspective of time, these respondents did not use the surgery until the end of the observation time (the survey time); Although their status can change if they have the surgery in the future, but it is not of interest to this research since the observation time has ended. These respondents remained in the risk set throughout the observation time (from age 15 until the time of the survey).

Still other respondents deserve a little more discussion here. The status of those who used sterilization for medical reasons, or for both medical and contraceptive reasons (the survey did not distinguish the primary reason for those who had the surgery for both

medical and contraceptive reasons; since this study only focused on contraceptive sterilization, these respondents were treated as censored rather than uncensored cases) was also coded as zero, since the event of interest (contraceptive sterilization) had not occurred to these individuals. From the perspective of time, these individuals can never have contraceptive sterilization once they had the surgery; they ended as censored cases at the time of the surgery (before the time of the survey) and they were taken out of the risk set from the time of the surgery for ever.

At the beginning of the first time interval, all respondents were exposed to the risk of contraceptive sterilization in the risk set (they were at risk of contraceptive sterilization through every time interval if their observation had not ended either due to having events or ending as censored cases), with the value of the status dependent variable as zero. At the end of the first time interval, those who used contraceptive sterilization attained a value of one for the status dependent variable and were taken out of the risk set for ever; those who used sterilization but not for, or not solely for contraceptive reasons had a value of zero for the status dependent variable and were taken out of the risk set for ever; those who had not yet used the surgery had a value of zero for the status dependent variable and remained in the risk set until they used the surgery. Therefore, the status of a respondent could change as they went through the time intervals, but the status would not change any more once they had used the surgery either for a contraceptive reason, a medical reason or both. For those who had not yet used the procedure at the time of the survey, their status remained the value of zero as under censoring from the beginning to

the end of the observation.

An alternative method of analysis would be to use a competing risk model, which can also be estimated by Cox regression. For the competing risk model, to examine the hazard of contraceptive sterilization, the status of those who had used contraceptive sterilization is coded as one and the status of all the others is coded as zero; to examine the hazard of medical sterilization, the status of those who had used medical sterilization is coded as one and the status of all the others is coded as zero; to examine the hazard of sterilization for both medical and contraceptive reasons, the status of those who had used sterilization for both medical and contraceptive reason is coded as one and the status of all the others is coded as zero. Since this study focused exclusively on contraceptive sterilization, there is no need to use the competing risk models to examine the hazard of respondents who use sterilization not for, or not solely for, contraceptive reasons.

The time dependent variable in this study can be converted into age. The starting point of observation time is at age 15 and the end point of observation time is either when the respondent used the surgery not solely for reasons of contraception, or the time of survey. Therefore, those who used sterilization not, or not solely, for contraceptive reasons, ended as censored cases at the time of the procedure. All the other people who had not yet used sterilization at the time of the survey ended as censored cases at the age of 49 or the survey time, whichever was earlier. For those men who were in a union at the time of the survey and their female partner was less than or equal to 49, the observation time for them was from the beginning of age 15 to when they underwent the surgery for

whatever reason or the survey time if they had not yet used the surgery by then; therefore, the value of the time dependent variable for these men can be greater than age of 49 (if converted into age): either the age when they used the surgery, or the age at the time of survey if they had not used the surgery by then can be greater than 49.

There was one person in the sample who was sterilized at the age of 12.5 though this person was older than or equal to 15 years old at the time of the survey. Since the age was less than the starting time for this model, this person can be no longer in the risk set after age of 15. The respondent was, therefore, left censored and as a result excluded from the model.

4.4. Explanatory Variables

To test my hypotheses, I adopted the following explanatory variables: gender, marital status, length of marriage, number of children birthed or fathered by the respondent, the highest education level, religious affiliation and religious devoutness. Marital status, length of marriage, and number of children are time-variant variables and the others are time-constant variables, the regular cross-sectional variables. To further examine the hypotheses, I also introduce age cohort, birth country and residence province as control variables. (The codes, operational definitions and descriptive statistics of all the covariates, which will be reported in the following discussions, are referred in Table 3).

Table 3. Definitions and Descriptive Statistics for Variables in the Research

Variable	Definition	Mean or Percentage	S.D.
Gender	Female	52.48%	
	Male	47.52%	
Marital Status ^a	Married	55.07%	
	Previously Married	15.31%	
Length of Marriage ^a	Single	29.62%	7.99
	Reference Category	6.92	1.26
Number of Children ^{a*}	Duration of the marriage from the beginning to the end	1.12	1.26
	Total number of children that the respondents birthed or fathered	2.82	4.79
Square of Number of Children ^a	Square of total number of children	3.15	1.42
	Highest level of education obtained by the respondents (in 5 levels, 1=Some secondary/elementary/no schooling or Other beyond elementary/high school, 2=High school diploma, 3=Some university/community college, 4=Diploma/certificate from community college or trade/technical, 5=Doctorate/Master's/Bachelor's ^(Advanced))		
Religious Affiliation	Religion of the respondent (1=Catholic, 0=Non-Catholic)	41.89%	
Religious Devoutness	Catholics	58.11%	
	Non-Catholics	2.74	1.49
Control Variables	Religious attendance of the respondent (in 5 levels, 1=Not at all/never, 2=At least once a year, 3=A few times, 4=At least once a month, 5=At least once a week)		
	Dummy variables of birth cohorts (1=yes, 0=no)		
Birth Cohort	1976-1967	28.04%	
	1966-1957	34.21%	
	1957 and before	17.05%	
Birth Country	Reference Category	20.70%	
	Country of birth of the respondent (1=Canada, 0= foreign countries)		
Residence Province	Canada	84.53%	
	Foreign Countries	15.47%	
Residence Province	Quebec	20.49%	
	Non-Quebec	79.51%	
	Region of residence of the respondent (1=Quebec, 0=Non-Quebec regions)		

Note: S.D. =Standard Deviation.

^a Time-variant variable. The mean or frequency is calculated from the person-0.1 year records.

• The largest number of children that a respondent had was thirteen.

Source: The 2001 General Social Survey, Statistics Canada.

4.4.1. Main Variables

4.4.1.1. Time-constant Variables

For the target sample 52.48% of were women and 47.52% were men. Among these Canadian men and women, 41.89% were Roman Catholic and 58.11% belonged to other religions or were not religious. Since previous research reported no effect or weakening effect of religion (Balacrishnan & Lapierre-Adamcyk, 1985; De Wit & Rajulton, 1991; Krishnan & Martin, 2004), Roman Catholic Church is famous for their hard anti-contraception position (De Wit & Rajulton, 1991), I therefore only compare Catholics and non-Catholics proposed by my hypothesis. Previous research has used church attendance to measure religiosity (Balacrishnan & Lapierre-Adamcyk, 1985); similarly, this study used how often a respondent went to a religious meeting or service to measure religious devoutness. Frequency of religious attendance was coded into five categories, ranging from 'not at all/never' to 'at least once a week'. The average score of religious devoutness was 2.74, which fell between the category of 'a few times' (coded as two out of the five score scale), and the category of 'at least once a year' (coded as 3 out of the 5 score scale).

Education was coded from one to five, indicating the lowest level of education, 'below high school diploma', to the highest level of education, 'a degree of or above bachelor'. The average level of education attained was 3.15 between 'some university/community college' (coded as three out of the five score scale) and 'diploma/certificate from community college or trade/technical' (coded as four out of the

five score scale).

4.4.1.2. Time-variant Variables

Marital status was coded as a time-variant variable, which indicated marital status, currently married, previously married, or never married (single) during each time interval. Those who were common-law or married during the time interval were coded as married at the time interval. Those who ended a union (marriage or common-law) before the time interval and were not in a union during the time interval were coded as previously married at the time interval. Those who had no union history until the time interval were coded as single at the time interval.

First, I located variables measuring starting ages of each union. Second, I created ending ages of each union, if ever ended, by combining ages of divorce, separation and death of the spouse, whichever was earlier. Third, I compared starting and ending ages of each union to the time dependent variable, which was sliced into each time interval. If the value of the time dependent variable was greater or equal to the starting age of the union and less than the ending age if the union had ever ended before the time of survey, marital status was coded as married at the time interval. If the value of the time dependent variable was greater or equal to the ending age of the union and less than the starting age of the next union if the union was ever followed by the next union before the time of survey, marital status was previously married at the time interval. The rest of the respondents were then single at the time interval. Single people can change into married

people or previously married people as they move through the time intervals. Married and previously married individuals can also change through the time intervals. But once a respondent was married or ended the marriage, he/she could never go back to the status of single. In the individual respondents' time records ('person-time records,' where the time unit is 0.1 year), 55.07% of the respondents were married, 15.31% were previously married and 29.62% were single through the observation time.

A similar strategy was employed to create time-variant variables, length of marriage, and number of children. During the time interval, if a respondent was not married, length of marriage was coded as zero; if he/she was in a union at the time interval, length of marriage was calculated by subtracting the starting time of the union from the value of the time dependent variable. The average length of marriage was 6.92 years throughout the observation period.

Number of children was coded as zero if the respondent had no children at the time interval. It was coded as one if the time dependent variable was greater than, or equal to the birth date of the first child at the time interval, coded as two if the time dependent variable was greater than, or equal to the birth date of the second children and so on. The average number of children was 1.12 throughout the observation time. To examine the non-linear effect of number of children, I also included number of children square in my model. It will be withheld in the model if it is significant and will be deleted if it is nonsignificant.

4.4.2. Control Variables

Among the sample, 28.04% were born between 1976 and 1967; 34.21% were born between 1966 and 1957; 17.05% were born before 1957 and 20.70% were born between 1986 and 1977 (reference category). Also, 84.53% of the sample were born Canadian; and 15.47% were foreign born. 20.49% were Quebec residents while 79.51% was non-Quebec residents.

4.5. Statistical Analysis

4.5.1. Survival Analysis

This study used event history analysis (survival model) to build the statistical model predicting the hazard of contraceptive sterilization (Allison, 1984). Survival models use longitudinal data to predict the occurrence of events during the observation period, usually at the individual level. An event is often regarded as a finite status qualitatively different from, or transitioned from, a previous fixed status. For example, a marriage is regarded as a transition from being unmarried to being married. Event history analysis uses non-parametric methods (the life table method and similar techniques) and parametric methods (regression techniques including Cox proportional hazard regression), using a set of covariates, to predict occurrence of events over an observation time, which is sliced into time intervals in order. Before the event actually happens, there is a period of observation (time intervals) at risk of occurrence of events. At the beginning of the observation period (age 15 for this study), the target sample is at risk of having events

(adoption of contraceptive sterilization in this study) or is censored during the time intervals until the event occurs to respondents; cases end as censored at the end of the observation time if events have not occurred to respondents (the time of survey in this study); cases also end as censored if the status is unknown at the time intervals during the observation time, for example, dead, lost from the follow-up, or moving to other regions (having sterilization for a medical reason or for both medical and contraceptive reason in this study). That a case ends as censored means an observation is terminated before the event occurs to a subject. Ending as censored can happen before, during and at the end of the overall observation time.

The hazard rate or hazard function, $h(t)$, is usually predicted to model event history analysis. Hazard function, the conditional instantaneous probability, together with probability density function, $f(t)$, and survivor function, $S(t)$, is used to predict continuous probability distribution across the observation duration. It is the instantaneous risk of the event occurring at time t , when the event has not yet occurred before time t . The probability of the event is zero at the exact point of time t . The hazard rate is the probability of the event in the time interval $[t, \Delta t)$ given the event has not yet happened at time t . The hazard function can also be interpreted as an unconditional instantaneous probability of events, the probability density function $f(t)$ divided by the survivor $S(t)$, which is the probability of survival beyond time t . Another way to understand the hazard rate is the number of events in a time interval $[t, \Delta t)$ of the observation time divided by total exposure time during this time interval of those who have not yet experienced the

event or been censored at time t .

$$h(t) = \lim_{\Delta t \rightarrow 0} \frac{\Pr\{t \leq T \leq t + \Delta t | T \geq t\}}{\Delta t}$$

$$h(t) = \frac{f(t)}{S(t)}$$

$$S(t) = P(T \geq t)$$

$$f(t) = \lim_{\Delta t \rightarrow 0} \frac{\Pr\{t \leq T < t + \Delta t\}}{\Delta t}$$

In this study, I will examine effects of socio-economic, cultural and demographic variables on the hazard rate of contraceptive sterilization during the period between age 15 to 49 (if it is a man in a union with his female partner aged 15 to 49, the age can be more than 49), or interview date, whichever is earlier.

