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Fertility in Alberta (Canada) in a Context of Rapid Economic Growth, 1997-2007

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Abstract

Over the twentieth century, the birth rate in Alberta followed closely the trajectory of change experienced by the other provinces in Canada. It went through a low point in the 1930s, a post-War baby boom in the 1950s and sixties, and a prolonged fall to sub-replacement fertility beginning in the mid 1970s. In recent years, Alberta has witnessed a sustained upswing of its total fertility rate, such that by 2007 it had reached 1.90 children per woman. In contrast, the national TFR has fluctuated around an average of 1.5 to 1.6 children per woman. In this study, I examine the contemporary and historical pattern of fertility change in Alberta, noting similarities and differences with the other provinces. I also investigate the association of change in selected structural factors, including marriage and unemployment, with the change in total fertility in Alberta between 1997 and 2007, a period of unprecedented economic growth in this province. A third aspect of this study involves a multivariate analysis of parity-specific birth rates in relation to age, period, and marital status. Overall, the findings are consistent with the proposition that increased economic prosperity in Alberta may have fostered a socioeconomic context favourable to childbearing. This effect however seems mostly attributable to women in their thirties, as for younger women, fertility rates have either not changed significantly or declined. It is also shown that with respect to birth-order, the upsurge in total fertility in Alberta is mainly attributable to an increased incidence of first births. In combination, these results suggest the possibility of a fertility recuperation phenomenon among women in their thirties and a continuation of fertility postponement among younger women.

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Introduction

Similar to most other highly developed countries, fertility in Canada has been well below the replacement level of 2.1 children per woman for more than three decades. This situation has been partly attributed to long term declines in marriage among young adults, many of whom have sought to either forego or postpone matrimony and parenthood to older ages (Balakrishnan, Lapierre-Adamcyk and Krotki, 1993; Lapierre-Adamcyk and Charvet, 2000; Le Bourdais and Lapierre-Adamcyk, 2004; Wu, 2000). Such profound demographic developments can only be understood in their full complexity through a careful systematic analysis of their social, cultural, and economic foundations. In this study I am concerned with one aspect of the overall picture regarding fertility in Canada. I focus on the exceptional case of Alberta, one of three provinces in the Prairie region of Canada (see Figure 1).[1] Following a prolonged period of declining total fertility rates (TFRs) dating back to the mid 1970s, Alberta has been in the midst of an unexpected birth surge in recent years.[2] Whereas the national birth rate has fluctuated around an average of 1.5 to 1.6 children per woman, in Alberta total fertility is edging close to the 2.1 replacement level, from a low of 1.66 in 2000, to 1.90 in 2007.[3] In 1997, Alberta recorded 36,522 births. By 2007, this figure had risen to 48,338; and in 2008, for the first time in the history of this province, the number of births exceeded 50,000.[4]

---Figure 1---

Figure 2 compares the TFR trajectories of Canada and Alberta between 1997 and 2007. Though irregular, the Alberta birth rate has followed an overall upward progression, with visibly pronounced increases after 2000[5]. Throughout most of this interval the pattern

[1] The other two provinces in the Prairie region are Manitoba and Saskatchewan. Alberta and Saskatchewan became provinces in 1905. This was 38 years after Canada became a confederation of provinces in 1867. Manitoba joined confederation in 1870.

[2] Beside it sociological significance, small increases in total fertility following a long period of low reproductive levels implies important long term demographic benefits for a population. Increased fertility would slow the pace of demographic aging; it would help maintain the future labor force, and thus having to rely less on immigration as a source of labor supply.

[3] 2007 is the latest year for which age-specific fertility rates are available; therefore it is not possible yet to compute TFR for Alberta for more recent years.

[4] The actual number of births in 2008 was 50,604. For 2009, Alberta Services has reported a record-breaking 51,443 births (Hall, 2010). With a population of just over 3.5 million, this accounted for a crude birth rate of slightly over 14 per 1000 population.

[5] The birth surge in Alberta has caught the attention of the news media, and various stories have appeared linking this phenomenon to buoyant economic times (see for example: Libin, 2007; Walton, 2006; Sadava, 2008; Priest, 2008; Audette, 2007; Derworiz, 2009; Hall, 2010).

for Canada has been generally flat; and only recently since 2006, is there evidence of an upturn, part of which can be attributed to the contribution of Alberta province.

---Figure 2---

The recent fertility increase in Alberta has occurred in a context of unprecedented economic growth. A defining feature of the post-War economy of this province are the two protracted booms, which among other things, attracted massive in-migration of labor from the rest of Canada and to a lesser extent also from abroad (Hiller, 2009; Parkland Institute. 2007; Marsh, 2006; Owram, 2006). The first boom began in 1973 and lasted until 1982, when the province fell into a decline that lasted until 1996, at which point a new period of intense growth broke out (Cross and Bowlby, 2006; Hiller, 2009). At the height of the economic boom, unemployment in Alberta had fallen to just 3.4 per cent in 2005, well below the national average of 6.3 per cent. In 2005, the median family income in Alberta was, next to Ontario, the second highest in the nation (see Table 1). From 2002 to 2005, the Gross Domestic Product (GDP) of Alberta rose by an average rate of 12.7 per cent annually. By comparison, China, the strongest economy in the world, experienced annual average GDP increases of 14.8 per cent during this same interval (Cross and Bowlby, 2006). This more recent economic expansion in Alberta dampened considerably in late 2008, when the world fell into the ongoing economic slump caused by the financial crisis in the United States.[6]

---Table 1---

Study objectives

One of the objectives of this study is to examine the relationship of change in selected socio-economic indicators for this province and its fertility increase between 1997 and 2007. I evaluate the proposition that economic growth (i.e., reduced rates of unemployment, increased labor force participation rates, and increased average wages) is positively related the fertility upsurge in Alberta. Two other questions I examine are the extent to which the rise of fertility in Alberta can be attributed to change in order-specific birth rates; and secondly, whether fertility increases can be attributed to younger or relatively older women. I assess these queries through a Poisson regression analysis of age-parity-specific birth rates classified by year of occurrence. Before proceeding to these analyses, I look at the long term trajectory of the TFR in Alberta stretching back to 1921, as to provide a brief comparative outlook with the other provinces in Canada.[7]

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[6] The Alberta economy is expected to recover once the energy prices rise (The Globe and Mail, Wednesday July 15, 2009, Thursday April 9, 2009; January 22, 2010).

[7] 1921 is the year when the Canadian vital registration system was instituted. The data for the historical overview of fertility are from Statistics Canada Vital Statistics publications (1921-1974, and Statistics Canada CANSIM data base for more recent years).

Alberta fertility in comparative historical perspective

As shown in Figure 3, over the course of the 20th century provincial birth rates in Canada have fluctuated through broad successive cycles of increase and decline: a sharp downturn in the 1930s; a post-War recovery in the 1950s and sixties; and a subsequent fall to sub-replacement levels beginning in the early to mid 1970s (Grindstaff, 1995, 1985, 1975; Romaniuk, 1984). In the Canadian north, the Territories (Northwest Territories, Yukon, and Nunavut) have exhibited higher birth rates than the rest of the country, largely as a function of the combined effects of geographic isolation and a predominantly Aboriginal population (Romaniuk, 1984). Notwithstanding these features, it seems quite clear that since the second half of the 20th century, with the exception of Nunavut, the fertility rates of these northern populations have followed a determined pattern of decline toward the Canadian average.

---Figure 3---

To better asses provincial differences in fertility levels the following index is applied to each province or territory, using the overall Canadian TFR as the standard: $\theta_{i(t)} = TFR_{i(t)} - TFR^*_{(t)}$, where $\theta_{i(t)}$ indexes a TFR difference for a province or territory *i* in year *t* in relation to Canada in year *t*; $TFR_{i(t)}$ is the total fertility rate for province/territory; and $TFR^*_{(t)}$ pertains to the TFR for Canada. An index value of zero would denote identical fertility between a given province/territory and the nation; a positive difference would mean above average fertility for a province/territory; a negative value would indicate the opposite.

