

Persistence and change of the relative difference in educational attainment by ethno-cultural group and gender in Canada

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Abstract

This article presents analytical findings on the persistence and change of the relative difference in educational attainment by ethno-cultural group and gender in Canada. As these trends cannot be observed from a single data source, a modelling technique to integrate longitudinal data lacking ethno-cultural detail with cross-sectional Census data was developed. First- and second-generation immigrants and/or members of most visible minority groups on average reach higher educational levels than their Canadian-born peers not belonging to a visible minority. This study reveals that the relative educational differences between the studied groups are both important in extent and remarkably stable over birth cohorts. The research presented in this paper was conducted in the context of Statistics Canada's population projection microsimulation model Demosim. Demosim marks an important milestone in establishing microsimulation for official population projections. It reflects the demand for models which can go beyond age and sex, capturing geographical detail, ethnic diversity, educational attainment and other characteristics.

1 Introduction: the context of this study

This article presents analytical findings on the persistence and change of the relative difference in educational attainment by ethno-cultural group and gender in Canada. As these trends cannot be observed from a single data source, a modelling technique to integrate longitudinal data lacking ethno-cultural detail with cross-sectional Census data was developed.

The research presented in this paper was conducted in the context of Statistics Canada's population projection microsimulation model Demosim (Caron Malenfant 2009; Statistics Canada 2010) where it provided the foundation for

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scenario development and model implementation concerning educational attainment. In this contribution we focus entirely on past trends and data integration issues which we believe are interesting by themselves apart from the overall aim of contributing to the development of a detailed population projection microsimulation model.

In the remainder of this introductory chapter, we briefly discuss the multi-layered context of this paper, starting with Canada's multiculturalism and the increasing demand of policy-makers for more detailed projections which can account for the increasing diversity of the Canadian population. Demosim responds to this demand, and in Demosim, education constitutes an important variable both as a characteristic by itself and as a variable entering key demographic behavioural equations. From a methodological point of view, our study has to be considered in its broader context of being part of a microsimulation modelling exercise which shaped its specific aims and thus the type of analysis, rather than being a pure analytical study. A discussion of implications and limitations arising from this fact concludes this chapter.

Multiculturalism is a central element of the Canadian identity, explicitly mentioned in the country's constitution. According to the high priority given to issues of anti-discrimination and the successful integration of newcomers and visible minorities, information on ethno-cultural characteristics is routinely collected in all (5-year) population Censuses in accordance with the Employment Equity Act. According to the 2006 Census, 16.2% of the Canadian population belonged to the visible minority population on the national level, a number now reaching or having passed 50% in some larger metropolitan areas, such as Toronto or Vancouver (Statistics Canada 2008). The visible minority population is increasing quickly; between 2001 and 2006, it grew by 27.2%, which is five times faster than the increase for the population as a whole. Three-quarters of the immigrants who arrived between 2001 and 2006 belonged to a visible minority group.

Another important minority group (not considered a visible minority according to Canadian terminology) is the Aboriginal population. About 3.75% of the Canadian population are of 'aboriginal identity'; i.e. these people reported identifying with at least one Aboriginal group, either North American Indian, Métis or Inuit (Statistics Canada 2009a). In Demosim we further distinguish between registered and non-registered North American Indians, a distinction usually corresponding to living on or off reserves.¹

Because of the various public policy implications of the rapid changes in the composition of the Canadian population, the Multiculturalism and Human Rights Branch at the Department of Canadian Heritage (this branch is now with Citizenship and Immigration Canada) commissioned Statistics Canada in 2004 to produce regional projections of the population of visible minority groups,

¹ 54% of the Aboriginal identity population is registered North American Indian, again according to the 2006 Census.

immigrant status, religion and the population with neither English nor French as a mother tongue (Statistics Canada 2010, p. 3). Demosim can be viewed as the second and extended edition of this project (initially named PopSim), commissioned 2008 by the Department of Canadian Heritage, Human Resources and Skills Development Canada and Citizenship and Immigration Canada. An analytical report of this project summarising its simulation results was published recently (Statistics Canada 2010) and received wide press coverage. From a technical point of view, this project marks an important milestone in establishing microsimulation for official population projections. By applying microsimulation rather than the traditional cohort-component approach, Demosim allows a level of detail in its projection that goes far beyond the age-sex-region framework of classical population projections. With respect to ethno-cultural groups, Demosim distinguishes amongst eleven visible minorities and four Aboriginal groups as well as the remaining mainstream population. All ethno-cultural groups are constructed from self-reported census information. One of the innovations of Demosim compared to the earlier PopSim model is its inclusion of education.

Over the last several decades Canada has experienced a considerable educational expansion. With each successive birth cohort, the proportion of those graduating from high school and attaining post-secondary education has increased. While this upward trend can be observed for all ethno-cultural groups, the relative differences between groups turn out to be remarkably persistent over many decades. Both the general educational expansion and the differences between population groups alongside various characteristics, including sex, ethnicity, socio-economic status and parents' education, are common patterns observed in many countries; these patterns are also frequently accounted for in microsimulation models, including the Canadian LifePaths model (Spielauer 2009a) and the Austrian Famsim+ model (Spielauer 2004). The study of educational differentials along such lines is a very active field of study in Canada, supported by specialised survey programs, most noticeably the Youth in Transition Study (HRDC & Statistics Canada 2000), a longitudinal survey collecting detailed information from both a cohort of PISA (Bussière et al. 2006) participants (age 15 at wave 1) and a cohort of youth, initially 18-20 years old, over 3 waves, respectively 4 years. A vast body of recent literature was generated by this survey (for a recent collection of papers, see Finnie et al. 2008), concentrating mostly on socio-economic status, parents' education, parents' occupations and immigration status as covariates in education decisions. So far, relatively little attention has been given to educational attainment by detailed visible minority group; this gap was identified explicitly in a recent literature review by Müller et al. (2008).

In an international comparison, Canada distinguishes itself by the fact, that virtually all native-born visible minority groups on average reach higher education levels than the White population. Interestingly, this also holds true for visible minority groups for which the average education is below average for

first-generation immigrants (e.g. south-eastern Asian). Besides the main goal of our research—the construction of a microsimulation model—our analytical findings add a longitudinal dimension to the existing literature, a dimension which cannot be detected by the analysis of a single survey alone.

Being part of a population projection project has several implications for our study of education progression in Canada. From an analytical point of view, we are still limited to a relatively small, specific set of variables, i.e. covariates which are projected into the future by Demosim. In comparison with pure analytical studies, we have to emphasise predictive power over detail, which also implies the choice of basing the analysis on the most representative (rather than detailed) data. The goal of our analysis is not the test of theory; instead, we are more on a quest to identify stable patterns over time which can be transformed into plausible projection scenarios. In this regard, our efforts have so far been rewarded—we found not only that there were considerable differences in educational pattern by ethno-cultural group and gender but also that these differences were remarkably persistent over time. There are exceptions to this finding, most notably the Black population, for which high-school and university graduation rates increased faster than for the overall population, surpassing the rates for the population average since the 1960 birth cohorts.

