Does moving disrupt immigrant fertility? The case of Canada

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Abstract

In this paper we examine the fertility experience of immigrants during their initial years in Canada. Fertility decisions at the time of arrival may be crucial in determining their economic assimilation into the new country, as households with infants usually face larger expenses and are constrained in the amount of time that can be supplied in the labour market. We use the 20 percent sample of the confidential files of the Canadian Census of Population for the years 1991 through 2006, to estimate different aspects of immigrant fertility during their initial years of stay in Canada. We estimate relative (to the Canadian born) differentials in the probability of the presence of infants and pre-school children. We further analyze a variety of questions of interest, such as the effect of conditioning on immigrant's place of birth or education level, the importance of cohort effects in explaining changes in fertility patterns for recent immigrants, or the extent to which the timing of births may help explain fertility differences between immigrants and the Canadian born.

Introduction

It is commonly accepted that the fertility of foreign-born women differs from that of the native born. Research in immigrant recipient countries such as Canada and the US has sought to document and understand these differences because of the prominent role that immigrant fertility plays in shaping demographic and economic trends in these countries. In this paper we focus on the fertility of Canadian immigrant women around the time of arrival in the new country. Assessing the fertility experience of recent immigrants may be crucial in determining their economic assimilation into the new country, as households with infants usually face larger expenses and are constrained in the amount of time that can be supplied in the labour market.

Much of the initial evidence on immigrant fertility originated from the study of internal migration from rural to urban areas (Goldstein and Goldstein, 1981; White, Moreno and Guo, 1995). However, rising international flows of individuals across borders brings other factors into consideration of migrant fertility For instance, it is likely that the selection and attraction mechanisms causing migration to different areas differ considerably across countries and affect subsequent immigrant behavior. Hence, any results concerning immigrants, including fertility behavior, are likely to differ not only by country of destination, but also by immigrant's source country. This confers particular interest to studies based on countries with a large and diverse immigrant population, such as the US, Australia, Canada or the UK.

Different mechanisms of fertility adjustment may explain the fertility experiences of adult immigrants (Goldstein and Goldstein 1981). Selection mechanisms highlight systematic differences between the fertility of immigrants and that of non-immigrant in the source country and this selectivity may explain their subsequent fertility patterns (Kahn 1988, Sobotka 2008). Alternatively, Convergence mechanisms highlight the fact of acculturation. Immigrants enter the host country with a set of potentially different fertility norms (from those of the native born) and over time, alter their reproductive behavior to optimize socioeconomic success and to conform to the childbearing practices of their host country (Alba and Nee 1997; Gordon 1964; Carter 2000). Disruption mechanisms focus on the disruptive effects of migration on fertility (Stephen and Bean, 1992; Kahn, 1994; Ng and Nault, 1997). Migration may separate spouses at least temporarily, and individuals who are planning to move may postpone childbearing until after they are settled in their new home. This anticipatory behavior may cause a temporary drop in fertility prior to the move or during the first years after migration (Toulemon 2004).

Economic theory builds on these ideas to incorporate the role that prices, opportunity costs, and fertility regulation play in fertility decisions. Thus, changes from the source to the host country in female wages, household income, childcare costs, etc… will also affect couples' fertility.

Our purpose here is to examine the fertility behavior of recent cohorts of immigrants during the first years of arrival because of the potentially large impact that this may have on the socioeconomic integration of immigrant families. This focus influences our analysis in important ways. Mostly, we divert from a substantial branch of the fertility literature that tries to distinguish between the selection and convergence explanations of immigrant fertility. Instead, we will abstract from the "acculturation" process, which is a long term occurrence, likely taking more than one generation to complete, and consider disruption mechanisms. This approach makes our study more directly comparable to those focusing on the short term effect of migration (Toulemon, (2004; Ng and Nault, 1997; Ram and George, 1990). This short term focus also influences the choice of fertility measures. We will be less concerned with cumulative measures of fertility, such as total fertility rate or total number of children in the household, and look instead for fertility measures with a direct impact on current labour market options of immigrant women, such as the number of young children in the household,

The immigration landscape in Canada has considerably changed since the 1990s. Significant reforms in Canadian immigration policy at this time had a profound impact on the composition of immigrant flows during this period. In turn, we can expect related changes in the fertility of recent immigrant arrivals to Canada. The importance of documenting fertility changes among immigrants is obvious for the purposes of social policy. Not only for its direct influence on demographic outcomes, but also because fertility may affect the socioeconomic integration of immigrant families*Fertility and the Immigration Context in Canada*

Although Canada has a long tradition as an immigrant receiving country, the nature and composition of immigration has changed significantly during the past 30 years. Immigration to Canada is controlled through a point system that assess applicants on the basis of individual characteristics such as education, age, language skills, arranged employment, personal suitability, and, until recently, occupation.[1] From the outset – and especially in recent years – the points system has focused on selecting skilled immigrants. Starting in the 1990s, Citizenship

[1] The point system was first introduced in 1960 to replace admission based on country of origin. Initially was used to respond to short term labour demand needs (Green and Green, 1999).

and Immigration Canada (CIC) specifically targeted the highly educated, on the premise that these immigrants will have the ability to adjust to changing labour market conditions and successfully integrate in Canadian society. Furthermore, as highly educated parents tend to have highly educated children, this strategy is likely to ensure a highly educated labour not only among immigrants (the first generation), but also among their children (the second generation). This was to be achieved by maintaining a constant inflow of immigrants, around 200,000 new entrants per year, and increasing the weight given to education in the point system.[2]

As a result of these changes the education level of immigrants rose dramatically. In the 1980s, approximately 10% of all entering immigrants aged 15 and over had a university degree; by 2005 it was 45%. Fully 78% of principal applicants (those being selected on points) admitted over the 2000 to 2007 period had a university degree, as did about one half of their spouses. In addition, the composition of Canadian immigration changed in other dimension. Before 1980, the majority of immigrants came from the United States or Europe (41 percent), while by 2006 only 19 percent of recent arrivals (that is, those arriving within the last five years) came from these places. Currently, immigration from Asia constitutes 58 percent of recent arrivals versus 34 percent of all those who arrived before 1980, and twice as many recent newcomers are from Africa as there were before 1980. How may these changes have affected immigrant fertility?

As mentioned, the fertility of immigrants when they arrive into a new country may be affected by different mechanisms (Goldstein and Goldstein, 1981). Of particular interest to us are the disruptive effects of migration on fertility (Kahn 1994, Ng and Nault 1997). Migration may separate spouses at least temporarily, and individuals who are planning to move may postpone childbearing until after they are settled in their new home. This anticipatory behavior may cause a temporary drop in fertility prior to the move or during the first years after migration. In this regard, results from the empirical investigation of immigrant fertility are mixed. Blau's influential study (1992) seems to support the disruption model regarding short run fertility adjustment of immigrants in the United States. The international evidence is disperse and tends to suggest that the effect of migration on fertility varies depending on the source and host country. Ford (1990) shows evidence of short lived fertility disruption for

[2] Currently, new changes to immigration policies are reducing the role of the point system and increasing the number of immigrants entering under new programs such as the Provincial Nominee Program or the Temporary Foreign Worker Program. This is unlikely to affect our results as it affected relatively small number of entrants before 2006.

immigrants to the US, while Choi (2011) documents similar but larger effects for Mexican immigrants to the US. Similarly, Jensen and Ahlburg (2004) find substantial fertility disruption among internal migrants in Philippines. In Europe, Mayer and Riphalm (2000) document the case of immigrants to Germany, finding no evidence of fertility disruption behavior, whereas Toulemon (2004) finds evidence of very short disruption before migration followed by substantially high fertility rates after arrival for immigrants to France. The Canadian evidence (Ng and Nault, 1997) reports short lived fertility disruption upon immigration and quick convergence with domestic born fertility levels with socio-economic assimilation for the cohort of women for immigrants arriving during the late 1980s.

Together with the disruptive mechanisms, selection mechanisms are also likely to play a role in explaining the fertility of Canadian immigrants. The changes in the immigrant selection process that took place in Canada makes it likely that immigrant fertility has changed since the 1990s, particularly fertility around the time of migration. Different cultures place different weight on fertility. While women from developing economies in South America, South Asia and Africa show higher level of fertility than women in Western economies, those from Northern Asian countries tend to have lower fertility than women in Western economies.[3] Further, immigrants from high fertility areas have also been shown to have higher fertility than non-immigrants in the source country (Choi, 2011; Coleman and Dubuc, 2010). Hence, the shift in country of origin could result in higher or lower fertility depending on the specific mix of immigrants.

