EARLY CANADIAN FERTILITY TRANSITION:
A COMPONENTS ANALYSIS OF CENSUS DATA

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Résumé — Le but de cette étude est d'analyser les composantes séparées qui s'opéraient pour affecter la transition en fécondité au Canada de 1851 à 1921. Les composantes étudiées sont les facteurs de composition par âge et par sexe, la fécondité maritale, la fécondité non-maritale, et la nuptialité féminine. On a constaté que les variables de la fécondité maritale et de la nuptialité féminine sont d'une grande importance; la fécondité maritale affectant l'ensemble de la tendance de déclin et la nuptialité féminine affectant la fluctuation en cours. La transition dans la fécondité canadienne à présent révèle une tendance à deux étapes. La première étape, de 1851 à 1891, celle de déclin de grande envergure, provient de l'action combinée des décroissances dans les deux variables. La deuxième étape, de 1891 à 1921, est celle du plateau, provenant des effets du contrebalancement de la fécondité maritale décroissante et de la nuptialité féminine croissante. L'expérience canadienne a été discutée en termes de tendances en fécondité qui se révèlent dans les populations de l'Europe occidentale et dans d'autres populations d'origine européenne, dans une tentative d'esquisser les communs et les caractéristiques uniques de l'exemple canadien.

Abstract — The objective of this paper is to analyze the separate components operating to affect fertility transition in Canada from 1851 to 1921. The components studied are age-sex composition factors, marital fertility, non-marital fertility and female nuptiality. The variables of marital fertility and female nuptiality are found to be of major importance, with marital fertility affecting the overall trend of decline and female nuptiality affecting fluctuation in trend. Canadian fertility transition at this time displays a two-stage trend. The first stage, 1851-1891, one of large-scale decline, results from the joint action of decreases in the two variables. The second stage, from 1891 to 1921, is one of plateau, as a result of the counterbalancing effects of decreasing marital fertility and increasing female nuptiality. The Canadian experience is discussed in terms of fertility trends displayed in western European populations and other European-derived populations, in an attempt to delineate the commonalities and the unique features of the Canadian case.

Key Words — **fertility transition, marital fertility, female nuptiality, components analysis**

I.   Introduction

Fertility transition results from the composite effect of changes in a number of variables. An understanding of the course of fertility decline in a society requires an analysis of the mechanisms at work determining that trend. These variables, which include age-sex compositional factors, female nuptiality, marital fertility, and non-marital fertility, are examined here in order to assess the role that each plays in fertility change in Canada from 1851 to 1921.

The importance of a components analysis can be discerned from the findings that have come to light in recent research concerning early fertility transition in European populations (Coale, 1969 and 1973; Demeny, 1968; Knodel, 1974; Lesthaeghe, 1977, Livi-Bacci, 1971 and 1977; van de Walle, 1972; van de Walle and Knodel, 1967). This

Princeton-based research has focused particularly upon the variables of marital fertility and female nuptiality in the determination of fertility level and trend in the fertility transitions of various European societies. These studies share a conceptualization that views fertility as departing from the physiologically maximum level as a result of the operation of two main types of control: the limitation of fertility within marriage, or what has been termed non-Malthusian control, and the limitation of marriage within a population, Malthusian control. A population can resort to one or both mechanisms in an effort to limit fertility. Wide variation has been found, between societies and between different provinces within European national boundaries, in level of general fertility prior to the onset of sustained decline. This variation is due to the combined effects of differences in level of marital fertility and level of female nuptiality. Also, populations with similar fertility levels have been found to have achieved that level through a differential mixture of components. Similarly, the timing and path of sustained fertility decline is determined by the joint effects of the components of marital fertility and female nuptiality.

Given that the level and trend of fertility result from the joint action of a number of variables and that those variables may be sensitive to different social and economic influences, fertility transition becomes a complex phenomenon. In order to shed some light on that complexity, it is necessary, at a minimum, to identify the role played by the different components of fertility during transition. Therefore, the aim here is to provide a components analysis of fertility change in Canada for the period of early transition, 1851 to 1921.

