Marital Fertility in Kingston, 1861-1881: A Study of Socio-economic Differentials

Eric G. Moore and Brian S. Osborne*

This article examines religion, birthplace and occupational status as they relate to changes in fertility in Kingston, Ontario between 1861 and 1881. The specific focus is on marital fertility which, in contrast to the European experience, was the dominant component of the demographic transition in Canada. The paper has three main objectives: to demonstrate the utility of the manuscript censuses as a micro-level database for studying complex social demographic effects on fertility; to identify the basic components of change in marital fertility for Kingston in 1861-1881; and, to determine the relative contributions of religion, birthplace and occupational status to age-specific marital fertility rates.

Cet article a pour but d'examiner les liens existant entre la religion, le lieu de naissance, le statut professionnel et les changements dans les taux de fécondité à Kingston en Ontario, entre 1861 et 1881. L'accent est mis avant tout sur la fécondité matrimoniale car, au Canada, à l'encontre de la situation européenne, c'était l'élément le plus important dans la transition démographique. Nous avons trois objectifs principaux : montrer l'utilité des manuscrits de recensement comme base de données micro-analytiques, pour étudier les effets des facteurs socio-démographiques complexes sur la fécondité; identifier les éléments de base permettant d'expliquer les changements dans la fécondité matrimoniale à Kingston entre 1861-1881; et déterminer quelle a été l'influence relative de la religion, du lieu de naissance et du statut professionnel, sur les taux de fécondité matrimoniales selon l'âge.

INTRODUCTION

Nineteenth century North America experienced a substantial and consistent decline in fertility. It is becoming increasingly apparent, however, that this decline cannot be explained solely by the classic model of a demographic transition associated with modernization in general and industrialization and urbanization in particular. Certainly, the latter developments provide the overarching context for the demographic transition in North America, and especially for the decrease in mortality, but a fuller appreciation of the causes of the fertility transition must be sought in more specific social, economic, and cultural processes. Research to this point has focussed primarily on the demographic experience of preindustrial Europe and has identified two quite distinct perspectives on fertility transition: first, the "continuity" perspective argues that declines in fertility, prompted by a variety of social and economic factors, may be recognized prior to modernization and industrialization; second, the "discontinuity" perspective argues for a transition from a

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"natural" to a "controlled" fertility associated with modernization.[1] In North America, an additional dimension is added to the debate, since the fertility experience in a population subject to high in-migration must inevitably reflect a continually changing mix of immigrant and developing local values.

Canada also experienced a major fertility decline in the nineteenth century.[2] The present paper is part of an ongoing research project investigating nineteenth century fertility decline in the following four Ontario study areas: the city of Kingston; six rural townships in the vicinity of Kingston; London; and Toronto. In this paper we examine differentials in religion, birthplace, and occupational status as they relate to changes in fertility in the city of Kingston in the period 1861 to 1881. More particularly, the specific focus is on changes in marital fertility. Shifts in overall fertility are a function of changes in nuptiality, legitimate births, and illegitimate births. However, E. Gee[3] has shown that marital fertility was the dominant component of change in Canada at this time in contrast to much of the European experience in which delay in marriage played a significant role.[4]

The paper has three main objectives:

i)   to demonstrate the utility of the manuscript censuses as a micro-level data base for studying complex socio-demographic effects on fertility;

ii) to identify the basic components of change in marital fertility for Kingston in 1861-1881;

iii) to determine the relative contributions of religion, nativity and occupational status to changes in age-specific marital fertility rates between 1861 and 1881.

THEORETICAL BACKGROUND

Most analyses of nineteenth century fertility utilize public records (census, parish records, vital registrations) and do not contain direct evidence regarding moral, attitudinal, or socio-psychological circumstances of individuals. Analysis focusses on contrasts in childbearing experience between socio-demographic and cultural sub-groups; as such, they emphasize correlations between indicator variables (such as religion, occupation or nativity) and fertility, which subsume a set of tendencies for consistent moral or attitudinal imperatives and individual choices regarding childbearing.

The problem in constructing explanations of childbearing behaviour from analyses of public records such as these is that the relations between fertility and indicator variables are themselves subject to change over time. For example, as religious groups develop different stances regarding fertility control, the nature of the influence of the indicator variable, "religion," will also change. Any such change over time can do little more than

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1. For an efficient summary of this debate, see J. Blake, "The Fertility Transition: Continuity or Discontinuity with the Past?," in *Proceedings of the International Union for the Scientific Study of Population* International Population Conference, Florence, June, 1985, pp. 393-401.

2. E. Gee, "Early Canadian Fertility Transition: A Components Analysis of Census Data," *Canadian Studies in Population* 6 (1979), pp. 23-32; R.M. McInnis, "Childbearing and Land Availability: Some Evidence from Individual Household Data.," in W.R. Lee (ed.), *Population Patterns in the Past* (New York: Academic Press, 1977), pp. 201-227.

3. Gee, "Early Canadian Fertility Transition," *op. cit.*

4. J. Hajnal, "European Marriage Patterns in Perspective," in D.V. Glass and D.E.C. Eversley (eds.), *Population in History* (London: Edward Arnold, 1965), pp. 101-146.

provide a clue to the underlying process which needs to be substantiated with different forms of evidence such as letters, sermons, and other qualitative materials from the study period. Indeed, we see much of the outcome of the present analysis as providing clues and guidelines to profitable future directions for more detailed research in such qualitative areas. With this perspective, we now turn to a number of basic themes in the literature.

Two major themes have dominated discussions of fertility change; one has stressed the predominance of economic opportunity and the rational assessment of the costs and benefits of childbearing while the other has focussed on cultural influences, particularly changing attitudes towards the family and the ability and responsibility to control one's own childbearing behaviour. While the two streams are not mutually exclusive, they also tend to have been associated with different methodologies; the former has sought evidence through family reconstruction at the micro level, while the latter has made more use of macro-level aggregate statistics.

At the core of economic arguments is the suggestion that parents make childbearing decisions in the light of the perceived costs and benefits of having children.[5] In particular, as costs of children increase either through increases in the real costs of maintaining a child or through increased opportunity costs from the wife's loss of earnings, fertility would be expected to decline. Although direct measures of these effects are difficult to obtain in the nineteenth century, the theory has led to expectations of an inverse relation between occupational status and fertility, and, more particularly, between the occupational status of the husband and the fertility of the wife.[6] Certainly, it is recognised that the connection between husband's occupation and fertility is not a direct one and more precisely reflects the outcome of such fundamental relations as the differential obligation for child-rearing among social groups, the relative economic costs of child-rearing, and the varying importance of wives' and childrens' labour. The presence or absence of female employment opportunities, age at marriage, the age of peak earnings, the degree of dependence upon female labour, and the economic value of child labour are all important influences upon household incomes and consequent fertility behaviour. For the purposes of this study, however, it is assumed that the occupation of the husband is the primary determinant of household resources and, therefore, is also an indicator of fertility behaviour.