Event history analysis is a robust method to examine life course behaviors such as adoption of contraceptive sterilization in this study, compared to other multivariate models such as Ordinary Least Squares (OLS) and logistic regression techniques (Allison, 2001). For example, OLS models cannot deal with a dichotomous dependent variable, such as adoption of contraceptive sterilization in this study. OLS models can analyze the length of time before adoption of sterilization, but must do so among those who have already used sterilization, thus excluding data of those who have not yet adopted sterilization for birth control at the time of interview. This can produce a serious estimation bias. Logistic regression deals with probability of occurrence of events, but cannot examine the rate of events during the observation time sliced into time intervals. It predicts the probability of adoption of contraceptive sterilization, but fails to examine

time variance in adoption of sterilization. In contrast, by predicting the 'hazard rate' of adoption of contraceptive sterilization at each time interval (e.g. 0.1 year in this study), event history analysis examines probability of using the procedure throughout the observation time by both respondents who have adopted contraceptive sterilization ending as uncensored cases, and those who have not yet used contraceptive sterilization during the survey time ending as censored cases.

Here, I adopt life table techniques to compute cumulative probability of contraceptive sterilization at each time interval (0.1 year as the time unit) from age 15. Then, I use the proportional hazard model to examine the effects of covariates on the 'risk' of sterilization as a method of birth control (Cox, 1972). This is the most popular survival model in demographic analysis. Data analysis is conducted using the SAS statistical package (version 9.1).

4.5.2. Life table Techniques

The life table technique was once one of the main methods of event history analysis used prior to Cox proportional hazard regressions (Allison, 2001). It produces a full picture of probability distributions during observation time and gives preliminary analysis of data without knowledge of covariates. It is, therefore, still a very significant method in demography. Another advantage is that it is a powerful tool for large data sets, a characteristic of this research. With the help of the life table method, I am able to obtain conditional probability estimates. By summing the conditional probabilities to a

particular time, I can calculate the cumulative probability of contraceptive sterilization at that time. The cumulative probability presented in this study is calculated in complete years so that I can report individuals' cumulative probability of adoption of sterilization as a method for birth control at each year of age.

4.5.3. Cox Proportional Hazard Model

The Cox proportional hazard model is a semi-parametric method using the regression model to predict the hazard rate of the event, which was first proposed by the British statistician Sir David Cox in his extensively cited article (Cox, 1972; Allison, 1984; 2001). This model runs with a set of covariates but without the intercept, which does not require specific time effects on hazard rates. This is the reason why it is called semi-parametric, which is represented by the following equation:

$$h_i(t) = \lambda_0(t) \exp(\beta x_i)$$

This function predicts hazard rate of individual i at time t . The hazard function equals the baseline hazard function $\lambda_0(t)$ multiplied by the exponentiation of a linear function of a vector of covariates: x is the vector of variables and β is the vector of the coefficients. The baseline hazard function can be treated as a function of an individual when all the covariates are zero, that is to say, the intercept, which reflects distribution of survival time. In Cox proportional hazard regression, the ratio of hazard rate of an individual to that of any other is constant over time; that is the reason this model is referred to as the proportional hazard model.

The model also proposed a new estimation method, the maximum partial likelihood method. Estimates are computed by calculating β values to maximize the partial likelihood. A regular maximum likelihood is the product of the likelihoods of all the individuals in the sample; however, a partial likelihood is the product of the likelihoods of all individuals who experienced the events. The Cox regression model computes likelihood at each event time.

$$L_i = \left[\frac{e^{\beta x_i}}{\sum_{j=1}^n Y_{ij} e^{\beta x_j}} \right]^{\delta_i}$$

$$PL = \prod_{j=1}^J L_j$$

The likelihood of an individual who experiences the event during the interval $[t, \Delta t)$ is computed by dividing his/her hazard by the sum of hazards of all the individuals in the risk set for this specific time interval. For the first equation, L_j is the likelihood for the j th event. The second equation is the product of all events. When $t_j \geq t_i$ then Y_{ij} equals one, and when $t_j < t_i$ then Y_{ij} equals zero. Y formula, therefore, excludes those who have already experienced events. If the case is censored, then δ_i equals zero and δ_i equals to one when the individual has experienced the event. It excludes those censored observations by this manipulation. First, calculate the hazard of an individual at time t_i , the starting point of the interval $[t_i, t_i + \Delta t)$; second, sum hazards of all individuals in the risk set during the time interval who have not yet experienced events at time t ; third, divide the former by

the latter and acquire the hazard ratio of the individual who experienced the event during the time interval; finally multiply all the hazard ratios of individuals who experienced events throughout the observation time.

β coefficients can be estimated with the baseline hazard function unspecified in the Cox regression. The anti-log of β provides the hazard ratio for interpretation. For example, if β_j is the coefficient of a continuous variable x_j , the $(\exp[\beta_j]-1)$ is interpreted as a change (positive β_j indicating increase and negative β_j indicating decrease) of the hazard rate with every unit change in x_j ; if β_k is the coefficient of a categorical variable x_k , then $(\exp[\beta_k])$ indicates the hazard ratio of the category of interest to the reference category.

Another topic deserving explanation is that the proportional hazard can be generalized to non-proportional hazards with no significant impact to the likelihood estimation, which allows this model to include time-variant variables (Allison, 1984). Similar to the time constant variable, the Cox regression computes likelihood at each time interval; the difference is that for different time intervals, the value of the time-variant variables can be different. This changes the hazards defined by the varying values and makes the computation more complicated. Since this study is designed to deal with several time-variant covariates (marital status, length of marriage and number of children in this study) the Cox proportional hazard model, which is able to handle the time-variant variable, is beneficial to this study.

4.6. Data Handling

Time-variant variables are always more complicated to handle compared to time constant variables. To create the time-variant variables of marital status and length of marriage, I merged the union data file to the main data file provided by GSS 15. In the union file, a record represents a union. Therefore, a respondent who had ever had a union, can have multiple records. I first separate the union file into eight files according to the rank of union, for example, the first union in a file, the second union in a file and so on (the highest rank of union was eight). I then locate as well as create variables measuring starting age and ending age of each union. Finally, I merge all the separate union files with the main files. By comparing starting age and ending age of each union to the time intervals, I can create the time-variant variable of marital status. Similarly, by computing the disparity of starting age of each union to the time intervals, I can create the time-variant variable, length of marriage.

To compute number of children at each time interval, I merged the child data file to the main data file. I use the same strategy as above, dividing the child file into separate files according to the order of children, for example, the first child in the same file, the second child in the same file and so on. After merging all the child files to the main file, I compared birth year of each child to the time interval. I calculated how many children the respondent had during each time interval.

Religious devoutness is another example of complex data handling. Since the question was not asked to those who did not declare a religious affiliation, about one fifth

of the sample are excluded from the model. To deal with this, I exclude these respondents when examining the effect of religious devoutness. When I examine the effects of other variables controlling for religious devoutness, I assign those nonreligious people to the lowest value category of religious devoutness, which is 'not at all or never go to church'. Using this strategy, I am able to include most of the respondents in the sample. However, I am still cautious with the variable religious devoutness. The survey only asked the respondent how often they attended religious services for the past twelve months. It is possible that their religious attendance can change through the lifecourse.

The variable education also deserves note. This variable was only measured at the time of the survey. Education is generally a variable sensitive to time or age. The variable, therefore, cannot adequately reflect education at each time interval. There is no way to precisely predict how education affects hazards of contraceptive sterilization. However, education can still largely reflect the variation of education at each time interval. Once an individual has attained the highest level of education in his/her life course, it will remain constant after that. In my sample, the average age of respondents is approximately 33. The highest level of education is coded as some of as well as above a bachelor's degree. It is possible that most of the respondents have attained their highest education; however, I am still cautious when examining the effect of education.

There are no major concerns surrounding the other variables. Whether you were born inside or outside Canada won't change with time. Gender is also generally a constant variable. There can be variations of residence outside or inside Quebec and

religion with time; however, the variations can be regarded to be so small that variables can be used as time constant variables. The variable birth cohort is a control variable indicating the hazard ratios of contraceptive sterilization among different cohorts. It is not considered an effect of age, so there is no need to convert it into a time-variant variable.

4.7. Model Building Procedure

I construct my statistical analyses in three stages. As discussed in the sections above, I first use life table techniques and then use the Cox proportional regression model at each stage. I focus on discussion of the use of Cox regression in this section. At the first stage, I focus on the whole sample. At stage two, I target female and male as separate samples, since previous research mostly focuses on women. This provides me with an opportunity to advance previous research. Finally, I focus on Quebec and non-Quebec residents separately considering Quebec as a 'distinct society' in Canada (Friesen, 2004).

At stage one, I build the simple models to separately examine the effects of gender, marital status (married, previously married, and single), length of marriage, number of children and square of number of children, education, religious affiliation and religious devoutness. Second, I use a full model, including all the variables controlling for age cohorts, birth country and residence province. Third, I examine each interaction proposed in my hypotheses, the interaction between gender and marriage, the interaction between gender and length of marriage, the interaction between gender and education and the interaction between religious affiliation and religious devoutness, without controlling for

other variables. Fourth, I add all interactions to the full model.

At stage two, I focus on women and men separately. For this stage, to simplify the calculation, I only use the full model without interactions to focus on the main effects. At the final stage, similarly, I focus on Quebec and Non-Quebec residents separately using the full model without interactions.

4.8. Summary

This study uses event analysis techniques to model the research with data obtained from the 15th cycle of GSS by Statistics Canada. It uses both socio- demographic variables and cultural variables to predict hazards of using contraceptive sterilization. The individually oriented event analysis method is consistent with the individually oriented framework, the reasonable choice (Allison, 1984). Furthermore, both the theoretical framework and the methodology fit well into the nature of the adoption of contraceptive sterilization: the individual decision-making feature and the event feature. Using cultural variables also allows greater freedom to apply the reasonable choice framework.

In the following chapter, I first focus on the entire targeted sample. I use the life table technique first, to provide estimates of hazard and cumulative proportion of using contraceptive sterilization, followed by Cox proportional hazard regression to predict the hazard rate using sets of covariates. I then split the sample into male and female, first using the life table technique, and then using the Cox regression. Using the same strategy, I select Quebec and non-Quebec for further analysis.