In Figure 4, precipitous long term declines are seen for all the provinces and territories. Concerning the Atlantic provinces of Prince Edward Island, Nova Scotia and New Brunswick and Newfoundland, by the middle of the 1980s, they had seen their birth rates fall below the Canadian level. [8] Prince Edward Island's TFR converged quite late, at the turn of the new millennium. For Ontario and Quebec, from the early 1920s through the early 1960s, their TFRs followed opposite trajectories. Early in the century, Quebec's rate was well above the Canadian level while Ontario's was noticeably lower. As the century progressed, rates in Quebec would fall dramatically and eventually converge with Canada in 1961. Ontario's upward movement reached convergence with Canada in the later part of the 1960s. Since about 1990, the birth rates of these two provinces have been almost indistinguishable, both being very near the national average.[9]

In western Canada, the three Prairie Provinces of Saskatchewan, Alberta and Manitoba, have also experienced periods of increase and decline, even though in relation to the national average they have generally maintained higher birth rates. By 1926,

[8] Total fertility rates for Newfoundland are not available prior to 1988.

[9] A small but visible rise in the TFR of Quebec is noticeable in 2007. More recent reports indicate a continuation of this trend for Quebec (A. Belanger, personal communication) even though the rate remains well below the replacement level of 2.1.

Manitoba's rate had fallen below Canada's, only to regain above average status by 1961. Alberta and Saskatchewan have shown levels consistently above the national rate, and in recent years, exhibit a characteristic upward trend not noticeable in any of the other provinces. Finally, on the west coast, British Columbia represents a very different picture to that of the Prairies. From 1921 to about the middle of the 1950s, its birth rate was well below the national average; and by 1956, it had converged with Canada. By the early 1990s, British Columbia, along with Nova Scotia, New Brunswick and Newfoundland, share the lowest fertility rates across the provinces, with TFRs around 1.4 children per woman.

As to the underlying structural causes of these provincial fertility patterns, undoubtedly variations in demographic composition must account for some of the discrepancies. In the cases of Alberta and Saskatchewan, delayed onset of urbanization and industrialization may account for their persistent pattern of above average fertility rates over the first half of the 20th century (Breen, 2006; Hiller, 2009, 2000; Stone, 1967; McInnis, 2000a, 2000b; Ward, 1983). However, with specific reference to Alberta's recent fertility upturn, historical conditions would seem inconsequential. Explanations for this recent phenomenon must be sought in more proximate conditions.

---Figure 4---

Economy and fertility in Alberta

How economic growth may be associated with fertility change has been a central question in demographic theory (e.g., Leibenstein, 1957; Becker, 1960, 1992; Davis, 1963; Easterlin, 1961, 1969, 1983, 1987; Eversley, 1965; Spengler, 1972; Kuznets, 1969; Simon, 1977;Caldwell, 1981; Hirschman, 1994). At the societal scale the historical evidence is consistent with an inverse association between economic development and fertility. From this perspective the current situation in Alberta may seem unusual. In the midst of a protracted period of economic expansion the birth rate in this province has increased rather than declined. What may explain this reality?

Recent macro-level evidence on the association between socioeconomic well-being and fertility can shed light on this question. New evidence suggests the Alberta case may not be at all unusual. Myrskyla, Kohler and Billari (2009) have shown convincingly that, as expected, across national populations there is indeed a strong inverse association between socioeconomic well-being (as measured by the UN's Human Development Index) and total fertility; however these authors also found that for those countries that have an established high level of development and correspondingly low birth rates, further advancements in socioeconomic conditions has the effect of boosting fertility away from lowest-low reproductive levels (i.e., TFR below 1.3) (Tuljapurkar, 2009).

Alberta seems to closely conform closely to this type of relationship. As is characteristic of post-modern societies in which total fertility rates have been below replacement for some time, the small family ideal is widespread in Alberta (van de Kaa,

2002; Lesthaeghe, 1995; Lesthaeghe and Surkyn, 1988; Simons, 1980), and on average relatively few women bear more than one or two children. In such societal contexts temporal shifts in period fertility rates are closely connected to alterations in the timing of first births, and to a lesser extent second-order births. "Change" means movement in the extent to which women postpone or advance the timing of the first or second birth. Widespread postponement (i.e., later age at maternity) results in reduced period fertility rates, whereas earlier age at childbearing would have the effect of boosting overall fertility in the population (Bongaarts and Feeney, 1998, 2000; Schoen, 2004). Thus, a sustained movement in either direction---that is, toward older or younger age at maternity--- would alter the intensity of fertility postponement and cause either a reduction or an increase in period birth rates. A wide range of structural factors, including economic conditions, are thought to be associated with change in the average timing of childbearing (Billari and Kohler, 2004; Kohler, Billari and Ortega, 2002; Goldstein, Sobotka and Jasilioniene, 2009). For instance, in their extensive analysis of lowest-low fertility countries between 1985 and 2008, Goldstein, Sobotka and Jasilioniene (2009) found that in nearly all of these lowest-low fertility countries, "improving economic conditions seem to provide part of the explanation for the rise in TFRs" (p. 683).[10]

The recent fertility surge in Alberta may conform to a similar relationship noted by Goldstein and colleagues (2009) for the OECD countries, and also the positive association between socioeconomic development and fertility increase across national population reported by Myrskyla, Kohler and Billari (2009). The intensity of fertility postponement in Alberta may have lessened over recent years as to cause a visible upward trend of the total fertility rate. A substantial part of this phenomenon may be attributable to Alberta's favorable socioeconomic climate in a context of unprecedented growth between the late 1990s and 2007.

This hypothesis is not inconsistent with economic theories of fertility that place emphasis, among other things, on the importance of economic security as a driving force in reproductive decision-making (Becker, 1960; Becker and Barro, 1988; Easterlin, 1969, 1987; Butz and Ward, 1979; Oppenheimer, 1994; Macunovich, 2002; Ermisch, 2003). Economic prosperity in Alberta may have played an important role in boosting fertility through its positive influence on couples' childbearing decisions. Buoyant economic times may have encouraged a greater sense of confidence in couples' perceived ability to satisfy long term child quality aspirations (i.e., invest more resources on their progeny) and household material goals (e.g., buying a new house) and also allowing women to better absorb opportunity costs associated with taking time off work to have children.

As reported by Goldstein, Sobotka and Jasilioniene (2009), advanced societies like Alberta with low birth rates over the past thirty or forty years are now witnessing fertility

[10] Another important finding by these authors was that immigrant fertility has helped, in varying degrees, to raise birth rates in such societies, even total fertility remains considerably removed from a TFR of 2.1 children per woman.

gains. As aptly demonstrated by these scholars this recent upswing in reproductive levels is not unexpected. Low fertility populations pass through a postponement transition. As the average age at first birth among women increases, the pace of fertility postponement first intensifies, reaches a maximum point, and then declines. As this transition unfolds birth rates drop to very low levels, and then years later gradually increase, though not to the replacement level. This type of postponement transition could take up to five decades to evolve completely. The situation in Alberta suggests that this is a population in the later stage of the postponement transition. The favorable economic climate in this province may have played an important exogenous role in this process, allowing many couples the opportunity to plan to have children, especially the first child, earlier rather than later, contributing in the aggregate to a slowing of the intensity of fertility postponement.

Fertility in Alberta during 1997-2007: Structural analysis

Table 2 displays various measures of fertility for Alberta province over the period 1997 to 2007.[11] This table includes the number of births, the crude birth rate (CBR), parity specific birth rates, average age at childbearing in accordance with parity, period TFRs, and the TFR adjusted for tempo distortions due to the postponement of fertility to older ages. [12] As aptly pointed out by (Goldstein, Sobotka and Jasilioniene, 2009) various possibilities can occur in regard to these two measures: the two sets of TFRs could diverge over time; they may possibly converge; and both may rise in more or less parallel fashion, the latter being consistent with a possible increase in quantum of fertility. Even though fertility has been increasing in Alberta, period TFRs have not yet reached the 2.1

[11] See the footnotes in Table 1 for data sources.

[12] The method of Bongaarts and Feeney (1998, 2000) was applied to derive the adjusted TFRs. This method is based on the idea that once parity specific birth rates have been adjusted for annual shifts in average age at birth for each birth order, the resultant adjusted TFRs reflects the average number of children women would bear over their reproductive lifetimes once tempo distortions due to fertility postponement have been accounted for. Schoen (2006, 2004) has proposed an alternate method that is similar to an earlier formulation by Butz and Ward (1979) for measuring cohort changes in the timing of fertility.