Recent studies of proto-industrialization in Europe have stressed the idea that early industrial workers, once divorced from the land, increased the number of children in their families and married earlier so that they could maximize the only resource left available to them for their support.[7] Other studies have demonstrated that this relation is mediated by both the nature of demand for female labour and the rate of economic growth of local

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5.   G.S. Becker, "An Economic Analysis of Fertility," in *Demographic and Economic Change in Developed Countries*: A report on a conference to the National Bureau of Economic Research (Princeton: Princeton University Press, 1960), pp. 209-230; G.S. Becker and N. Tomes, "Child Endowments and the Quality and Quantity of Children," *Journal of Political Economy* 84 (1976), pp. 143-162; H. Liebenstein, "The Economic Theory of Fertility Decline," *Quarterly Journal of Economics* 89 (1975), pp. 1-31.

6.   X. Sallume and F.W. Notestein, "Trends in the Size of Families Completed prior to 1910 in Rural India: an Economic Analysis," *American Journal of Sociology* 38 (1932), pp. 406-7; W.H. Grabill, C.V. Kiser, and P.W. Whelpton, *The Fertility of American Women* (New York: Wiley, 1958); T.K. Hareven and M.A. Vinovskis (eds.), *Family and Population in Nineteenth Century America* (Princeton: Princeton University Press, 1978), pp. 85-125.

7.   H. Medick, "The Protoindustrial Family Economy: the Structural Function of Household and Family during the Transition from Peasant Society to Industrial Capitalism," *Social History* 1 (1976), pp. 291-315; D. Levine, *Family Formation in an Age of Nascent Capitalism* (London: Academic Press, 1977).

economies.[8] However, for David Levine, the increased fertility associated with proto-industrialization was generated by earlier dates of first marriage, increased frequency of marriage, higher marital fertility, and increased illegitimacy.[9] The type of variation indicated by this literature also suggests that, in the longer run, analysis should be sensitive to regional differences in fertility experience. Not only should we be concerned with rural-urban contrasts but with differences between urban areas with varying experiences of growth and industrial mix.

The second theme in the literature argues that economic rationality does not provide the sole basis for childbearing decisions. An ability to recognize a responsibility for childbearing and to translate expectations regarding fertility into actions are prerequisites for fertility control.[10] Thus, in varying degrees, parents adhere to the traditional values of the cultural groups to which they belong, are influenced by the behaviour of others around them, and have their own ideas regarding the relative desirability of different sizes of family. These factors are themselves circumscribed by both knowledge of, and access to, methods of fertility control.

The importance of socio-cultural background, particularly in a North American context with its high levels of immigration, has led to much attention being focussed on the role of birthplace and ethnic status. There is some support for the traditional view that foreign-born women in nineteenth-century America had more children than their native counterparts,[11] while others have argued that there was little difference in fertility among women of different ethnic or religious background.[12] In their analysis, Hareven and Vinovskis[13] support the traditional view since their data demonstrate significant ethnic variations in fertility with French Canadians and the Irish exhibiting the highest rates while the lowest fertility was found among English-speaking Canadians.

The difficulty with much of the analysis of ethnicity, particularly in the United States, is that it has been undertaken in the absence of matching data on religion. Interpretation of the meaning of the "ethnic effect" is thus made problematic by the fact that it compounds

8.   D. Friedlander, "Demographic Patterns and Socioeconomic Characteristics of the Coal Mining Population in England and Wales in the Nineteenth Century," *Economic Development and Cultural Change* 22 (1973), pp. 359-381; M.R. Haines, "Fertility, Nuptiality, and Occupation: A Study of Coal Mining Populations and Regions in England and Wales in the Mid-Nineteenth Century," *Journal of Interdisciplinary History* 8 (1977), pp. 245-280; Idem, *Fertility and Occupation: Population Patterns in Industrialization* (New York: Academic Press, 1979).

9.   David Levine, "Production, Reproduction, and the Proletarian Family in England, 1500-1851," in David Levine (ed.), *Proletarianization and Family History* (Orlando: Academic Press Inc., 1984), pp. 87-127.

10.   R.I. Woods and C.W. Smith, "The Decline of Marital Fertility in the Late Nineteenth Century: The Case of England and Wales," *Population Studies* 37 (1983), pp. 207-225; P. Ariès, "Interprétation pour une histoire des mentalités," in H. Bergues, *et al.*, *La Prévention des Naissances dans la Famille, ses Origines dans les Temps Modernes* (Paris: INED, Presses Universitaires de France, 1960), pp. 311-327.

11.   L.A. Glasco, "The Life Cycles and Household Structure of American Ethnic Groups: Irish, Germans, and native Born Whites in Buffalo, New York, 1885," *Journal of Urban History* 1 (1975), pp. 33-364; W.H. Bash, "Changing Birth Rates in Developing America: New York, 1840-1875," *The Millbank Memorial Fund Quarterly* 41 (1963), pp. 161-182.

12.   Michael B. Katz, *The People of Hamilton, Canada West: Family and Class in a Mid-Nineteenth Century City* (Cambridge, Massachusetts: Harvard University Press, 1975); S. Blumin, "Rip Van Winkle's Grandchildren: Family and Household in the Hudson Valley, 1800-1860," *Journal of Urban History* 1 (1975), pp. 293-315.

13.   T.K. Hareven and M.A. Vinovskis, "Marital Fertility, Ethnicity, and Occupation in Urban Families: An Analysis of South Boston and the South End in 1880," *Journal of Social History* 9 (1975), pp. 69-93.

both the effects of religious differences and variations between ethnic groups; it also contains a host of time-dependent cultural and economic influences on the prior fertility experience of specific groups. Thus, one might be forced to conclude that the "ethnic effect" is a group-specific historical residual; for example, it might be said that the differentiated behaviour of Irish-born women in North America in the 1860's was a response to the specific economic and cultural circumstances in Ireland in the 1830's and 1840' rather than those of their current, lived-in world.

This potential for a residual ethnic effect makes it particularly important that other related variables are included in the analysis. Given its fundamental link to attitudes regarding fertility control, religion has a high priority for inclusion in these analyses. The role of religion has received less attention than that of ethnic status. This is, in part, because of the lack of appropriate data, particularly in the manuscript census in the U.S., and what evidence is available is contradictory. Thus, Michael Katz[14] and S. Blumin[15] failed to find any significant effects of religious differentials on fertility behaviour. However, in another study, Vinovskis argues that although the 1861-1881 study period predates religious sanctions against the use of specific contraceptive devices, there is a more subtle relation involving attitudes towards the expression of individual choice.[16] Religious groups which most allowed the expression of individual choice, such as Presbyterians and Unitarians, tended to be associated with lower fertility, while those which favoured a greater degree of social control, such as Baptists and Methodists, exhibited somewhat higher fertility levels.