Chapter Five

Findings

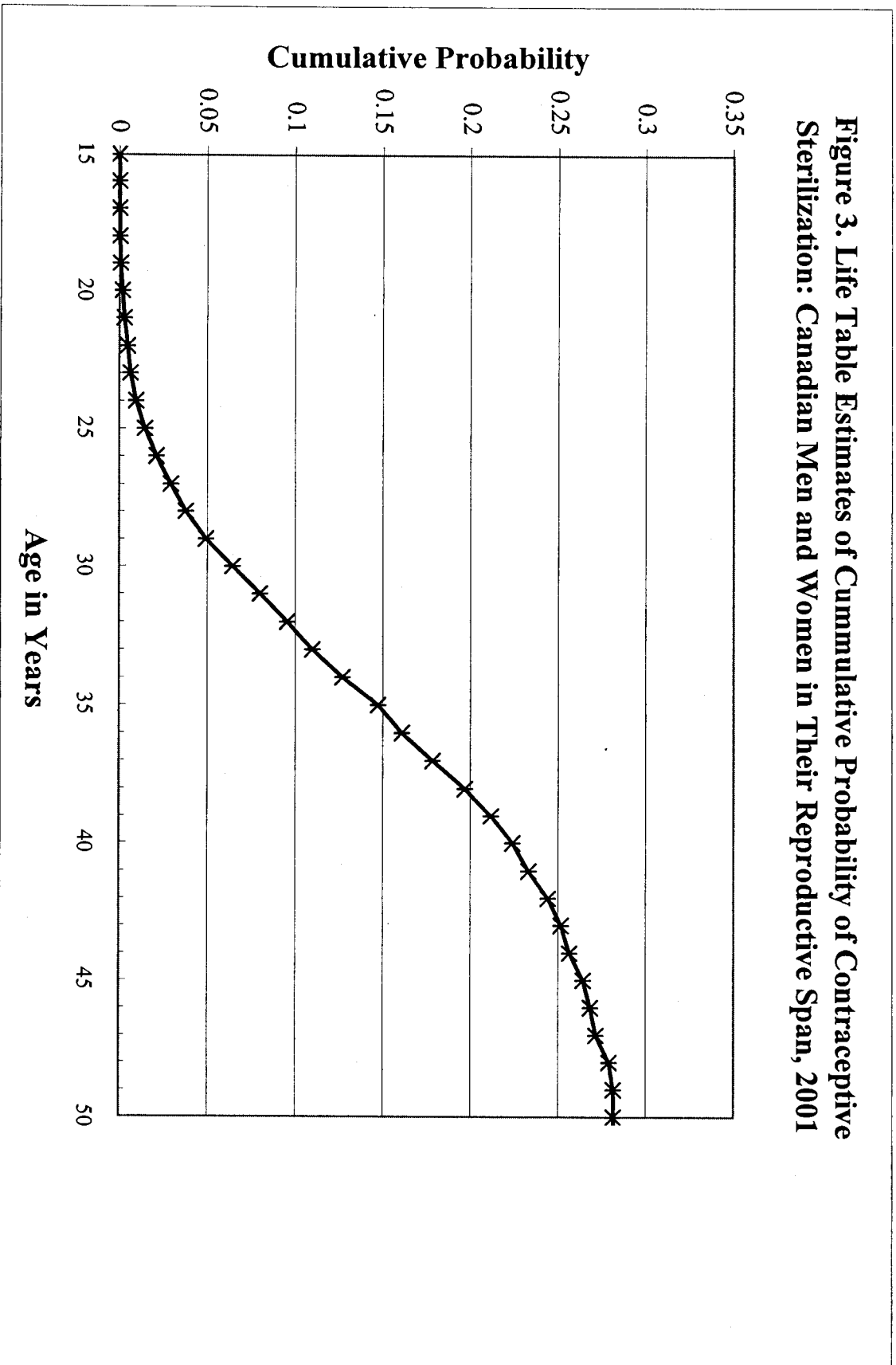
In this chapter, I first used life table techniques to estimate the time pattern of the use of sterilization as a method of birth control by Canadians. I then used the Cox proportional hazard model to predict the hazard rate of using contraceptive sterilization by demographical, social and cultural measurements. Secondly, I split the sample by gender, and then used life table techniques. After that I used Cox regression to further test gender differences. Finally, I split the population into Quebec residents and non-Quebec residents. I adopted the same strategy, first life table techniques and then Cox regression, as I used to test gender differences to predict the time pattern and the hazard of the use of sterilization as a method of birth control across Quebec.

5.1. Life Table Estimates

At this stage of analysis I used life table techniques to estimate the time pattern of the probability distribution of contraceptive sterilization within the whole Canadian population (see Figure 3). The life table method calculates relative estimates at each time interval (0.1 year in this study). Summing the conditional probability at each age, I calculated the cumulative probabilities in complete years of age.

From the life table estimates, it is clear that by age 30, only 6% of Canadians used

Figure 3. Life Table Estimates of Cumulative Probability of Contraceptive Sterilization: Canadian Men and Women in Their Reproductive Span, 2001



contraceptive sterilization (Figure 3). The cumulative probability curves upward after age 30 until about age 40 (increased by about 16 percent in these 10 years). This suggests that people in their 30s are more likely to get sterilized for birth control than those in the younger cohort (ages 15 to 30). The increasing rate slows after the age of 40 and decelerates after the age of 44 (about 6 percent in 10 years of people aged between 40 and 50). Canadians in this age range are less likely to get sterilized for contraception compared to those in their 30s. The cumulative probability estimate of Canadians who were sterilized by age 50 is slightly less than one third.

5.2. Cox Proportional Hazard Regression

Life table techniques reveal a dynamic pattern whereby Canadians approach contraceptive sterilization in their life stages scaled by age in years. However, we don't know yet how social-demographic and cultural variables structure this pattern. In this section, I used the simple Cox models to predict hazard ratios of contraceptive sterilization by separately examining the effects of gender, marital status, length of marriage, number of children, education, religious affiliation and religious devoutness, which were proposed in my hypotheses for this study. Then I used a full model with all the variables above, while controlling for birth country and residence province. I then added the interaction terms to the full model to discuss how the effects of certain covariates depend on other related covariates.

5.2.1. Main effects

Models 1 through 7 (refer to Table 4) are simple models that separately examine the effects of gender, marital status, length of marriage, number of children, education, religious affiliation (Catholics and non-Catholics) and religious devoutness. Model 8 (refer to Table 4) is a full model examining all the effects together, controlling for age cohort, birth country and residence province (region as Quebec versus non-Quebec).

5.2.1.1. Simple Models

First, I looked at the simple models: Models 1 through 7 (refer to Table 4). The effect of gender is not statistically significant (Model 1). However, religious devoutness is significantly related to contraceptive sterilization ($p < 0.05$) (Model 7), while all the rest of the variables have highly significant effects ($p < 0.001$) (Models 2 through 6).

Compared to the hazard rate of contraceptive sterilization of single people, that of married people is 7.63 times higher, and that of previously married people is 5.23 percent higher (Model 2). One year of marriage increases the hazard rate about four percent, ten years increases about 50 percent and twenty years increases about 120 percent (Model 3) (refer to Table 4-1 below for details).

Both the effect and the square effect of number of children are substantially significant (Model 4) (refer to Table 4-1 below for details). It is verified that there is a nonlinear relationship between number of children and the use of contraceptive sterilization. Having one child increases the hazard ratio about five times, and having

three or four children increases the hazard rate to about 40 times as high; the hazard rate then decreases after four children. As education goes up one unit on the five-point scale, the hazard rate decreases by about thirteen percent (Model 5) (refer to Table 4-1 below for details). That is to say, the hazard rate of an individual who has a university degree or above decreases almost one fourth compared to that of an individual who has a high school diploma.

Table 4-1. Hazard Ratios of Use of Contraceptive Sterilization of Continuous Variables in the Simple Models (Models 3, 4, 5 & 7): Canadian Men and Women in Their Reproductive Span, 2001

Model 3		Model 4		Model 5		Model 7	
Length of Marriage	Hazard Ratio	Number of Children	Hazard Ratio	Education	Hazard Ratio	Religious Devoutness	Hazard Ratio
1	1.04	0	1.00	1	0.87	1	0.96
5	1.22	1	6.04	2	0.76	2	0.92
10	1.49	2	20.26	3	0.67	3	0.88
15	1.82	3	37.82	4	0.58	4	0.84
20	2.22	4	39.27	5	0.51	5	0.81
25	2.70	5	22.68				
30	3.30	6	7.28				
		7	1.30				
		8	0.13				
		9	0.01				
		10	0.00				

Note: Calculations based on statistics from Table 4.

Surprisingly, the hazard rate for Catholics is about one fourth greater than that for non-Catholics (Model 6). Every unit increase in religious devoutness decreases the hazard rate of the use of contraceptive sterilization by approximately four percent, which

is a fairly minimal effect (Model 7) (refer to Table 4-1 above for details). An individual who attended religious service/meeting at least once a week has a hazard rate fifteen percent higher than that of those who never attended a service/meeting.

5.2.1.2. The Full Model

I then compared results of the simple models and the full model. Unlike the simple model, in Model 8 (the full model, refer to Table 4; for the detailed information of continuous variables, refer to Table 4-2 below), gender is highly significant. Women are seventeen percent less likely than men in the hazard rate to use contraceptive sterilization. Education is not significant in the full model. Religious affiliation is less significant, and religious devoutness is more significant in the full model. The effect of religious affiliation weakens in the full model: being Catholic increases the hazard rate by about twelve percent compared to being non-Catholic. The effect of religious devoutness in the full model is similar to that in the simple model.

Another noticeable change is the effect of marital status. The magnitudes of the effect of both variables decreases greatly with a trend toward convergence: the hazard rates are 8.63 and 6.23 in Model 2 and they are 2.1 and 2.01 in Model 8. Both the effect and the square effect of number of children are similar in the simple model and the full model, though the child effect (the hazard rate of each child in order calculated by combining both parameters of number of children and number of children square) weakens in the full model: having three or four children increases the hazard rate to about

33; the hazard rate decreases with more children.

Table 4-2. Hazard Ratios of Use of Contraceptive Sterilization of Continuous Variables in the Full Model (Model 8): Canadian Men and Women in Their Reproductive Span, 2001

Length of Marriage	Hazard Ratio	Number of Children	Hazard Ratio	Education	Hazard Ratio	Religious Devoutness	Hazard Ratio
1	0.99	0	1.00	1	1.00	1	0.95
5	0.97	1	5.58	2	1.00	2	0.90
10	0.94	2	17.88	3	0.99	3	0.86
15	0.91	3	32.89	4	0.99	4	0.82
20	0.88	4	34.72	5	0.99	5	0.78
25	0.85	5	21.04				
30	0.83	6	7.32				
		7	1.46				
		8	0.17				
		9	0.01				
		10	0.00				

Note: Calculations based on statistics from Table 4.

5.2.2. Interaction Effects

I proposed interaction effects between gender and marital status, gender and length of marriage, gender and education, and between religious affiliation and religious devoutness. First I used simple interaction models (refer to Table 5) only focusing on the relevant interacting variables above. Models 9 through 12 (refer to Table 5, refer to Table 5-1 below and Table 5-2 below for details) examine the simple interaction terms without controlling for other variables. Later, I included all the interactions in the full model, Model 13 (refer to Table 5, refer to Table 5-3 below for details) for comparison and further analysis.

Table 5. Proportional Hazard Models Examining Interaction Effects of Use of Contraceptive Sterilization

Variable	Model 9		Model 10		Model 11		Model 12		Model 13	
	Parameter (β)	Hazard Ratio exp(β)	Parameter (β)	Hazard Ratio exp(β)	Parameter (β)	Hazard Ratio exp(β)	Parameter (β)	Hazard Ratio exp(β)	Parameter (β)	Hazard Ratio exp(β)
Gender	Female	1.10945***	3.033	0.18389***	1.202	0.82637***	2.285	1.40546***	4.077	
	Male ^b									
Marital Status ^a	Married	2.92475***	18.629					1.31258***	3.716	
	Previously Married	1.73519***	5.67					0.49691	1.644	
	Single ^b									
Gender*Marital Status	Married Female	-1.43282***	0.239					-1.00438***	0.366	
	Previously Married Female	-0.02731	0.973					0.21625	1.241	
Length of Marriage ^a			0.06387***	1.066				0.00405	1.004	
Gender* Length of Marriage			-0.04734***	0.954				-0.02475***	0.976	
Number of Children ^a								1.94546***	6.997	
Square of Number of Children ^a								-0.26823***	0.765	
Education					-0.01418	0.986		0.10932***	1.116	
Gender*Education					-0.26127***	0.77		-0.23504***	0.791	
Religious Affiliation										
	Catholics						0.41104***	1.508	0.12399*	1.132
	Non-Catholics ^b									
Religious Devoutness							0.0003213	1	-0.05382***	0.948
Religious Affiliation* Religious Devoutness							-0.0773*	0.926		
Control Variables										
Birth Cohort	1976-1967								-0.54137	0.582
	1966-1957								-0.64176*	0.526
	1957 and below								-0.89198***	0.41
1986-1977 ^b										
Birth Country	Canada							0.85082***	2.342	
	Foreign Countries ^b									
Residence Province	Quebec									
	Non-Quebec ^b							0.21352***	1.238	

Note: ^a Time-variant variables^b Reference category

* p<0.05

**p<0.01

***p<0.001 (two-tailed test)

Source: The 2001 General Social Survey, Statistics Canada

5.2.2.1. Interaction between Gender and Marital Status

Model 9 (refer to Table 5) shows a strong interaction effect between gender and marriage and no interaction effect between previous marriage and gender. However, the block test shows the interaction between gender and marital status as a whole is significant. The hazard rates from the highest to lowest are as follows: married men (18.63), previously married women (16.73), married women (13.48), previously married men (5.67), single women (3.03) and single men (1) (refer to Table 5-1 below for details). Both single women and previously married women have a higher hazard rate than their male counterparts in the use of sterilization as birth control; both married women and married men seem to be exceptions among their same gender counterparts.