The birth-order specific total fertility rates that went into the computation of the Bongaarts-Feeney adjusted TFR for tempo distortions had to be initially inflated by the ratios shown below. This was necessary because the computed period TFRs for Alberta based on age-specific fertility rates published by Statistics Canada did not perfectly match the TFRs computed for Alberta based on age-by-parity specific births obtained from Alberta Vital Statistics annual reports. In fact, as shown in the tabulation below, the latter were with few exceptions consistently lower than those reported by Statistics Canada; therefore it was decided to inflate computed TFRs for Alberta accordingly:

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
(A)	1.680	1.710	1.700	1.660	1.670	1.690	1.740	1.739	1.749	1.815	1.903
(B)	1.676	1.706	1.700	1.636	1.648	1.668	1.715	1.714	1.723	1.792	1.866
(A)/(B)	1.00239	1.00234	1.00000	1.01467	1.01335	1.01319	1.01458	1.01459	1.01509	1.01283	1.01983

(A) = TFR reported by Statistics Canada for Alberta; (B) = TFR computed with Alberta births and Statistics and Canada CANSIM age-specific female population estimates; (A)/(B = inflation factor applied to TFRs in (B).

replacement level, which suggests that fertility postponement may be dampening period TFRs. [13]

The overall picture in Table 2 is consistent with a sustained pattern of fertility increase in Alberta. Between 1997 and 2007, the number of births amounted to almost half a million; the CBR grew from 12.9 to 14.2; first-order TFRs rose from 0.697 to 0.837; and although more modest, increases are also noted for higher-order TFRs. The mean age at birth for first, second, and third and higher parities have been increasing, though not by very much, thus indicative of some fertility postponement. Consistent with this interpretation, tempo adjusted TFRs are indeed consistently higher than the observed TRFs. Thus, postponement seems to have played a role in maintaining fertility below replacement, notwithstanding notable fertility increases in recent years.

---Table 2---

What structural factors correlate with fertility increases in Alberta? The proceeding analysis in Table 3 is confined to zero-order correlations involving selected economic and social demographic variables in relation to overall, first-, second-, and third-order TFRs.[14] As expected, year is positively correlated with each of these fertility measures; however, the association is statistically significant only with the overall TFR and the first-order TFR. This is not surprising, as first-order birth rates account for most of period total fertility rates in highly developed societies.

In demographic analysis, a population's birth rate is determined by the varying effects of the proximate determinants of fertility (Davis and Blake, 1954; Bongaarts, 1978), the main ones being the extent of marriage, contraceptive use, abortion and post-partum amenorrhea. In the context of this investigation, I am able to examine the possible relevance of marriage and abortion rates on fertility change. Increases or declines in marriage would be expected to correlate closely with change in total fertility on a lagged basis by two or three years, as most often couples do not have a child in the same year they marry. As seen in Table 3, lagged marriage rates do correlate strongly with overall and first-order TFRs, but surprisingly the direction of relationship in both instances is counter to expectation. A positive relationship was expected, but in fact the correlations are negative. This suggests (though not conclusively) that change in marriage rates do not account for increased fertility in Alberta. I view this as a provisional conclusion, as later I explore the differential contribution of marital and non-marital fertility to change in

[13] Here, the word "may" is important because the Bongaarts-Feeney adjustment is based on two strong assumptions: (1) that all age groups experience the same degree of postponement; and (2) that there is absence of cohort effects on postponement. The adjusted TFRs should be interpreted with these assumptions in mind. For additional discussion on the Bongaarts-Feeney (1998) formula see: Kim and Schoen (2000); van Imhoff and Keilman (2000); Bongaarts and Feeney (2000); Goldstein, Sobotka and Jasilioniene (2009).

[14] The analysis is confined to correlations because of the few data points, only 11 years of observation.

overall birth rates in Alberta through a multivariate analysis of parity-specific birth rates. The abortion rate shows no significant correlation with fertility rates. The ratio of births out-of-wedlock to births in wedlock is strongly correlated with the overall and first-order TFR, though only moderately with second- and third-order TFRs.

A number of economic indicators are also examined in Table 3. The correlation between economic indicators and fertility rates are all in the expected direction. Unemployment shows a robust inverse relationship with total fertility and also with the first-order TFR. Periods of low unemployment in Alberta are associated with increased birth rates whereas increases in unemployment reduce fertility, especially the incidence of first births. Male and female average weekly wages show positive correlations, suggesting that increased economic prosperity may serve as an important stimulus for childbearing. Labor force participation rate for women is only moderately associated with first-order TFR.

Although these correlations cannot provide definitive answers as to the causes of fertility change in Alberta, they do point to potentially fruitful directions for future inquiry. In particular, the role of out-of-wedlock childbearing, unemployment and wages, deserve further systematic attention.

---Table 3---

Multivariate analysis of parity-specific birth rates

The data for this part of the investigation consists of a large tabulation of births by birth order by age of mother by wedlock status (married vs. other), by year of occurrence (1997-2007) published by Service Alberta (i.e., Vital Statistics Annual Reports). The denominators for the computation of birth rates are postcensal population estimates taken from Statistics Canada's CANSIM data base. Multivariate analysis is based on Poisson models for the age-parity-specific birth rates (Agresti, 1990).[15] Let r_{ijt} represent the age-by parity-by year specific birth rate, defined as B_{ijt}/W_{it}, where B_{ijt} = number of births to women aged i of parity j in year t; and W_{it} = the mid-year population of women aged i in year t. The letter i indexes five-year age groups (15-19, ..., 45-49); j birth-order (1, 2, 3, 4, 5+); and t year of occurrence (0 = 1997, ..., 10 = 2007).[16]

The Poisson models fitted to the fertility rates are expressed in log-linear form: $\ln(r_{ijt}^*) = \lambda + \Sigma\lambda_{\text{Age}} + \Sigma\lambda_{\text{Wedlock Status}} + \Sigma\lambda_{\text{Parity}} + \Sigma\lambda_{\text{Year}} + \Sigma\lambda_{\mathbf{I}}$ [17] Here, $\ln(r_{ijt}^*)$ refers to the

[15] The Poisson model assumes random independent events (i.e., births).

[16] The fertility rates being modeled here are unconditional rates because they are not based on the women actually exposed to the risk of having a birth of a specific birth order. The data for this type of rate (i.e., conditional parity specific birth rate) are not available. A more detailed discussion of conditional and unconditional birth rates is given by Ni Bhrolcháin and Toulemon (2005).

[17] The parameters are constrained, such that $\Sigma\lambda_{Age} = \Sigma\lambda_{Wedlock\ Status} = \Sigma\lambda_{Parity} = \Sigma\lambda_{Year} = 0$.

natural logarithm of the expected birth rate; λ is the intercept, and the other lambdas are slope parameters for age, wedlock status, parity, and year, respectively. The terms, $\Sigma\lambda_I$ captures slope parameters for linear-by-linear interactions of year with age, year with birth-order, and year with wedlock status. An interaction involving age with parity is also included to control for the strong dependence of fertility rates on the intersection of these two variables.[18] The slope coefficients in the log-linear model measure deviation of log of rates from the overall mean of log of rates due to unit change in predictor variables.

In Table 4, the main effects of year, age and parity are in the expected direction. The birth rate in Alberta has followed an increasing trend over time, with a clear acceleration since 2003. Overall, the dominant age category in predicting the risk of childbearing is 25-29. With respect to parity, the first birth-order (P_1) exerts the strongest effect on overall fertility. Regarding wedlock status, this variable is statistically significant; it indicates that fertility in Alberta is largely driven by married women. That is, notwithstanding possible increase over time in the number of out-of-wedlock births, married women have substantially higher birth rates than do non-married women.

The linear interactions of year with the other predictor variables are of particular importance to this analysis. Among other things, these coefficients can help to partial out the unique contributions of change in age-specific as well as parity-specific rates to overall fertility change. Judging from the magnitude and direction of the interactions of year with age it can be concluded that fertility increase in Alberta has been driven primarily by increased birth rates among relatively older women in their 30s. Indeed, the coefficients corresponding to ages 30-34, and especially 35-39, are positive and statistically significant, whereas for younger women they are negative, indicating a reduced contribution to overall fertility. The year-by-parity coefficients are positive for parities one and two, but only the first birth-order is significant. For higher parities their effects on overall fertility are negative. These results are suggestive of two important conclusions: (1) that the fertility surge in Alberta has been primarily driven by increases in first-order birth rates; and (2) by the contribution of increased fertility rates among women in their 30s. As noted in Table 4, the interaction of year with wedlock status is positive and highly significant, confirming the importance of marital fertility.