This paper begins with a discussion of the underlying data issues and of our modelling approach. Given the nature of available datasets, we had to use alignment methods as part of the estimation process, an issue requiring some explanation. These alignment procedures as well as the Demosim model itself were programmed in the generic microsimulation programming language Modgen, developed and maintained by Statistics Canada (2009b).

The paper then presents the overall education trends by gender and place of birth, as well as relative differences in education progression probabilities between ethno-cultural groups.

Note that some caution is advised concerning the interpretation of analytical results. A drawback of the present approach is that it delivers only central estimates. As this is all that was required for the purpose of population projections, no measures of statistical reliability were developed (and thus no such measures are included herein). This is not deemed to be a shortcoming for the results presented in this paper, however, given that the educational and ethno-cultural information was collected from a 20% sample of the Canadian population (the long form of the general Census).

2 Data issues

The main data source of the Demosim project is the 2006 Census which, after various imputations, is also used as the starting population of the population projection. The Census is also central for the modelling of education.

Unfortunately, inconsistencies between Census waves impede a synthetic cohort approach. Changes in the phrasing and organisation of questions on education in the Census lead to a steep increase in reported diplomas almost independent of age; thus the modelling of educational progression cannot be based on Census data of different waves. On the other hand, no single survey contains all of the required information, i.e. ethno-cultural information and education biographies. For education biographies, we selected the General Social Survey (GSS) of 2001 as the best available data source (Statistics Canada 2002). This wave of GSS contains retrospective histories on education, but no information on ethno-cultural background (while the latter was included in the 2006 follow-up wave of GSS, education biographies were discontinued). We are therefore unable to estimate models from one single data source but rather have to find ways of combining the cross-sectional information of the Census with the longitudinal information contained in GSS. This is done by alignment techniques described in section 4.

3 Cross-sectional differences in the educational composition

The cross-sectional differences between ethno-cultural groups (we selected the 1976-1980 cohorts in the 2006 Census for comparison) can be summarised by the following observations:

- In the Canadian-born population, using high-school graduation or university graduation rates as indicators, all visible minority groups reach higher education than the mainstream White population. With respect to visible minorities, all Asian groups except South-East Asians score highest. Whites are close to the national average. The four Aboriginal groups display far lower graduation rates.
- Females on average reach higher levels of education. This holds true both for Canadian-born and immigrant (except for Arab) females.
- Immigrants have higher education levels than Canadian-born individuals. White immigrants are again close to the average.

Around 20% of the Canadian population of the considered cohort belong to a visible minority group, an equally large proportion of the population are foreign-born; of the foreign-born population, around 70% belong to a visible minority.

Figure 1:
Educational composition of the 1976-1980 cohorts, Canadian-born (census 2006)

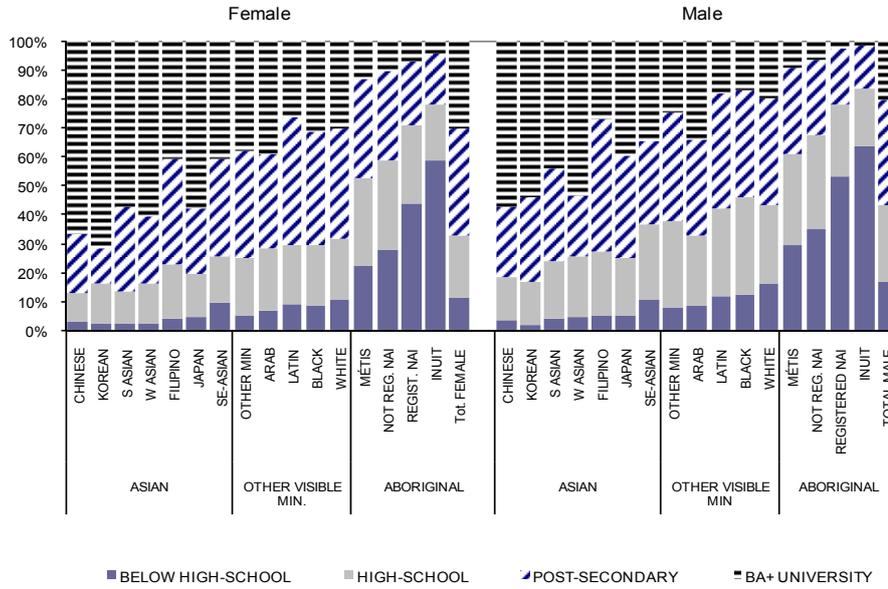
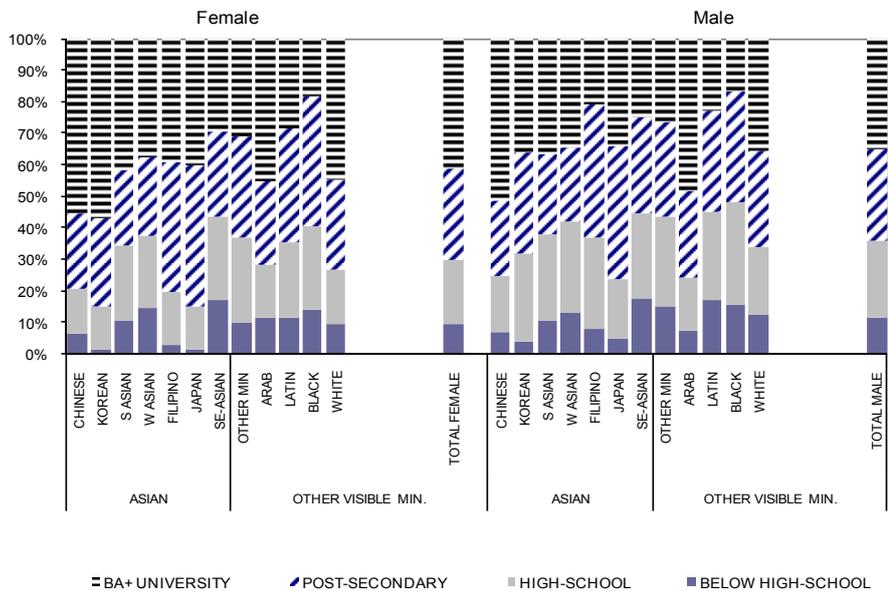


Figure 2:
Educational composition of the 1976-1980 cohorts, foreign-born (census 2006)



4 The modelling approach

Technically, the goal of this study is to find a model which produces yearly probabilities of educational progression differentiating between four levels: below high-school, high-school, non-university post-secondary education and university graduations (BA or above). Individual characteristics are cohort, sex, birth in Canada or abroad, year of last graduation and ethno-cultural group.