What are the implications of these mechanisms for the fertility of Canadian immigrants in view of the changes in immigration policy? First, as immigration veered from Europe to other areas of higher fertility, immigrant fertility could be expected to increase depending on the extent and direction of the selection mechanism. Canadian immigration policies, with emphasis on highly skilled and educated immigrants might well have selected those with preference for low fertility. Second, if the cost of immigration is – as suspected - higher for these new immigrants, they might experience higher disruption effects (Stephen and Bean, 1992). In this context it is hard to determine the direction of such effect. Higher than anticipated cost of immigration due to lack of employment opportunities, low wages among female immigrants or difficulties accessing day care, may have reduced the opportunity cost of having children for

[3] See Adsera and Ferrer (2010) {PLUS OTHER CANADIAN EVIDENCE} for Canadian evidence

highly educated female immigrants, and increased their fertility. On the other hand, a high cost of immigration may induce female immigrants to postpone childbearing and go into the labour force to maintain household income.[4]

Next section documents the immigration context in Canada. Next we discuss data and methodology. The fourth section examines the fertility of Canadian immigrants during the first years after arrival. The following section concludes.

Methodology and Data description

The ability to explore in depth all above implications of immigration on fertility is limited by the availability of data. Unfortunately Canada lacks a fertility survey with complete fertility histories that we can use for our analysis. Instead we rely on the confidential files of the Canadian Census of Population (20% sample) for the years 1991, 1996, 2001, and 2006 to analyze fertility at the time of immigration. A disadvantage of the Census is that it contains only survey year information, but not information about individual characteristics at the time of the births or at the time of entry. However, by focusing on the period immediately surrounding migration we reduce these shortcomings to some extent.

The confidential files have the great advantage of providing large samples and more detailed information on individuals. In particular, it gives access to a very rich categorization of relationships among members of the household. Using this detailed information, we are able to link individuals in the same household and to compute the number of children of each woman living in the household. We select adult women between 18 and 45 years of age, excluding aboriginal individuals, whose analysis presents a very different set of challenges. For each of the selected women we have information about age, education, marital status, number of living births (in the 1991 Census only), number of children living in the household, province of

[4] The empirical evidence indicates that the socioeconomic integration of new immigrants to Canada has declined considerably during the 1990s and 2000s. Abdeymir and Skaterud (2005) document the rising earnings gap between new entrants and the Canadian born. This has mostly been attributed to change in source country and the subsequent difficulties for new immigrants to validate their education and skills (Ferrer, Green and Riddell, (2008); Picot and Hou, 2010), thus suggesting that the cost of immigration is indeed higher for recent immigrants.

residence and immigrant status. In addition, for immigrant women we have information about year of immigration (becoming permanent resident), age at immigration and country of birth. [5]

We measure fertility using the "own children" method which exploits the fact that the vast majority of young children live with their mothers. Rather than the actual number of children born to a woman, this measure computes the number of children living in the household. To the extent that some children may not live with their mothers, our dependent variable may be measured with some error.[6] The advantages of this method over the use of vital statistics to calculate differential fertility according to place of birth are discussed in Cho et Al. (1986). Further, for the Canadian case, Ng and Nault (1997) and Belanger and Gilbert (2003) show that estimated fertility differentials for immigrants and domestic born individuals using both methods are not very sizeable. In particular, Belanger and Gilbert (2003) show that estimated fertility differentials for immigrants and domestic born individuals for the period 1996-2001 using both methods are not very sizeable – with a downward bias of the census for women younger than 30 and an upward bias for those aged beyond 30.[7] In order to reduce computing time to reasonable length, from each census we select all immigrant observations plus a 20 percent random sample of Canadian born individuals and weight the observations accordingly. The four censuses are then pooled, resulting in a total of over one million observations. The pooled census data has a key role in the analysis of immigrant outcomes as it allows us to track immigrants by arrival cohort. It is well known, that using a single cross section of data to infer assimilation outcomes may be misleading. It implicitly assumes that successive cohorts of immigrants will show similar behavior once they have stayed the same amount of years in the host country. This is the essence of Borjas' (1985) critique on immigrant assimilation studies. The solution is to use panel data or, in its absence, to construct synthetic cohorts of immigrants from pooled cross-section surveys. We use the Canadian Census of

[5] There are household surveys, such as the Survey of Labour and Income Dynamics (SLID) from which similar information could be obtained. However, this survey over-samples rural areas, resulting in too few immigrant observations for our purposes.

[6] The census questionnaire asks respondents to include children in joint custody who live most of the time in a household as household members. Therefore, our sample excludes all the children who are living only with their father. To the extent that young children are far more likely to live with their mothers, even after marriage disruption, this is not too important a concern.

[7] We test the extent of the bias by tabulating the number of children in the household and the number of children ever born, which is available in the 1991 census. We find a small bias similar to that reported by Belanger and Gilbert (2003).

population for the years 1991, 1996, 2001 to follow cohorts of immigrant women through their first five years in Canada.

Finally, we also restrict the sample to those immigrants arriving in Canada as adults – at age 18 or older. This is because when analyzing the fertility of immigrants, it is important to consider only the fertile years that the immigrant spent in Canada. Immigrants arriving as children may have, to some extent, conformed to Canadian fertility values and norms by the time they reach their fertile years (Mayer and Riphalm, 2000; Adsera and Ferrer, 2010a and 2010b). Since our focus is on the fertility decisions surrounding immigrant arrival in Canada, it is natural to exclude the experiences of child immigrants, as they are not facing the trade-off between household and market time allocation faced by adult immigrants. Note that Canadian women are also restricted to be adults, hence providing an adequate comparison group.

The measure of fertility

The use of the own children method presents some difficulties when one wants to study fertility by years since migration, as children of different ages have been born at different stages of the mother's stay in Canada. An alternative is to confine the ages of the children to produce more precise estimates of current fertility (Ng and Nault, 1997). It is important to look at current fertility since fertility differentials can change substantially during short time intervals. This is particularly the case for immigrants, where each new entry cohort may have markedly different characteristics. Hence, in order to have an accurate measure of fertility decisions surrounding the time of immigration, we employ an indicator for the presence of an infant in the household (under one year of age) at the time of the Census. Infant fertility is a good indicator of current fertility choices and allows to track accurately yearly fertility decisions.

However, an additional goal in examining immigrant fertility at the time of arrival is to assess how this may influence the economic assimilation of immigrant women. We use a second (complementary) measure of fertility, namely the number of children of preschool age in the household. As young children are more likely to require time and resources from their mothers, this measure will indicate to what extent there are additional time resources to devote to the labour market. Therefore, large differences between the number of preschool age children in immigrant and Canadian-born households during the initial settlement years are likely to result in reduced economic outcomes for immigrant women and limited economic independence. Although this measure of fertility is less precise regarding when the child has

been born, it provides a useful measure of the burden of immigrant women to devote time to labour market, during the first years after arrival.

Census Data

Table A1 in the appendix provides summary statistics of our sample. It portraits the immigrant population as slightly older and better educated than the Canadian born. Female immigrants are also more likely to be married and have more children. These differences are increasing over the survey years. The table also illustrates the shift in country of origin that took place in the 1990s, with less immigrants arriving from the US and Europe and a higher fraction arriving from Asia, Africa and the Middle East. The average age at immigration is roughly constant across census years, between 26 and 27 years of age. This indicates that the average immigrant has stayed in Canada for around nine to ten years.

Panel (a) in table 1 reports the average number of infants (one year of age or less) by years since migration of the mother.[8] Canadian born females are also shown for comparison purposes. Table 1 contains raw figures; hence there is not control for mother's age or other determinants of fertility. Note, however, that since mean age at immigration does not change across the survey years (See table A1) considered here the results are not likely to be driven by differences in age across census years. Further evidence of this is provided in figure 1, which plots the average number of infants by age for the native born and immigrants arriving within 1, 2 3, 4 and 5 years. Fertility is substantially higher two or more years after migration for *all* ages at arrival that immigrants arriving two or more years ago.

On average (last column in Table 1), the fraction of infants peaks once the mother has stayed two years in the country and diminishes slightly after that. The growth in infant fertility between recently arrived immigrants and those with 2 years of stay in the country is about 83%. Looking at individual census years (columns 1 through 4) provides a sense of the importance of fertility changes over time. A change in trends becomes noticeable between 1991 and subsequent years. In 1991, the fraction of infants among very recent immigrant women rises only 2 years after migration, and keeps slowly increasing for women with a longer stay in Canada. In 1996, 2001 and 2006 censuses, on the other hand, infant fertility peaks two years

[8] The Census reports as the year of arrival the year at which the immigrant became a permanent resident. It is possible that the immigrant stayed previously in Canada as a temporary immigrant previously, which makes it difficult to ensure that a child born before the year of arrival has indeed been born outside Canada

after migration, and starts diminishing after. Further, the growth in fertility between women two years in Canada and those just arrived is much smaller for the 1991 census (28%) compared to subsequent years, when it typically doubles (100% growth in 1996, 91% in 2001 and 145% in 2006). The five year growth in fertility calculated using each Census year is shown in row 8, also indicates rising fertility every year with the exception of 2001. This likely reflects the end years of the 1991 economic downturn. Finally, the average number of infants born to "settled" immigrant women (those staying more than 5 years in the country) was lower than that of Canadian born females in 1991, but became similar for the years 1996 through 2006. Despite the yearly differences, cursory examination of the data suggests that there is some fertility disruption at the time of migration, at least in reference to the rapid growth in fertility shortly after. There is also evidence of significant changes in fertility between 1991 and the rest of the Census years. This is not surprising given the large changes in the composition of the immigrant population discussed above.