II. Methods — Data

As the period prior to 1921 pre-dates the institutionalization of the national registration system in Canada, and as the counts of births provided in the Canadian censuses are known to be inadequate, it is necessary to use estimated births. The estimates utilized are those of Gee (1978:30), which were computed using the reverse survival method, with corrections made for census undercounts of the population aged zero to four years. The number of births for 1921 is arrived at using Ryder's (1954:80) estimate of 91 per cent completeness in the registration count of births and Henripin's (1972:372) estimate for Quebec, which was not yet a part of the national registration system in that year. As data on illegitimate births for the years prior to 1921 do not exist, it is assumed that illegitimate births comprise two per cent of total births. Data on female marital status and age-sex composition are extracted from the censuses, with interpolations performed on the earlier data not aggregated in standard five-year age groupings. (Gee, 1978:39-42).

III. Methods — Components Analysis

Any given value of the crude birth rate is the composite of a number of factors operating together. The factors are related arithmetically such that:

(1) $B/T = B/F^* \times F^*/F \times F/T$

where

B = *total births*

F^* = *1,000 women aged 15 to 49*

F = *1,000 total women*

T = *1,000 total population*

and (2) $B/F^* = LB/M^* \times M^*/F^* + IB/UM^* \times UM^*/F^*$

where:

LB = *total legitimate births*

IB = *total illegitimate births*

M^* = *1,000 married women aged 15 to 49*

UM^* = *1,000 unmarried (i.e., all marital statuses other than married) women aged 15 to 49.*

From expression (1), it can be seen that the crude birth rate *(B/T)* is the product of the general fertility rate *(B/F*)* and two demographic structural factors, the sex ratio and the proportion of the female population in childbearing ages. Expression (2) shows that the general fertility rate is itself a function of four factors, two of which are related to fertility, *LB/M** or the marital fertility rate and *IB/UM** or the non-marital fertility rate, and two of which are related to female nuptiality. Change in each of the terms in expression (2) affects the trend of the general fertility rate; similarly change in each of the terms in expression (1) affects the trend of the crude birth rate.

In order to measure the "pure" effect of each of the above components on overall fertility level, a series of standardized rates is constructed. The object of the standardization procedure is to determine what part of the observed change in overall fertility results from change in each component. For both expressions (1) and (2), only one term in the equation is allowed to take on its realized or observed value, while the other terms are held constant at their 1851 value, resulting in a hypothetical rate which reflects only the effect of the variable that is allowed to vary. Each term in each equation is treated in this fashion, thereby parcelling out the observed changes in fertility to the constituent parts.[1]

IV. Results

Table 1 presents observed values of the crude birth rate (column 8) and the general fertility rate (column 5) and of the components of each for the period from 1851 to 1921. The crude birth rate and general fertility rate reveal the same trend: marked and rather consistent decline for the period from 1851 to 1891 followed by a period of relative constancy from 1891 to 1921. For example, the general fertility rate declined approximately 75 points from 1851 to 1891 and then registered a decrease of only three points over the next three decades. Thus, Canadian fertility change during the period under consideration underwent a two-stage transition; a stage of significant decline and a stage of plateau.

The overall decline in the crude birth rate from 1851 to 1921 can be attributed to decreases in the general fertility rate. As shown in Table 1, change in the sex ratio *(F/T)* was slight and the increase in the proportion of females in the childbearing ages *(F*/F)* would, other things equal, operate to raise the crude birth rate. Decline in the general fertility rate itself can be attributed to marital fertility, which decreased 143.9 points or approximately 40 per cent from 1851 to 1921. Change in non-marital fertility was slight,[2] and female nuptiality registered a general increase.