---Table 4---

Separate equations are shown in Table 5 for birth-orders 1, 2 and 3, respectively. As might be expected, the peak net effect of age on overall fertility shifts upwards with

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[18] In order to make the regression model parsimonious (to avoid a very large number of parameters) age, wedlock status, birth order, and year were specified as categorical and the interaction of these variables with year were coded as linear-by-linear terms (i.e., year*age15-19, year*age20-24,…, year*age40-44, with age45-49 as reference; year*parity1, year*parity2, year*parity3, year*parity4, with parity 5+ as reference; year*married, with “other” as reference).

increasing birth-order (i.e., older women are more likely to have higher-order births as compared to younger women, who are more likely to have lower-order births). The marital status effect is pronounced across these equations, especially for first and second-order parities. Linear interactions of year with age indicate the occurrence of significant fertility declines over time among relatively younger women. In each of the parity-specific regressions the age-by-year coefficients for ages below 30 are either negative or statistically insignificant. On the other hand, for relatively older women aged 30-34 and 35-39, the coefficients are positive and significant in relation to the first parity. Moreover, for the second birth-order the relevant slope coefficients are statistically meaningful for ages 35-39 and 40-44. In the case of third-order births, the only significant year-by-age effect is for women aged 40-44. Regarding wedlock status, the results in this table confirm those noted in noted earlier in Table 4.

---Table 5---

Conclusion

Alberta represents an interesting case among post-modern societies characterized by decades of sub-replacement fertility rates stretching back to the 1970s. In some of these populations, birth rates have until fairly recently hovered around an average of 1.3 children per woman, and in some cases even lower (Billari and Kohler, 2004; Kohler, Billari and Ortega, 2002; Sobotka, 2004; Goldstein, Sobotka and Jasilioniene, 2009). Widespread fertility postponement among cohorts of women born after World War II has contributed to this low fertility phenomenon across such populations. Among the more recent generations, now passing through their prime childbearing years, birth rates appear to be lower than the cohorts which preceded them. This observation has led some demographers to assert that recent cohorts of women are unlikely to achieve replacement fertility by the end of their childbearing years (Frejka and Sardon, 2004). It has been argued in the literature that low fertility societies have seen the emergence of a new mindset among young adults where childlessness has become a desirable and socially acceptable alternative to parenthood and completed fertility targets may have been set below the two-child norm; others have proposed that in such societies continued low fertility may have become endemic (Lutz, Skirbekk and Testa, 2006; Caldwell and Shindlemayr, 2003; Lesthaeghe, 1995).[19]

The evidence uncovered in this investigation concerning Alberta province strongly suggests (though not definitively) that the recent fertility surge in this province has been driven mainly by an ostensible increase in first-order births, and to a lesser extent also second-order births. These fertility increases appear to be primarily attributable to women in their 30s. The contribution of younger women was found to be statistically insignificant

[19] An example of the new mindset concerning fertility among young adults today in Canada is found it a recent article in Maclean's magazine by Kingston (2009): "the case against having kids." There are also examples of this perspective based on reports from Western European countries (see for example, Westcott, 2006).

or negative. All this suggests a dual process may have evolved in Alberta during recent years. On the one hand, younger women may be postponing the timing of their first child, and on the other, older women in their thirties may be undergoing a process of fertility recuperation, a kind of "catching up" phenomenon, whereby a significant proportion of women are having their first progeny. I posed the argument that fertility recuperation in Alberta has been precipitated by a growing sense of economic security in a context of widespread and sustained economic growth in this Canadian province. It would appear that the economic prosperity has had little impact on younger women.

As reported by Goldstein, Sobotka and Jasilioniene (2009), many of the countries which were first observed as occupying lowest-low fertility status in the 1980s and 90s, are now approaching the end of the postponement transition, and are extricating themselves out of a possible "low fertility trap" (Lutz, Shirbekk and Testa, 2006). Alberta appears to be a population in the later stage of the postponement transition from the indication presented in this analysis,.

The postponement transition implies behavioral processes operating at the level of the individual and couples in particular. The argument posed in this investigation is that a sustained period of economic growth can create a socioeconomic context favorable to childbearing, encouraging couples to have children earlier than they would have under less optimal times. For Alberta, it was expected that this type of process would include both younger and older women in the childbearing years, especially with regard to first-order births. The findings in this analysis indicate that this effect is specific only among relatively older women in their 30s, and this is responsible for the fertility surge over recent years in Alberta. The increased fertility rates among women in their later years of childbearing may have contributed to a deceleration of fertility postponement, as well as recuperation of fertility on the other.

The current economic downturn caused by the financial crisis in the United States may reverse the fertility upswing in Alberta. However, as argued by Goldstein, Sobotka and Jasilioniene (2009), the economy predictably follows cycles of growth, decline and recovery. Thus, once the current downturn is over a new period of growth should follow. Whether replacement level fertility will ever be actualized in Alberta remains an open question. For many low fertility countries with a long history of very low birth rates replacement fertility may no longer be possible notwithstanding recent increases (Goldstein, Sobotka and Jasilioniene (2009). However, given that its TFR is already at 1.9 children per woman, an eventual TFR of 2.1 may not be out of reach for Alberta. But this may be highly dependent on sustained economic expansion in the future.

A number of important questions remain open for further investigation into the Alberta case. First, it would be important to asses the extent to which institutional policies may have stimulated fertility increases. On the surface, there is no evidence of government instituted policies aimed at boosting fertility in this province. However, there may be other social policies in place that may have contributed indirectly. This possibility

needs to be explored in subsequent research. Second, given its strong economic performance over the past decade, Alberta has attracted many migrants from other parts of Canada and from abroad. A possible contributor to fertility increase may be its immigrant population. The relative contribution of immigrants, internal and external, should be examined systematically to determine how much of the fertility increase is attributable to the Alberta born population and to migrants. Third, it would be especially important to extend the analyses executed in this study to the other Canadian provinces. This would provide a broader perspective on the uniqueness of the Alberta experience in the context of Canada. Fourth, additional insight into the role of macroeconomic conditions on fertility change could be gained by a more extensive analysis based on longer time series stretching back to the early 1970s, when Alberta had experienced its first protracted economic boom. Indeed, there is indication that at that time Alberta had also witnessed a similar fertility increase as noted for the more recent context (see Figure 5). The addition of parity-specific data comprising the 1970s through the most recent year available would allow for a more comprehensive test of the propositions posed in this investigation. Finally, a clearer understanding of the fertility surge in Alberta is possible through a survey of women's fertility histories. This would allow more comprehensive analysis of the social demographic and economic determinants of fertility postponement, advancement, and recuperation among Alberta women.

---Figure 5---

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Table 1: Labour force statistics for Canada and the provinces; and median earnings in 2005 (2005 constant dollars; full time-wage earners, excluding the self-employed)

	Participation rate %	Employment rate %	Unemployment rate %	Median family income
Canada	**67.2**	**63.0**	**6.3**	**$41,401**
Newfoundland & Labrador	59.2	50.4	14.8	$37,429
Prince Edward Island	68.7	61.1	11.0	$34,140
Nova Scotia	62.9	57.9	7.9	$36,917
New Brunswick	63.7	58.1	8.8	$35,288
Quebec	65.5	60.2	8.0	$37,222
Ontario	67.7	63.5	6.3	$44,748
Manitoba	68.8	65.8	4.3	$36,692
Saskatchewan	69.1	65.9	4.7	$35,948
Alberta	**73.4**	**70.8**	**3.4**	**$43,964**
British Columbia	65.7	62.5	4.8	$42,230

Sources: Alberta Employment, Immigration and Industry. 2007. Annual Alberta Regional Labour Market Review, p. 3; Statistics Canada. 2008. Earnings and Incomes of Canadians Over the Past Quarter Century, 2006 Census. Cat. No. 97-563-X, p. 14.