Table 5-1. Hazard Ratios of Use of Contraceptive Sterilization of Interacting Covariates in the Simple Interaction Models (Model 9 & 10): Canadian Men and Women in Their Reproductive Span, 2001

Marital Status	Model 9		Length of Marriage	Model 10	
	Female	Male		Female	Male
Married	13.48	18.63	1	1.22	1.07
			5	1.31	1.38
Previously Married	16.73	5.67	10	1.42	1.89
			15	1.54	2.61
Single	3.03	1.00	20	1.67	3.59
			25	1.82	4.94
			30	1.97	6.79

Note: Calculations based on statistics from Table 5.

From the perspective of time sequence in the life course, contraceptive sterilization originally seems to be single women's job. Following that, marriage seems to retrieve

women from the job while burdening men with the responsibility. However, without protection from marriage, previously married women take responsibility for contraceptive sterilization as birth control again. To sum up, sterilization as a method for birth control seems to be women's job first; however, marriage functions differently for men and women in terms of use of the procedure.

5.2.2.2. Interaction between Gender and Length of Marriage

Model 10 (refer to Table 5) examines the interaction between gender and length of marriage. Gender, length of marriage and the interaction term are highly significant, with a positive gender effect, a positive effect of length of marriage and a negative interaction effect. The hazard rates for both men and women increase as they stay longer in the marriage, whereas men's hazard rate increases much faster than women's (refer to Table 5-1 above for details). In the beginning years, women still have a higher hazard rate than men. From the fourth year of marriage, men's hazard rate becomes higher than the women's rate and increases very quickly.

It seems that women are still taking initiative in the use of contraceptive sterilization at the beginning of marriage. The longer they stay in the marriage, men are more likely to share birth control with women and thus exempt women from using the procedure. The interaction between gender and marriage length is consistent with the interaction between gender and marital status.

5.2.2.3. Interaction between Gender and Education

In Model 11 (refer to Table 5), the effects of gender and the interaction term between gender and education are highly significant, while the effect of education is not significant. This indicates that education affects women's use of contraceptive sterilization; however, men with different levels of education are not statistically different from one another in the use of sterilization as a method of birth control (refer to Table 5-2 below for details). The hazard rates for well educated women are less than those for poorly educated women. For example, the hazard rate of a university degree woman is 75 percent, whereas that of a high school diploma woman is 173 percent. However, the effect of education on men is not significant compared to the education effect on women in the use of contraceptive sterilization.

Table 5-2. Hazard Ratios of Use of Contraceptive Sterilization of Interacting Covariates in the Simple Interaction Models (Model 11 & 12): Canadian Men and Women in Their Reproductive Span, 2001

Education	Model 11		Religious Devoutness	Model 12	
	Female	Male		Catholic	Non-Catholic
1	1.73	0.99	1	1.40	1.00
2	1.32	0.97	2	1.29	1.00
3	1.00	0.96	3	1.20	1.00
4	0.76	0.94	4	1.11	1.00
5	0.58	0.93	5	1.03	1.00

Note: Calculations based on statistics from Table 5.

5.2.2.4. Interaction between Religious Affiliation and Religious Devoutness

Model 12 (refer to Table 5) shows that the interaction term between religious affiliation and religious devoutness is significant and the effect of religious affiliation is highly significant; however, religious devoutness loses its significance in predicting the use of sterilization as a method of birth control inside the interaction term. This suggests that the degree of religious devoutness influences Catholics' use of contraceptive sterilization, while it has no effect on non-Catholics' use of the procedure. The hazard rates of Catholics who attended religious services/meetings at least once a week are about one fourth lower than that of Catholics who attended religious services/meetings at least once a year (refer to Table 5-2 above for details). For a non-Catholic individual, the degree of religious devoutness, measured by the frequency of attending religious services/meetings, does not influence risk of using contraceptive sterilization.

5.2.2.5. Interactions in the Full Model

Compared to the simple interaction models, the interaction between religious affiliation and religious devoutness is not significant, and I thus did not include this interaction in Model 13 (refer to Table 5); previous marriage is marginally significant (at $p=0.06$), and the interaction between gender and previous marriage is also not significant. Length of marriage is not significant whereas the interaction between gender and length of marriage is highly significant. Finally, education is not significant.

It is worth discussing a little more about the effect of gender. Gender involves three interactions: gender and marital status, gender and length of marriage, and gender and

education. The effect of gender in the full interaction model, therefore, depends on the effects of the three other variables. To compute the effects of a particular interaction between gender and a specific other variable, the two other interactions involving gender have to be excluded (i.e. controlling for the two other variables interacting with gender in the main effect term) (refer to Table 5-3 below for detailed results). In the following paragraphs, I first compare interactions in the full interaction model (Model 13) to that in the simple interaction models (Models 9 through 12). Then I talk about main effects of the remaining main variables not involved in the interactions.

Table 5-3. Hazard Ratios of Use of Contraceptive Sterilization of Interacting Covariates in the Full Interaction Model (Model 13): Canadian Men and Women in Their Reproductive Span, 2001

Marital Status	Education		Length of Marriage	
	Female	Male	Female	Male
Married	2.50	4.09	1	1.36
Previously Married	3.87	1.77	5	1.25
Married			10	1.39
Single	2.06	1.00	15	0.92
			20	0.80
			25	1.74
			30	0.54
				0.48
				0.42
				1.01
				1.04
				1.08
				1.12
				1.16
				1.20
				1.25

Note: Calculations based on statistics from Table 5.

The disparity in the effect of marital status on men and women in the full interaction model dwindles compared to that in the simple interaction model. However, the trend is still consistent. The highest hazard rate through the lowest hazard rate are as follows, married men (4.09), previously married women (3.87), married women (2.50), single

women (2.06) and single men (1) (refer to Table 5-3 above). It again suggests that women initially use more contraceptive sterilization on their own; however, marriage greatly decreases their risk while increasing men's risk of using the procedure. Furthermore, it seems that single women are not very different from married women in using the surgery, which affirms that marriage relieves women from the responsibility of contraceptive sterilization greatly. It is necessary to clarify the disparity between married women and married man from the nature of the Cox regression. For the operation of the model, at first, all the sample was exposed to the risk of contraceptive sterilization. As individuals went through time intervals in time order, those who used sterilization for either contraceptive reason or medical reason or both were taken out of the risk set from the time on. Therefore, since single women were in a relatively higher rate to use sterilization compared to single men, this relatively dwindled the amount of married women in the risk set who had not used the surgery. However, this avoids the cumulative effect and truly reflects the effect of marriage.

Compared to the simple interaction model, the interaction effect between gender and length of marriage in the full interaction model changes noticeably: length of marriage is no longer significant which indicates that length of marriage has no effect on men. Furthermore, women slightly lower their hazard rate of contraceptive sterilization as they stay longer in the marriage. At first glance, it seems contrary to other findings. However, it is consistent with the effects of marital status. Since marital status is controlled in the model, it is probably indicating that the interaction between marriage and gender already

accounts for married men's effect. Since women in the marriage are exempted from undergoing the procedure by the protection of married men, it is possible that women decrease their use of contraceptive sterilization as the length of marriage increases. This again confirms that marriage functions differently for men and women in terms of the use of sterilization as a method of birth control.

Compared to the simple interaction model, education is now highly significant. Furthermore, education has a negative effect on women and a positive effect on men, which verifies my hypothesis. Compared to a woman with an education level less than high school, a woman having a bachelor degree or above decreases her hazard rate of using the surgery from 135 percent to 80 percent. In contrast, a university degree man has a hazard rate about 60 percent higher than that of a minimally educated man.

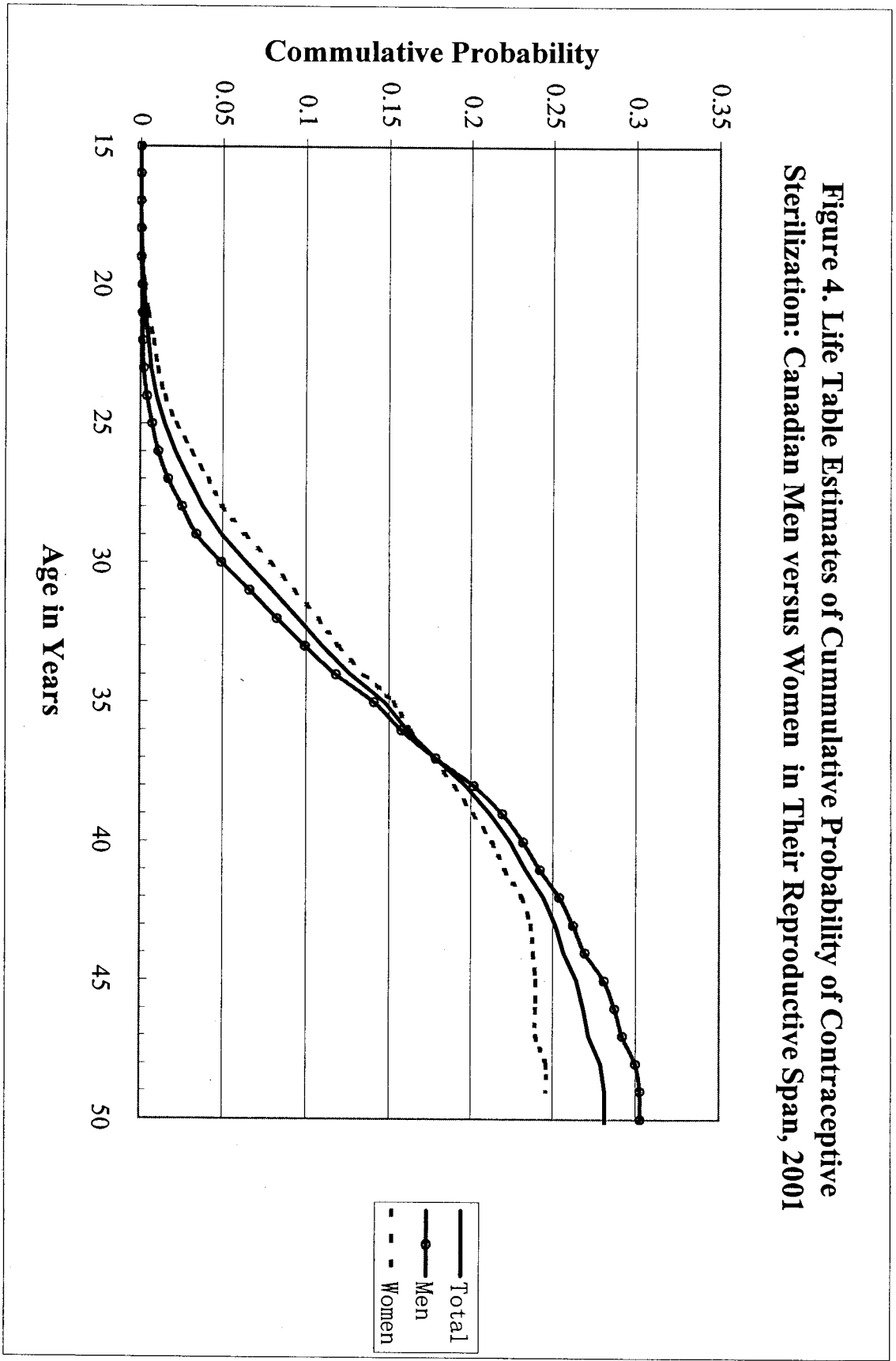
Number of children, religious affiliation and religious devoutness are not involved in the interactions in Model 13. Compared to Model 8, the effects of the variables above are all similar.

5.3. Gender Difference

5.3.1. Life Table Estimates

Figure 4 shows the cumulative probabilities of three populations: the entire Canadian population, females and males, which are sixteen percent for each population, crossing around age 36. Before this critical age, the cumulative probabilities of females

Figure 4. Life Table Estimates of Cumulative Probability of Contraceptive Sterilization: Canadian Men versus Women in Their Reproductive Span, 2001



are higher than that of males of the same age; after age 36, men have higher cumulative probabilities of using contraceptive sterilization than women of the same age. In general, the slope of the cumulative probability of men is sharper than that of women. Men are catching up with women quickly in later ages and even surpass women in the use of contraceptive sterilization.