We pointed out how using a single cross-section to infer the evolution of immigrant fertility may be misleading. It is, however, possible to track down the entry cohorts in Table 1. For instance, immigrants entering the country during the 4 first months of 1991 will have been around 5 years in the country in 1996. The fertility outcomes for 1991 and 2001 entry cohorts, and their evolution after five years in Canada, are boxed in table 1. Following these cohorts, suggest a lower growth in fertility - during the first 5 years in Canada - for the 1991 cohort (39% - from 0.064 to 0.089 – versus 58% measuring across cohorts) and the 1996 cohort (49% versus 89%), but a higher growth in fertility for the 2001 cohort (70% versus 32%). These differences highlight the importance of controlling for cohort effects as they indicate that successive immigrant cohorts have different fertility behaviour during their first years of stay in Canada.

Panel (b) in table 1 shows similar figures for the number of school age children in the household. On average, the fraction of immigrant households with school age children is higher than that of Canadian born households at any given time since immigration except for households where immigrants arrived one year earlier or less. There have also been some changes over the census years regarding the speed at which pre-school child fertility has changed. For the cohort s we can track (the 1991, 1996 and 2001 entry cohorts), we note that the fraction of pre-school age children rose between 76% and 80% during the first five years in

the country. Even if immigrant women arrive on average with less pre-school age children and have, potentially more resources to devote to the labour market, they quickly surpass the native born in this regard. By the time they have spent five years in Canada they have almost twice as many children of pre-school children than the average Canadian born woman.

3. Immigrant fertility surrounding the time of arrival

3.1 Infants

The above results capture the average behavior of recent immigrant households according to the length of stay in the country. However, to understand immigrant fertility around the time of migration it is important to control for the effect of other determinants of fertility which are likely to influence fertility decisions. To this effect we estimate the probability of having an infant at different times since migration using a non-linear probabilistic model (probit) of the following form:

$$P(F_i = 1 \mid x_i) = \phi\{\alpha X_i + \beta \sum_{n=0.5}^{5} YSM_i^n + afterfive\} \quad (1)$$

where ϕ is the normal distribution function, F_i is an indicator variable for the presence of infants in household *i*, YSM_i^n are a series of indicators for *n* yeas since migration (from less than one to five) for the female in household *i*, *afterfive* is an indicator for immigrants that have spent more than five years in Canada, and X_i are the remaining controls of the female.[9] These include controls for mother's age, census survey year, geographical location (province indicators plus a rural area indicator) and cohort entry effects. As the evidence from Table 1 suggests, entry effects are important to isolate differences between immigrants arriving at different points in time. Entry effects will reflect the influence of factors such as changes in the economic conditions at the time of entry or changes in the composition of the entry cohort not considered elsewhere in the regression. There is some controversy in the literature about whether or not it is appropriate to include controls for income in the analysis of fertility. Income measures reflect in part the respondents' decisions to enter the labor force. Fertility and labor market decisions (which ultimately affect income) are so intertwined that it is not realistic to regard them as exogenous to one another. Females with strong preferences for work may also

[9] We opt for keeping these immigrants and control for their fertility decisions rather than eliminating them from the analysis because we are interested in comparing the results of recent immigrants with those that have been longer in the country.

have low preferences for child rearing, and this may introduce selection bias in our estimates.[10] Overall, considerations of joint labor market and fertility decisions require special modelling that is beyond the scope of this paper. In our case, we face the additional problem that the income measures we have are current measures and do not correspond necessarily to the time of birth. In these circumstances we deem preferable not to include income controls in our analysis and to stress the fact that we claim no causal interpretation to the reported coefficients.

Marital status is a standard control in fertility regressions. However, marital status is also potentially an endogeneous variable and including it in a regression might bias our estimates if unobserved characteristics influencing high preferences for fertility also affect the probability of being in a partnership. Further the determinants of marriage/partnership are likely to differ between immigrants and non-immigrants. We have again decided against controlling for marital status as the Census reports marital status at the time of the survey but not at the time the child is born or even at the time of entry. Instead we take advantage of the large samples in the Census to perform our analysis for a subsample of married or Common Law (CL) women. We initially report estimates for all women to show the differences and then confine the analysis to married-CL women.

Since estimates from nonlinear models have no easy interpretation, Table 2 reports the predicted probabilities by time since migration resulting from estimating equation (1).[11] Controlling for age, census year, location of residence and cohort entry effects, the probability of having an infant in the household is 0.036 for recently arrived immigrants (compared to 0.048 for Canadian born households with similar demographic characteristics). This probability peaks 2 years after immigration when it reaches 0.066 and slowly declines after that. For the subsample of married women, the probabilities are higher but trends are similar.

An interesting question is how the fertility of immigrants of different background evolves at the time of entry. The disruption model speculates that the length and magnitude of disruption

[10] The direction of the bias is not straightforward. To the extent that children are a normal good, females with more income may have more children, since they can afford to pay for the extra services involved in raising children. However, women may have higher incomes precisely because they reduced or postponed their fertility.

[11] Predicted probabilities calculate the probabilities using individual values of the covariates and averaging over the sample. They standardize the effect of a given amount of years since migration with the distribution of other covariates. The probabilities are comparable because only "years since migration" is changing across different probabilities. They are also representative of the sample because they use the individual's value of other covariates to evaluate the probabilities.

will be influenced by differences in economic opportunities between the host and the source country. To determine the different effect of source country on fertility disruption, we compute the probability of having an infant (relative to Canadian born households) for immigrant households coming from different areas of the world, reported in Columns 3 through 8, Table 2. We classify area of origin into six categories: US-Europe, South America, the Middle East, South Asia, Rest of Asia and Africa. Most immigrants follow the general pattern of rising number of infants peaking two or three years after migration. There are, however, significant differences across groups. Infant fertility for US-European immigrants continues to grow through the first five years in Canada, rather than "peaking" at two years after migration. South American and Middle East immigrants have initially similar higher fertility levels than the average immigrant, but infant fertility of South American immigrants does not rise as much, or as quickly as that of Middle Eastern immigrants. Asian immigrants present the lowest levels of fertility at all points during the first five years in Canada, with little variation after two years since migration. Within Asian immigrants, those from South Asia show a faster and large infant fertility growth during the first two years since migration. Finally, African immigrants show the highest levels of immigrant fertility, even during the initial years in the country.

The last row in table 2 computes the growth in the number of infants in the household between recent immigrants and those that have stayed in Canada more than 5 years. This measure highlights the extent of which immigration affects fertility (compared to the fertility in more settled immigrant households) after considering other factors such as mother's age, geographic location, survey year and cohort entry effects. To the extent that settling into a new country disrupts fertility, it provides a sense of the extent of such disruption, if taken the fertility of settled immigrants as reference. Asian immigrants experience the highest difference in this regard (over 200%), followed by immigrants from the Middle East. Other groups experience less difference with same origin settled immigrants than the average married immigrant.

An additional possibility worth exploring is to what extent these estimates change when we consider the education of the mother. Changes in immigration policy over the period of study increased the numbers of educated immigrants arriving in Canada. The stress on education and skills usually applies to the principal applicant (typically the husband in a couple). However, the education level of the spouses has also risen during these years (Sweetman and Warman, 2009). For instance, the fraction of female immigrants with non-

university post-secondary education (referred to as college education) or more went from 35% to 54% over the sample period (versus 31% to 42% for the native-born women). It is possible that better educated women have a higher opportunity cost of children, particularly during the initial years and defer fertility in order to offset the costs of immigration. If this were the case we would expect to see higher immigrant-native born differentials for educated women.

The interplay between education and fertility is a complicated one, affected by the same sort of problems that plague the interaction between fertility and labour market activity. To disentangle the effect of education and fertility, we would at least need information on maternal education at the time the child was born, which we do not have. We do, however, have information about the mother's education level at the time of the survey and we use this to simply estimate fertility separately for those with or without college education, without claiming any causality for these estimates. Table 3 shows the probability of having an infant for women with and without college education. This probability is higher for college educated women. This is likely due to differences in the age composition of the two samples – with educated women tending to be older – and the well-known tendency among educated women to differ childbirth. The patterns show some evidence of disruption effects, being lower immediately after migration. We find however no significant differences in relative (to similarly educated native-born women) fertility by education. [12] .

3.2 Pre-school children

We next look into the differential number of children under five in immigrant and Canadian born households. This measure of fertility, although less precise regarding at which time since migration the child was born, provides a more useful measure of the time resources immigrant women have to devout to labour market activities, during the first years after arrival.