The religious argument is also significant in R.J. Lesthaeghe's analysis of the nineteenth century Belgian experience.[17] His contrast lies between Catholics and non-Catholics with the Catholic church taking a strong stand against notions of fertility-centred calculations. In Lesthaeghe's view, the application of rationality to fertility was strongly linked to the more general process of secularization with its most immediate effects being observed in the Catholic/non-Catholic contrast. The statistical nature of these religious effects forms a major focus of subsequent analysis in the present paper.

The above discussion provides the rationale for the analysis of change in marital fertility in Kingston from 1861-81. It follows that the focus will be on the effects, both direct and in interaction with other factors, of the following variables:

1.   Age of mother
2.   Occupational Status, that of the father being used as the primary indicator
3.   Religion, emphasizing the contrast between Catholics and non-Catholics
4.   Birthplace of mother
5.   Ethnic Origin, with particular attention being given to distinguishing differences between Irish and non-Irish.

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14.   Katz, *op. cit.*
15.   Blumin, 1975.
16.   M.A. Vinovskis, *Fertility in Massachusetts from the Revolution to the Civil War* (New York: Academic Press, 1981).
17.   R.J. Lesthaeghe, *The Decline of Belgian Fertility, 1800-1970* (Princeton: Princeton University Press, 1977).

DATA AND METHODS

Clearly, if these compositional effects are to be disentangled, then it is important to have access to individual rather than aggregate records so that individual socio-demographic profiles can be used in the analysis. The Canadian manuscript censuses for 1851, 1861, 1871 and 1881 permit an analysis of a broad range of complex demographic phenomena and constitute the principal source for the present analysis of marital fertility in Kingston for the two years, 1861 and 1881.[18] The aggregate tables from the Censuses of 1851, 1861, 1871, 1881, 1891 and 1901 provide other supplementary material.

These manuscript censuses provide data on each individual in the population, grouped by household. Given the focus on marital fertility, a separate record was created for each woman between the ages of 15 and 49 for which the presence of a spouse or of own children (or both) could be determined. A count was generated of other women aged 15-49 and their marital status (single, married or widowed) but no separate records were created. This process resulted in a total of 1,602 usable records for 1861 and 1,680 records for 1881; these were merged into a single file sorted by year. The statistical analyses in the paper focussed more explicitly on women aged 20-49 and excluded women whose spouses had agricultural occupations which reduced the combined file from 3,282 to 3,002 observations.

The list of variables and data types used in this analysis is given in Table 1. While most variables are defined in a self-evident way, additional comments are appropriate for the following:[19]

Table I   **List of Variables**

No.	Variable	Type	Abbreviation
1	Ward	Nominal	
2	Age of Mother	Integer	MAGE
3	Number of Children	Integer	NCHIL
4	Occupation	Nominal	OCC
5	Religion	Nominal	MREG
6	Birthplace	Nominal	BMUM
7	Ethnic Status	Nominal	EMUM
8	Age-Group	Ordinal	MGP
9	Number of Children 0-4	Integer	NFIVE
10	Occupational Status	Ordinal	OCUP
11	Foreign-Born	Nominal	IRISH

(i) *Occupational Status*. The occupational coding was based on the Armstrong classification.[20] However, since the nine original categories are too numerous for statistical analysis, they were collapsed into three groups: Upper, Middle and Lower

18. See, for example, M.D. Ornstein, "Discrete Mutlivariate Analysis: An Example from the 1871 Canadian Census," *Historical Methods* 16:3 (1983), pp. 101-108; see also Ornstein and J.G. Darroch, "The Regional Economy of Family and Household in Nineteenth Century Canada." Paper read at the Annual Meetings of the American Sociological Association (San Francisco, 1982).

19. For a full description and discussion of each variable in the data base, see Eric G. Moore, B.S. Osborne and A. Nash, "Fertility Change in the City of Kingston, 1861-1881," Department of Geography, Queen's University, 1984, manuscript.

20. W.A. Armstrong, "The Interpretation of Census Enumerators' Books for Victorian Towns," in H.G. Dyos (ed.), *The Study of Urban History* (London: Edward Arnold, 1968), pp. 67-85.

Status. These groups comprised the variable OCUP (Table 2) which emphasizes the contrasts between the professional/managerial group, skilled workers, and semi-skilled or unskilled workers following the strategy used by Harevan and Vinovskis.[21]

(ii) *Catholic/Non-Catholic*. To be consistent with the discussion of the previous section, the full religious categorization was collapsed into a Catholic/non-Catholic dichotomy named CATHOLIC.

(iii) *Birthplace*. Two new variables were created: FBN is a dichotomous variable which distinguishes between Canadian-born and Foreign-born. The variable "IRISH" combines the birthplace and ethnic status information to create the following categories: Canadian-born; Canadian-born, Irish origin (1881 only); Foreign-born, non-Irish; Irish-born.

Table 2   **Occupational Coding from the Armstrong Scale**

	Armstrong Code	Occupational Status	Industrial Status
1	Professional Managerial	Upper	Non-Industrial
2	Intermediate Non-Manual	Upper	Non-Industrial
3	Skilled Manual/Industrial	Middle	Industrial
4	Other Skilled Manual	Middle	Non-Industrial
5	Semi-Skilled Manual/Industrial	Lower	Industrial
6	Other Semi-Skilled Manual	Lower	Non-Industrial
7	Unskilled Manual	Lower	Industrial
8	Farm and Farm Labourer	*	*

Source: Armstrong (1968)

* :   Omitted in subsequent analyses

With these variables selected, attention was directed to the most appropriate method for measuring fertility. One strategy would have been to attempt to analyze age-specific marital fertility rates directly, using the number of births in the previous year grouped by the specific age of mother. This approach was found to be problematic on several counts. First, the birth data are more unreliable than other age data, with substantial underreporting of those in the first year of life. Secondly, with 30 age categories for the range 20-49, there would have been sparse cell counts for several of the age by population sub-group tables. Thirdly, and most critically, the role played by infant mortality introduces considerable uncertainty into such a constrained analysis. Infant mortality appears to have been quite high during this period, one estimate calling for 189 infant deaths per 1000 males births in 1861 and 165 per 1000 in 1881.[22]

In this paper, the widely adopted measure of child-women (C-W) ratios is used.[23] The ratio is constructed using the number of surviving children aged 0-4 as the numerator. As such, it helps to smooth local temporal variations in fertility behaviour and provides a summary measure of the experience of the previous five years. An argument can be made

21.   Hareven and Vinovskis, *op. cit.*

22.   R. Bourbeau and J. Légaré, "Evolution de la Mortalité au Canada et au Québec, 1831-1931," *Collection Démographie Canadienne* 6 (Montréal: Les Presses de l'Université de Montréal, 1982).