A more exact picture of the role played by the components of fertility is given in Tables 2(a) and 2(b). Looking first at the standardized crude birth rates (Table 2(a)), it can be seen that the effects of sex ratio and age distribution changes were quite minor, with a slight tendency operating to inflate overall fertility level, and, therefore, hamper the process of fertility decline. If the age-sex composition of Canada had remained at the 1851 level, the crude birth rate in Canada in subsequent years would have been a little lower, for example, 29.1 in 1921 instead of the observed 31.2. The overwhelmingly

TABLE 1 OBSERVED VALUES OF THE COMPONENTS OF THE CRUDE BIRTH RATE
AND THE GENERAL FERTILITY RATE. CANADA,[1] 1851-1921

	(1)		(2)		(3)		(4)		(5)		(6)		(7)	(8)
Year	LB/M*	x	M*/F*	+	IB/UM*[6]	x	UM*/F*	=	B/F*	x	F*/F	x	F/T =	B/T
1851[2]	357.0		.5670		9.5		.4330		206.5		.4678		.4849	46.8
1861[3]	340.2		.5163		7.4		.4837		179.2		.4785		.4860	41.7
1871[4]	311.6		.5179		6.8		.4821		164.7		.4821		.4937	39.2
1881	276.9		.5107		5.9		.4893		144.2		.4958		.4939	35.3
1891	253.6		.5078		5.3		.4922		131.4		.5126		.4816	32.4
1901[5]	–		–		–		–		133.4		.5061		.4877	32.9
1911	227.9		.5587		5.9		.4413		129.9		.5101		.4697	31.1
1921	213.1		.5880		6.8		.4120		128.1		.5031		.4845	31.2

[1] Refers to present area of Canada, excluding Newfoundland, unless otherwise stated.

[2] Refers to Ontario (then Upper Canada) and Quebec (then Lower Canada).

[3] Refers to Ontario (then Upper Canada), Quebec (then Lower Canada), and Nova Scotia.

[4] Refers to Ontario, Quebec, Nova Scotia, and New Brunswick.

[5] No data on marital status, cross-tabulated by age and sex, are available.

[6] Illigitimate births assumed to comprise 2 percent of total births prior to 1921.

Sources: Data on births are from estimates performed by Gee (1978:30).
Data on total population, male and female population, and females
aged 15-49 are taken from Census of Canada: 1851 (v. 1,
Appendices 5 and 6); 1861 (v. 1, General Abstract of Ages);
1871 (v. 2, Table 7); 1921 (v. 2, Table 9). Data on marital
status are extracted from Census of Canada: 1851 (v. 1,
Appendices 5 and 6); 1861 (v. 1, General Abstract of Ages);
1871 (v. 2, Table 8); 1881 (v. 4, Table G); 1891 (v. 4,
Table H); 1921 (v. 2, Table 29).

important component was the general fertility rate, the pure effect of which was to lower
the Canadian crude birth rate almost 18 points from 1851 to 1921.

The standarized general fertility rates, as presented in Table 2(b), reveal the
important role that declines in marital fertility played in Canadian fertility reduction.
Keeping the proportion of females married (and, thus, unmarried, as well) and
non-marital fertility constant at 1851 levels, it can be seen that the effect of marital fer-
tility decline was substantial (81.5 points or 39.2 per cent) and, equally important,
steady. The fluctuations characteristic of the observed crude birth rate and general fertil-
ity rate are not embodied in the standardized marital fertility rates. Thus, if change in
marital fertility had been the sole factor at work, Canadian societal fertility would not
have exhibited the uneven (stage-like) trend that it did over the period from 1851 to
1921.

In contrast to the steady, declining effect of marital fertility, changes in Canadian
nuptiality were markedly uneven. As shown in Table 2(b), the pure effect of nuptiality

TABLE 2(A)   STANDARDIZED CRUDE BIRTH RATES AND PER CENT CHANGE
CANADA 1851-1921[1]

Year	Allowed To Vary Only:		
	B/F*	F*/F	F/T
1851	46.8	46.8	46.8
1861	40.7	47.9	47.0
1871	37.3	48.3	47.7
1881	32.7	49.7	47.7
1891	29.8	51.3	46.5
1901	30.2	50.7	47.1
1911	29.5	51.1	45.4
1921	29.1	50.4	46.8
Percent Change			
1851-1891	-36.3	+ 9.6	- 0.6
1891-1921	- 2.3	- 1.8	+ 0.6
1851-1921	-37.8	+ 7.7	0.0