Table 2: Fertility measures for Alberta province, 1997-2007 and TFR adjusted for tempo distortions

					Parity-specific TFR			Mean age at birth by parity					
Year	Births	Annual % change, births	CBR	% females 15-44	P_1	P_2	P_{3+}	P_1	P_2	$P_{(all)}$	TFR(t)	TFR tempo adjusted	TFR(t)-TFR adjusted
1997	36,522	---	12.91	23.7	0.697	0.588	0.396	26.77	29.15	28.61	1.680	---	---
1998	37,654	3.1	12.99	23.2	0.716	0.592	0.362	27.76	29.22	28.63	1.670	1.754	-0.08
1999	37,734	0.2	12.78	23.4	0.717	0.580	0.402	26.73	29.35	28.67	1.700	1.748	-0.05
2000	36,588	-3.0	12.80	23.2	0.707	0.564	0.389	26.85	29.44	28.77	1.660	1.761	-0.10
2001	37,201	1.7	12.17	23.0	0.706	0.581	0.383	26.99	29.55	28.85	1.670	1.755	-0.09
2002	38,269	2.9	12.28	22.8	0.716	0.584	0.390	27.01	29.59	28.89	1.690	1.737	-0.05
2003	39,845	4.1	12.60	22.7	0.757	0.586	0.397	27.30	29.64	29.01	1.740	1.814	-0.07
2004	40,251	1.0	12.55	22.5	0.763	0.577	0.399	27.39	29.78	29.07	1.739	1.794	-0.05
2005	41,536	3.2	12.66	22.3	0.762	0.589	0.398	27.43	29.85	29.12	1.749	1.797	-0.05
2006	44,630	7.4	13.24	22.2	0.791	0.613	0.412	27.38	29.86	29.12	1.815	1.840	-0.03
2007	48,338	8.3	13.91	22.1	0.837	0.645	0.421	27.45	29.91	29.16	1.903	1.965	-0.06
2008	50,605	4.7	14.20	23.6	na	na	na	na	na	na	na		

Notes: Total births 1997-2008 = 502,516. In 2009, there were 51,443 births. Per cent female population 15-44 based on female population in this age category in a given year divided by the total Alberta population in the same year. The adjusted TFR were computed by the method of Bongaarts and Feeney (1998). “na” means data not yet available.

Data sources: The fertility measures in this table are based on births obtained from published Alberta annual vital statistics (Alberta Services, annual reports) and estimated female population denominators obtained from Statistics Canada CANSIM data base.

Table 3: Zero-order correlations between selected structural variables and TFR overall and parity-specific TFRs; Alberta, 1997-2007

Predictor Variable	TFR	$TFR_{(1)}$	$TFR_{(2)}$	$TFR_{(3)}$
(1) Year $_{(1997\text{-}2007)}$	**.757***	**.866***	.475	.336
(2) Marriage rate $_{(t\text{-}2)}$	**-.810***	**-.911***	-.531	-.468
(3) Marriage rate $_{(t\text{-}3)}$	-.458	**-.639***	-.164	-.381
(4) Log abortion rate	.071	-.144	.328	.332
(5) Births out of wedlock /Births in wedlock	**.923***	**.926***	**.720***	**.653***
(6) Unemployment rate	**-.766***	**-.798***	-.512	-.358
(7) Unemployment rate (male)	**-.788***	**-.811***	-.527	-.399
(8) Unemployment rate (female)	**-.707***	**-.765***	-.468	-.288
(9) Male weekly average wage	**.836***	**.885***	**.628***	.445
(10) Female weekly average wage	**.817***	**.875***	**.614***	.405
(11) Female labor force participation rate	.444	**.600***	.381	.101

Note: $TFR_{(1)}$, $TFR_{(2)}$ and $TFR_{(3)}$ are TFRs for birth-orders 1, 2 and 3, respectively. Statistically significant correlations are bolded ($p \leq .05$, two-tailed test).

Data sources: (2)-(5): Alberta Services (1997-2007) Alberta Vital Statistics Annual Review, and Statistics Canada CANSIM data base (for female population), Table 051-0010 (Estimates of Population by Marital Status, Age Group and Sex); Alberta Reproductive Health Report Working Group (2008); Alberta Reproductive Health: Pregnancies & Births Table Update 2007 (Alberta Health and Wellness). (6)-(11): Statistics Canada CANSIM data base (labor force tables, 282-0069 and 282-0010).

Table 4: Poisson regression of Alberta parity-specific birth rates, 1997-2007

Parameter		Coefficient	Z
Year	1997	-0.0745	-5.5
	1998	-0.0481	-4.3
	1999	-0.0435	-4.8
	2000	-0.0723	-10.2
	2001	-0.0561	-10.1
	2002	-0.0290	-6.0
	2003	0.0153	2.8
	2004	0.0258	3.7
	2005	0.0435	4.9
	2006	0.0946	8.6
	2007 (R)		
Age	15-19	-1.0499	-10.2
	20-24	1.5104	72.8
	25-29	1.8890	96.8
	30-34	1.6936	87.1
	35-39	0.8363	42.6
	40-44	-0.8777	-41.1
	45-49 (R)		
Parity	P_1	1.2866	57.1
	P_2	1.0423	46.0
	P_3	0.1262	5.1
	P_4	-0.9594	-30.8
	P_{5+} (R)		
Wedlock Status	Married vs. Other	0.7690	384.7
Linear interactions			
Age*Year	15-19*Year	-0.0575	-18.2
	20-24*Year	-0.0285	-10.6
	25-29*Year	-0.0079	-3.0
	30-34*Year	0.0065	2.5
	35-39*Year	0.0237	8.5
	40-44*Year	0.0177	4.7
	45-49*Year (R)		
Parity*Year	P_1*Year	0.0203	21.2
	P_2*Year	0.0007	0.8
	P_3*Year	-0.0094	-7.8
	P_4*Year	-0.0080	-4.6
	P_5*Year (R)		
Wedlock Status*Year	Married vs. Other*Year	0.0088	14.3
Model L^2 (df))		13,047.2 (713)	
L^2 (Baseline) (df)		862,152.1 (769)	

Note: Age-by-parity interactions not shown. (R) = reference category. In this and the subsequent table, coefficients are statistically significant if Z $\geq$ 2.0 (i.e., $p \leq .05$; Z score not computed for reference category of given variable); baseline model is the model that includes only the intercept term (equiprobability model).

Table 5: Poisson regressions of age-specific birth rates by parity, Alberta, 1997-2007

	Parity 1		Parity 2		Parity 3	
Parameter	Coefficient	Z	Coefficient	Z	Coefficient	Z
Year 1997	-0.1294	-4.9	-0.1157	-4.1	-0.0757	-2.1
1998	-0.0895	-4.2	-0.0862	-3.8	-0.0259	-0.9
1999	-0.0721	-4.3	-0.0821	-4.6	-0.0195	-0.8
2000	-0.0875	-6.9	-0.1029	-7.6	-0.0572	-3.1
2001	-0.0729	-8.0	-0.0501	-5.1	-0.0617	-4.2
2002	-0.0387	-5.2	-0.0157	-1.9	-0.0352	-2.7
2003	0.0373	4.2	0.0154	1.6	0.0158	1.1
2004	0.0612	5.0	0.0252	1.9	0.0221	1.2
2005	0.0739	4.4	0.0710	4.0	0.0274	1.1
2006	0.1283	6.1	0.1373	6.1	0.0883	3.0
2007 (R)						
Age 15-19	1.8529	105.3	0.4299	18.7	-0.9914	-21.2
20-24	2.1678	130.2	1.9136	104.0	1.5798	63.7
25-29	1.8244	110.5	1.8574	102.9	1.9442	82.1
30-34	1.1948	71.5	1.5846	87.6	1.7828	75.3
35-39	-0.0393	-2.2	0.5679	30.4	0.9310	38.1
40-44	-1.9266	-80.0	-1.4085	-59.8	-0.9108	-29.9
45-49 (R)						
Married vs. Other	0.8108	266.7	0.8710	244.1	0.6943	133.4
Linear interactions						
15-19*Year	-0.0474	-8.6	-0.0741	-10.5	-0.0963	-6.6
20-24*Year	-0.0167	-3.2	-0.0367	-6.5	-0.0361	-4.8
25-29*Year	0.0034	0.7	-0.0168	-3.1	-0.0121	-1.7
30-34*Year	0.0223	4.3	-0.0025	-0.5	-0.0051	-0.7
35-39*Year	0.0276	5.0	0.0252	4.4	0.0138	1.9
40-44*Year	0.0067	0.9	0.0266	3.7	0.0201	2.1
45-49*Year (R)						
Married *Year	0.0063	6.8	0.0072	6.6	0.0112	7.0
Model L^2 (df)	3,780.1 (129)		1,507.1 (129)		5,917.8 (129)	
L^2 (Baseline) (df)	237,208.9 (153)		212,860.5 (153)		835,277.6 (153)	