To estimate this differential we use a Poisson model, as Ordinary Least Square is not appropriate when the dependent variable is a count variable as it is the case with the number of children under five. [13]

[12] We repeat the exercise using a sample of older women (21 and 25 years or older) and find the same patterns. For these exercises we restrict the immigrant population to arrive at 21 and 25 years of age to ensure that studies have been completed outside Canada (Ferrer and Riddell 2006)..

[13] A test of the goodness of fit test to assess the null hypothesis that the data are Poisson distributed and fail to reject the null.

$$F_i = \exp\{\gamma X_i + \beta \sum_{n=0.5}^{5} YSM_i^n + after5 + \varepsilon_i\} \quad (2)$$

where, as before, F_i is the measure of fertility (number of children under five years of age in the household *i), YSM_i* measures years since migration for the female in household *I, after5* is an indicator for immigrants that have spent more than five years in Canada, and X_i are the remaining controls (mother's age, census year, geographical location and cohort entry effects).

For ease of interpretation, rather than reporting the coefficients of the Poisson model, we report incident rate ratios (IRR). The IRR is the effect of a one unit change in the independent variable on the relative incidence rate of fertility of foreign born relative to the reference category (the Canadian born). For the central variables in this analysis, those indicating a particular time since migration, the relative incidence rate can also be interpreted as the percentual difference in the number of children under five for immigrants that have spent so many years in Canada relative to the Canadian born. For instance, in the case of the indicator for arriving less than a year ago, *"l.t.1"*, the relative incidence is computed as:

$$IRR(\mathrm{Lt1_i}) = \frac{\mathrm{E(F_i \mid Lt1_i = 1)} = \exp(\hat{\gamma}X + \hat{\beta}(1))}{\mathrm{E(F_i \mid Lt1_i = 0)} = \exp(\hat{\gamma}X + \hat{\beta}(0))} = \exp(\hat{\beta})$$

We report the IRR of our basic model in Table 4. The first column uses all women between 18 and 45 years of age (labeled "All immigrants") and the column labelled "Married immigrants" refers to a specification run on the subsample of married women. The native born are the reference group in both cases. Relative to them, there are less pre-school aged children in immigrant households, 77% the amount in native-born households for immigrants with less than one year of stay. The gap diminishes with years spent in the country, reverses at three years since migration, and by the fifth year in the country, there are 38% more pre-school children in immigrant households. These results is consistent with that initially observed in Table 1 and suggests that age, location and year and cohort entry effects explain a substantial part of the variation in the number of children 5 years or under by year since migration. For married women the pattern is the same, although the gap is much larger initially, 58% the amount in native-born households among recent arrivals. Married immigrants only show similar numbers of pre-school aged children than the native born after five years in Canada. This would suggest

that married immigrants have potentially more time resources to devote to the labour market than the native born at the time of arrival.

As outlined in the introduction, a low number of infants or young children in the household upon arrival could be the result of the changes in selection policy that favor more skilled immigrants and therefore could be associated with lower desired fertility among new immigrants. However, one would also expect the switch in the country of origin towards South Asian and African migration to increase immigrant fertility. To determine the generality of the results outlined in column (II) we expand the model introducing an interaction between the indicators for years since migration and indicators for broad area of origin. The resulting IRR are shown in Table 2, panel (III) and represented graphically in Figure 1. The differences even across such broad areas of origin are striking. Women from China-North Asia appear to have fewer children five or under upon arrival (only 35% the number in similar native-born households). Further, even five years after migration, these households still have only 89% the amount of pre-school children than similar native-born households. The number of children 5 or under in US-Europe, Middle East and South Asian households upon arrival is slightly over half that in native-born households. This difference decreases with time upon arrival at different paces (slower for US-European women, faster for Middle Easter or South Asian women). Women from South America and Africa show the largest number of children five 5 or under upon arrival among immigrants, but still 73% and 87%, respectively, the number of pre-school children in native-born households. By the fifth year after migration African and south Asian women show a substantial increase in the number of children five or under (27% and 9% more children respectively) than similar native born. Middle Eastern and South American women seem closer to the native-born benchmark, while women from Us-Europe or China-Asia are substantially below native-born levels. Immigrants from the Middle East and South Asia have, upon arrival, roughly the same number of pre-school children as similar native-born women. Over the first five years in Canada the differences with the reference group increase, ending with 15% (Middle East women) and 18% (South Asian women) more children aged 5 or younger than in Canadian born households.

3.4. Timing to birth

Timing is an important aspect of fertility analysis. How long does it take for women to have their first child and how far apart successive births are, arise as a complementary questions to that of the number of children women have. This analysis relies in the use of duration models which estimate the risk of a certain event happening over time. The hazard function (λ) is defined as the event rate at time *t* conditional on survival until time *t* or later (that is, $T \geq t$),

$$\lambda(t)\,dt = \Pr(t \leq T < t + dt \mid T \geq t) = \frac{f(t)\,dt}{S(t)} = -\frac{S'(t)\,dt}{S(t)}$$

, where the survival function (*S)* is the probability that the time of the event is later than some specified time.We characterize λ using the Cox proportional hazard models of the timing of births. For woman *i* who enters a state of risk of a certain event at time t = 0, the (instantaneous) hazard ratio of exit (e.g., first birth) at time t>0 is assumed to take the following form:

$$\lambda_{it} = \lambda_0(t)\ exp(X'_{it}\,\beta) \qquad (1)$$

where $\lambda_0(t)$ is the baseline hazard function; *exp*(.) is the exponential function; X_{it} is a vector of covariates summarizing woman's characteristics at time *t*; and β is a vector of parameters to be estimated.

Because we are interested in fertility around the time of migration, we look at the probability of the first birth occurring within the period starting two years before and up until to four years after the year of migration. Since the Census does not record the month of immigration, the dependent variable is measured in years. In our basic model we include the total number of previous children, the age and gender of the previous child, as well as controls for the census year as covariates in the model. We report the corresponding survival functions starting two years before migration.[14] The estimated hazard ratios for all models are reported in Table A2 in the appendix. Standard errors are obtained using a grouped robust variance estimator as described in Lin and Wei (1989).

Table 5 shows the survival fertility of married immigrant women around the time of migration using the basic model (that is, the percentage of women that did not have a child at each point in time). The slope of the survival function indicates the speed at which a birth arrives around the time of migration. We are, however, interested in changes in the slope of the survival function around this time, therefore we report beside the estimates, the yearly change in the survival fertility. Overall, there is some indication that fertility accelerates somewhat around

the time of immigration, as indicated by the steeper slope of the survival function at this point. The yearly change in survival fertility drops from -6 percentual points before migration to -11 percentual points for the year of immigration. This kink suggests that there might be a reduction in fertility immediately before and during the early stages of migration.

We have checked the robustness of this result by adding other controls to the model: education, cohort effects, place of birth, and age at immigration. Accounting for these factors does not change the observed pattern.. However, when we add age at immigration as a control to the basic model (column (II), table 5) the observed "kink" in the survival function becomes slightly more pronounced, suggesting that age at arrival is an important determinant of the timing of immigrant fertility. For this reason, we next look at survival fertility stratified by age at immigration (arriving at age 20 to 24; 25 to 29; 30 to 34; and 35 to 45), that is allowing different baseline hazard functions for each group. Results are shown in Figure 2 (See also Table 6). Substantial changes in the slope of the survival function around migration are found for the younger arrivals, with the reduction in survival fertility for the youngest immigrants going from a drop of 6 to a drop of 13 percentual points. Those immigrating in their late 20s also show a substantial increase in the speed of fertility (from a drop of 8 to a drop of 13 percentual points). The survival functions for immigrants arriving over thirty years of age are, in contrast, quite linear. There is nevertheless differences in the survival fertility for immigrants arriving in their earlier 30s (faster) and those arriving at a later age (slowest), which are likely related to the age of the women rather than to the migration process itself. Again, adding controls for education, place of birth or cohort entry effects does not change these estimated hazards.