Women have a higher probability than men of using sterilization for birth control at younger ages and the disparity reverses in later ages, which is consistent with the effects of marital status and length of marriage. The age changes are usually consistent with changes of life arrangements, such as marriage and family formation, throughout the life course. At the early ages, women are usually single and more dependent on themselves to initiate sterilization as a method of birth control; as they age and probably go through marriage and family planning, men are participating in taking the responsibility for contraceptive sterilization.

5.3.2. Cox Proportional Hazard Regression

Two Cox proportional hazard regression models, Models 14 and 15 (refer to Table 6), representing female and male populations with the same covariates as the full model, Model 8 (see Table 4), were separately run. The following findings were based on description and comparison of the two models.

I begin by focusing on significant differences among relevant covariates between the

Table 6. Proportional Hazard Models of Use of Contraceptive Sterilization: Gender Difference

Variable	Model 14: Female		Model 15: Male	
	Parameter (β)	Hazard Ratio exp(β)	Parameter (β)	Hazard Ratio exp(β)
Marital Status^a				
Married	0.3186	1.375	1.16926***	3.22
Previous Married	0.7603***	2.139	0.29555	1.344
Single ^b				
Length of Marriage ^a	-0.00973	0.99	-0.00628	0.994
Number of Children ^a	1.83323***	6.254	2.04644***	7.74
Square of Number of Children ^a	-0.23431***	0.791	-0.29997***	0.741
Education	-0.11085***	0.895	0.10257***	1.108
Religious Affiliation				
Catholics	0.1579*	1.171	0.10505	1.111
Non-Catholics ^b				
Religious Devoutness	-0.06942**	0.933	-0.04416	0.957
Control Variables				
Birth Cohort				
1976-1967	-0.49502	0.61	-0.95925	0.383
1966-1957	-0.50259	0.605	-1.21919	0.295
1957 and before	-0.41159	0.663	-1.77994***	0.169
1986-1977 ^b				
Birth Country				
Canada	0.47167***	1.603	1.30511***	3.688
Foreign Countries ^b				
Residence Province				
Quebec	0.16055	1.174	0.25103***	1.285
Non-Quebec ^b				

Note: ^a Time-variant variables
^b Reference category
 * p<0.05
 ** p<0.01
 *** p<0.001 (two-tailed test)
 Source: The 2001 General Social Survey, Statistics Canada

two models, which means that the effect of the same covariate in two models on separate populations (i.e., the female population and the male population) is significantly different in magnitude. I used the formula $t = \frac{\beta_a - \beta_b}{\sqrt{\sigma_a^2 - \sigma_b^2}} \sim T(n - k - 1)$ ($p < 0.05$, critical value of t is 1.96). The results indicate that effects of marriage and education are significantly different for men and women. I then also compare those covariates which affect one of the populations but lose effect on the other population, that is, significant for men or women, but not for both. The effects of previous marriage, religious affiliation and religious devoutness are significant for women, but not significant for men.

5.3.2.1. The Effects of Current Marriage and Education for Male and Female

The effects of marriage and education in the female model, Model 14, and the male model, Model 15 (refer to Table 6), are significantly different. Furthermore, women's marriage is not significantly different from singlehood in terms of the hazard rate of being sterilized for a contraceptive purpose. However, the hazard rate of married men is 222 percent higher than that of single men in terms of the use of contraceptive sterilization. The fact that married women are not different from single women in the use of contraceptive sterilization can be interpreted by the followings: married men have a relatively higher hazard rate of using the procedure than single men; The fact that the husband has the surgery exempts the wife from using the procedure for birth control purpose.

The effect of education is opposite for men and women. For women, the hazard ratio of the use of contraceptive sterilization decreases with increases in the level of education; for men, the hazard ratio increases as the level of education increases. A woman with a university degree has a hazard ratio about one third lower than that of a minimally educated woman. A man with a university degree has a hazard ratio about 60 percent higher than that of a minimally educated man. The findings above consistently suggest that women initiate the use of sterilization as a method of birth control and men's undergoing the procedure always saves women from the responsibility. The education effect is also consistent with the findings above. Well educated men's use of the procedure probably also reduces the chances for well educated women to choose to use the surgery.

5.3.2.2. The Effects of Previous Marriage, Religious Affiliation and Religious

Devoutness for Male and Female

Previous marriage, religious affiliation and religious devoutness all affect women's hazard of using sterilization as a method of birth control; however, they don't affect men's use of the surgery at all. This is probably because previously married women have to depend on themselves to use the procedure: the ending of a marriage takes away from them the alternative surgery on the husband's side. However, coming out of a union also relieves a man from using the surgery to share his wife's responsibility of sterilization for birth control. This suggests that men's role in contraceptive sterilization compared to

women's is still secondary and compensatory.

Catholic women are about seventeen percent higher than non-Catholic women in the hazard rate of using sterilization for birth control, whereas there is no variation among men whether Catholic or not. Again this is also consistent with the findings above. The Roman Catholic Church is generally conservative in social values and norms. Since birth control, including contraceptive sterilization, is traditionally regarded as women's job, the conservative husband might be unwilling to share the wife's job. Therefore, Catholic women might have to depend more on themselves to use the procedure.

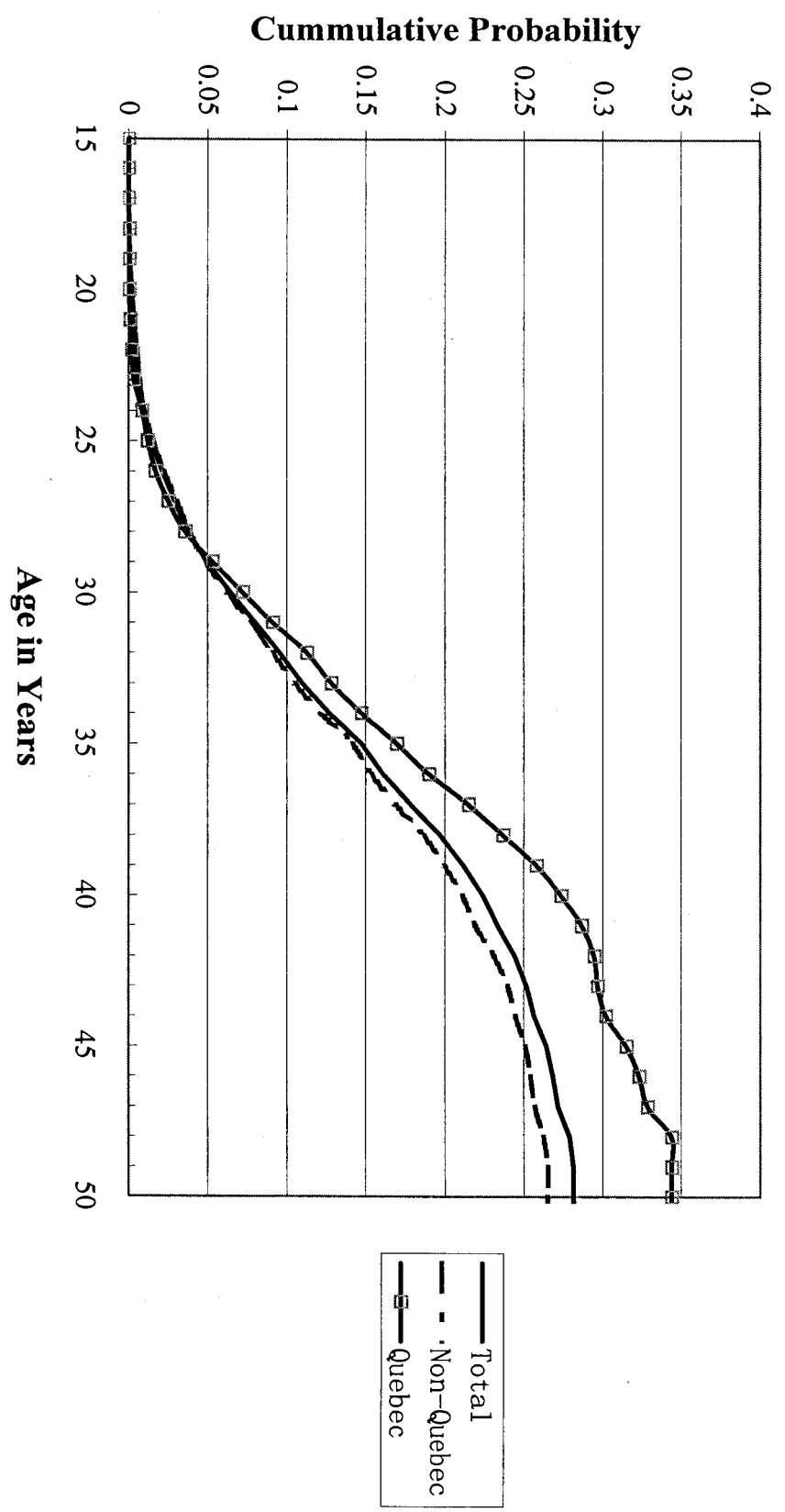
However, the more religious a Catholic woman is, the hazard ratio decreases accordingly, though slightly. The anti-contraception doctrine of the Roman Catholic Church could have hesitated these very religious women from practicing the surgery.

5.4. Regional Difference

5.4.1. Life Table Estimates

Before age 30, the cumulative probabilities of Quebec and non-Quebec residents advance at almost the same pace (refer to Figure 5). After the age of 30, the cumulative probability of Quebec residents increases much faster than that of the rest of Canada. The increase in the rate of the cumulative probability of non-Quebec residents lessens after late 30s; however the cumulative probability of Quebec residents keeps increasing quickly until early 40s, levels off around the middle 40s and increases quickly again after the middle 40s.

Figure 5. Life Table Estimates of Cumulative Probability of Contraceptive Sterilization: Quebec versus Non-Quebec Residents in Their Reproductive Span, 2001



At about age 30, the cumulative probability for non-Quebec and Quebec residents is about seven percent and six percent separately; at about age 40, it is thirty percent and twenty percent respectively; by age 49, about thirty-five percent of the Quebec population have undergone the procedure for birth control while only about twenty-five percent of the non-Quebec population have used the surgery for birth control.

5.4.2. Cox Proportional Hazard Regression

Two Cox proportional hazard regression models (see Model 16 for the Quebec population, and Model 17 for the Non-Quebec population; refer to Table 7), use the same covariates as the full model, Model 8 (see Table 4). I compared findings of the two populations in the following paragraphs. Religious affiliation is significantly different for the Quebec and non-Quebec populations. Furthermore, religious affiliation is significant for the Quebec population and not significant for the non-Quebec population. The effects of marriage, previous marriage and religious devoutness are significant for the non-Quebec population, whereas they are not significant for the Quebec population.

In the gender difference section I discussed significant differences of the covariates between the two model and then discussed covariates losing the effects in one model but having the effects in the other model. I used a slightly different narration strategy here. I will first focus the differences of the effects of current marriage and previous marriage between the two populations. Then, I will compare the differences of the effects of religious affiliation and religious devoutness between Quebec and non-Quebec residents.

Table 7. Proportional Hazard Models: Quebec Versus Non-Quebec Residents

Variable	Model 16: Quebec		Model 17: Non-Quebec		
	Parameter (β)	Hazard Ratio exp(β)	Parameter (β)	Hazard Ratio exp(β)	
Gender	Female	-0.36579***	0.694	-0.28557***	0.752
	Male ^b				
Marital Status ^a	Married	0.36638	1.443	0.82507***	2.282
	Previous Married	0.59784	1.818	0.7023***	2.018
	Single ^b				
Length of Marriage ^a		-0.0081	0.992	-0.00571	0.994
Number of Children ^a		1.88908***	6.613	2.0187***	7.529
Square of Number of Children ^a		-0.2549***	0.775	-0.27926***	0.756
Education		-0.06335	0.939	0.02313	1.023
Religious Affiliation	Catholics	0.57883***	1.784	0.05356	1.055
	Non-Catholics ^b				
Religious Devoutness		-0.00211	0.998	-0.05926***	0.942
Control Variables					
Birth Cohort	1976-1967	-0.11703	0.89	-0.6712*	0.511
	1966-1957	-0.35303	0.703	-0.75219*	0.471
	1957 and before	-0.40686	0.666	-1.06499***	0.345
	1986-1977 ^b				
Birth Country	Canada	1.13321***	3.106	0.75093***	2.119
	Foreign Countries ^b				

Note: ^a Time-variant variables^b Reference category

* p<0.05

** p<0.01

*** p<0.001 (two-tailed test)

Source: The 2001 General Social Survey, Statistics Canada

5.4.2.1. The Effects of Current Marriage and Previous Marriage across Quebec

The hazard rate of non-Quebec residents who were in marriages is 128 percent higher than that of their single counterparts. In contrast, married Quebec residents are not different from their single counterparts in using the procedure. Similarly, the hazard rate of non-Quebec residents who had ended a marriage(s) is about 100 percent higher than that of their single counterparts. However, there is no significant difference between previously married Quebec residents and single Quebec residents. These findings suggest that the institution of marriage could have a different dynamic in this 'distinct society', which differently structures decision making as well as the behavior pattern of sterilization as a method of birth control. Variations in the effects of social norms/social institutions across different societies, social groups, and individuals strongly defy the strict assumption of precise rational calculation of human behavior.