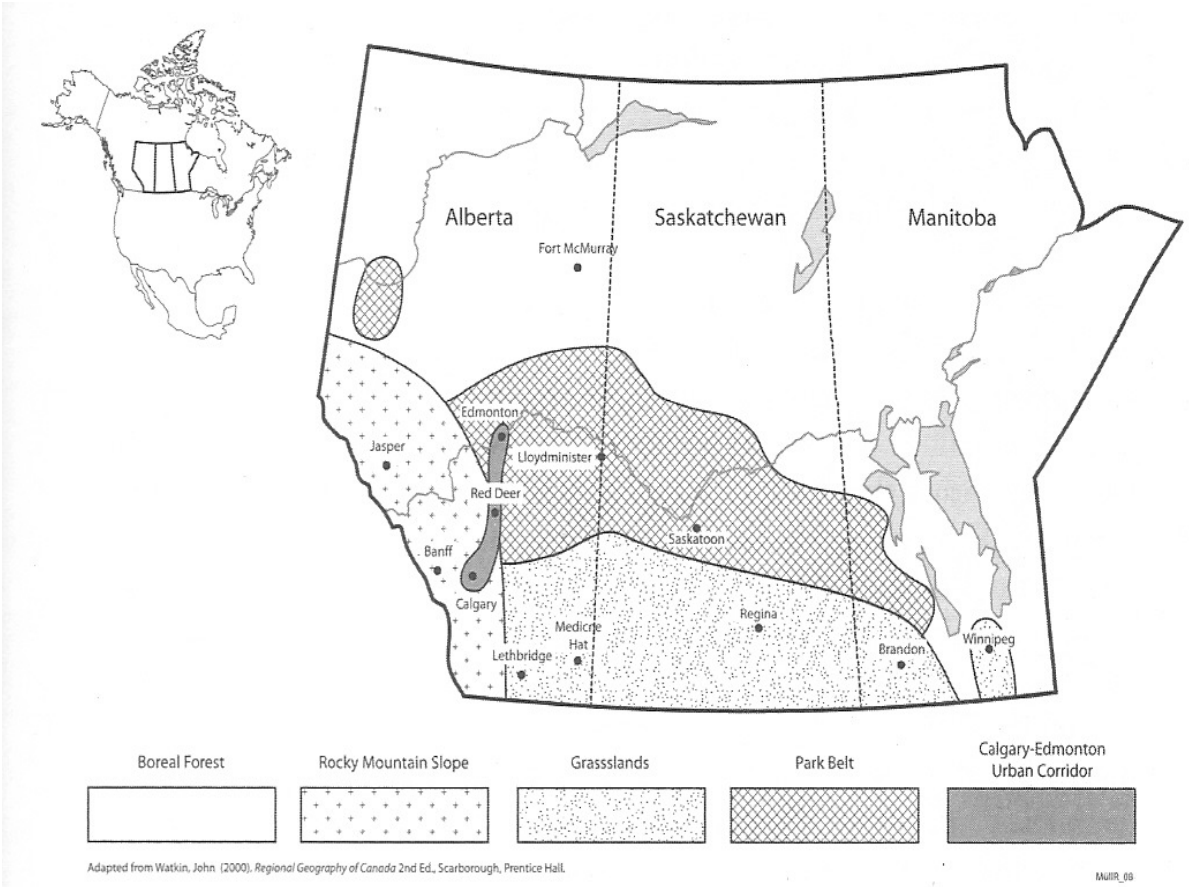


Figure 1
SOURCE: Adapted from John Warkentin. *A Regional Geography of Canada*, 2nd ed. (Scarborough: Prentice Hall, 2000).

Figure 1: The Prairie Provinces of Canada: Alberta, Saskatchewan and Manitoba.

Source: Hiller, Harry. 2009. Second Promised Land: Migration to Alberta and the Transformation of Canadian Society. Montreal and Kingston: McGill-Queen's University Press, p. 91.

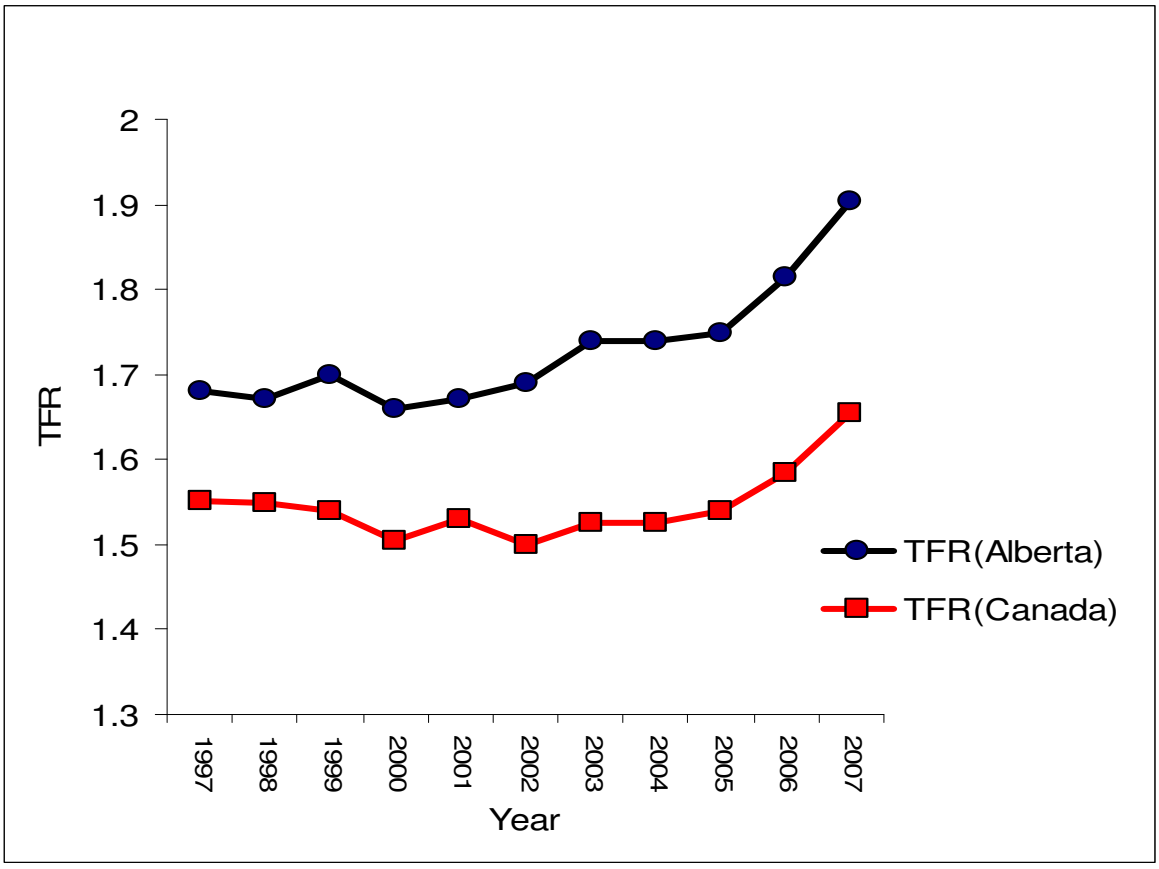


Figure 2: TFR for Alberta and Canada, 1997-2007.

Data sources: Alberta Vital Statistics (Service Alberta annual reports); Statistics Canada (CANSIM data base).