Finally, to assess the influence of cultural background on the timing of fertility we have stratified the hazard rates by broad area of origin (US-Europe, Middle East, South Asia, Rest of Asia and Africa). Results, shown in Figure 3 (See also Table 7), indicate that although all immigrants experience some change in the speed of fertility around migration time, the result seems to be driven by South Asian immigrants, particularly during the first year of migration. This group moves from a drop in the survival probability of 7 percentual points for the years before migration to a drop of 17 percentual points at migration time. Immigrants from the rest

[14] We have also considered additional time before migration (3 years) but the results do not change substantially.

of Asia and Africa also show significant changes in the speed to first birth at the time of migration relative to the years before migration.[15] [16]

Conclusion

We have examined the fertility of immigrants around the time they arrive to Canada. In general, the number of infants in immigrant households, upon arrival, is lower than in native-born households. However, after five years in Canada, immigrants have higher numbers of infants than the Canadian born, with equality occurring around the second year after migration. Once we restrict the sample to married-CL (at the time of the survey) individuals, similar rates of infants between immigrant and native-born households only happen 5 year after arrival (or more). The larger differential in current fertility between married individuals is probably linked to differences in marriage propensities between Canadian and immigrant women and its implications for fertility. For instance, it could be the case that marriage/partnership status in Canadian culture is more strongly associated with fertility than among immigrants. Hence restricting the sample to married-CL women will increase the fertility differences, particularly considering that marriage/partnership rates are higher among immigrants. We are also able to isolate the influence of culture on fertility, using broad area of origin. African and Middle Eastern immigrants show higher current fertility while other groups show lower current fertility earlier after arrival than the Canadian born. These estimates provide evidence of significant differences in fertility preferences upon arrival, measured by differential fertility outcomes with respect to the native born. They also suggest some degree of fertility disruption, taking as reference immigrants form the same area of origin that are more settled in the country.

We also look into the number of children of pre-school age to assess the woman's potential to devote resources to the labour market. Married immigrant women have similar or less pre-school aged children even after five years in Canada. Again, disaggregating by broad area of origin, reveals substantial differences: African and South Asian women have

[15] We have estimated the models without controlling for age at immigration, which is a potentially endogenous variable, and seen no change in the speed of fertility.

[16] For the years 2001 and 1991, we also have information about religion. We have re-estimated the hazard function, stratifying by religion (Christian, Muslim, Hindu/Sikh, No religion and Other Religion) for those two years. The results indicate that the largest change in the slope of the survival function around migration occurs for the Hindu/Sikh denomination. This is consistent with our results based on majoritarian religion in broad areas of origin.

significantly more children five or under, while women from US-Europe and elsewhere in Asia have substantially less. This analysis suggests that around 22% of recent immigrant households (those from Africa and South Asia) have a larger burden than the native born in terms of available time resources to put into labour market activities, while other immigrants have similar or lower demands on their time.

This paper highlights the importance of a deeper understanding of immigrant fertility. The increasing dependence on immigration to sustain population growth and social services demands more accurate measures of fertility able of considering the changing composition of the immigrant population. Our focus on the years surrounding the arrival of immigrants, stresses the connection between fertility and immigrant women availability for paid work. It suggests another channel that can potentially explain the lower levels of economic assimilation among recent immigrants to Canada. The higher fertility among African and South Asian immigrant women means a much higher opportunity cost for work. These results indicate areas of future research to gain a better understanding of the interplay between fertility and work for immigrant women and its contribution to the well-being of immigrant families..

References

Adsera, A. 2004. "Changing Fertility Rates in Developed Markets: The Impact of Labor Market Institutions." *Journal of Population Economics* 17: 17-43.

Anderson, G. 2004 "Childbearing after Migration: Fertility Patterns of Foreign-Born Women in Sweden." *International Migration Review* 38 (2): 747-74

Becker, G. 1981. *A Treatise on the Family*. Cambridge, MA: Harvard University Press,.

Bélanger, A., and S. Gilbert. 2003. "The Fertility of Immigrant Women and Their Canadian-Born Daughters." *Report on the Demographic Situation in Canada 2002*, 91-209.

Bélanger, A., L. Martel, and É. Caron-Malenfant. 2005. "Population Projections for Canada, Provinces and Territories 2005-2031." Statistics Canada catalogue No. 91-520-XIE.

Blau, F.D. 1992. "The Fertility of Immigrant Women: Evidence from High Fertility Source Countries." In *Immigration and the Work Force: Economic Consequences for the United States and Source Areas*, edited by G.J. Borjas and R.B. Freeman, 93-133. Chicago: UCP.

Blau, F.D., L . Kahn, A. Yung-Hsu Liu, and K.L. Papps. 2008. "The Transmission of Women's Fertility, Human Capital and Work Orientation across Immigrant Generations." *NBER* working paper no. 14388.

Borjas, G. 1999. "The Economic Analysis of Immigration" In *Handbook of Labour Economics*, North Holland, vol. IIIA, Ashenfelter O.C. and D. Card, editors.

Chiswick, B.R. 1978. "The Effect of Americanization on the Earnings of Foreign-Born Men." *Journal of Political Economy* 86 (5): 897-922.

Cho, L.J., R.D. Retherford and M. Choe, 1986. "Own children Method of Fertility Estimation" (Honolulu: University of Hawaii Press, 1986)

Choi, K. (2011) "Fertility Patterns in the Context of Mexican Migration to the United States:Childbearing Before and After Migration" CCPR Working paper series PWP-CCPR-2011-004

Coleman, D. and S.Dubuc (2010) "The fertility of ethnic minorities in the UK, 1960s-2006" Population Studies, 64(1) pp.19-41

Coleman, D. 2006. "Immigration and Ethnic Change in Low-Fertility Countries, Demographic Transition." *Population and Development Review* 32 (3): 401-46.

Goldstein, S. and A. Godlstein 1981. "The Impact of Migration on Fertility: an 'Own Children' Analysis for Thailand"Population Studies vol.35(2), pp.265-84

Fernandez, R., and A. Fogli. 2006. "Fertility: The Role of Culture and Family Experience." *Journal of the European Economic Association.*

Ferrer, A.M., D. Green, and W. Craig Riddell. 2006. "The Effect of Literacy on Immigrant Earnings." *Journal of Human Resources* 41 (2): 380-410.

Ferrer, A.M and W. Craig Riddell. 2006. "The Effect of Literacy on Immigrant Earnings." *Canadian Journal of Economics* 41 (2): 380-410.

Hervitz, H.M. 1985. “Selectivity, Adaptation, or Disruption? A Comparison of Alternative Hypotheses on the Effects of Migration on Fertility: The Case of Brazil.” *International Migration Review* 19, 293-317.

Jense, E. and D. Ahlburg (2004) “ Why does migration decrease fertility? Evidence from the Philippines?” *Population Studies* vol 58 (2), pp.219-31

Kahn, J. 1994. “Immigrant and Native Fertility during the 1980s: Adaptation and Expectations for the Future.” *International Migration Review* 28 (3): 501-19.

Kalbach,W. 1970. “The Impact of Immigration on Canada's Population.” Queen's Printer, Ottawa.

Mayer, J. and R. Riphahn (2000) “Fertility assimilation of immigrants: Evidence from count data models”, *Journal of Population Economics* 13 (2): 241-261

Ng, E., and F. Nault. 1997. “Fertility among Recent Immigrant Women to Canada, 1991: An Examination of the Disruption Hypothesis.” *International Migration* 35 (4): 559-80.

Ram, B., and M.V. George. 1990. “Immigrant Fertility Patterns in Canada, 1961-1986.” *International Migration* 28 (4): 413-26.

Stephen, E. and F. Bean. 1992. “Assimilation, Disruption, and the Fertility of Mexican Origin Women in the United States”. International Migration Review 26(1): 67-88.

Sweetman, A.and Warman, C., 2009. “Temporary Foreign Workers and Former International Students as a Source of Permanent Immigration,", *CLSRN Working Papers* 34, UBC

White, M. L. Moreno and S. Guo, 1995. “The Interrelationship of Fertility and Geographic Mobility in Peru: A Hazard Model Analysis” International Migration Review 29(2):492-515

Woldemicael, G. and R. Beaujot 2010, “Fertility Behavior of Immigrants in Canada: Converging Trends”, Discussion Paper No. 10-05, PSC University of Western Ontario

Table 1. Raw Fertility by year since migration [1]

	(a) Average fraction of infants in the household [2]				
	Year				
	1991	1996	2001	2006	Average
Native born	0.055	0.049	0.043	0.046	0.048
Years since migration					
Less than 1 year	0.064	0.047	0.053	0.042	0.052
1 year	0.063	0.060	0.066	0.069	0.065
2 year	0.082	0.094	0.101	0.103	0.095
3 year	0.088	0.088	0.092	0.101	0.093
4 year	0.100	0.086	0.077	0.089	0.087
5 year	0.101	0.089	0.070	0.090	0.086
5 year growth	58%	89%	32%	143%	65%
More than 5 years	0.041	0.047	0.046	0.045	0.045
	(b) Average number of pre-school children in the household [3]				
Native born	0.268	0.258	0.226	0.226	0.244
Years since migration					
Less than 1 year	0.251	0.228	0.260	0.208	0.237
1 year	0.245	0.247	0.270	0.257	0.255
2 year	0.296	0.285	0.327	0.318	0.306
3 year	0.360	0.343	0.362	0.384	0.362
4 year	0.444	0.397	0.366	0.414	0.403
5 year	0.528	0.446	0.410	0.459	0.452
More than 5 years	0.274	0.299	0.306	0.304	0.297

(1) Women 18 to 45 years of age. Immigrants are adult immigrants (older than 18) at the time of arrival

(2) Infants are children under 1 year of age

(3) Pre school age children are children 5 years of age or younger.

