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The relation between education and labour force participation of Aboriginal peoples: A simulation analysis using the Demosim population projection model

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Abstract

This study aims at quantifying the impact of educational attainments on the future labour force participation of Aboriginal peoples. Using Statistics Canada's Demosim population projection model, we are able to simulate alternative scenarios of educational change and resulting effects on the future labour force until 2056. About half of the observed difference in labour force participation rates between Aboriginal peoples and the Canadian-born population belonging neither to an Aboriginal nor to a visible minority group can be attributed to educational differences. While the impact of educational improvements on the future labour force is significant, the change is found to be a slow and gradual process, as successive young school-age cohorts have yet to enter the labour market and renew the workforce.

Keywords: aboriginal peoples, education, labour force participation, microsimulation, projection.

Résumé

Cette étude vise à quantifier l'effet du niveau d'instruction sur la participation future des peuples autochtones à la population active. Grâce au modèle de projections démographiques Demosim de Statistique Canada, nous avons pu simuler des scénarios à partir de différents niveaux d'éducation et d'en constater l'effet sur la population active future jusqu'en 2056. Près de la moitié des différences observées dans les taux de participation à la population active entre les peuples autochtones et la population née au Canada, n'appartenant ni aux peuples autochtones ni à une minorité visible, est attribuable aux différences sur le plan de l'éducation. Bien que l'effet des améliorations sur le plan de l'éducation soit considérable auprès de la population active future, le changement aurait lieu lentement et progressivement au fur et à mesure que les cohortes d'âges scolaires entrent sur le marché du travail et que la population active se renouvelle.

Mots-clés : peuples autochtones, éducations, participation à la population active, microsimulation, projections.

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Introduction

With the development of the *Demosim microsimulation model*, Statistics Canada has created a population projection tool capable of capturing Canada's diversity by visible minority status, Aboriginal identity, immigration status, and a number of other variables, either closely linked to demographic behaviours, like education, or dependent on socio-demographic characteristics, like labour force participation (Statistics Canada 2011). Demosim explicitly models the educational differentials between the main groups of Aboriginal Peoples, the Canadian-born White population, and various visible minorities. Both ethno-cultural and educational background feed into its labour force models. In this study, we capitalize on Demosim's ability to single out the effect of education on labour force participation, and create scenarios allowing assessment of the extent and timeline of hypothetical improvements in education on the future labour force participation of Aboriginal peoples.

The educational attainment gap between the Aboriginal peoples and the non-Aboriginal population is the subject of a growing body of literature, including historical studies (e.g., Kirkness 1999; Carr-Stewart 2001, 2006), attempts to explain underlying causes (Frenette 2011; Richards and Scott 2009; Wotherspoon and Schissel 1998), and policy analysis and recommendations (Richards 2006; Paquette and Fallon 2010; Richards and Scott 2009). Low educational attainments are determined to be partially responsible for the relatively poor labour force participation of Aboriginal peoples in Canada (e.g., Walters et al. 2004) and the income gap between Aboriginal peoples and the rest of Canada (Wilson and Macdonald 2010).

There is broad agreement that improvements in education attainments would benefit Aboriginal youth and society as whole, facilitating greater participation in the Canadian economy and improving Aboriginal peoples' community well-being and social cohesion. Or as Richards and Scott put it, while "many of the Aboriginal/non-Aboriginal gaps have complex origins [...] improving education outcomes is probably the most important dimension of social policy to tackle" (2009: 6). Concerning the gap in labour force participation rates, we find that about half of the gap can be attributed to education, with the remaining gap decreasing with education level. In fact, Hull (2000, 2005) has found that the gap virtually disappears for university graduates. However, Pendakur and Pendakur (2011) showed that, controlling for similar characteristics, Aboriginal people will still earn less than their non-Aboriginal Canadian majority counterparts even with the same education credentials.

From a demographic perspective, the Aboriginal population of Canada can be described as having a strong natural rate of increase, resulting from a young age structure and high fertility. In the context of an ageing society, this makes Aboriginal workers a growing segment of the native labour force, especially among younger ages.[2] Both the future size and human capital of this group will heavily depend on current educational investments. For an economic perspective on investing in Aboriginal education, and the potential contribution of Aboriginal Canadians to labour force, employment, productivity, and output growth, see, e.g., Sharpe and Arsenault (2010) and Sharp et al. (2009). The

2. Demosim projects a 35-per-cent increase of the Aboriginal population aged 25–44 until 2056, while, e.g., the Canadian-born White population group is projected to decrease by 16 per cent in absolute size. The growth of the Aboriginal population is close to the projected total growth for the whole population—including immigration (34 per cent), which keeps the share of Aboriginal peoples in the total population of this age group roughly constant. In terms of the labour force, in the base scenario described below, the proportion of the aboriginal labour force aged 25–44 would stay virtually constant at around 3.3 per cent between 2012 and 2056, the natural growth of this group balancing out immigration. In the alternative convergence scenarios, the relative share increases up to 3.7 per cent, due to increased labour force participation.

literature agrees on high rates of return on investments in education, and single them out as "one of the rare public policies with no equity-efficiency trade-off" (Sharpe and Arsenault 2010: 27). Sharpe and Arsenault (2010) also calculate labour force outcomes, variations in GDP, and fiscal effects resulting from a hypothesized full or partial convergence of educational attainments of Aboriginal people towards the education distribution of the non-Aboriginal population. In contrast to such stylized macro studies, Demosim accounts for the changing population composition, size, and age structure, and models education longitudinally. When creating convergence scenarios, we do not change the education of the whole Aboriginal population, but rather model improvements in the education attainments of current and future school-age cohorts, simulating the process of population renewal. Therefore, our approach also allows an estimate of the time needed for this process to take place.