23.   Hareven and Vinovskis.

for adjusting the numerator for mortality as in Haines[24] but the decision was made to use the number of surviving children for the following reasons:

i)   Since the emphasis is on contrasts between the fertility behaviour of differing groups, the structural effects would not change significantly with a similar adjustment for all groups. Further, there is little evidence that infant mortality changed dramatically between 1861 and 1881[25] while the downward direction of change would tend to reduce the observed fertility differentials and therefore lead to conservative statements from our analysis.

ii)   In a study of contrasts between different socio-demographic groups, it would only make sense to adjust for mortality if we had data on comparable differentials in infant mortality. While desirable, these are simply not available. In fact, the level of mortality decline for this period suggested by McQuillan[26] would produce only a two to three percent increase in C-W ratios, all other factors being held constant. These effects are likely to be quite small compared with the anticipated fifteen to twenty-five percent declines in fertility during the same period.

iii) Even given the concerns about interpreting C-W ratios directly in terms of fertility, the argument can still be made that an analysis of surviving children per se is of value as it is an indicator of "effective fertility" (i.e. net of mortality) within the society.

While it is possible to compare both graphically and analytically the age-group profiles for C-W ratios for each class, it is also desirable to produce summary measures for comparing several different classes at once. However, the simple ratio of total children to married women would be highly sensitive to the age-distributions of different sub-groups. It is necessary, therefore, to introduce a weighting scheme to create an age-standardized measure. In this paper the overall C-W ratio is standardized on the distribution of married women in Kingston in 1881.[27]

Analysis of the C-W ratios is pursued at two levels. Descriptive measures of both age-group specific and age-standardized measures are presented for different socio-demographic groups in both tabular and graphic forms. However, more rigorous analysis is necessary in order to identify the relative importance of different direct and interaction effects.

The general procedure is to analyze the various effects of childbearing behaviour in terms of an unbalanced analysis of variance model, with the usual notation for main effects and interactions.[28] The dependent variable is NFIVE (number of children aged 0-4 for each married woman) with the factors being defined by the categorical variables MGP (5-year age group), OCCUPATION, CATHOLIC, FOREIGN-BORN, IRISH and YEAR. Each fitted model represents NFIVE as a function of selected main effect variable and designated interactions; the model parameters are estimated for the categories of the original

    24. M.R. Haines, "Ethnic Differentials During Fertility Decline: Philadelphia 1850-1900." Paper presented at the Annual Meeting of the Population Association of America (Minneapolis, 1984).
    25. McInnis, R.M., 1978; Bourbeau and Légaré, "Evolution de la Mortalité," p. 58.
    26. K. McQuillan, "Ontario Mortality Patterns 1861-1921." Paper presented at the annual meeting of the Canadian Population Society (Vancouver, 1983).
    27. See Moore, *et al.*, "Fertility Change," for detailed procedures. In that study a second standardization was also used, based on the procedures in Hareven and Vinovskis, "Marital Fertility." These results, however, are virtually identical with those presented here.
    28. *SAS User's Guide: Statistics* (Cary, North Carolina: SAS Institute Inc., 1982), p. 141.

variables and for cross products of categories for the interaction terms.[29] This is best illustrated by an example.

Consider the following model specification:

$$NFIVE = \{YEAR \; MGP \; CATHOLIC \; MGP*CATHOLIC\}$$

which expresses NFIVE in terms of the main effects of YEAR, MGP and CATHOLIC and the interaction between MGP and CATHOLIC. If the MGP*CATHOLIC interaction were significant, it would mean that the *relative* C-W ratios were different for Catholics and non-Catholics at different ages (in fact, we might expect the differences to be larger at older than at younger ages if non-Catholics were more likely to control family size). In more conventional terminology, the model can also be specified as:

$$NFIVE = a_0 + a_1T + b_1S_1 + b_2S_2 \quad b_3S_3 + b_4S_4 + b_5S_5 + c_1R + d_1\,(T*R)$$

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\begin{aligned}
\text{where } T &= 1 \text{ if YEAR} = 1881 \text{ and } 0 \text{ if YEAR} = 1861 \\
S_1 &= 1 \text{ if mother's age} = 20\text{-}24; = 0 \text{ otherwise} \\
S_2 &= 1 \text{ if mother's age} = 25\text{-}29; = 0 \text{ otherwise} \\
S_3 &= 1 \text{ if mother's age} = 30\text{-}34; = 0 \text{ otherwise} \\
S_4 &= 1 \text{ if mother's age} = 35\text{-}39; = 0 \text{ otherwise} \\
S_5 &= 1 \text{ if mother's age} = 40\text{-}44; = 0 \text{ otherwise} \\
R &= 1 \text{ if respondent is Catholic}; = 0 \text{ otherwise}
\end{aligned}
$$

The statistical analysis of this model provides a number of outputs:

i)   a measure of the significance of the overall model;

ii) a measure of the significance of each main effect and each included interaction. Thus, if YEAR is significant, the values for NFIVE for 1881 are different from those for 1861, controlling for all other variables;

iii) measures of the size of the effect associated with each variable (the a's, b's, c and d);

iv) an ability to test for the differenes between parameters for a given main effect. Thus a test of the difference between b^3 and b^4 would indicate whether the contrast between 30-34 year-olds and 35-39 year-olds is significant, controlling for all other variables.

The general strategy followed in fitting the models is that the saturated model which includes all possible interactions is fitted first and then interactions which are not significant are progressively removed. In some instances, non-significant effects are left in the model presentations when they illustrate specific points of theoretical interest.

ANALYSIS

In 1851, Kingston had a population of 11,585. In the decades that followed, not only did Kingston fail to enjoy the consistent and often spectacular growth experienced by other urban centers but even experienced absolute population decline. Thus, during our study period the population first declined by almost 10 percent during the 1860's and then increased marginally to 14,091 in 1881, which was only 348 more than it had been in 1861.

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29. *Ibid.*, p. 165. The computations were all undertaken using Type III partial sums of squares.

But while it did not share the high growth rates experienced by other Ontario urban centres during the latter half of the nineteenth century, Kingston's population did undergo significant structural change. Most noticeable was the dramatic shift in the proportion of the population who were native born. In 1861, only 52.4 per cent of the population had been born in Canada; by 1881, it had risen to 70 percent. For married women the relevant figures were 22.5 percent in 1861 and 58.5 percent in 1881. This component of change is particularly significant given the importance of nativity in recent analyses of fertility change.[30] The foreign born married women tend to be significantly older than the native born and to exhibit sizeable differences in their occupational and religious composition, both of which, as stated above, enter into existing explanatory accounts of fertility behaviour.

Kingston presents a particularly interesting context in which to study the relative roles of ethnicity and religion. In 1861, not only were 77.5 percent of married women between 20 and 49 foreign-born but 53.3 percent were born in Ireland. However, only 53.8 percent of the Irish-born were Catholics, with almost as large a proportion being Presbyterian or Anglican. By 1881, the proportion of Irish born had fallen significantly to 23.1 percent, although 28.5 percent of the married women were still Canadian-born of Irish descent. Thus, the Kingston population of this period provides an excellent opportunity to examine the relative contributions and interactions of religion, birthplace and ethnic origin during a period of rapid change in fertility behaviour.