Table 2. Predicted Probability of having an infant [(1)]
By YSM

			Married women					
	All women	**Married women**	**US Europe**	**South America**	**Middle East**	**China-N.Asia**	**South Asia**	**Africa**
NB	0.048	0.078	0.076	0.076	0.076	0.076	0.076	0.076
Immigrants								
Time in Canada								
Less than 1 year	0.036	0.039	0.037	0.048	0.046	0.016	0.018	0.078
1 year	0.044	0.047	0.033	0.049	0.059	0.025	0.034	0.094
2 year	0.066	0.075	0.053	0.066	0.088	0.050	0.063	0.126
3 year	0.065	0.073	0.056	0.065	0.091	0.050	0.052	0.117
4 year	0.062	0.072	0.056	0.061	0.087	0.051	0.053	0.114
5 year	0.062	0.073	0.058	0.064	0.085	0.054	0.056	0.105
More than 5 years	0.055	0.062	0.049	0.054	0.078	0.050	0.035	0.106
Observations	1,372,620	914,590	615,215	543,085	585,230	552,695	566,010	519,895
Disruption *	53%	59%	32%	13%	70%	213%	94%	40%

Each column shows the predicted probability of having an infant in the household in different models.

(1) The first column uses the whole sample of 18 to 45 year old women and controls for age, geographical location and census year and entrance cohort effects
(2) The second column uses a subsample of married women, using the same controls
(3) Columns 3 to 8 uses a subsample of married women from the area of origin specific at the top of the column using the same controls

(*) Growth in the number of infants in the household between recent immigrants and those that have stayed in Canada more than 5 years

Table 3. Predicted Probability of having an infant
By YSM and education

	(I) Non-College	(II) College
Canadian born	0.069	0.088
	(0.000)	(0.000)
Immigrants – YSM		
Less than one year	0.035	0.045
	(0.000)	(0.000)
1 year since migration	0.043	0.055
	(0.000)	(0.000)
2 years since migration	0.068	0.085
	(0.000)	(0.000)
3 years since migration	0.063	0.086
	(0.000)	(0.000)
4 years since migration	0.062	0.084
	(0.000)	(0.000)
5 years since migration	0.062	0.084
	(0.000)	(0.000)
More than 5 years	0.056	0.073
	(0.000)	(0.000)

Each column shows the predicted probability of having an infant in the household for married women, 18 to 45 years of age. Immigrants are adult immigrants (older than 18) at the time of arrival

Includes controls for age, location, survey year and cohort entry effects.

Column (I) uses women with less than college education and column (II) uses women with college education

Table 4. IRR for the number of Pre-school age children in the Household (Poisson estimates)

	(I)	(II)	(III) by area of birth (married)					
	All	Married	US-Europe	South America	Middle East	China-N. Asia	South Asia	Africa
Less than 1	0.768	0.580	0.557	0.728	0.571	0.352	0.521	0.868
	(0.000)	(0.000)	(0.000)	(0.000)	(0.591)	(0.000)	(0.203)	(0.000)
1	0.808	0.590	0.533	0.716	0.616	0.381	0.556	0.848
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.167)	(0.000)
2	0.952	0.713	0.636	0.785	0.758	0.471	0.699	0.985
	(0.222)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
3	1.117	0.830	0.732	0.877	0.865	0.600	0.825	1.125
	(0.006)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
4	1.230	0.926	0.800	0.970	0.948	0.686	0.936	1.229
	(0.000)	(0.054)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
5	1.377	1.048	0.924	1.030	1.059	0.845	1.094	1.269
	(0.000)	(0.243)	(0.061)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
More than 5	1.334	0.973	0.851	0.938	1.011	0.888	0.900	1.190
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

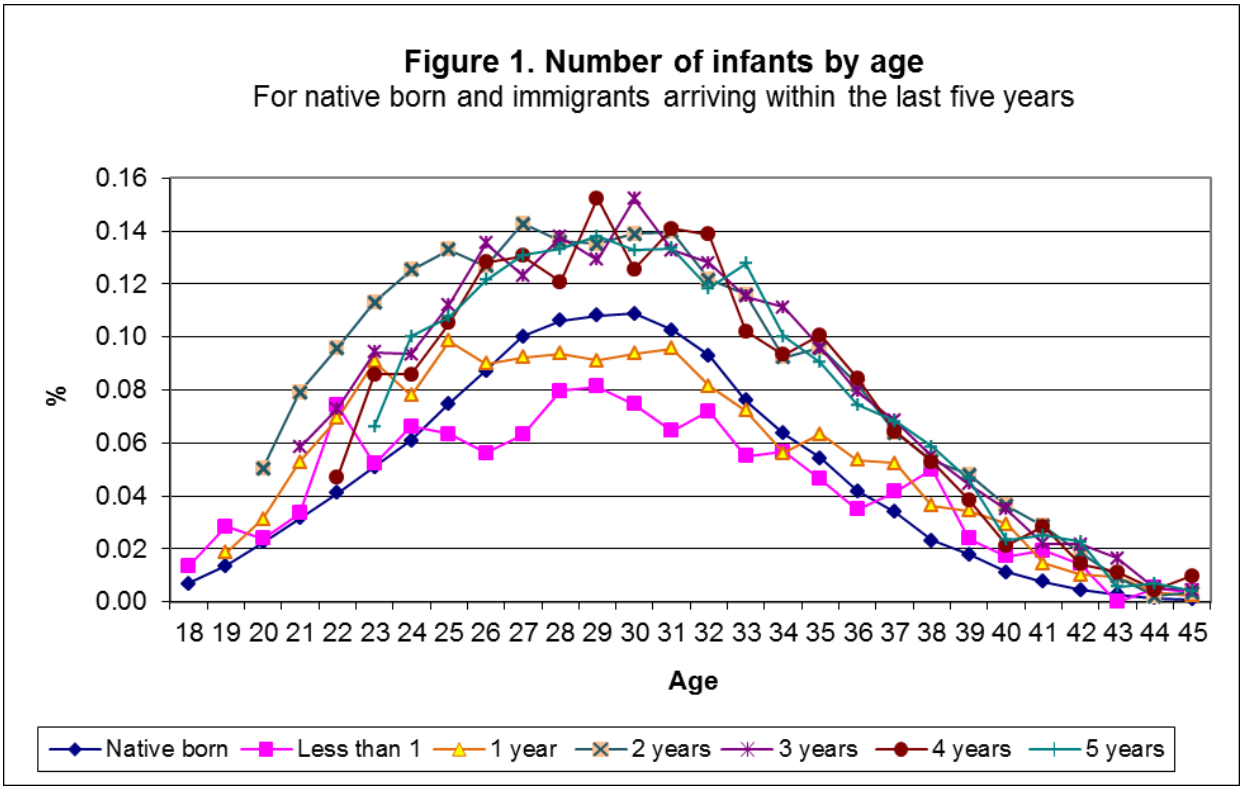
Columns (I) and (II) show the IRR for the number of pre-school age children (0 to 5 years of age) in immigrant households with a given length of stay in Canada, relative to Native born households. Estimated over the full sample and the sub-sample of married women respectively. The regression includes controls for age, province and rural area, year of survey and cohort entry effects.