[1] Footnotes 1 - 6 in Table 1 apply.

change was to raise the general fertility rate 3.6 per cent from 1851 to 1921 but to lower it 9.9 per cent from 1851 to 1891. Thus, the direction of the effect of female nuptiality varied over time. In the latter half of the 19th century, the effect of nuptiality change was to lower general fertility whereas, in the early years of this century, the effect was in the opposite direction, to raise general fertility.

These standardized general fertility rates illustrate two facts concerning early Canadian fertility decline. One, the effect of declining marital fertility far outweighed the effect of change in any other variable in terms of the extent of overall fertility decline. Two, much of the unevenness exhibited in the Canadian fertility trend can be attributed to the effect of a fluctuating nuptiality variable.

V.   Discussion

Two topics can be addressed given the presented data: (i) initial level of, and timing of decline in, fertility, and (ii) the trend of decline.

. Canada in 1851 registered a crude birth rate in excess of 45 births per 1,000 population. As such, fertility in Canada was higher than in western European societies at mid-century, which typically registered levels of the crude birth rate ranging in the middle 30s (Mitchell, 1975). However, a crude birth rate higher than 40 was not atypical of European overseas populations at the middle of the 19th century. In 1861-65, the Aus-

TABLE 2(B)   STANDARDIZED GENERAL FERTILITY RATES AND PER CENT CHANGE
CANADA, 1851-1921[1]

Year	Allowed To Vary Only:		
	LB/M*	M*/F*[2]	IB/UM*
1851	206.5	206.5	206.5
1861	197.0	188.9	205.6
1871	180.8	189.5	205.4
1881	161.1	187.0	205.0
1891	147.9	186.0	204.7
1901	–	–	–
1911	133.4	203.7	205.0
1921	125.0	213.9	205.4
Percent Change			
1851–1891	– 28.3	– 9.9	– 0.9
1891–1921	– 15.5	+ 15.0	+ 0.3
1851–1921	– 39.2	+ 3.6	– 0.5

[1] Footnotes 1 – 6 in Table 1 apply.

[2] Is equivalent to allowing UM*/F* to vary as UM*/F* equals 1 – (M*/F*).

Source: Table 1.

tralian crude birth rate was 42.4 (Spencer, 1971:249) and in 1850, the crude birth rate in the United States was 43.3 (Thompson and Whelpton, 1933:263). The higher levels in the European overseas populations were the result of higher levels of marital fertility and a somewhat higher female nuptiality. Also, the age structure was amenable to higher birth rates in the overseas populations as the age-selectivity involved in migration resulted in higher proportions in the childbearing ages.

Canada witnessed substantial early declines in fertility; the birth rate decreased approximately 31 per cent between 1851 and 1891. The overseas populations of Australia and the United States registered comparable declines over this period.[3] However, western European societies did not witness reductions of this magnitude.[4] This differential in the extent of 19th-century fertility decline can be accounted for by the operation of the nuptiality variable. Whereas the level of female nuptiality remained relatively constant in western Europe, the proportion of married females dropped in Canada and in Australia and New Zealand,[5] facilitating the trend of overall decline (Jones, 1971:309).

That female nuptiality was decreasing in the European derived societies operates to complicate the interpretation of the timing of commencement of sustained decline in fer-

tility in these populations. It could be argued that a noticeable (say, 10 per cent or greater) decline in overall fertility "means" that fertility behaviour is moving within the realm of deliberate and conscious control. Underlying such an argument would be one of two assumptions: that the magnitude of overall fertility decline reflects the magnitude of marital fertility decline; or, that decreases in nuptiality reflect a deliberate effort to limit family size at the level of the individual.