Within each age group, the propensity to be married changed little over the two decades. Coupled with a low estimated level of illegitimacy,[31] there is strong support for the contention that the main contribution to declining fertility rates stemmed from changes in marital fertility.

There are very few married women under the age of 20; as a consequence, subsequent standardization procedures refer only to those women in the 20-49 age groups. This population of married women is not homogeneous in terms of its age distribution over various socio-cultural sub-groups, with the most important and largest differences being between native-born and foreign-born women. Figure 1 illustrates very clearly both the maturing of the age distribution over the two decades and the significantly older foreign-born component of the Kingston population of married women in both years. The clear implication is that any calculation of gross fertility or child-women ratios would be very misleading and provides the motivation for including age controls or age standardization throughout the analysis.
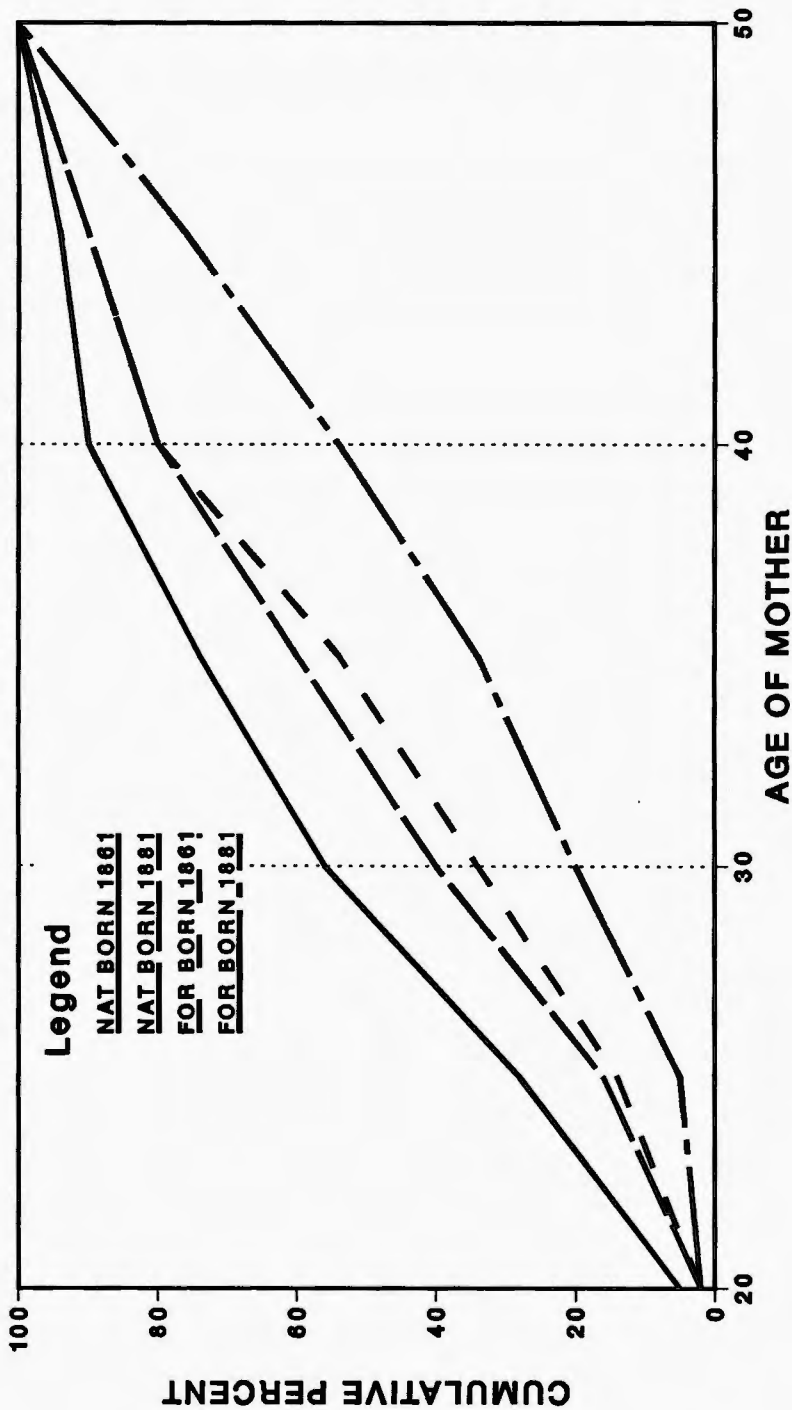
Perhaps the most dramatic change in the attributes of married women lies in the nativity variable. In 1861, of the 22.5 percent that had been born in Canada only 8.3 percent were born in Ontario. More than half the women had been born in Ireland and the majority of the remainder in other parts of the United Kingdom. By 1881, the majority of the population had been born in Ontario. The greater proportion of the foreign-born women were still of Irish origin but the absolute frequency was less than half of 1861. However, despite the decline in foreign-born women, the Kingston population still retained its strong Irish character (Table 3).

Changes not only occurred in age-distributions but also in religious and occupational composition. The most important observation for this paper is that although the Kingston

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30.   Haines, "Ethnic Differentials," *op. cit.*; Hareven and Vinovskis, "Marital Fertility," *op. cit.*
31.   Gee, "Early Canadian Fertility Transition," *op. cit.*

FIGURE 1
AGE DISTRIBUTION OF MARRIED WOMEN 15-49 IN 1861 AND 1881 BY NATIVITY

Legend

NAT BORN 1861
NAT BORN 1881
FOR BORN 1861
FOR BORN 1881

AGE OF MOTHER

CUMULATIVE PERCENT

Table 3   **Relation Between Ethnic Origin and Birthplace in 1881**

| Ethnic Origin | Ireland | U.K. | Birthplace | | Other | Other |
			U.S.A.	Ontario	Canada	
Irish	387	11	16	404	42	4
	[44.8]*	[1.3]	[1.9]	[46.8]	[4.9]	[0.5]
English/Other U.K.	18	215	41	370	35	6
	[2.6]	[31.4]	[6.0]	[54.0]	[5.1]	[0.9]
Other European	1	1	12	53	37	12
	[0.9]	[0.9]	[10.3]	[45.6]	[31.9]	[10.3]
Other	0	0	1	6	1	1
	[0.0]	[0.0]	[11.1]	[66.7]	[11.1]	[11.1]

Source: Manuscript Census, 1881
* :   Percentage of row total

population was dominated by those of Irish origin, it was by no means predominantly Catholic. Although it is true that virtually all foreign-born Catholics were Irish, the converse is far from the case (Table 4). In both 1861 and 1881, only just over half the Irish-born were Catholics, most of the rest being Anglican or Presbyterian. By 1881, only about a third of Canadian-born women of Irish descent were recorded as Catholics. Overall, between 1861 and 1881 the percentage of married women recorded as Catholic declined from 34.9 to 29.0; during this period the principal gains were made by Methodists.