As a first step we estimate six discrete time logistic event history models from GSS which constitute the basis for the modelling of education progression. These six models break down into:

- Three models for high-school graduation. Due to differences in cohort trends we distinguish between first chance graduations (i.e. those attained between ages 16-20), second chance graduations (attained between ages 21-25) and adult graduations;
- Two simultaneous models for the first post-secondary diploma, either a non-university post-secondary graduation or a BA;
- One model for obtaining a BA diploma after a non-university post-secondary graduation.

These models serve as a ‘standard surface’ of education progression probabilities by cohort and age (respectively time since last graduation in the case of post-secondary studies) and are estimated separately by sex and place of birth. For high-school graduation we found that cohort factors can be closely approximated by a logarithmic trend; for the other models we use a piecewise-linear trend.

Our models so far do not contain factors for the separate ethno-cultural groups, as such parameters cannot be estimated directly from GSS. To solve this problem we follow an alignment approach. The idea is to find relative factors (log odds) for each cohort and ethno-cultural group which—when added to our models—result in an exact match of cross-sectional educational attainment calculated from our longitudinal models and the Census targets.

The procedure we follow in order to obtain relative factors and the necessary assumptions of this approach can be summarised as follows:

- We assume that cohort trends estimated from GSS data continue until the Census year 2006 and project the (unaligned) educational composition in 2006 by birth cohort, sex and place of birth in each of our six longitudinal models.
- We then compare the projected educational composition of each population group with the composition found in the Census and search for alignment factors which, when introduced as additional factors (log odds) into the logistic regression models, lead to an exact match of simulated and observed data. This ‘first-round’ alignment is an overall alignment, not yet distinguishing the different ethno-cultural groups. For each birth cohort, sex and place of birth we have to find a set of three alignment factors: one for

high-school graduation, the second for non-university post-secondary graduation, and a third for obtaining a BA. To obtain these factors we use numerical simulation techniques. This alignment round can also be interpreted as a test of consistency between the two data sources: in the optimal case, alignment factors would be very close to zero and reflect random sampling variations in the survey rather than systematic differences.

- In a second alignment round we then search for an additional set of factors for each ethno-cultural group (again by cohort, sex and place of birth). This additional alignment leads to an exact match of the modelled educational composition with Census data for each ethno-cultural group. A necessary assumption of this step is that, for a given cohort, the relative differences between groups remain constant over the cohort's lifetime, e.g. the same group-specific log odds, apply at each year of age. A second assumption is that the age baselines are fixed over all cohorts and ethno-cultural groups (but can vary between sexes and places of birth).

The search algorithms to find alignment factors were implemented in Modgen, the same language used for the implementation of Demosim itself. The alignment program produces model generated parameter tables (a Modgen concept) based on the parameterisation of the longitudinal models and the census targets.

For a person of given sex, place of birth and birth cohort the probability of obtaining a high-school diploma at a given age can be expressed as a function of the log odds estimated by logistic regression $f(\text{age}, \text{cohort})$:

$$p = \frac{1}{1 + e^{-f(\text{age}, \text{cohort})}}$$

The probability of having a high-school diploma in 2006 thus can be expressed as:

$$PROB_{2006} = 1 - \prod_{\text{age}=16}^{\text{age in 2006}} \left(1 - \frac{1}{1 + e^{-f(\text{age}, \text{cohort})}}\right)$$

First-round alignment forces this equation to produce a target probability $TARGET_{2006}$ by finding a correction term c :

$$TARGET_{2006} = 1 - \prod_{\text{age}=16}^{\text{age in 2006}} \left(1 - \frac{1}{1 + e^{-f(\text{age}, \text{cohort}) - c}}\right)$$

Second-round alignment forces the equation to produce a target probability $VISMINTARGET_{2006}$ for a specific ethno-cultural group by adding an additional alignment factor v :

$$VISMINTARGET_{2006} = 1 - \prod_{\text{age}=16}^{\text{age in 2006}} \left(1 - \frac{1}{1 + e^{-f(\text{age}, \text{cohort}) - c - v}}\right)$$

Both alignment factors can be interpreted as additional proportional parameters (log odds) of the logistic expression equation.

The search for alignment factors follows the same idea for all types of graduation, but is technically more challenging for post-secondary studies as we

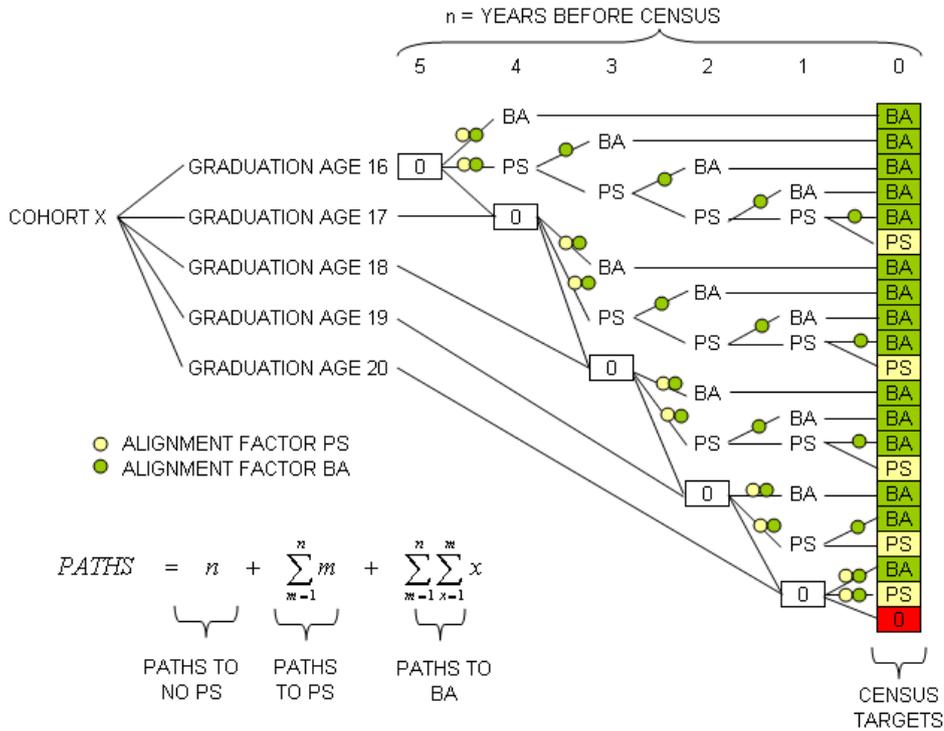
have to deal with simultaneous processes: the probability of graduating from university alters the probability of graduation from a non-university post-secondary program, and vice versa. Given the variable high-school graduation dates, we have to align a weighted set of trees of alternative pathways to post-secondary diplomas. To be able to find a solution to this problem, we assumed that the same alignment factors apply both in the process of direct and indirect university graduation (i.e., obtaining a BA directly after high-school or after another non-university postsecondary diploma). For the two simultaneous processes (direct BA and non-university post-secondary diploma), the periodic probabilities of one type of diploma depend on the probability of obtaining the other type. In this case, periodic probabilities can be obtained from logistic regression models $f(\text{period}, \text{cohort})$ and $g(\text{period}, \text{cohort})$ by the formulas:

$$p_1 = \frac{e^{f(\text{period}, \text{cohort})}}{1 + e^{f(\text{period}, \text{cohort})} + e^{g(\text{period}, \text{cohort})}}$$

$$p_2 = \frac{e^{g(\text{period}, \text{cohort})}}{1 + e^{f(\text{period}, \text{cohort})} + e^{g(\text{period}, \text{cohort})}}$$