Let us address each assumption in the Canadian case. The first assumption is clearly invalid, as early declines in general fertility exceeded decreases in marital fertility in magnitude. For example, in the decade 1851-1861, general fertility declined by 13 per cent whereas marital fertility decreased less than five per cent. While we might be tempted to date the commencement of fertility decline in Canada at 1861, as overall fertility declined more than 10 per cent between 1851 and 1861, we would be in error if we, at the same time, wanted to argue that deliberate control of fertility within marriage had begun to occur as well. The small (i.e., less than 10 per cent) decline in marital fertility registered in the decade between 1851 and 1861 suggests that a later date for the commencement of deliberate fertility control is more appropriate.

The second assumption is a more difficult one to deal with given the constraints of secondary data. On the one hand, it has been argued that lowered nuptiality is a mechanism consciously used by individuals in an attempt to curtail family size (Drake, 1972). Others, however, have suggested that the decision to postpone marriage stems from a different set of motivations than the decision to control family size within marriage, although the effects on overall fertility level may be similar (Coale, 1969:7; van de Walle, 1972:149). Support for this second argument lies in the age pattern of fertility change that is commonly detected within populations at the early stages of fertility transition. Within a population beginning voluntary birth control, the initiating segment is couples in which the woman is in the later years of childbearing and of high parity. In other words, attempts to limit family size are made late in married life. The second argument appears to be more plausible in the Canadian case. Although data concerning age-specific fertility are lacking for this early period, other data are supportive of the argument made by Coale and van de Walle. If nuptiality and marital fertility behaviour reflected the same underlying set of motivations, one would expect that their respective trends would bear a constant relationship to one another, although not necessarily a positive one in the statistical sense. However, no such parallelism existed throughout the latter half of the 19th century. While marital fertility decreased at a consistent pace, nuptiality change was marked in the decade from 1851 to 1861 and minor throughout the remainder of the century.

Thus, early decline in overall fertility in Canada should be interpreted with caution, as it resulted from the joint effects of two variables, only one of which can be viewed as indicative of deliberate fertility control. Taking decline in marital fertility as a more valid indicator of the onset of deliberate fertility limitation, 1871 can be identified as the threshold year in Canada, as it was then that decline from the 1851 level exceeded 10 per cent.

While the trend of Canadian fertility displayed characteristics in common with other European overseas populations (i.e., initially high levels of overall fertility and early and substantial declines), the Canadian trend departed from that in both western Europe and other overseas societies in its unevenness after decline commenced. The plateau in fertility from 1891 to 1921 was a phenonmenon unique to Canadian transition. All other western populations registered declines in birth rate at this time, with per cent reductions typically in excess of 15 per cent,[6] due, in large part, to decreases in marital fertility.

Although Canada similarly experienced declining marital fertility, its effect was counterbalanced by a comparable increase in female nuptiality. If marital fertility had been the only factor operating upon the trend of fertility in Canada, overall fertility would have declined 15.5 per cent, in line with reductions experienced in other western populations.

The one feature unique to the Canadian fertility transition, then, was the stage of plateau after sustained decline commenced. We have seen that this period of relative constancy from 1891 to 1921 was largely the result of increasing female nuptiality. A question comes to mind, then. Why did Canada undergo this large increase in female nuptiality that operated to counterbalance decreasing marital fertility and hamper the trend of overall fertility decline?

Two factors can be identified as possible contributors to increased female nuptiality, each related to migration. In contrast to the latter half of the 19th century when Canada experienced negative net migration, the early decades of the 20th century were years of large-scale in-migration. Given that migration tends to be sex-selective, the balance of the sexes became distorted in a way favourable to the marriage opportunities of women. Computations of the ratio of males aged 20 to 49 to females aged 17.5 to 47.5 in Canada reveal that the early decades of this century were ones in which male surplus was greater than in either earlier or later periods (Gee, 1978:186). Therefore, one factor that may have functioned to raise female nuptiality was increased availability of mates.