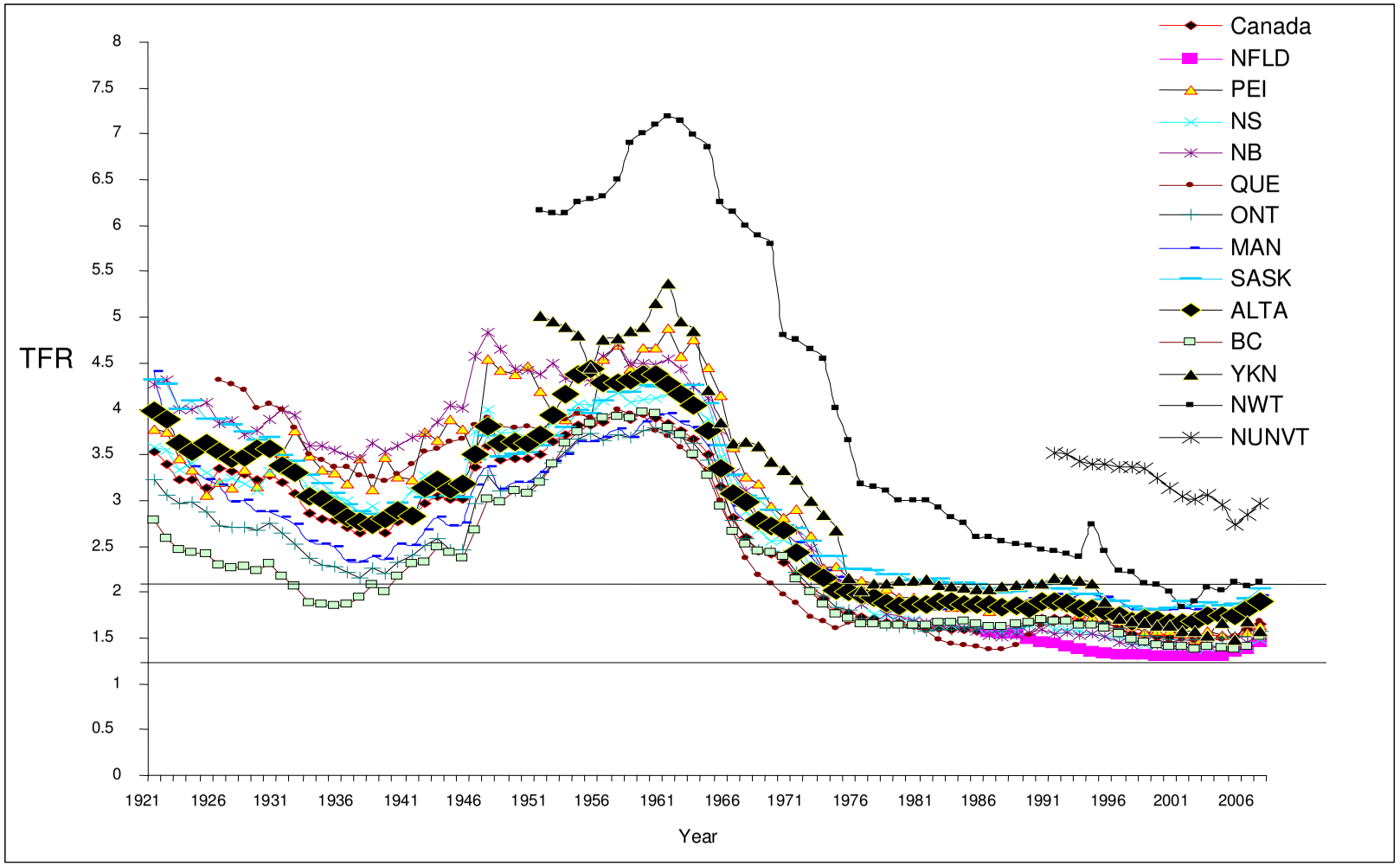
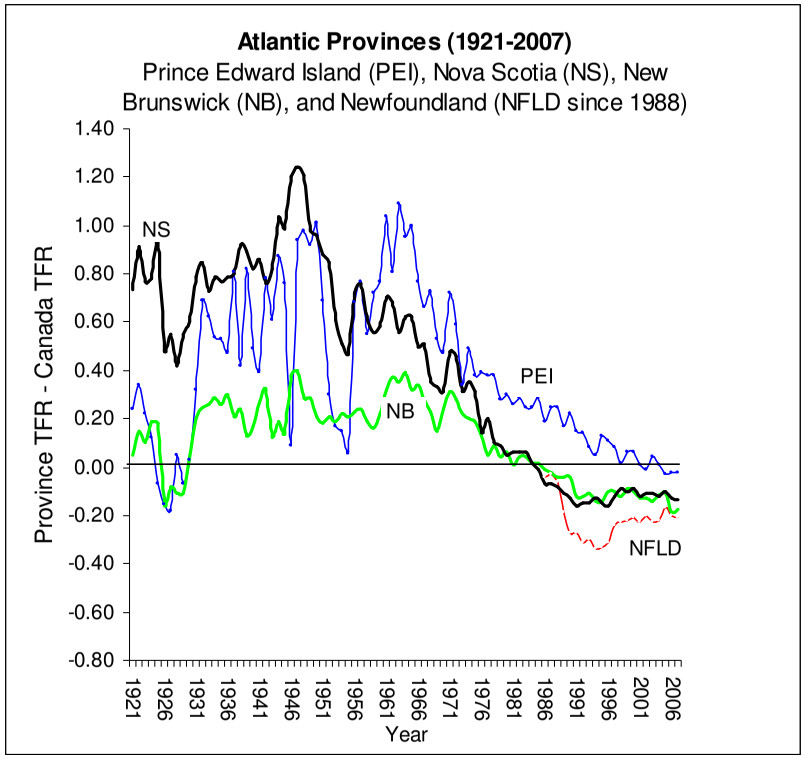


Figure 3: Historical trend of provincial, territorial and overall Canadian Total Fertility Rates, 1921-2007 (the two horizontal lines denote demarcations for TFR between 1.3 and 2.1)**.**

Note: NFLD=Newfoundland; PEI=Prince Edward Island; NS=Nova Scotia; NB=New Brunswick, QUE=Quebec, ONT=Ontario; MAN=Manitoba; SASK=Saskatchewan; ALTA=Alberta; BC=British Columbia; YKN=Yukon; NWT=Northwest Territories; NUNVT=Nunavut. Data sources: Statistics Canada Vital Statistics (annual and historical) and Statistics Canada CANSIM data base.



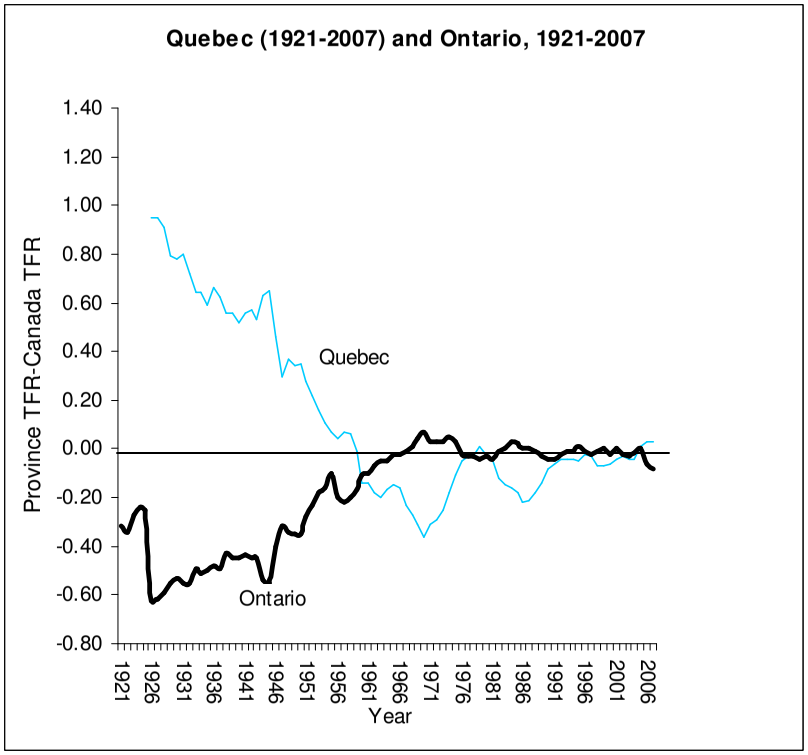
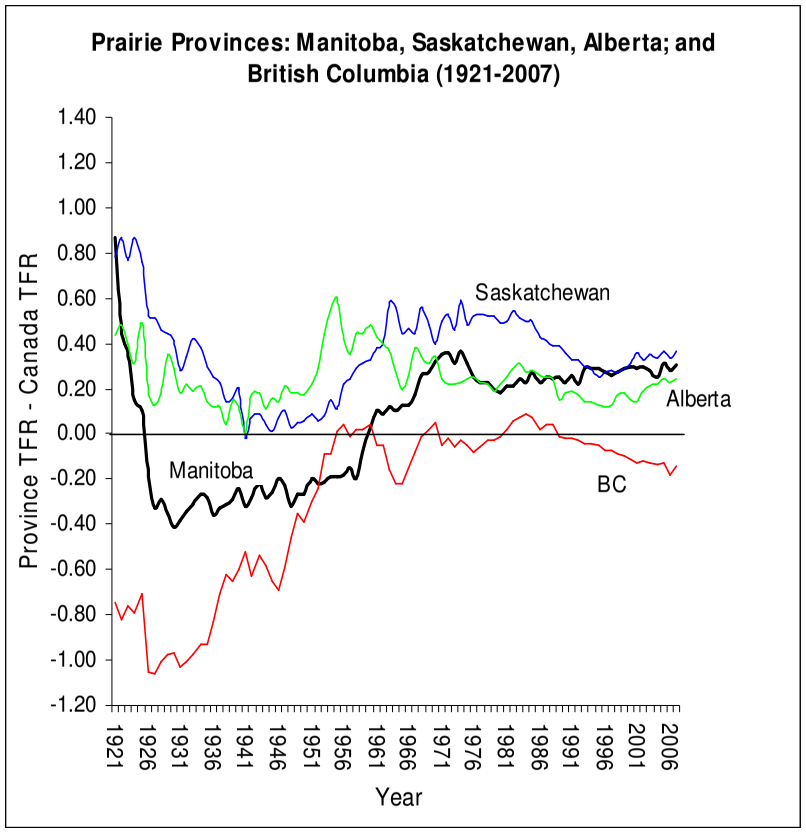