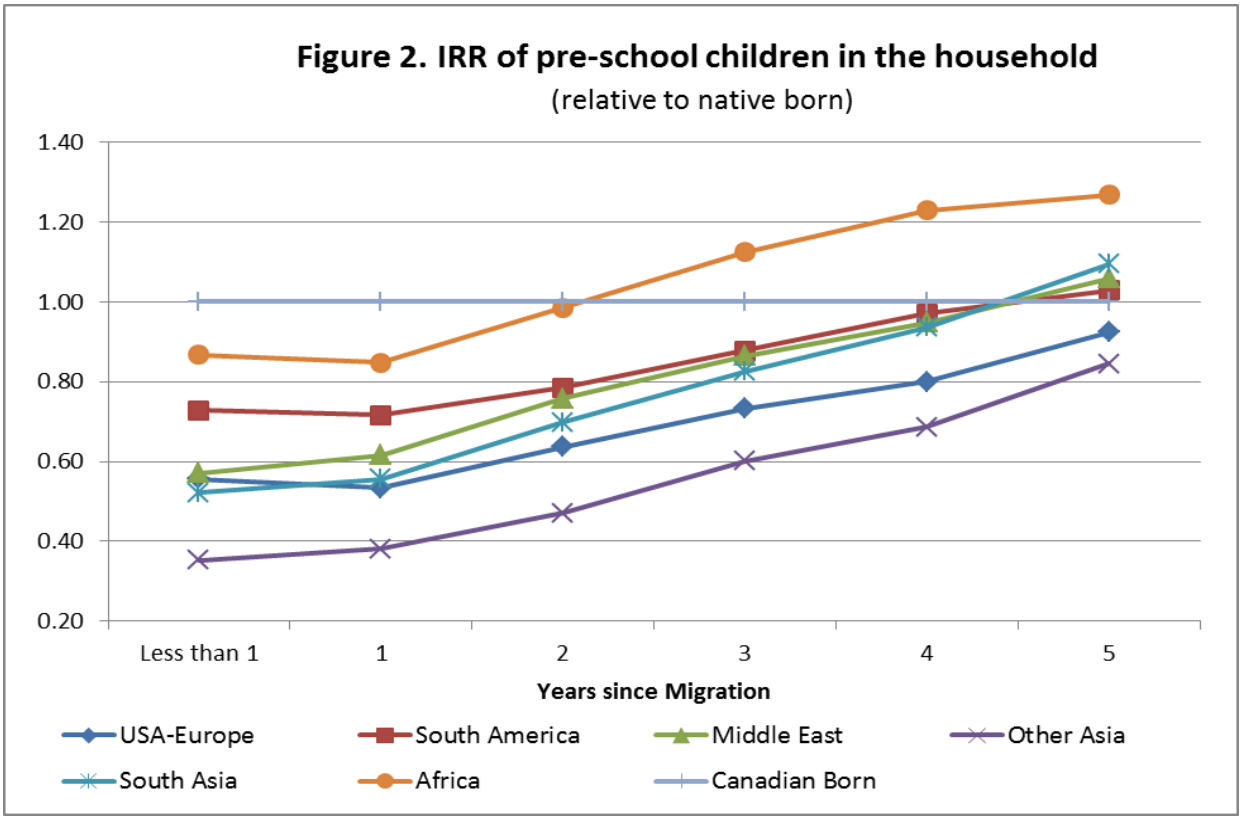
Columns in Model (III) show the IRR for the number of pre-school age children (0 to 5 years of age) in immigrant households with a given length of stay in Canada and from a given area of origin, relative to Native born households The regression (estimated over a subsample of married women) includes controls the above controls plus the interaction of time since migration indicators and area of origin indicators. Represented in Figure 1.

Table 5. Survival fertility of Married Immigrants

	(I)		(II)	
	Survival	Yr change	Survival	Yr change
2 yrs before	0.94		0.93	
1 yr before	0.87	-0.06	0.86	-0.07
Migration	0.76	-0.11	0.74	-0.12
1 yr after	0.67	-0.10	0.64	-0.10
2 yrs after	0.59	-0.08	0.55	-0.08
3 yrs after	0.52	-0.06	0.49	-0.07
4 yrs after	0.47	-0.05	0.43	-0.06

(I) Includes basic controls (age, number of children, age of previous child, gender of previous child, survey year and rural area)
(I I) Includes basic controls + Age at immigration
See Table A2, columns for Figure 2





Controls for age, location, survey year, and cohort entry effects. Married women

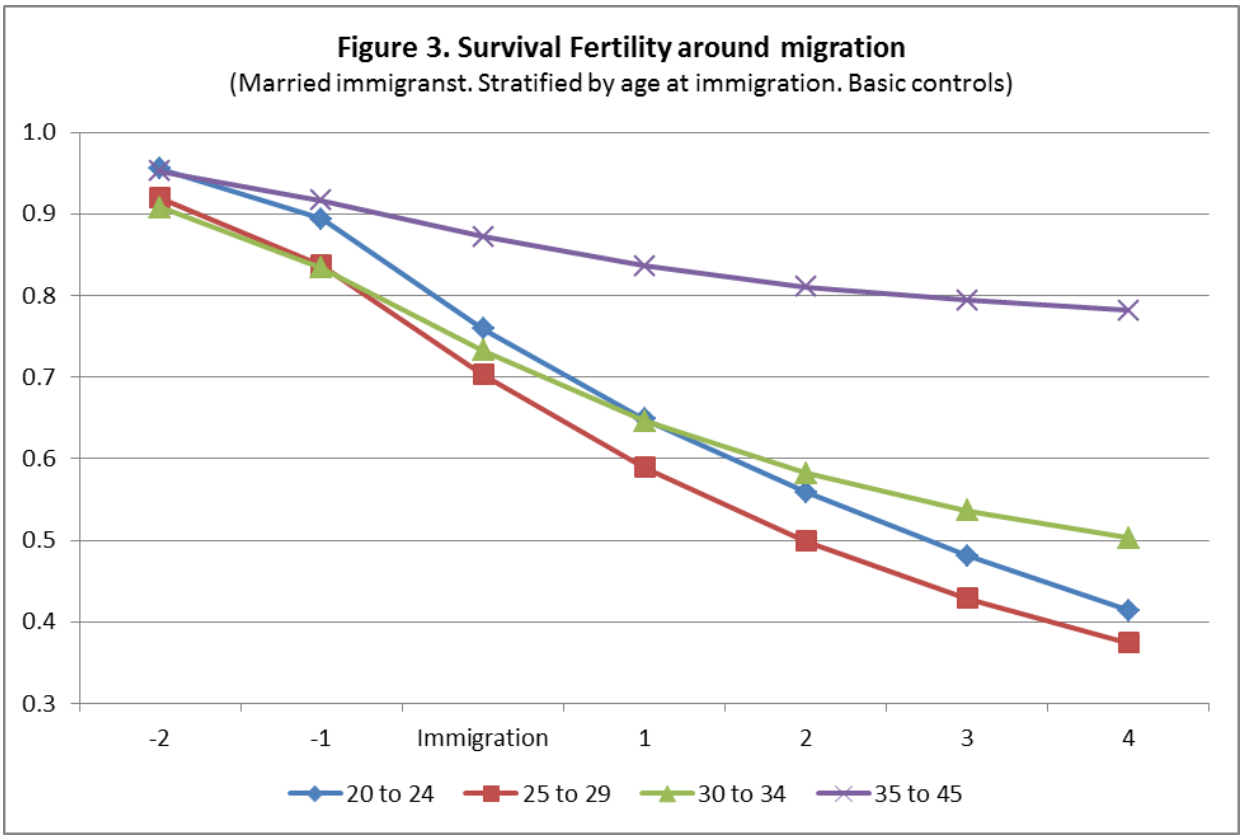


Table 6. Survival Fertility of Married Immigrants (Stratified by age at immigration)

	20 to 24		25 to 29		30 to 34		35 to 45	
	Survival	yr change	Survival	yr change	Survival	yr change	Survival	yr change
2 yrs before	0.96		0.92		0.91		0.95	
1 yr before	0.89	-0.06	0.84	-0.08	0.83	-0.07	0.92	-0.04
Migration	0.76	-0.13	0.70	-0.13	0.73	-0.10	0.87	-0.04
1 yr after	0.65	-0.11	0.59	-0.11	0.65	-0.09	0.84	-0.04
2 yrs after	0.56	-0.09	0.50	-0.09	0.58	-0.06	0.81	-0.03
3 yrs after	0.48	-0.08	0.43	-0.07	0.54	-0.05	0.79	-0.02
4 yrs after	0.41	-0.07	0.37	-0.05	0.50	-0.03	0.78	-0.01

Includes basic controls (age, number of children, age of previous child, gender of previous child, survey year and rural area). See Table A2, column for figure 3