Second, not only did the early decades of the 20th century witness a large volume of in-migration, the characteristics of the immigrants differed significantly from earlier years. Prior to the turn of the century, the majority of immigrants to Canada was of western European origin. Partly because of changed Canadian immigration policy and partly because of altered economic conditions in Europe, Canada was populated in the early years of the present century by large numbers of immigrants from traditionally "non-preferred" areas of Europe, i.e., the countries of eastern Europe.

The significance of the changed ethnic composition of immigrants lies in the differential marriage patterns that traditionally prevailed in western and eastern Europe. As Hajnal (1965) has shown, the two portions of Europe differed markedly in marriage behaviour at this time, with western European groups characterized by significantly older marriage and more non-marriage than eastern European groups. The movement of persons into Canada from home areas displaying relatively high levels of female nuptiality would operate to inflate the nuptiality level within Canada.

Thus, the argument here is that two factors associated with migration in the early 20th century account for the increase in female nuptiality and, hence, the interruption in the path of fertility decline. The view offered here, then, is that the factors operating to increase female nuptiality level at this time were not internally generated within Canadian society, but rather were brought about by the introduction of people to Canada.

VI Conclusion

Canada underwent a substantial decline in fertility during the period from 1851 to 1921. The bulk of decline occurred between 1851 and 1891, the result of the combined effects of decreasing marital fertility and decreasing female nuptiality. The period from 1891 to 1921 witnessed a plateau in fertility, due to increased nuptiality levels which counteracted the continued trend of decrease in marital fertility. The effect of other components that operate on fertility trend was found to be inconsequential.

The first stage of fertility (1851-1891) was one in which Malthusian limitation, i.e.,

marriage restriction, was practised throughout. It was further characterized by the introduction of non-Malthusian limitation to Canada. The onset of control of fertility within marriage in Canada was 1871. In the second stage (1891-1921), non-Malthusian control increased and a tendency to the abandonment of the marriage restriction mechanism occurred.

The levels and trend of fertility in Canada have been found to contain both common and unique features, in comparison with other western populations. Canada shared with other overseas populations in displaying initially high levels of overall fertility and early, substantial declines, as compared to western European populations. Canada departed from both western European societies and other European-derived populations in the trend of decline. Canada alone underwent a long (30-year) interruption in transition after decline had commenced. The plateau was the result of heightened female nuptiality, stemming from migration as it affected sex ratios and ethnic composition in Canada.

Footnotes

1 The sum of changes in the constituent parts does not equal the total change in observed overall fertility, owing to interaction effects.

2 This is because of the assumption that illegitimate births comprise two per cent of total births throughout the entire period from 1851 to 1911.

3 In Australia, between 1861-65 and 1891-95, the crude birth rate declined approximately 19 per cent (Spencer, 1971:249). In the United States, the reduction between 1850 and 1890 approximated 28 per cent (Coale and Zelnik, 1963:21; Thompson and Whelpton, 1933:263).

4 Between 1850 and 1890, the per cent reduction in crude birth rate in selected western European population was as follows: United Kingdom (England and Wales) 9.6 per cent; Netherlands 4.9 per cent; Sweden 12.2 per cent; Germany 4.0 per cent (Mitchell, 1975:108ff). In some populations, slight increases in the crude birth rate were registered during this period; for example, Portugal (Livi-Bacci, 1971:21) and Belgium (Lesthaeghe, 1977:8). In others, little change occurred; for example, Italy (Livi-Bacci, 1977:53).

5 Data concerning female nuptiality in the United States prior to 1890 do not exist.

6 In this period, crude birth rates registered the following reductions: Australia 27.5 per cent; United States (whites only) 19.9 per cent; United Kingdom (England and Wales) 15.6 per cent; Germany 27.4 per cent; Netherlands 13.1 per cent; Sweden 15.7 per cent; Portugal 4.0 per cent; Italy 26.1 per cent; Belgium 33.0 per cent (Coale and Zelnik, 1963:21; Lesthaeghe, 1977:8; Livi-Bacci, 1971:36; Livi-Bacci, 1977:53; Mitchell, 1975:108ff; Spencer, 1971:249).

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