As was the case with high-school graduation, we have to find first- and second-round alignment factors which fit the overall and group-specific Census targets in 2006. Figure3 illustrates the tree of possible pathways for a person who graduated 5 periods before 2006 at age 16. Note that during the alignment of these processes, we have to deal with a weighted set of such trees of possible pathways, as high-school graduation can occur at different ages. These weights can be calculated from the aligned high-school graduation probabilities. The alignment factors for both post-secondary diploma types have to be found simultaneously, as the alignment of one process also affects the other.

Figure 3:
Alignment of post-secondary pathways



5 General trends in education progression

For high-school graduation, we found that the cohort factors can be closely approximated by logarithmic trends, i.e. the increase of high-school graduation rates levels off for younger cohorts. This is especially true for first-chance graduations. For second-chance graduations, we found a steeper trend; especially for females, second-chance graduation became common only for recent cohorts. Figures 4 and 5 display the cohort trends estimated from GSS data, both using yearly cohort dummies, and approximated by a logarithmic trend variable. The graphs also show the trends after the first-round alignment: relatively little alignment is necessary for Canadian-born individuals, while graduation rates are systematically higher in the Census than in GSS for immigrants, especially for younger cohorts.

In comparison to high-school graduations, no levelling-off effects can be detected so far with respect to post-secondary graduations. For all three differentiated processes we find differences between Census and GSS data: reported non-university graduations are systematically higher in the Census, whereas slightly more BA diplomas are reported in GSS. An interesting feature of post-secondary trends is the increase in slope around the 1960 cohorts found especially for the Canadian-born population.

Seen together with the shape of the trend in high-school graduations the educational expansion in Canada can be described as a three-step process. First, we observe a very steep increase in high-school graduations among the pre-1960 cohorts with rather stagnant post-secondary trends (for BA's we even find a falling trend for males). Second, for post-1960 birth cohorts, trends for university graduations get steeper and thereby, third, also start crowding out other non-university diplomas.

Figure 4:
Estimated and aligned cohort trends for ‘first chance’ high-school graduations

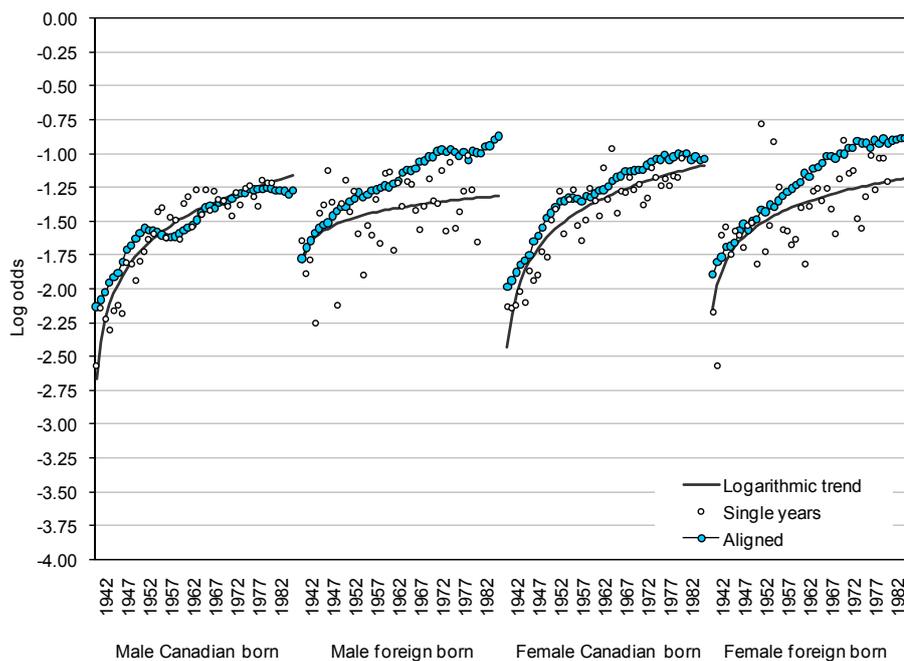


Figure 5:
Estimated and aligned cohort trends for ‘second chance’ high-school graduations

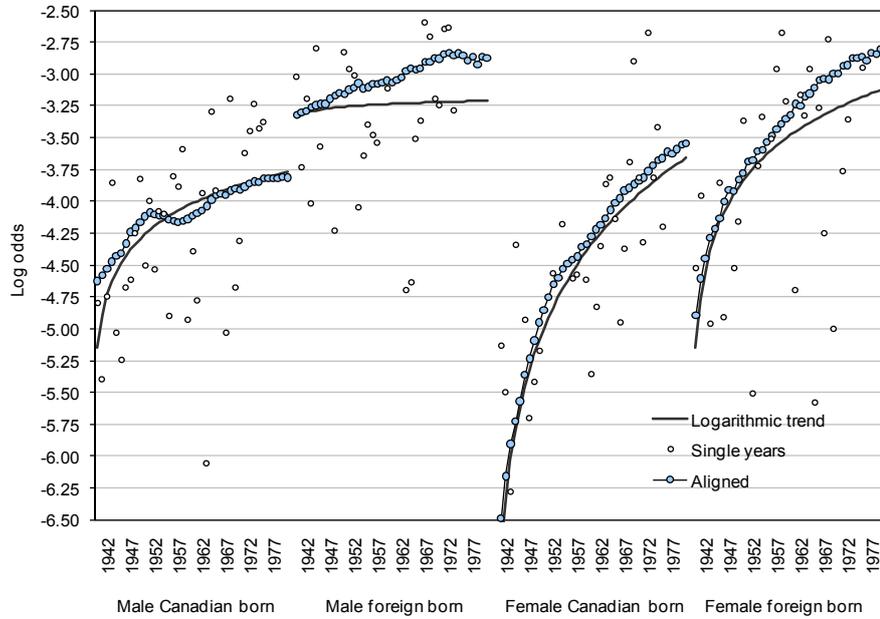


Figure 6:
Estimated and aligned cohort trends for post-secondary graduations below BA