Table 4   **Relation Between Nativity and Religion 1861 and 1881**

Nativity		Catholic	Religion Anglican/Presbn	Methodist
1861				
	Irish-Born	53.8*	39.1	6.6
	Other Foreign-Born	6.5	66.1	19.7
	Canadian-Born	20.3	55.0	20.6
	Total	34.8	49.2	12.9
1881				
	Irish-Born	53.2	35.7	7.9
	Canadian Irish	37.0	39.9	18.5
	Other Foreign-Born	8.1	61.6	16.3
	Canadian-Born	16.1	47.0	29.7
	Total	29.2	45.2	18.8

Sources: Manuscript Censuses, Census of Canada 1861, 1881

* :   Percent of population of nativity group
+ :   Percent of total population

Having established the age and socio-cultural attributes of married women, attention could then be directed to the determination of the fertility patterns exhibited by Kingston's married women. Table 5 presents the overall age-specific Child-Women (C-W) ratios for both years. Not only have these ratios declined substantially during the two decades but they have done so for all age groups. There is a clear pattern in the proportionate reduction

in fertility by age (see also Figure 2); both the younger and older ages make significantly greater reductions than those in the 30-40 age group. Although it has to be established that this is a true reflection of behaviour and not just a compositional effect, it is suggestive of two important ideas: first, that the younger age groups are more receptive of innovative ideas about fertility control and herald more long lasting changes; second, not surprisingly, that those over forty are more likely to cease having children altogether.

Table 5		Age-Specific Child-Women Ratios for Married Women: Kingston 1861 and 1881			
Age	1861	N	1881	N	Ratio 1881/1861
15-19	0.829	35	0.5	10	0.603
20-24	1.385	239	0.947	170	0.684
25-29	1.692	367	1.291	319	0.763
30-34	1.502	309	1.177	305	0.784
35-39	1.221	340	0.983	290	0.805
40-44	0.835	170	0.567	247	0.679
45-49	0.348	132	0.204	226	0.586

Source: Manuscript censuses, 1861 and 1881

This is particularly interesting with regard to the "Spacing versus Stopping" debate,[32] for one might infer that both processes were proceeding at the same time rather than having to judge whether one or the other were occurring.

Table 6 provides further insights into overall change by looking at the explicit distribution of children under five years of age. From this it can be seen that fertility reduction is pervasive. For all age-groups, the proportion of women with no children under five is greater in 1881 than 1861 and there is a significant reduction in "continuous childbearing," namely in women with three or more children under five years; in 1861, 12.2 percent had three or more children under five and this had dropped to 4.8 percent by 1881.

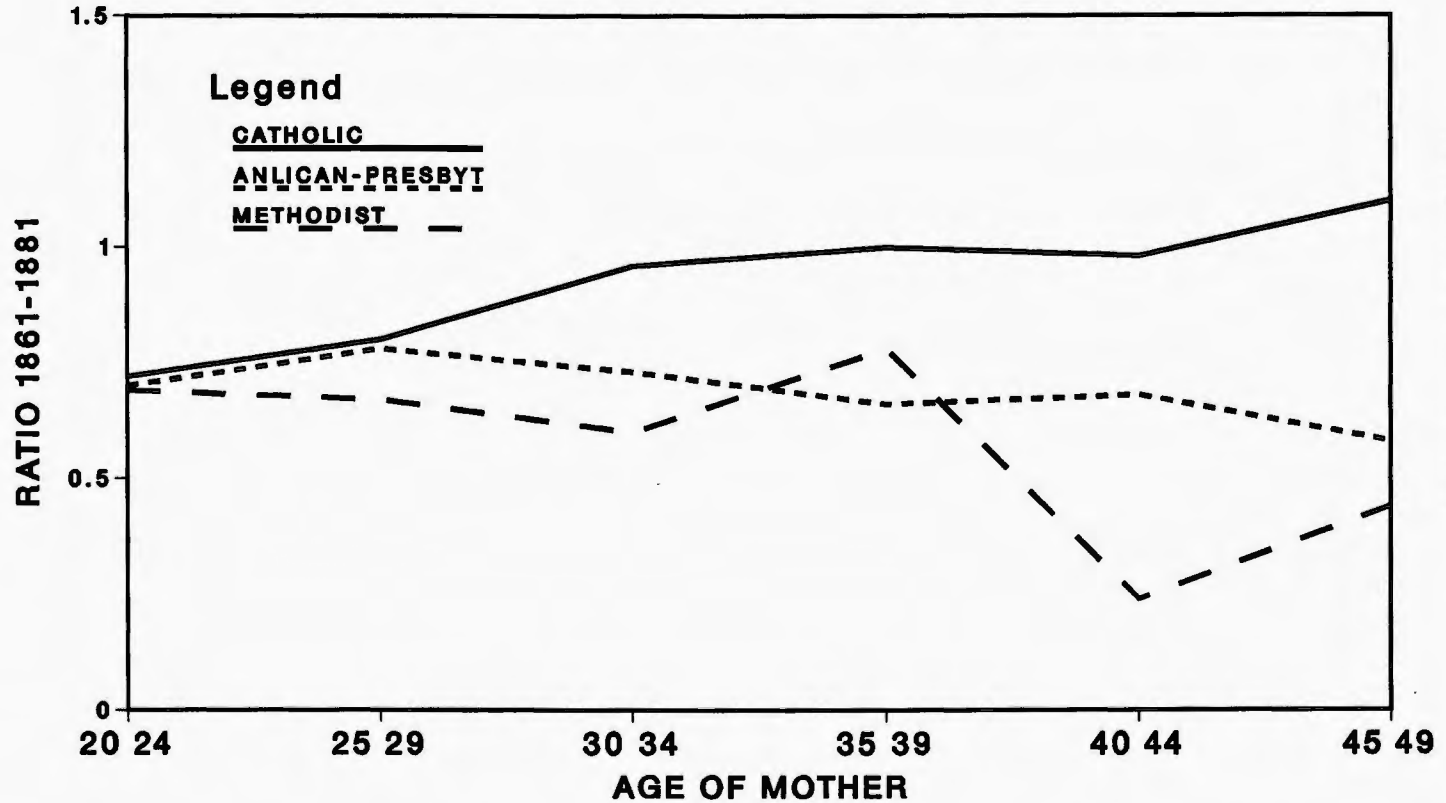*The Fitted Models*

The data were modelled in three steps:

i)   a set of models were estimated for 1861 (the best fit model is presented in Table 7).

ii)   a set of models were estimated for 1881 (the model corresponding to that for 1861 is presented in Table 8).

iii)   a set of models were estimated for the two years combined with an explicit variable YEAR included for 1861, YEAR0 and for 1881, YEAR1 (Table 9).