Figure 4: Time trend of provincial/territory TFR in relation to Canada TFR, 1921-2007.

Note: data for Newfoundland not available prior to 1988. Data series for Quebec start in 1926.



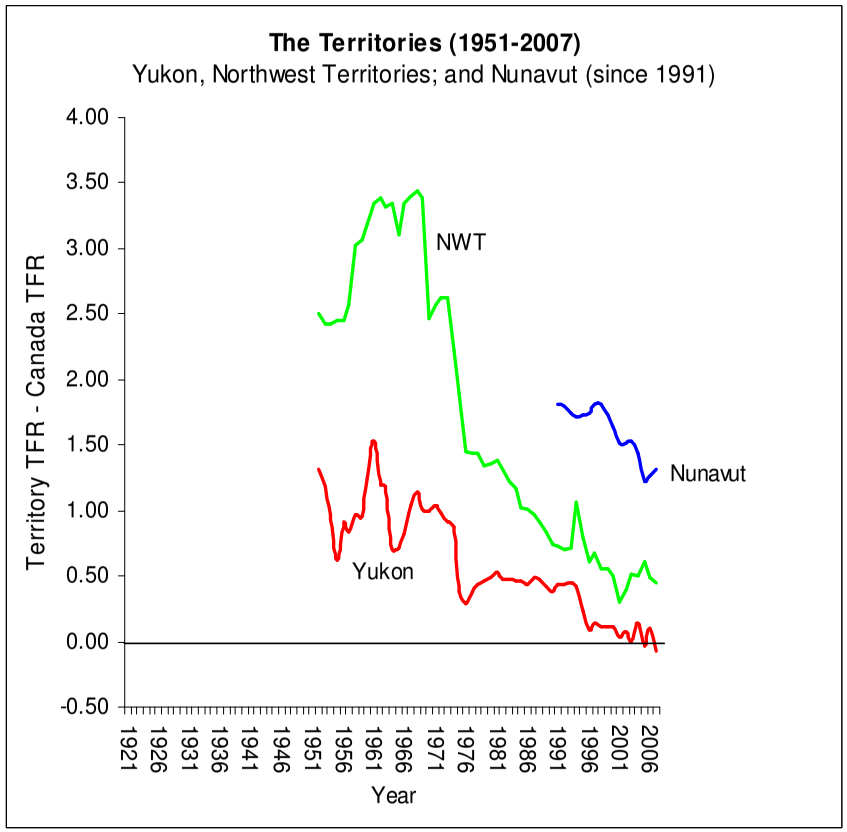


Figure 4 (cont): Time trend of provincial/territory TFR in relation to Canada TFR, 1921-2007.

Data sources: Statistics Canada Vital Statistics publications (historical and various years) and Statistics Canada CANSIM data base for years 2000 to 2007.

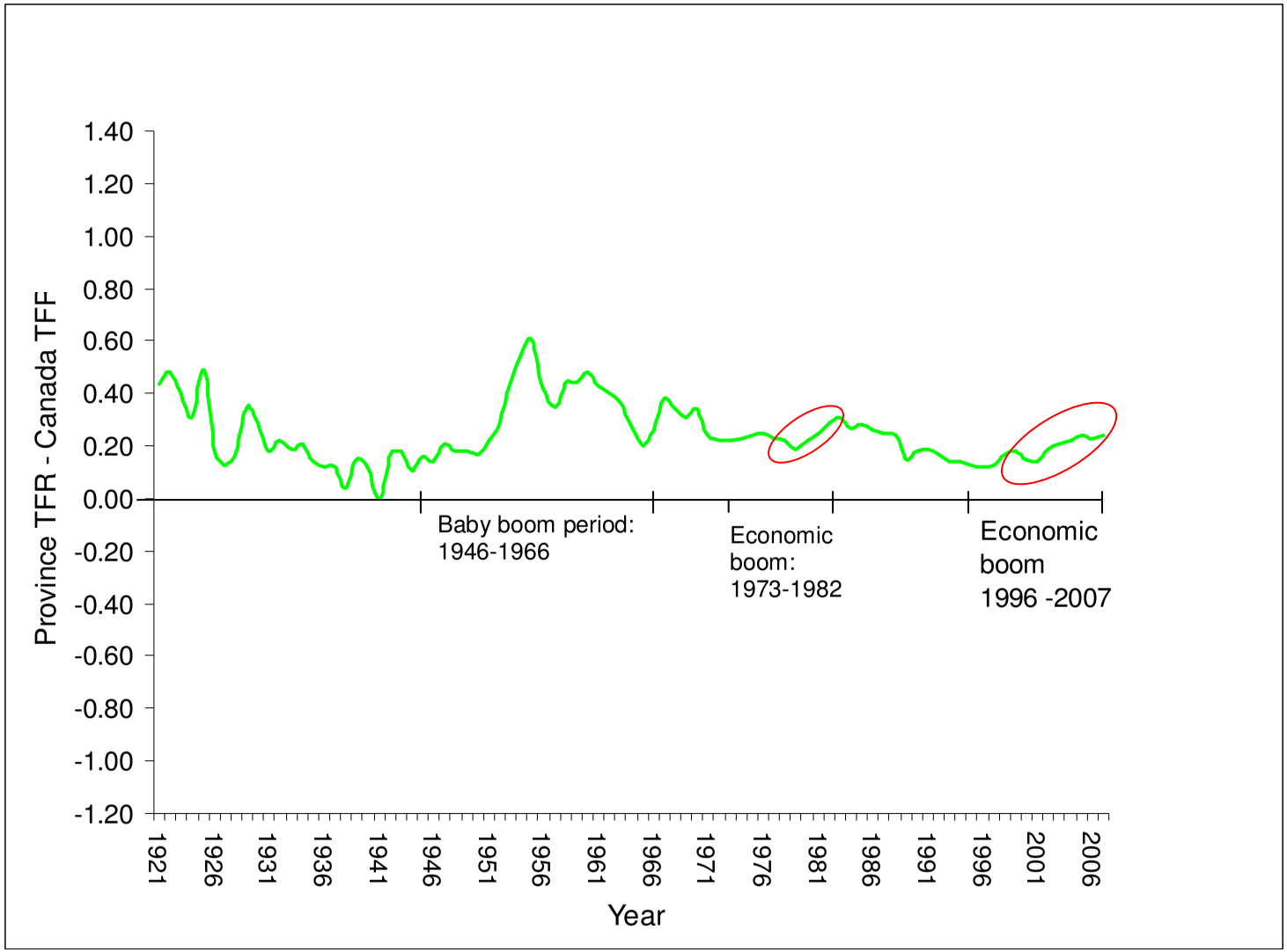


Figure 5: Trajectory of TFR difference between Alberta and Canada, 1921-2007, showing the baby boom period and the two Post-War economic booms in Alberta.