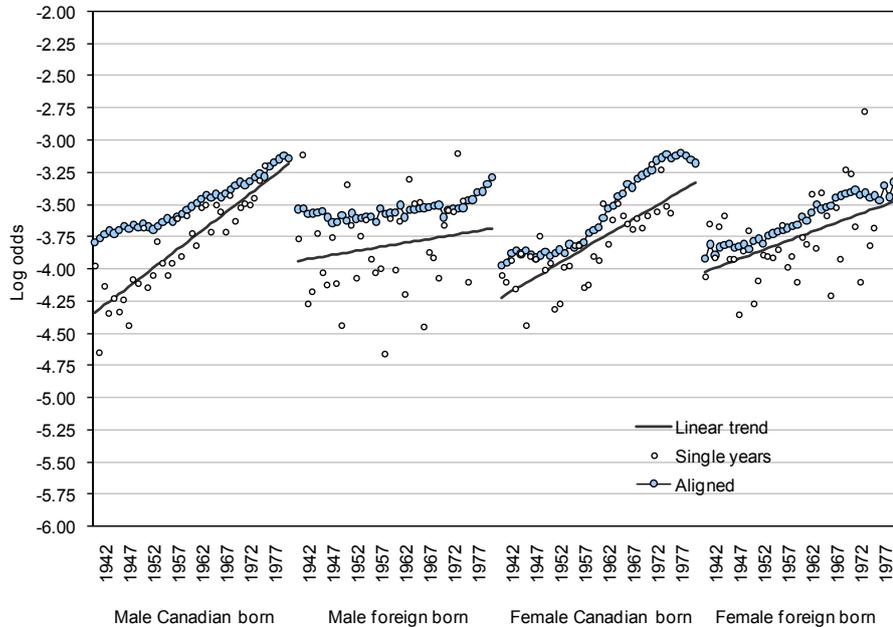


Figure 7:
Estimated and aligned cohort trends for ‘direct’ BA graduations

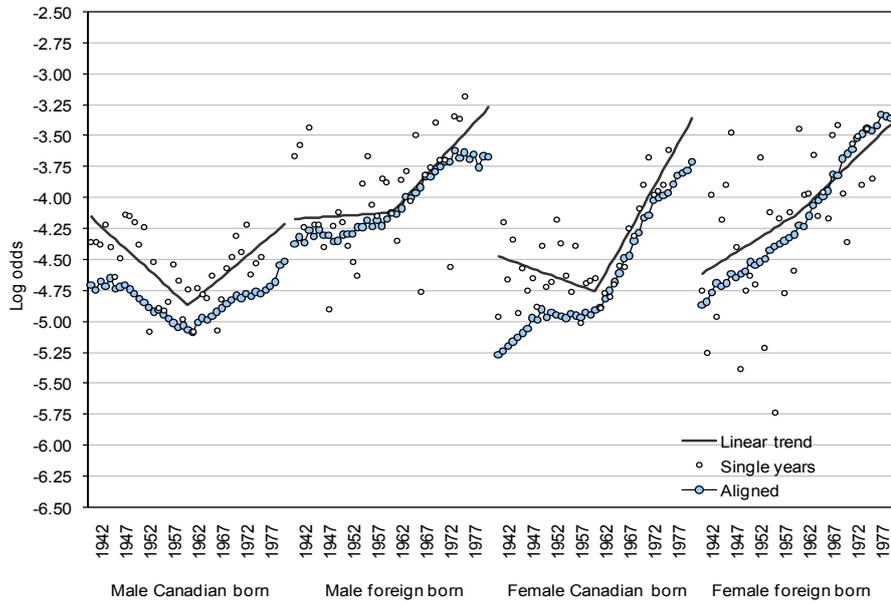
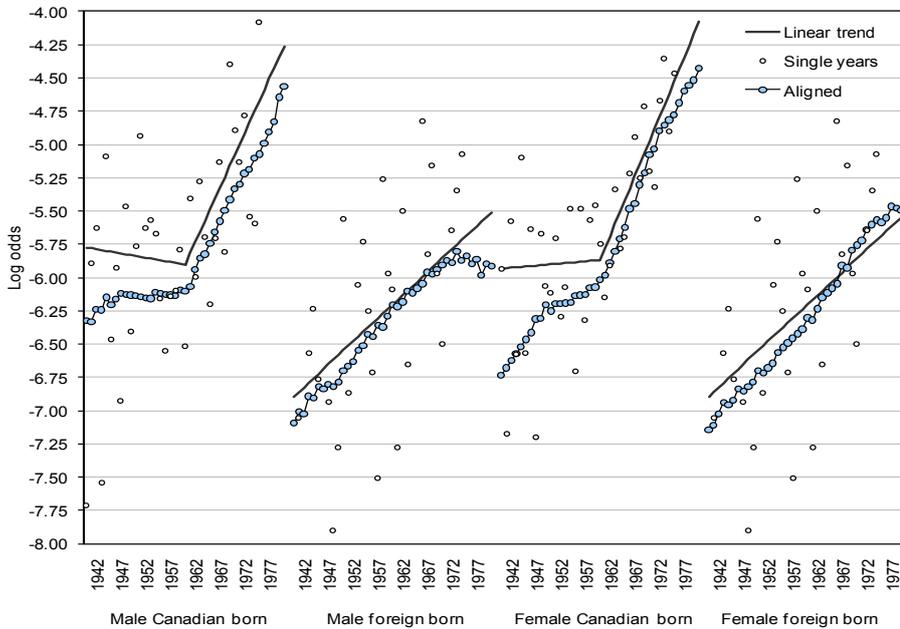


Figure 8:
Estimated and aligned cohort trends for BAs after other postsecondary diplomas



6 Ethno-cultural and gender differences

In this section we extend our study on differences between ethno-cultural groups by adding a longitudinal dimension: how did the relative differences (expressed as log odds) in graduations evolve over cohorts?

Technically this analysis comprises the second-round alignment as outlined above: we searched for cohort series of alignment factors which, when added to the first-round alignment, make the longitudinal models match the group-specific education composition of the 2006 Census. We obtain a set of three alignment factors (high-school, post-secondary below BA, BA) per birth cohort for each of the 16 separate ethno-cultural groups, with further breakdowns of results for each of the four sub-populations by sex and place of birth. The full result of this exercise is available in the form of 168 cohort series of alignment factors in Spielauer (2009b); in this section we limit ourselves to highlighting some of the main patterns. Note that some components of the observed trends may be coming from selection effects, e.g. selective out-migration from Canada.

6.1 High-school graduation

The following graphs (Figure 9 and Figure 10) on high-school graduations of selected ethno-cultural groups of the Canadian-born population emphasise the central finding of this analysis: the persistence of differences over all 50 compared birth cohorts from, from 1940 to 1990. The Chinese, who can be seen as representative of most Asian visible minority groups, range on top with almost constant log odds of 0.7 (equivalent to an odds ratio of 2:1 to the average population). The groups with the lowest high-school graduation rates are the four Aboriginal groups: again we observe no time trends.² The eleven visible minority groups perform better than the average population (which closely coincides with the White population).