Each of the models presented in Tables 7, 8, and 9 is highly significant, with the residual error showing that no major term has been omitted.[33] The models indicate that,

32.   W. Sanderson, "'How Soon Did They Do It?' Marital-Duration Specific Patterns of Fertility Control among Native White Couples, circa 1900." Paper presented at the Annual Meetings of the Population Association of America (Minneapolis, 1984).

33.   In fact, a number of models were examined including one with all YEAR by socio-demographic variable interactions. The YEAR*CATHOLIC interaction is the only one which is significant.

FIGURE 2
CHANGE IN CHILD-WOMEN RATIOS 1861-1881
MARRIED WOMEN IN KINGSTON BY RELIGION

Legend

CATHOLIC

ANLICAN-PRESBYT

METHODIST

RATIO 1861-1881

AGE OF MOTHER

20 24   25 29   30 34   35 39   40 44   45 49

Table 6 **Frequency Distribution of Children 0-4 in 1861 and 1881**

Age Group	Year	0	1	2	3	4	5	6
				Number of Children				
15-19	1861	34.3*	54.3	5.7	5.7			
	1881	50.0	50.0					
20-24	1861	20.5	31.4	37.7	10.4	6.3		
	1881	31.2	45.9	20.0	2.9			
25-29	1861	14.2	26.7	37.3	19.9	1.6		0.3
	1881	24.5	31.0	35.4	9.1			
30-34	1861	20.4	25.4	40.8	11.3	1.9	0.3	
	1881	31.5	27.5	32.8	8.2			
35-39	1861	28.5	32.1	29.1	9.4	0.9		
	1881	38.6	29.3	27.9	3.5	0.7		
40-44	1861	43.5	34.1	17.7	4.7			
	1881	61.1	22.7	14.6	1.6			
45-49	1861	75.0	18.2	5.3	0.8		0.8	
	1881	81.4	17.3	0.9	0.4			
Total	1861	28.0	29.0	30.8	11.0	1.0	0.1	0.1
	1881	43.3	28.4	23.4	4.7	0.1		

Source: Manuscript censuses, 1861 and 1881

* :   Percentage of Row Total

not only have the overall C-W ratios declined between 1861 and 1881 but the socio-demographic structure of these ratios has also changed.

In 1861, age of mother is the dominant influence and the only significant main effect. The impact of religion is not felt directly but through three two-way interactions: the significance of the AGE*IRISH interaction reflects the fact that Irish/non-Irish differentials are higher at younger than older ages; the RELIGION*IRISH interaction is a function of higher C-W ratios for Canadian-born Catholics as opposed to non-Catholics, a relation which is reversed for Irish-born women (Table 10); perhaps most interesting of all is the relation between religion and occupation (Table 11). Amongst Catholics and Anglican-

Table 7 **Model Fit to Child-Women Ratios for Kingston Married Women by Age-Group, Religion, Ethnic Status and Occupation for 1861**

Model Component	DF	Partial SSQ*	F	PR>F
Age-Group	5	134.6	29.39	0.0001
Religion	2	0.17	0.09	0.9118
Irish	2	0.32	0.17	0.8410
Occupation	2	3.44	1.88	0.1532
Age × Irish	10	17.14	1.87	0.0450
Religion × Irish	2	6.84	1.87	0.1135
Religion × Occupation	2	17.77	4.85	0.0007
Error	1431	1310.52		
Model	29	254.55	9.58	0.0001

* :   Represents the SSQ attributable to that component controlling for the effects of all other components

Table 8   **Model Fit to Child-Women Ratios for Kingston Married Women by Age-Group, Religion, Ethnic Status and Occupation for 1881**

Model Component	DF	Partial SSQ*	F	PR>F
Age-Group	5	139.35	38.72	0.0001
Religion	2	12.25	8.51	0.0002
Irish	3	2.76	1.28	0.2792
Occupation	2	2.52	1.75	0.1746
Age × Irish	15	12.22	1.13	0.3211
Religion × Irish	6	7.57	1.75	0.1056
Religion × Occupation	4	3.08	1.07	0.3706
Error	1351	972.5		
Model	37	224.2	8.42	0.0001

* :   Represents the SSQ attributable to that component controlling for the effects of all other components

Table 9   **Model Fit to Child-Women Ratios for Kingston Married Women by Year, Age-Group, Religion, Ethnic Status and Occupational Status**

Model Component	DF	Partial SSQ*	F	PR>F
Year	1	29.39	35.75	0.0001
Age-Group	5	274.24	66.72	0.0001
Religion	2	3.10	1.88	0.1521
Irish	3	0.43	0.18	0.9104
Occupation	2	4.17	2.54	0.0793
Year × Religion	2	8.56	5.20	0.0055
Age × Irish	15	24.57	1.99	0.0127
Religion × Irish	6	6.60	1.34	0.2362
Religion × Occupation	4	8.15	2.48	0.0421
Year × Religion × Occupation	6	10.63	2.16	0.0445
Error	2964	2437.00		
Model	37	577.68	18.99	0.0001

* :   Represents the SSQ attributable to that component controlling for the effects of all other components.

Presbyterian mothers, lower status women have higher fertility, but among Methodists the reverse is true, a situation which changes substantially over the next twenty years.

By 1881, the structure of C-W ratios has become much simpler. The age-group effect is still dominant, but now the religious effect is a clear differentiator in its own right. Catholics, whose C-W ratios fall the least, lie at one end of the spectrum, while Methodists, who experience large reductions, lie at the other; the Anglican/Presbyterian group occupy a middle ground. These results are set out in more detail in Table 12 using pairwise contrasts estimated for each of the three models. The RELIGION*OCUP interaction (Table 8) is still marginally significant, reflecting the continuing higher C-W ratios of upper class Catholics compared with the behaviour of upper class respondents in the other religious groups.

Table 10   Age-Standardized Child-Women Ratios 1861 and 1881 by Religion and Ethnic Status

	1861		1881	
	Catholic	Non Catholic	Catholic	Non Catholic
Canadian Born	1.326*	1.264	1.139	0.844
Canadian Irish	+	+	1.061	0.927
Foreign Born	#	1.218	#	0.857
Irish Born	1.143	1.254	1.050	0.862

* :   The number of children aged 0-4 per married woman aged 20-49 standardized on the Kingston married population in 1881.

+ :   Canadian Irish could not be identified as a separate population in 1861.

\# :   Insufficient observations to estimate a rate.