5.4.2.2. The Effects of Religious Affiliation and Religious Devoutness across

Quebec

The effect of religious affiliation is very interesting. Catholics in Quebec are significantly different from non-Catholics in Quebec, where they are 1.8 times more likely than non-Catholics in the hazard rate to use sterilization as a method of birth control. It is, however, a different story for the non-Quebec population: Catholics are not significantly different from others in undergoing the procedure. Furthermore, religious devoutness loses its effect on the Quebec population, but the hazard rate of using

contraceptive sterilization by the non-Quebec population decreases by 6 percent with every unit increase in the 5-point scale measuring the frequency of religious service attendance.

Contraceptive sterilization as a method of birth control is in conflict with the anti-contraception doctrine of the Roman Catholic Church. Religious devoutness does not affect Quebec residents' use of the surgery while being Catholic increases their hazard rate of use the procedure. This suggests that religion does not directly affect their decision making of contraceptive sterilization, but functions in an indirect way. However, religious affiliation does not affect non-Quebec residents' use of the procedure, but religious devoutness does deter these individuals from using the surgery. This suggests that religion still directly affects these individuals' decision making in regard to contraceptive sterilization but in a limited way. All this suggests that religion as a social institution differently regulates decision making of contraceptive sterilization by individuals inside and outside the province of Quebec.

5.5. Summary

In this chapter, I used both life table methods and Cox proportional hazard regression to pattern time and use of sterilization as a method of birth control by Canadian men and women in all marital statuses: married, previously married and single (refer to Table 8 for summary of hypotheses testing).

Table 8. Result of Hypothesis Tests

	Hypotheses	Findings
1	Canadian women are more likely than men to choose sterilization for birth control.	Opposite
2	Married and previously married people are more likely than single people to choose sterilization for birth control.	Verified
3	There is an interaction between marital status and gender in terms of the use of contraceptive sterilization.	Verified
4	The longer an individual stays in the marriage, the more she/he is likely to practice sterilization for birth control.	Verified
5	There is an interaction between length of marriage and gender.	Verified
6	The rate of contraceptive sterilization increases as the number of children increases, and it levels off when the parity arrives at 3 and 4.	Verified
7	There is an interaction between education and gender. Well-educated men and less educated women are more likely to pursue prevention of pregnancy by sterilization.	Verified
8	More religious Catholics are less likely than others to choose sterilization.	Verified

Source: The 2001 General Social Survey, Statistics Canada

Hypothesis 1 is not verified. Prior to controlling for other variables, women are not different from men in the use of contraceptive sterilization as a means of birth control. When other variables are controlled for, in contrast to my hypothesis, women appear less likely than men to use sterilization as a method of birth control. However, when interactions between gender and marital status, length of marriage and education are introduced into the analyses, the findings reveal that there are more variations between males and females.

My findings support hypotheses 2 through 8, though some effects are strong and others are moderate. Both married people and previously married people are more likely to choose contraceptive sterilization than single people. Married men are somewhat more likely than married women to use the procedure. In contrast, single women are more likely than single men to use it. The disparity between previously married women and previously married men is not significantly different from the disparity between single women and single men.

Length of marriage is positively related to the use of contraceptive sterilization, although the effect disappears after controlling for other covariates. As length of marriage increases, men become more likely to use the procedure while women become less likely to use the procedure. However, the interaction is no longer significant after controlling for other covariates.

The hazard rate of contraceptive sterilization increases fast after one has the first child; it peaks at three to four children. Beyond previous research (Belanger, 1995; De

Wit & Rajulton, 1991; Kaufman, 1998; Taneerananon, 1988), I found that the hazard rate decreases quickly as the number of children increases after individuals have about four children. This is probably because previous research only tracked number of children to the category of four and above and therefore failed to examine the detailed effect of higher numbers of children. For all the models, number of children is a very powerful and stable predictor of the use of sterilization as a method of birth control. Education is positively related to men's use of the procedure and negatively related to women's use of it, which is consistent with the hypothesis.

Hypothesis 8 is moderately supported. The more religious a Catholic is, the less likely she/he is to practice sterilization for birth control; religious devoutness does not affect non-Catholic's use of the surgery. However, after controlling for other covariates, the interaction effect disappears. This more or less suggests that the effect of religion on sterilization as a method of birth control is not as significant as before.

My findings on gender difference and regional difference further suggest that marriage as well as religion as social institutions differently structure individuals' pattern of sterilization as a method of birth control. Therefore, in the final chapter, I will further frame the findings from the reasonable choice perspective, and argue that the reasonable choice framework is more appropriate than the rational choice framework in terms of structuring individuals' decision making with respect to contraceptive sterilization. I will also discuss limitations of this study and propose possible improvements or resolutions for future research in this area.

Chapter Six

Discussions and Conclusions

6.1. Summary

This study adopted event history analysis to model the time and pattern of contraceptive sterilization by Canadians. Based on previous empirical research, I employed the following demographic and social-cultural covariates to model these Canadians' behavior pattern of contraceptive sterilization: gender, marital status, length of marriage, number of children, education, religious affiliation and religious devoutness. Inspired by Gary Becker's rational choice approach (Becker, 1960&1993), I adopted a reasonable choice perspective to frame my research. Beyond pure rational calculation and utility maximization by the individual proposed by the rational choice approach, I focus on how social norms operate through social institutions to regulate individuals' decision making: utility maximization as well as behavior acceptance.

Gender alone no longer accounts for the decision to undergo sterilization as a method of birth control. However, women are less likely than men to choose sterilization as a birth control method after controlling for other covariates.

Both current marriage and previous marriage increase the use of sterilization as a method of contraception. However, the institution of marriage differently structures men and women's use of contraceptive sterilization. Married men are more likely than married women while single women are more likely than single men to use the procedure.

Married men tend to be more likely to be sterilized for birth control than single men, although previously married men are not significantly different from single men. Married women are not different from single women in the use of contraceptive sterilization; however, previously married women are more likely than single women to use the procedure.

Length of marriage in general increases an individuals' likelihood of using sterilization for birth control. However, while it increases married men's risk of contraceptive sterilization; it in fact decreases married women's risk. All effects of length of marriage disappear when controlling for other covariates. Number of children is a constant and robust estimate of the use of sterilization as a method of birth control. When having less than five children, the hazard rate of using the surgery increases fast as number of children increases; after having four children, each additional child decreases the hazard rate of being sterilized for birth control.

As women achieve more education, they are less likely to use sterilization as a method of birth control. However, it is the opposite for men: well educated men are more likely to use it for birth control. Religious devoutness functions differently for Catholics and non-Catholics: the more devout a Catholic is, the less likely she/he is to be sterilized as a method of birth control; use of the procedure by non-Catholics is not affected by the degree of religious devoutness. However, the interaction between religious devoutness and religious affiliation disappears after controlling for other covariates.

As to gender differences, married men are more likely than single men while

previously married women are more likely than single women to practice contraceptive sterilization. Catholic women are more likely than non-Catholic women to practice it; however, religious devoutness relatively deters these Catholic women from using this birth control method. Both religious affiliation and religious devoutness have no effect on men in terms of the use of contraceptive sterilization.

For the Quebec and non-Quebec difference, both marriage and previous marriage increase the likelihood of non-Quebec residents' use of the procedure for birth control; there is no difference between married people and single people, and between previously married people and single people among the Quebec population. Catholics are more likely to use contraceptive sterilization in Quebec; however, religious devoutness deters non-Quebec residents from practicing it.

6.2. Discussions

In this section, I discuss the effects of all the covariates in the order that I hypothesized in the theoretical framework chapter. First I discuss the effect of gender (Hypothesis 1). Then, I discuss the effects of marital status and length of marriage (Hypothesis 2 & 4), followed by the interaction effect between gender and marital status, and the interaction between gender and length of marriage (Hypothesis 3 & 5). Following the discussions above, I discuss the effect of number of children (Hypothesis 6) and then the interaction effect between gender and education (Hypothesis 7). Finally, I discussed the interaction effect between religious affiliation and religious devoutness (Hypothesis

8).

6.2.1. The Effect of Gender

Gender alone is not significant for understanding contraceptive sterilization patterns among Canadians. After controlling for other variables, women are even less likely than men to use sterilization as a contraceptive method. This is different from previous research (Forste, Tanfer & Tedrow, 1995; Godecker, Thomson & Bumpass, 2001; Ross, 1991) that finds women more likely than men to use the surgery. Along with other fertility related behaviors, contraception, was once considered as only women's responsibility (Goldscheider & Gayle, 1996). However, research (Rind, 1989) from a health perspective, also shows that male vasectomy has fewer negative health related side effects than female tubal ligation. Furthermore, over the past few decades, men have become more likely to share the responsibility of birth control, as well as sterilization in particular, with women (Krishnan and Martin, 2004).

From a pure rational choice approach, men should have already been more likely than women to use the procedure considering the advantage of male vasectomy over female tubal ligation. But why do men only until recently begin to use the procedure more? As more men are willing to share the responsibility of birth control that is traditionally regarded as women's job, this creates an increasing reference group for men to practice male vasectomy. Furthermore, the fact that a relatively large number of men have practiced the procedure legitimates the behavior by itself. The social norms which

regard birth control as women's job are thus gradually changed towards a climate benign to the male procedure. Also, the social norm of family responsibility probably at the same time affirms men's sharing birth control with women as a contribution to the family. As the male procedure is more acceptable among men, as well as its health related advantage, it is no surprise that men are more likely than women to use sterilization as a method of contraception.

Another reason why men are more likely to use the procedure than women is probably due to the fact that many women use the procedure for or partially for medical reasons (Krishnan & Martin, 2004). This, as a result, somewhat reduces women's use of sterilization solely as a contraceptive.

6.2.2. The Effect of Marriage: Marital Status and Length of Marriage

Both currently married and previously married people are much more likely than single people to use sterilization as a form of contraception, although the effect of previous marriage is weaker than that of current marriage. After controlling for other variables, disparity of the effects of current marriage and previous marriage dwindles. This differs from previous research (Krishnan & Martin, 2004) that argues that previous marriage usually has a larger impact than one's current marriage on one's decision to undergo contraceptive sterilization.

Single people are less likely than those ever married to practice sterilization for birth control. Single people have not yet started a marriage or their own family life in their life

course. They are usually younger and have not started family planning. Furthermore, the variations of future life are usually more flexible and unpredictable. Sterilization as an irreversible procedure permanently terminating child giving is thus too costly to afford for this group of people. Also, the proliferation social norm can make the procedure very unacceptable in terms of timing for single people (Godecker, Thomson & Bumpass, 2001). The proliferation social norm used in this study is generally the traditional ideas or behavior patterns that encourage birthgiving.

Marriage is often a serious commitment to life, which provides the couple with a more predictable and stable life arrangement in the future. It is usually related to family planning, which includes both starting and stopping having children. Once a couple decides not to have offspring, or has reached their desired family size, sterilization, as a procedure permanently terminating birthgiving, is much more acceptable than before they finish the family planning considering the social proliferation social norm. Furthermore, in terms of stopping birthgiving permanently, sterilization is usually more effective than other contraceptive methods. The longer a marriage lasts, the more likely an individual is to use the procedure. A longer marriage usually reflects a more stable and predictable family life. The effect of length of marriage therefore confirms the effect of marital status.