² The odds ratio between White and Inuit lie around 1:5; for all Aboriginal groups together the ratio mirrors the ratio of Chinese with around 1:2.

Figure 9:
Relative differences (log odds) in high-school graduation: Canadian-born males

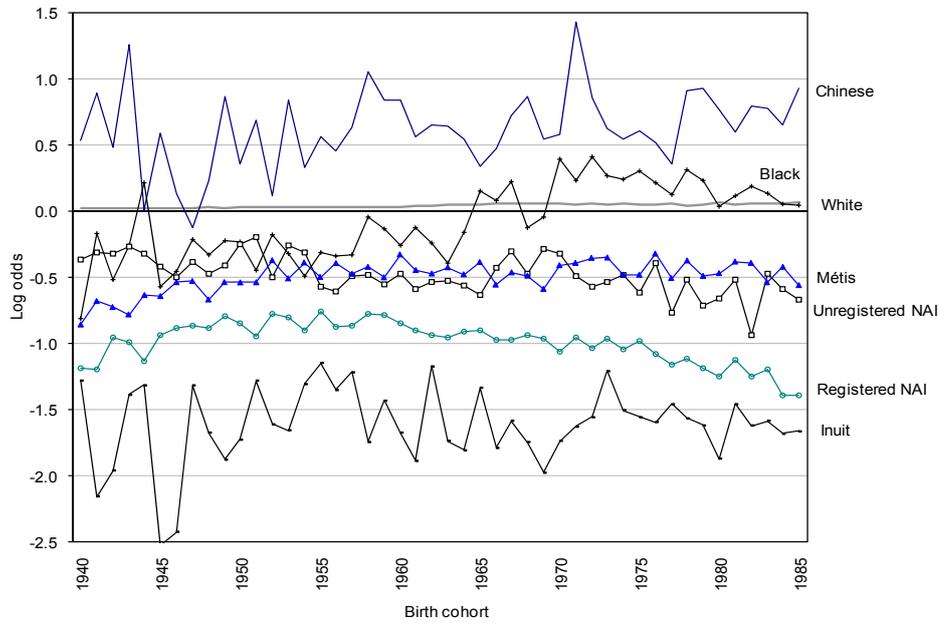
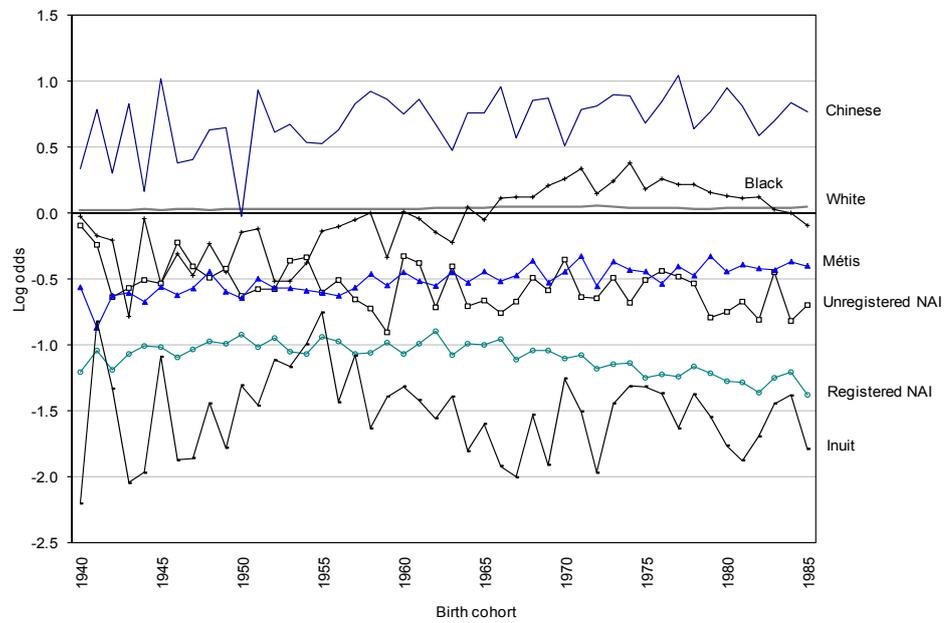


Figure 10:
Relative differences (log odds) in high-school graduation: Canadian-born females

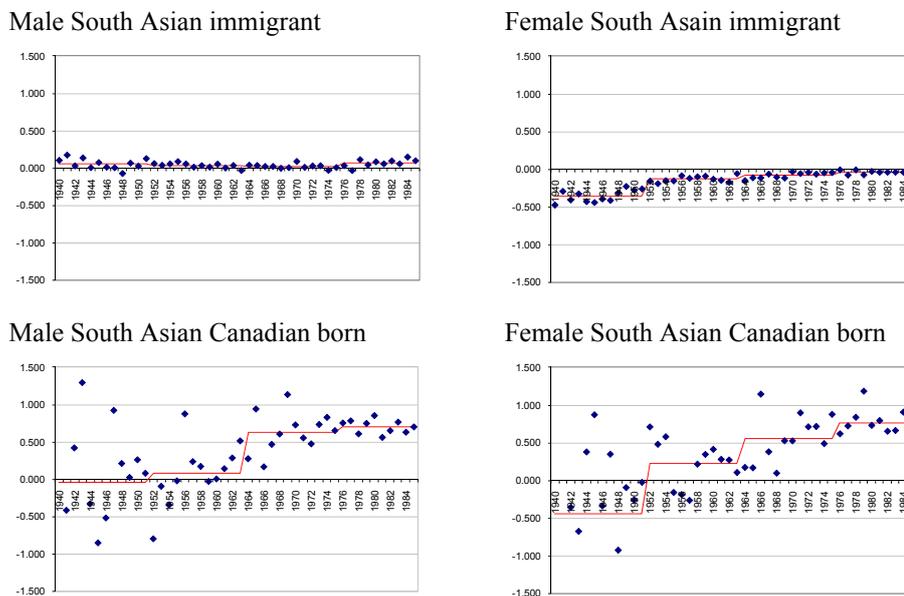


The range of differences between groups is slightly smaller for females, whereas the overall patterns show no differences due to gender. A negative cohort trend can be found for registered North American Indians (NAI), which is especially pronounced for females. Being registered usually corresponds with being ‘on reserve’. As this status can change over a lifetime, selection effects can be expected (e.g., persons who graduate from high-school on a reserve might be more likely to leave the reserve).

On the other hand, the Black population moved from below average to comparability with the White population.

An interesting observation is what can be labelled as the ‘Asian pattern’. While all Canadian-born Asian visible-minority groups closely resemble the Chinese pattern of a 2:1 odds ratio of high-school graduation compared to the average, Asian immigrants have a far more mixed pattern, with some groups (e.g. southern Asian and south-eastern Asian) ranging below average. Figure 11 gives an example of this Asian pattern. The 1960+ birth cohorts of southern Asian immigrants rank ‘average’ among immigrants, whereas the Canadian-born southern Asians resemble the Chinese pattern.³

Figure 11:
Example of the ‘Asian Pattern’: southern Asian immigrants and Canadian-born



³ Note that Figure 11 as well as Figures 15 and 16 are only intended to highlight typical patterns; the difference of reference categories by immigration status and gender impedes a direct comparison of attainment levels.