Table 11   Age-Standardized Child-Women Ratios 1861 and 1881 by Religion and Occupational Status

Status	Catholic		Religion Anglican/ Presbytn.	Methodist
Upper	1861	0.927*	1.219	1.422
	1881	1.052	0.788	0.722
	1881-1861	1.135	0.646	0.508
Middle	1861	1.197	1.201	1.428
	1881	1.103	0.906	0.855
	1881-1861	0.921	0.754	0.599
Lower	1861	1.255	1.291	0.882
	1881	0.925	0.968	0.713
	1881-1861	0.737	0.750	0.808

* :   The number of children aged 0-4 per married woman aged 20-49 standardized on the Kingston married population in 1881.

The combined model (Table 9) reinforces the above discussion. It includes YEAR explicitly and two higher order interactions involving YEAR. The significance of YEAR as a main effect is consistent with the observed overall drop in C-W ratios. The YEAR-RELIGION effects emphasizes the importance of the difference in the religious effects that have developed over the twenty year period while the YEAR-RELIGION-OCUP interaction indicates that the relation between religion and occupation in their mutual impact on C-W rates has also changed, primarily in terms of the relative roles of Catholics and Methodists among upper status women (Table 11).

The story that emerges from this analysis is a complex one. Many of the effects which have been identified in previous work arise in the Kingston situation but operate simultaneously and differentially for different socio-demographic groups. In summary, the following effects are most relevant to the general framework:

i.   The overall complexity of fertility structure appears to diminish over time. Although the role of age-structure is dominant throughout, the direct effect of religious differentials becomes highly significant by 1881, while higher order effects disappear.

Table 12   **Contrasts Between Religious Categories in Model Incorporating Age, Occupation, Religion and Ethnic Status**

	Contrast	DF	SSQ	F	PR>F
1861					
	Catholic vs Others	1	0.12	0.13	0.7163
	Ang/Pres vs Others	1	0.11	0.13	0.7237
	Methodist vs Others	1	0.01	0.01	0.9207
	Catholic vs Ang/Pres	1	0.17	0.18	0.6683
	Ang/Pres vs Methodist	1	0.01	0.01	0.9077
	Catholic vs Methodist	1	0.06	0.06	0.8018
1881					
	Catholic vs Others	1	10.37	14.41	0.0002
	Ang/Pres vs Others	1	0.11	0.16	0.6903
	Methodist vs Others	1	10.32	14.33	0.0002
	Catholic vs Ang/Pres	1	3.95	5.49	0.0193
	Ang/Pres vs Methodist	1	5.20	7.22	0.0073
	Catholic vs Methodist	1	12.25	17.02	0.0001
Combined 1861 and 1881					
	Catholic vs Others	1	2.79	3.40	0.0654
	Ang/Pres vs Others	1	0.11	0.02	0.8784
	Methodist vs Others	1	2.42	2.95	0.0862
	Catholic vs Ang/Pres	1	1.42	1.73	0.1880
	Ang/Pres vs Methodist	1	0.94	1.14	0.2851
	Catholic vs Methodist	1	3.08	3.74	0.0532

ii.   Among Anglican/Presbyterians and particularly among Methodists, greater declines in C-W ratios are experienced by older women which, for these groups, suggests the simultaneous operation of control through spacing and stopping after specific family sizes have been achieved.

iii. By 1881, religious differentials dominate the nativity/ethnic status effect. Where birthplace effects occur, the primary contrast is between Irish-born and Canadian-born Catholics. In fact, when the effects of religious differences are controlled, there is no evidence that foreign-born have higher fertility than native-born women in the Kingston population, a finding which brings into question some of the traditional focus on ethnicity.

iv.   The role of occupational status is particularly intriguing. Over the twenty-year period, lower-status women reduce their fertility whatever their religious background, whereas the documented higher reduction of fertility among upper status groups is strongly differentiated between Catholic and non-Catholic. It is clear that the explanation of such differences requires analysis which goes beyond the scope of this research as it implies that among Catholics there was a strong status differentiation in their acceptance of ideas regarding fertility control.

CONCLUSIONS

The results of this research raise many questions, both methodological and substantive. The role played by religious differences is of major significance, particularly given the emphasis on nativity and ethnicity in other work. The importance of the Catholic/Anglican-Presbyterian/Methodist trichotomy in Kingston, together with its ethnic mix, pro-

duces an excellent context for the present analysis. However, if the relations identified here are to lead to more general statements about fertility change in nineteenth century Ontario, then there is a need both to replicate the analysis in other areas and to explore other documentary sources which can provide greater insights regarding attitudes and values towards the family.

The debate over "spacing versus stopping"[34] receives some insights from this analysis with the suggestion that both processes might be operating simultaneously. Further evidence should be forthcoming with more sophisticated analysis of the present data since it is possible to estimate a parity progression model,[35] the parameters of which will permit the detection of changes in spacing behaviour. Again, such analyses would benefit by their extension both over time and space to include a range of urban environments in Ontario.

Occupation still constitutes the most contentious variable. Using the Armstrong scale in its collapsed form, subtle and complex relations emerge, particularly in the relations with religious groupings. Reasons for the differentiated behaviour of these groups must depend on other more detailed arguments. Such arguments should consider both the relative access to knowledge and attitudes towards fertility control which underly the emphasis on literacy in other studies[36] and the economic and labour force conditions which bear on the costs of children.[37]

We should reiterate the note of caution in linking C-W ratios to marital fertility which stems from our inability to include infant mortality. As long as we are prepared to accept not only that infant mortality changed by a relatively small amount between 1861 and 1881 and, more importantly, that no significant intergroup differentials existed, then we believe our results are relatively robust for Kingston. If infant mortality were to be established as being substantially higher for lower status mothers (particularly Catholic mothers) then some re-evaluation is required. However, it is difficult to imagine that differentials can be so large as to negate the major findings of the study. They would also have to operate in counter-intuitive directions such that higher status mothers would have to have greater infant mortality than lower status mothers and Methodists higher mortality than Catholics. Since no group-specific mortality rates are available, one strategy is to develop simulation strategies to assess the level of mortality differentials which would have to exist to reduce the estimated differences in child-women ratios. This strategy has worked quite well in other contexts, particularly for household reconstruction.[38]

Finally, all our comments relate specifically to the conditions in Kingston between 1861 and 1881. The question obviously must be asked whether these relations are sustained in other environments in Ontario and what forms they take over subsequent years. Such analyses, both in rural areas and in other urban centres will allow more broad ranging conclusions regaring the nature of the fertility transition experienced by nineteenth century Ontario.

34. Sanderson, 1984 *op. cit.*

35. G. Feeney, "Population dynamics based on birth intervals and parity progression," *Population Studies* 37:1 (1983), pp. 75-89.

36. See, for example, R.M. McInnis and H. Tremble, "School Attendance of Farm Children in 1861 Ontario: A Preliminary Look", Department of Economics, Queen's University, 1983, manuscript.

37. Becker and Tomes, "Child Endowments," *op. cit.*

38. K.W. Wachter, E.A. Hammel, and P. Laslett, *Statistical Studies of Historical Social Structure* (New York: Academic Press, 1979).