The more married people undergo sterilization as a contraceptive method, the more other people are encouraged to choose the procedure in their marriage when they decide to stop birthgiving, as there is an expanding reference pool of sterilized individuals in

marriage. From the perspective of reasonable choice, on the one side, those who have not yet used the procedure in marriage have a large reference pool for sideward-looking to facilitate their decision making in terms of contraceptive sterilization if lots of married people have used the procedure. On the other side, if a large number of married people have already used the procedure, this fact legitimates the behavior itself. This makes the use of contraceptive sterilization an acceptable choice for other married people. As a result, it becomes a reasonable choice for these married people. The longer a marriage is, the larger reference group of married people that have ever practiced the surgery an individual will have. This also prompts the individual to accept contraceptive sterilization as a reasonable choice for him/her.

However, the weaker effect of previous marriage on the use of contraceptive sterilization partially lies in the fact that there is no protection of a current marriage for a relatively stable future life. Sterilization as a non-reversible procedure to terminate birthgiving, is relatively more expensive with a relatively unpredictable future life; it is thus more unaffordable and unacceptable for the previously married people than for currently married people. However, having been previously married still predicts a higher likelihood that the individual will choose to be sterilized as contraception compared to a never married individual.

From a rational choice perspective, since both single and previously married people lack protection of a current marriage for a relatively stable and predictable future living arrangement, sterilization can be similarly expensive to them. But why are previously

married people more likely than single people to use the procedure? A reasonable choice approach will consider how social norms as well as reference groups influence the decision making of previously married people. When the previously married individual was in his/her marriage, sterilization, as a method of birth control, had already been more legitimate and more acceptable than to a single person. Once at risk of having unwanted children, sterilization becomes then a much more reasonable choice to previously married people than to single people since its acceptance has already been legitimated in the previous stage of life course. That is, his/her previous marriage. Although the proliferation social norm might still affect single people's decision making more, the institution of marriage has already somewhat legitimated sterilization as an acceptable behavior for people who have ever had a marriage. The legitimation thus makes the decision to be sterilized much more a reasonable choice for those who have ever undergone a marriage compared to those who have never had a marriage.

This study shows that being previously married is almost as strong a predictor of one's decision to be sterilized as contraception compared to being currently married, which is in opposition to previous research (Krishnan & Martin, 2004; Forste et al. 1995; Godecker, Thomson & Bumpass, 2001). This is probably also due to the fact that many studies conducted cross-sectional analysis rather than utilizing a time model. In previous research, the impact of the previous marriage on one's use of sterilization as birth control is then a cumulative effect of the procedure that was conducted during his/her previous marriage, rather than after his/her previous marriage.

6.2.3. The Interaction Effect between Gender and Marriage: the Interaction

between Gender and Marital Status and the Interaction between Length of Marriage

The interaction between gender and marriage shows that married men are more likely than married women to use contraceptive sterilization and single women are more likely than single men to use it. Married men are the most likely while single men are the least likely to use the procedure. The interaction between gender and length of marriage shows that the longer a marriage lasts, the more likely men will use the surgery and the less likely women will use the procedure. Being single pushes women to be more responsible for using sterilization than men; however, marriage functions differently for men and women: it pushes men to use the procedure more and therefore prevents women from using it.

Married men are usually a few years older than their partners. The life table estimates all suggest that men are more likely to use the procedure at a later age than women. All these are consistent with previous research that suggested that the longer a marriage lasts, the more men are likely to be sterilized for a contraceptive protection (Forste et al., 1995; Backrach, 1984).

Marriage is usually an agreement to the common future life for men and women, which requires both sides to fulfill their responsibility. A longer marriage is usually related to a constant life arrangement, which increases the predictability of future life. The relative stable family life probably encourages men to take more family

responsibility, which, thus, also includes sharing the responsibility of fertility with their wives. From another perspective, the longer a couple is married, the more a wife may expect or encourage her husband to share contraceptive responsibility, which therefore exempts her from being solely responsible for contraceptive deeds as a woman's job. Therefore, as a stable family life continues, the traditionally utilitarian-oriented responsibility of men seems to incorporate more of the birth control responsibility traditionally assumed as a woman's job.

The analysis above indicates that gender discourse in the broader societal context interacts with the institution of marriage at the unit of family in structuring the pattern of contraceptive sterilization. The longer a marriage, the more a male vasectomy on the husband's side is legitimated as an acceptable behavior by the institution of marriage. The social norms such as family responsibility, women's traditional responsibility as well as men's utilitarian-oriented responsibility are, therefore, modified by the interaction between gender and marriage, which makes the vasectomy in the marriage especially at a later age a rather reasonable option for men. Here, under the framework of reasonable choice, gender discourse and the marriage institution can be understood as the medium, which conveys social norms, as well as the mechanism, in which social norms operate and are modified. How social norms, with the help of social institutions, structure individuals' behavior pattern, as suggested above, also defies the simplistic and reductionist assumption of human behavior by the individually-oriented rational choice approach, which only emphasizes rationality and utility maximization of individuals.

6.2.4. The Effect of Children

Having the first child increases an individual's hazard of being sterilized as contraception more than three times that of an individual without children, and the hazard continues to increase remarkably until one has about three children to four children. The hazard rate peaks at three to four children and decreases rapidly as the number of children increases further.

From the rational choice perspective, with more children, people can be more likely to use sterilization as a method of birth control, considering children are a cost rather than benefit in industrial society (Becker, 1960). It seems to be irrational that those with very high parity do not seem to desire the procedure. Those with few children who used the surgery may believe that sterilization is an acceptable contraceptive method after they arrived at the desired family size. As a result, they chose this as their preferred birth control method. In contrast, those with high parity might be more or less structured by a strong proliferation norm and thus cannot accept sterilization, an irreversible procedure, as a method of birth control, even though children cost more than they benefit their parents. Therefore, to practice sterilization for birth control is more than a calculation of economic costs and benefits. The social norms dictate other considerations to be taken into account.

6.2.5. The Interaction Effect between Education and Gender

Education reduces women's risk of sterilization as a method of birth control. One

possible explanation is that well educated women can also have more information and more access to other alternative contraceptive methods, as previous research suggests (Forste et al., 1995). This reduces their risk of pregnancy compared to their less-educated counterparts. Also, traditional social norms, such as the proliferation norm as well as birth control being women's responsibility, could become weaker as women achieve more education. Accordingly, more education could also prompt men to defy the traditional norms and thus be more willing to share with women in terms of contraceptive sterilization.

Previous research (Goldscheider & Waite 1986; Teachman et al. 1987) also suggests that well educated people are more likely to be married. As a result, well educated women are more likely to be prevented from using the procedure as their husbands have used the procedure. Similarly, well educated men are more likely to use the procedure partly because they are more likely to be married. As analyzed above, marriage functions to protect women from using the procedure by providing women with male vasectomy as an alternative. Well educated women could also expect more gender equality and may demand their partner to share more contraceptive responsibility.

Sterilization as a method of contraception was traditionally regarded as a woman's responsibility. My analysis above suggests that only as men get married or as men age to a certain time in their middle age (e.g. 36), they are willing to practice the procedure more, and even more than women use it. Therefore, it seems that the procedure is initially a single woman's job, then a married man's job and gradually a middle-aged man's job

and a well educated man's job. It is first a woman's job, and then, men participate to share or take this responsibility as they experience certain life course events/changes (such as marriage, family life, more education and middle-age experience). However, marriage/family life, more education and middle-age coalesce at a certain time during the life course.

Therefore, men's taking the responsibility is more related to their commitment to the family. Men's practicing the procedure is thus still sharing, compensatory and secondary to women, who are more automatic in terms of meaning or motivation of the behavior, although men are more and more willing to take the traditionally regarded women's responsibility. Whether a male vasectomy is acceptable or reasonable it is still based on men's relative relationship to women. It is then no surprise why education contrarily affects men and women's use of the procedure. It is not contrary but actually compensatory between each other.

6.2.6. The Interaction Effect between Religious Affiliation and Religious

Devoutness

The interaction between religious affiliation and religious devoutness indicates that an increase of religious devoutness decreases Catholics' use of sterilization as contraception, but has no influence on non-Catholics. However, the effect disappears after controlling for other covariates. Considering the adamant position toward proliferation and anti-contraception that the Roman Catholic Church has held (De Wit &

Rajulton, 1991), it is no surprise that the more religious a Catholic is, the more unacceptable sterilization is as an irreversible procedure to terminate fertility.

The religion doctrine of Catholic thus functions as a restrictive social norm to regulate Catholics' decision making on contraceptive sterilization: the more devout a believer is, the more the anti-contraceptive dogma constructs the procedure as unaffordable and unacceptable to him/her.

6.3. Gender difference

As analyzed above, both marriage, and education contribute to variations in gender differences. Splitting the Canadian population into males and females allows for a better understanding of the gender disparity in the use of sterilization as a method of birth control. The effects of current marriage and education are significantly different for men and women. Previous marriage, religious affiliation and religious devoutness all contribute to the use of contraceptive sterilization for women, but they do not affect men's use at all. Since I have discussed the effect of education thoroughly on men and women, I will not discuss it here. In the following section, I will first compare how current marriage and previous marriage differently structures men and women's use of sterilization as a method of birth control. Then I will discuss how religious affiliation and religious devoutness differently affect men and women's use of the procedure.

6.3.1. The Effect of Marriage as a Social Institution

Married men are more likely to use sterilization as contraception compared to single men; however, there is no significant difference between previously married men and single men. In contrast, there is no significant difference between married women and single women in the use of sterilization as a method of birth control; previously married women are more likely than single women to use it as birth control.

These effects are not different from the interaction effect between gender and marriage except that the effect of previous marriage on men and women are clearer in the gender difference models than in the full interaction model. The full interaction model only tells that the interaction effect between gender and previous marriage is not significant. However, the gender difference models tell that previous marriage is significant for women while previous marriage is not significant for men. This again confirms that marriage bestows more responsibility to men, and provides more protection for women, in contraceptive sterilization in this study. Without protection of marriage, previously married women are therefore more likely to use contraceptive sterilization on their own; in contrast, without restriction or responsibility of family, previously married men are not different from single men. This further testifies that women are initiative in the use of contraceptive sterilization on their own while men's role in the use of the surgery from the perspective of motivation is still compensatory and depends on their relationship to women. The social norm that operates in the institution of marriage thus differently structures men and women in their decision to use sterilization as contraception.

The different effect of marriage as a social institution on men and women confirms that the institution of marriage seems to interact with the discourses of gender in patterning men and women's choice to be sterilized as a method of contraception. All in all, contraceptive sterilization has not yet been accepted as a neutral responsibility between men and women. Being married decreases contraceptive sterilization solely being women's responsibility, although single women and previously married women are disadvantaged, lacking in the protection of a male vasectomy when at risk of unwanted children.

6.3.2. The Effect of Religion as a Social Institution

Religion is also worth discussing here. Neither religious affiliation nor religious devoutness affects men's use of sterilization as a method of birth control, which means religion has no effect on men. Catholic affiliation increases women's choice to be sterilized as contraceptive protection; however, religious devoutness decreases women's use of the surgery. Similar to the analysis of religion in the Findings Chapter, this indicates that religious affiliation indirectly affects women while religious devoutness directly affects women in respect of the use of contraceptive sterilization though with a limited effect.

The fact that neither religious affiliation nor religious devoutness affects men's contraceptive sterilization is consistent with previous research (Krishnan & Martin 2004). But why does religion still affect women though with a limited effect? At first glance, it

seems to be a puzzle. The traditional social norms regard sterilization for birth control as women's responsibility. Though the Roman Catholic Church is very anti-contraceptive (De Wit & Rajulton, 1991), it is generally conservative and supports the traditional social norms such as the traditional roles of women (D'Antonio, 1985). The social norms regard birth control as women's traditional responsibility while the Roman Catholic encourages women to fulfill their traditional roles. Therefore, the conservative religious doctrine might strengthen sterilization for birth control as women's job. As a result, Catholic women are more likely than non-Catholic women to use the procedure. However, the very religious Catholic women are still more or less deterred from practicing contraceptive sterilization according to the Catholic anti-contraception doctrine.

As analyzed above, the traditional social norms about contraceptive sterilization as women's job can be strengthened by the institution of religion and, as a result, it can bring more stress into Catholic women's decision making of using contraceptive sterilization. Contrary to the social institution of marriage, which protects women from using the procedure, the Catholic religion on one side puts women at a disadvantage to take more responsibility to practice the surgery; on the other side it discourages them from using the surgery. The dynamic of the interaction between social norms and social institutions in structuring individuals' decision making of sterilization as a method of birth control again confirms that rational choice approach is not adequate in the exploration of the behavior pattern of human being, at least in the area of contraceptive sterilization.