Immigrant groups generally display higher cohort variations (see Appendix), especially for older age cohorts. For younger age cohorts (cohorts born after 1960) we observe almost the same persistence of differences as for the Canadian-born counterparts. Immigrant groups with below-average odds for high-school graduation are Black, Latin (especially male), southern Asian, south-eastern Asian and older cohorts of female Arabs.

6.2 Post-secondary graduation

In our study of post-secondary graduation, we distinguish between three simultaneous respectively linked processes. Graduation from a non-university post-secondary program and 'direct' graduation from university are modelled as simultaneous processes, meaning that the probability of one event influences the probability of the other. After a non-university diploma, we start a third process of 'indirect' university graduation, i.e. obtaining a BA after having obtained another non-university diploma. When analysing the results of our second-round alignment, we thus have to view the alignment factors for non-university and university graduations simultaneously.

A first general observation is the far narrower range of differences for non-university graduations. In Figure 12 we illustrate this point by selecting the same seven population groups as in Figure 9 for high-school graduation. Alignment factors are close to zero for most ethno-cultural groups with the exception of Aboriginals, where relative factors are deteriorating, moving from above average for older cohorts to (far) below average for younger ones.

Moving our attention to university graduations, we obtain a far broader range of relative factors, broader even than found for high-school graduations. Log odds lie above 1 for Chinese (indicating an odds ratio to average, which equates in this case to White, of around 3:1). This picture is mirrored by the Aboriginal groups (1:3), except for Métis (around 1:2).

As for high-school graduation, the White population lies almost exactly at the centre, thus enabling it to serve as a reference category. Again, the Black population is comparable with the White population at least for birth cohorts after 1960; older Black cohorts display lower odds of university attainment.

Figure 12:
Relative differences in post-secondary graduations (below BA): Canadian-born males

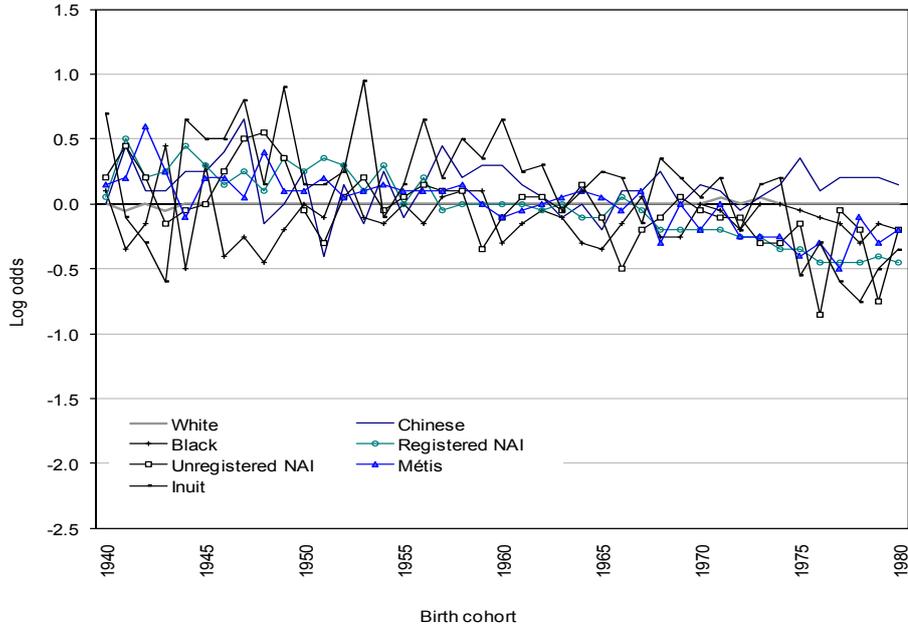
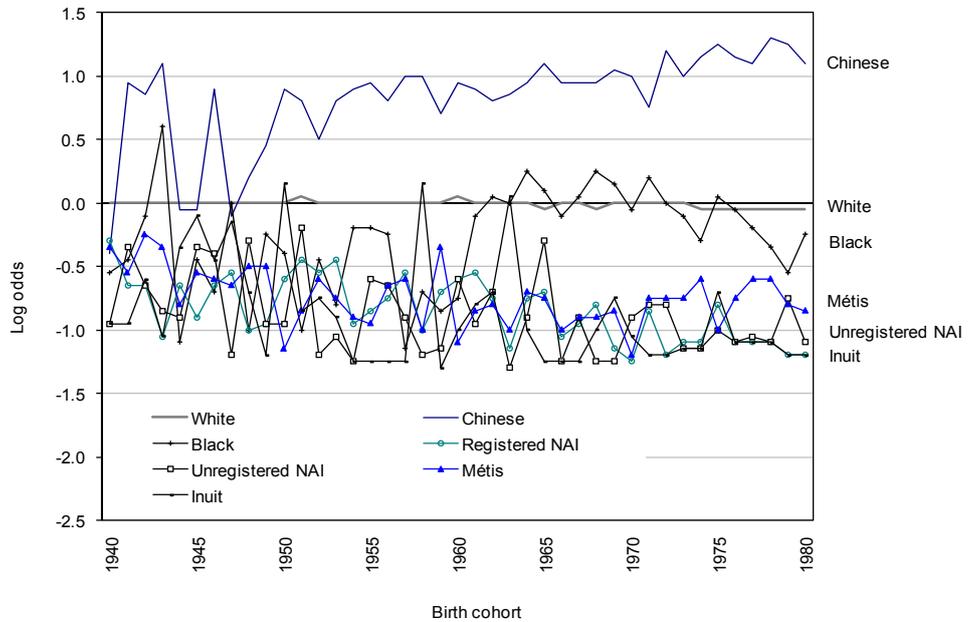
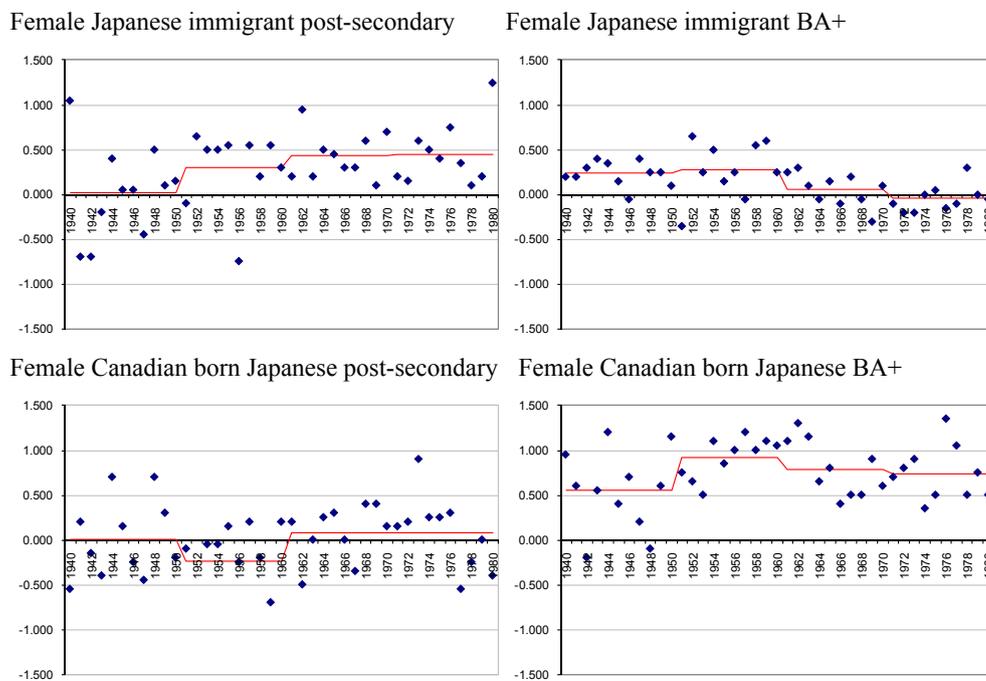