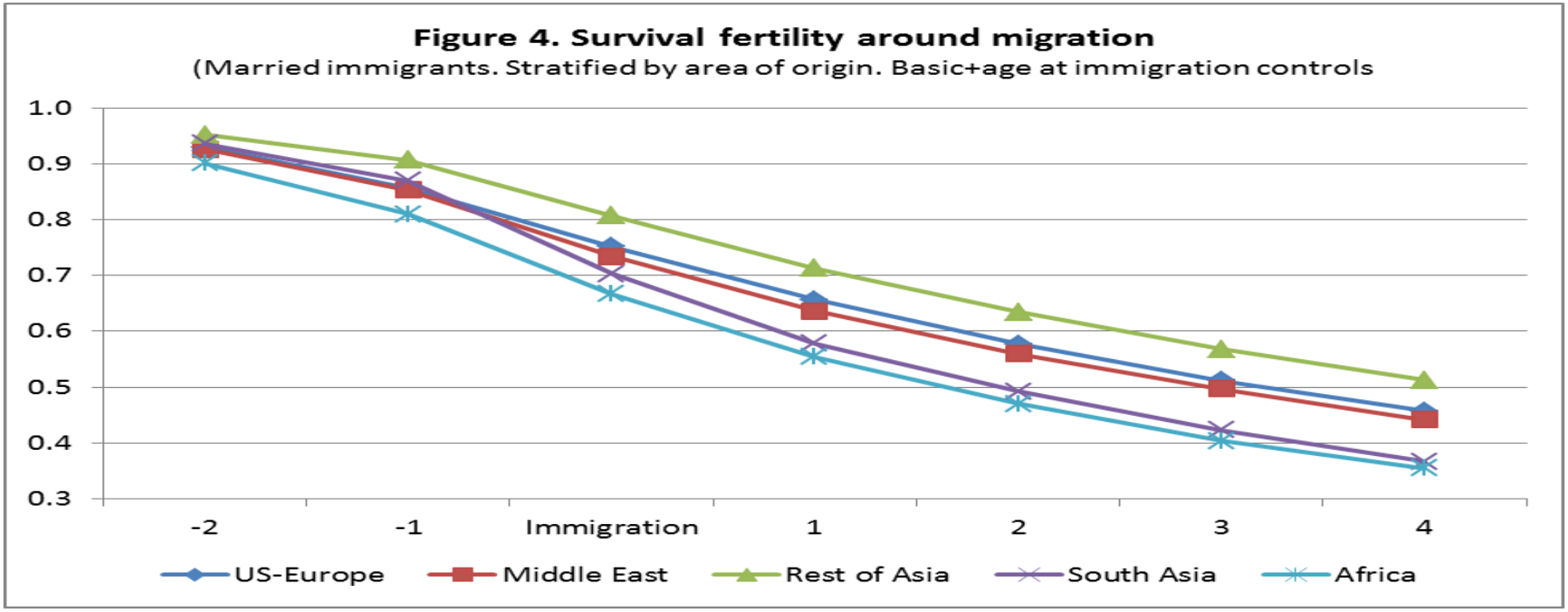


Table 7. Survival Fertility of Married Immigrants (Stratified by area of origin)

	US-Europe		Middle East		Rest of Asia		South Asia		Africa	
	Survival	yr change	Survival	yr change	Survival	yr change	Survival	yr change	Survival	yr change
2 yrs before	0.93		0.93		0.95		0.94		0.90	
1 yr before	0.86	-0.07	0.85	-0.07	0.91	-0.05	0.87	-0.07	0.81	-0.09
Migration	0.75	-0.10	0.73	-0.12	0.81	-0.10	0.70	-0.17	0.67	-0.14
1 yr after	0.66	-0.09	0.64	-0.10	0.71	-0.09	0.58	-0.12	0.55	-0.11
2 yrs after	0.58	-0.08	0.56	-0.08	0.63	-0.08	0.49	-0.09	0.47	-0.08
3 yrs after	0.51	-0.07	0.50	-0.06	0.57	-0.07	0.42	-0.07	0.40	-0.07
4 yrs after	0.46	-0.05	0.44	-0.05	0.51	-0.06	0.37	-0.06	0.35	-0.05

Includes basic controls (age, number of children, age of previous child, gender of previous child, survey year and rural area) + Age at immigration. See Table A2, column for figure 4

Appendix

TABLE A1. Sample Summary Statistics (Sample selection: older than 18; adult immigrants. Weighted)

	All				1991				2006			
	Canadian Born		Immigrant		Canadian Born		Immigrant		Canadian Born		Immigrant	
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Age	31.93	8.05	35.73	6.38	31.46	7.67	35.64	6.57	32.00	8.35	36.03	6.26
College	0.42	0.49	0.49	0.50	0.34	0.47	0.37	0.48	0.48	0.50	0.60	0.49
Married	0.60	0.49	0.77	0.42	0.64	0.48	0.78	0.41	0.56	0.50	0.79	0.41
Young Children	0.19	0.39	0.25	0.43	0.21	0.41	0.24	0.43	0.18	0.38	0.26	0.44
Infants	0.05	0.21	0.06	0.23	0.05	0.23	0.06	0.23	0.04	0.21	0.06	0.24
Years since Migration												
Less t. 1 year			0.03	0.18			0.04	0.20			0.03	0.17
1 year			0.08	0.27			0.09	0.29			0.08	0.27
2 year			0.08	0.26			0.08	0.27			0.07	0.26
3 year			0.07	0.26			0.07	0.25			0.07	0.26
4 year			0.07	0.26			0.06	0.24			0.07	0.25
5 year			0.06	0.25			0.04	0.20			0.08	0.26
More than 5			0.60	0.49			0.61	0.49			0.60	0.49
Area of origin												
USA-Europe			0.27	0.44			0.37	0.48			0.21	0.41
South and Central America			0.14	0.35			0.16	0.37			0.12	0.33
Middle East			0.23	0.42			0.16	0.36			0.24	0.43
Other Asia			0.14	0.35			0.11	0.32			0.15	0.36
South Asia			0.15	0.36			0.15	0.36			0.19	0.39
Africa			0.07	0.25			0.05	0.22			0.09	0.28
Age at immigration			26.97	6.10			25.94	5.92			27.51	6.01
	3,902,385		546,455		928,035		113,115		1,083,720		157,760	

Table A2. Time to first birth between 2 years before and 4 years after migration. Hazard ratios

	Figure 2 (Common Hazard)		Figure 2 (Common Hazard)		Figure 3 (Stratified by Age at Immigration)		Figure 4 (Stratified by Area of Birth)	
	Hazard	P-value	Hazard	P-value	Hazard	P-value	Hazard	P-value
N. Children	0.660	0.000	0.769	0.000	0.767	0.000	0.752	0.000
Age prev. child	1.008	0.000	1.006	0.000	1.008	0.000	1.007	0.000
Prev. child-girl	1.150	0.000	1.197	0.000	1.184	0.000	1.209	0.000
Age (omitted 40-45)								
20 to 24	0.907	0.000	0.821	0.000	0.890	0.000	0.784	0.000
25 to 29	1.091	0.000	0.941	0.000	0.942	0.000	0.915	0.000
30 to 34	1.232	0.000	1.035	0.000	1.010	0.116	1.023	0.000
35 to 39	1.201	0.000	1.074	0.000	1.058	0.000	1.070	0.000
Year (omitted 2006)								
Year 1991	1.117	0.000	1.082	0.000	1.077	0.000	1.101	0.000
Year 1996	1.041	0.000	1.041	0.000	1.040	0.000	1.061	0.000
Year 2001	0.990	0.126	0.994	0.336	0.994	0.366	1.005	0.392
Rural	1.142	0.000	1.127	0.000	1.130	0.000	1.150	0.000
Age at Immigration(omitted 20 to 24)								
25 to 29			1.153	0.000			1.175	0.000
30 to 34			0.904	0.000			0.936	0.000
35 to 45			0.371	0.000			0.388	0.000
Observations					324,110			

Hazard ratios (and robust P-values) on the risk of birth around migration time, corresponding to figures 2, 3 and 4.

TABLE A3. Classification of Countries by Region of Origin

South America: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Falkland Islands (Malvinas), French Guiana, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela, Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Cuba, Dominican Republic, Haiti, Puerto Rico, Jamaica, Trinidad and Tobago, Guadeloupe, Martinique, Bahamas, Barbados, Netherlands Antilles, Saint Lucia, Saint Vincent and the Grenadines Virgin Islands, US Grenada , Antigua and Barbuda, Dominica, Cayman Islands, Aruba, Anguilla, Bermuda, Montserrat, Saint Kitts and Nevis Turks and Caicos Islands, British Virgin Islands

US-Europe: US, Austria, Belgium, Germany, Liechtenstein, Luxembourg, Monaco, Netherlands, Switzerland, France, : Greenland, Denmark, Finland, Iceland, Norway, Sweden, Bulgaria, Czech Republic, Slovakia, Czechoslovakia, n.i.e., Hungary, Poland, Romania, Estonia, Latvia, Lithuania, Belarus, Moldova, Republic of Russian, Albania Federation, Ukraine, USSR., n.i.e., Bosnia and Herzegovina, Croatia, Slovenia, Yugoslavia, Andorra, Gibraltar ,Greece, Italy, Malta, Portugal, San Marino, Spain, Vatican City State, Macedonia, Ireland, Republic of (Eire) United Kingdom

Middle East: Afghanistan, Cyprus, Iran, Turkey, Armenia, Azerbaijan, Georgia, Kazakstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, Bahrain, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, United Arab Emirates, Yemen, Palestine/West Bank/Gaza Strip

Rest of Asia (and the pacific): People's Republic of China, Hong Kong, Macao, Mongolia, Japan, Korea, North Korea, South Taiwan, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Singapore, Thailand, Vietnam, American Samoa, Australia, Cook Islands, Fiji, Polynesia, New Caledonia, New Zealand

Southern Asia: Philippines, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka

Africa: Algeria, Egypt, Libya, Morocco, Tunisia, Sudan, Western Sahara, Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea, Gabon, Sao Tome and Principe, Zambia, Zaire, **:** Benin, Burkina Faso, Côte d'Ivoire, Cape Verde, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo, Botswana, Lesotho, Namibia, Republic of South Africa, Swaziland, Eritrea, Uganda, Sudan, Kenya, Tanzania, Rwanda, Burundi, Somalia, Djibouti, Ethiopia, Comoros, Madagascar, Malawi, Mauritius, Mayotte, Mozambique, Reunion, Seychelles, Zimbawe