6.4. Regional Difference

The effect of religious affiliation is significantly different for the Quebec and non-Quebec population; furthermore, religious affiliation is not significant for the non-Quebec residents. Marriage, previous marriage, and religious devoutness all affect non-Quebec residents' use of contraceptive sterilization; however, they do not affect Quebec residents.

First, I will talk a little about Quebec as a 'distinct society' in Canada (Friesen, 2004). I will then discuss how the institution of marriage structures the use of sterilization as contraception differently among the Quebec and non-Quebec population. Then I will compare the religion effect on the Quebec and non-Quebec populations.

6.4.1. Quebec as a 'Distinct Society' in Canada

Quebec is culturally distinct from the rest of Canada in terms of both language and religion: a dominant Francophone dialect and a high proportion of Catholics, which is 'historically and constitutionally grounded' (Friesen, 2004). Before the 1950s, Quebec had been a very traditional and agrarian society dominated by the authority of the Catholic church, isolated and dragging behind the rest of Canada in terms of both social and economic developments (Couture, 1998; Guindon 1988; Rioux, 1993;). The domination of the Catholic church continued until the 1950s (Dickinson & Young, 1993).

Commencing in 1960, the election of Quebec's Jean Lesge's Liberal Party, 'La revolution Tranquil', the 'quiet revolution' was a crucial 'catching up' period for Quebec

in order to keep pace with other regions in Canada; this transformed Quebec from a rural and Catholic-church-centred traditional society into a modern, industrial and urban area (Friesen, 2004). The Liberal Party prompted social and economic transformation in order to bring Quebec on par with the rest of Canada, as well as North America in general. Besides social and economic development, Quebec's values also shifted. The Catholic value system broke down (Guindon, 1978). Quebec has changed from a Catholic-authority-centred society controlled by the traditional social institution of religion into a secular and individualistic society (Caldwell & Fournier, 1987; Krull and Trovato, 1994).

Throughout the 1960s and 1970s, both Canada and Quebec underwent dramatic social and economic changes. However, Quebec has changed so much that it has become a more radical region than the rest of Canada (Adams, 2003). Although labeled as a Catholic society, Catholics in Quebec may even resist their religious doctrine to a larger extent than the rest of Canadians (Pollard, 1998). The social control of traditional institutions weakens, which indicates the increase of discretion of individual free will (Krull, 1996). For example, marriage might be less a legitimation of fertility behavior; however, individuals' personal will regarding a couple's life together might strengthen.

As I employed the reasonable choice framework to analyze the Canadian population, I found that social norms operate through the social institution, such as marriage and religion, to regulate individual's decision making regarding contraceptive sterilization. It is very interesting how social norms in Quebec as a 'distinct society' organize individuals

to make their decision to be sterilized through the institution of marriage and religion.

6.4.2. The Effect of Marriage as a Social Institution

Both married and previously married Quebec residents are not different from their single counterparts in the use of sterilization as birth control. In contrast, married and previously married Canadians outside Quebec are much more likely than their single counterparts to be sterilized for birth control. It indicates that marriage as a social institution is losing its power in predicting Quebec residents' behavior of contraceptive sterilization. .

Quebec is going further than the rest of Canada on the way of anti-tradition. The tradition that regards marriage as a serious commitment is probably not as strong as elsewhere in Canada. Further, pronatalism as a tradition probably is also less preferred in Quebec. Quebec residents even do not need marriage to justify their use of sterilization as a method to permanently stop fertility. Another reason could be that marriage is not as strong a legitimation of fertility behavior as the rest of Canada. While number of children is still a strong index to the use of contraceptive sterilization, marriage is no longer a reliable prediction in Quebec. Since marriage is no long a predictor of contraceptive sterilization, the effect of previous marriage disappears correspondingly. The number of children that one has is still a strong indication of the use of contraceptive sterilization, which confirms that family planning, especially terminating fertility, is not strongly related to marriage in Quebec.

6.4.3. The Effect of Religion as a Social Institution

Catholics are much more likely than non-Catholics to use contraceptive sterilization inside Quebec, which is in conflict with the anti-contraception and proliferation doctrine of the Roman Catholic Church; religious devoutness does not affect Quebec residents' use of the procedure. This indicates that religion loses its direct effect from deterring individuals from using contraceptive sterilization, in Quebec, but indirectly regulates Quebec residents' behavior of contraceptive sterilization. However, religious devoutness rather than religious affiliation still affects non-Quebec residents' use of contraceptive sterilization outside Quebec; this is consistent with previous research (De Wit & Rajulton, 1991), which indicates that the religion effect weakens.

The puzzle is why Catholics are more likely than non-Catholics to use sterilization as a method of birth control in Quebec. At first glance, it is not rational, even not reasonable. The 'quiet revolution' has already transformed Quebec from a rural Catholic society to a individual and secular and gender equal society. Quebecers have gone even further on the anti-tradition path. It is probably that the anti-tradition norm in Quebec combines with the fact that the anti-contraception doctrine of the Roman Catholic Church is very outdated when contraception is highly prevalent and accepted in Canada. This conflict might motivate Catholics to go further to defy the outdated religious dogma. Though this effect is not a direct effect of religion, it is the effect of how individuals cope with the outdated doctrine of religion.

It again shows how social norms operate through religion to affect individuals'

decision making of sterilization for birth control. However, the dynamics cannot be explored using the framework of the rational choice approach. It would also be interesting to explore how Catholics in Quebec as 'a distinct society' in Canada cope with other dimensions as marriage and cohabitation in their life within the framework of the reasonable choice.

6.5. Limitations of the Study

Like all other research, this study has its limitations. I will discuss the limitations mainly from the perspective of how the methodology and theoretical framework are limited in predicting the research in relevant aspects.

6.5.1. The Statistical Model and the Quantitative Approach

Although use of retrospective data is prevalent in the survival model as a longitudinal model, there are still limitations with this usage: you will certainly miss those who died or can't be recruited for other reasons such as moving (Allison, 2001). As a retrospective researcher, I can only use a fixed point in time, which is the survey time for this study, to track back through time until the respondent was age 15. As a result, those who died before the survey time cannot be recruited into the target population, causing a bias in the population studied.

Even for a prospective study, to choose a starting point of time unavoidably excludes a potentially valuable population, since one has to cut out a time span in the sequence of

human development; one cannot choose a starting point of time from the very beginning of human society. To choose a starting point of time is still more or less subjective and relative; however, we cannot stop collecting information and doing research to increase knowledge that reflects the world. This paradox rises to challenge the basic assumption of knowledge and the procedure and methodology to acquire knowledge (research), which indicates knowledge is subjective and research is relative. Ignoring these natural limitations of knowledge and research can only lead to bias and dogma; therefore, it is appropriate to admit the limitations of research at the same time one presents findings and contributions.

It is beneficial to examine human behavior with knowledge of his/her characteristics at the time of event under study. As discussed in the data chapter, this survey did not provide sufficient retrospective measures to predict the trajectory of Canadian's contraceptive sterilization pattern. Two things can further distort this prediction: first, some factors might have delayed effects, that is, this individual's behavior/ decision making is more relevant to his/her previous status rather than current situation at the time of event. For example, individual A decided to practice sterilization for birth control when she was married with 2 children. However, before she actually underwent the procedure, she had an unwanted pregnancy and divorced. Therefore, it is not three children and previous marriage that motivated her decision making; however, the survey can only provide the three children plus previous marriage information rather than two children and current marriage within my statistical model.

Secondly, although this individual is labeled by characteristics reflected in the survey questionnaire, he/she may not identify himself/herself in terms of that label, whereas, he/she is not able to identify himself/herself other than these labels in the survey. For example, individual B was born in a Catholic family, went to church sometimes and does not regard himself as a true Catholic. However, the survey labeled him as a Catholic. Individual C immigrated to Quebec due to a good work offer. He had developed his personality to a mature and stable person elsewhere in Canada rather than in Quebec. However the survey assigned him as a Quebec resident. Therefore, my statistical model has to be built on the survey data, which is not precise as analyzed above to reflect individuals' real everyday life. This concern may be alleviated with the addition of concurrent qualitative research. Quantitative research, including statistical models, such as the regression technique, helps to understand certain trajectories, or patterns, of human behavior. However, it is still not enough to understand in detail the attitude, motivation and other aspects underlying patterns of Canadian contraceptive sterilization.

6.5.2. The Theoretical Framework and Its Application to This Study

This study proposed the 'reasonable choice' perspective, a variant of Gary Becker's rational choice approach. I challenged the basic assumption of Gary Becker's rational choice approach which is in an effort to advance the theoretical framework used to examine Canada's sterilization pattern. In doing so, this thesis contributed to building a theory of fertility behavior and beyond. It also revealed a new perspective, the reasonable

choice framework, to examine the dynamics of contraceptive use, more specifically, sterilization in Canada. This study uses the most recent data (the 15th GSS by Statistics Canada) and a robust statistical model in order to update the existing literature base.

However, the link to directly connect the statistical model and the theoretical framework is still elusive. Though my findings and discussions indicate that the reasonable choice approach more adequately captures the behavior pattern of individual's contraceptive sterilization use than the rational choice theory, there is no direct measurement as to how the mechanism of decision making operates, for example, various aspects of motivation: utility maximization or preference to abide by social norms, if there are such motivations, and so on. A follow-up qualitative research project may compensate for the obscure connection between the statistical model and the theoretical framework along with extending the knowledge base for this research project.

6.6. Conclusion

In all, Canadian women are less likely to use contraceptive sterilization than their male counterparts. Marriage and education are two notable contributors for this gendered pattern. Number of children is a very constant and prominent factor that contributes to individuals' decision making of sterilization as a method of birth control. Certain social norms operate through the institution of marriage to regulate individuals' decision making of contraceptive sterilization. The dynamic of how the institution of marriage and religion affect the Quebec population are unique in terms of contraceptive sterilization. Marriage

does not increase Quebec residents' use of the procedure; however, being Catholic greatly enhances their probability of using sterilization as a contraceptive method. My findings suggest the reasonable choice approach is a more appropriate framework to examine Canadian's contraceptive sterilization pattern compared to the rational choice model.

Still some points deserve mentioned here. The research focused on voluntary sterilization for birth control. Neither sterilization for a medical reason nor sterilization for both medical and contraceptive reasons was not a big concern of this research. It merits noting that there are a substantial amount of females who used sterilization for medical reason. However, individuals who used sterilization for both medical and contraceptive reasons were in quite a small number. As a result, women who already used medical sterilization can never adopt sterilization for a contraceptive purposed in my analysis. It also merits noting that men and women in my target sample were not in exactly the same range of age. Women were ranged from age 15 to age 49. Men's ages were roughly between 15 and 49. However, those males who were older than 49 but whose wives were between 15 and 49 were also included in the sample. Since these men were not large in number, this is also not a serious issue for this study. Compared to previous research, which found that men were less likely to use sterilization than women (Forste, Tanfer & Tedrow, 1995; Godecker, Thomson & Bumpass, 2001; Ross, 1991), my study found that women are less likely than men to use sterilization for birth control. On the one hand, it is probably because previous studies did not distinguish contraceptive sterilization from medical sterilization. On the other hand, it reflects social changes in the

gendered pattern of use of sterilization for birth control. Considering psychological advantage and disadvantage, male vasectomy as a surgery is easier and safer than female tubal ligation (Rind, 1989). In the future, as this information spreads out, more men will have more information and relatively objective understanding of the procedure. It is possible that more men will employ this procedure as a method for birth control.

For future study, it is very important to conduct specific surveys on fertility containing multi-dimensional variables designated to reflect motivation and more time-variant measurements. However, this study points to the importance of incorporating measures of sociological and psychological dimensions, specifically social norms, values, human attitudes and behaviors to more directly test the proposed model. Future empirical studies are required to test the variant framework of this study within the field of fertility and beyond. In summation, a macro-level quantitative survey, with the help of robust statistical models, can be powerful in predicting trajectory of individuals' behavior patterns and, an intensively focused qualitative survey can help to specify how the social institutions help structure the motivation of an individual's decision making and corresponding behavior in their everyday life.

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