Figure 13:
Relative differences (log odds) in university graduations: Canadian-born males



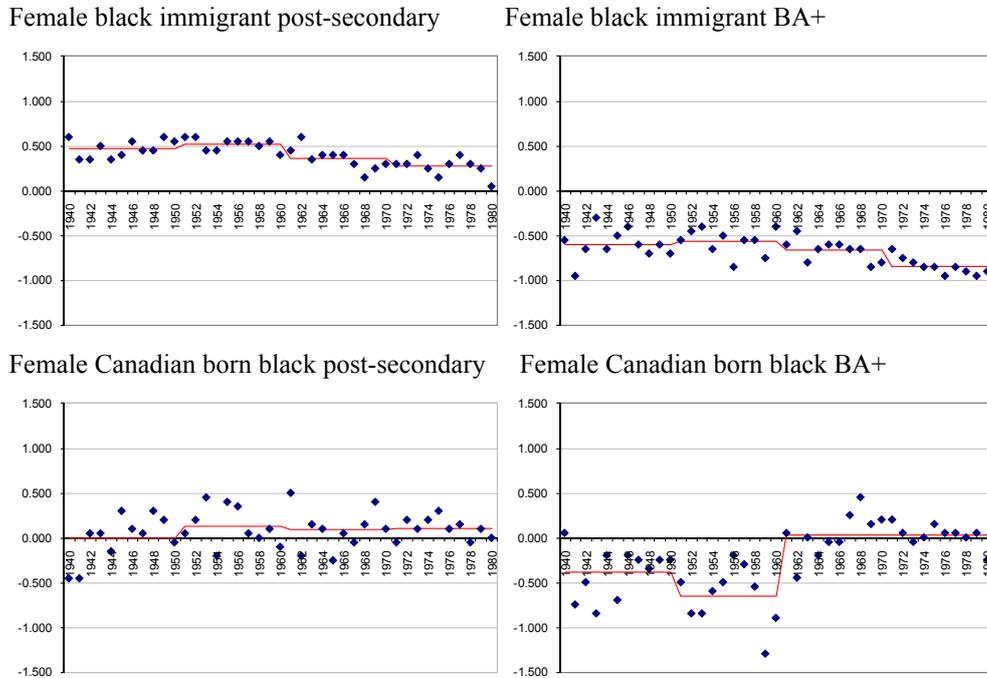
Another parallel to high-school graduation is what we have called the ‘Asian pattern’. Again we observe that—independent of the much more varied educational composition of immigrants from different Asian groups—Canadian-born Asians show the same characteristics over all groups: non-university post-secondary graduation factors are close to average, but there are very high odds for university studies. To illustrate this point, we have selected the (female) Japanese visible minority (Figure 14) For immigrants, what we have labelled the ‘Asian pattern’ is reversed—we observe high non-university graduation rates but only average university graduations; rates for Canadian-born Japanese are typical to those of all Canadian-born Asian groups.

Figure 14:
Example for ‘Asian pattern’: Post-secondary pattern for Japanese females



A related phenomenon can be found for the Black visible minority. While Black immigrants have stable low odds for university graduations and above-average odds for other post-secondary studies, Canadian-born Blacks are very similar to the mainstream White population, at least for cohorts born after 1960.

Figure 15:
Relative Post-secondary pattern for Black females



7 Summary and outlook

At the risk of oversimplifying an already simplified picture, the analytical findings presented in this paper can be summarised in the following points:

- Canada is experiencing an ongoing educational expansion with time trends not showing any signs of slowing down except for first-chance (age 16-20) high-school graduation.
- There are considerable relative differences between ethno-cultural groups which are remarkably persistent over time. The range of differences between all groups is almost constant over all 50 studied birth cohorts for high-school graduation while it is slightly increasing for post-secondary graduation.
- Visible minority groups are generally performing better than the mainstream White population. This is especially true for Asian groups. While all visible minority groups have higher odds for high-school graduation than Whites, with respect to post-secondary studies we find some convergence of non-Asian visible minority groups towards the average.

- Canada's Aboriginal population participates in the overall educational expansion at a far lower rate, with relative differences being very stable for high-school graduation, and even increasing for post-secondary diplomas.

In the context of the Demosim population microsimulation project, the high persistence of relative differences between ethno-cultural groups supports the development of plausible projection scenarios. Between-group differences are important in magnitude and persistent over time. While much of the uncertainty comes from future immigrants, our findings indicate that many between-group differences disappear for Canadian-born individuals; e.g. Asians born in Canada do not differ amongst the different Asian groups, while there is considerable variation between Asian immigrant groups. This convergence additionally strengthens the prediction power of Demosim.

From a technical point of view we have presented an approach of linking longitudinal and cross-sectional datasets by means of alignment, thus making alignment part of the estimation process.

This paper focused entirely on past trends and data integration issues. In the context of Demosim, the main findings of this study are represented by the way in which education progressions are modelled and parameterised in Demosim. Users can create scenarios that distinguish common trends from ethno-cultural differences which are parameterised separately. In the current base scenario we assume that the relative differences between groups will persist in the future while the time trends are assumed to level off over the next decades. Model users can easily create alternative scenarios, including convergence scenarios (ethno-cultural differences diminishing), or status-quo scenarios (time trend stopped).

At the time being, only a restricted set of projection results is available to the general public in the form of an analytical report (Statistics Canada 2010) while detailed tables (including educational projections by visible minority group) were made available to the clients only. Statistics Canada currently develops a web-based version of Demosim which can be accessed by researchers via internet and will allow registered users to alter and run alternative scenarios.

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