The contribution of this study is twofold. First, we aim to answer the question of how an increase in educational attainment of Aboriginal peoples would impact their labour force participation. By distinguishing four Aboriginal groups (see next section), we are able to detect a variety of patterns in how education is linked to labour force participation. The second question concerns the timeline of how improvements in educational attainments would impact future labour force participation.

This study is organized as follows: The first part addresses data and modelling issues, capturing how our analysis was performed. We start this discussion by depicting current education and labour force differences between the studied Aboriginal groups and the Canadian-born White population as captured in the 2006 Census. In the remainder of the first part, we introduce the Demosim model and the methodologies behind its labour force and educational projections—the latter captured in more depth to provide a foundation for the education scenarios. The second part of this study then describes selected education scenarios, resulting projection results, and their interpretation.

Data and methods

Variable categories and conventions

In this study, we distinguish four groups of Aboriginal peoples that are identifiable in the 2006 Census and used in Demosim projections:

- Registered North American Indian (NAI);
- Non-registered NAI;
- Métis;
- Inuit.

We contrast these groups to the Canadian-born (CB) White population, which is used as a reference category. Concerning education, CB Whites currently closely represent the Canadian population average. Canada's visible minority population and immigrants generally have higher educational attainments. By excluding them from the reference category, this study isolates educational scenarios from immigration effects and other composition effects caused by different growth rates of visible minorities.[3] We distinguish three levels of education:

- below high-school;

3. Demosim models the relative differences in educational attainments between Canadian-born (CB) Whites, eleven visible minority groups, and four Aboriginal groups. These relative differences, expressed by odds ratios, have been remarkably stable over time and are kept constant in the base projection scenario. Given the different growth rates of the distinguished groups, selecting CB Whites as reference category prevents composition effects in the modelling of relative differences.

- high-school diploma only;
- post-secondary diploma.

The considered age range throughout this study is 25–64 years, sometimes broken up into 25–44 and 45–64 age groups. We have selected an age cutoff of 25 years, as most people have left school at this age.

All illustrations are based on Demosim projections which start from the 2006 Census (Demosim is described below). Data are adjusted for Census net under-coverage, and concerning the average labour force participation, they also take into account more recent observations from the Labour Force Survey.

The demographic assumptions for the future used in this study are identical with the Scenario-1 published in "Population Projections by Aboriginal Identity in Canada" (Statistics Canada 2011) and assumes constant Aboriginal fertility (for given individual level variables like education) and no intra-generational ethnic mobility.[4] Concerning labour force participation, we have chosen the *recent trend scenario* (Scenario C) published in Martel et al. (2011), which is based on identical demographic assumptions and produces population and labour force outcomes lying in the centre of the five scenarios published. Concerning educational projections, the baseline scenario of this study is identical with the assumptions in both above studies, and will be contrasted with two alternative scenarios added in this study. Note that this study does not provide any forecasts, and is strictly to be seen as a what-if projection. This is an important nuance, because we expect forecasts to tell us what the future will most likely be, whereas projections instead tell us what would happen if the assumptions and scenarios chosen were to be proven correct. Thus, this is a prospective exercise, whose purpose is to support the planning of public policies rather than to predict the future.

Current labour force participation and education

As shown in Figure 1, Aboriginal peoples on average have lower educational attainments than CB Whites, the gaps being largest for Inuit and Registered NAI. Currently, high-school non completion rates are around 50 per cent for registered NAI and over 60 per cent for Inuit, compared to 16 per cent of the CB White population, aged 25–64.

Education attainments are closely linked to labour force participation (Figure 2). While Aboriginal peoples' labour force participation in most cases is lower also within education categories, the differences are very pronounced when comparing education groups within all population groups. Of the compared groups, registered NAI have the lowest overall labour force participation, with the gap to CB Whites being around 20 percentage points. On the other end, for a given educational attainment, labour force participation of Métis is almost indistinguishable from the rates of CB Whites—and even slightly higher for high-school graduates.

4. Ethnic mobility is "the phenomenon by which individuals and families change their ethnic affiliation" (Guimond 2003). Ethnic mobility has two components: intragenerational and intergenerational (Boucher et al. 2009). Intragenerational ethnic mobility results from a change in an individual's ethnic affiliation over time. For example, a person who reports no Aboriginal identity in one census but a Métis identity in the following census is deemed to have experienced intragenerational ethnic mobility (Boucher et al. 2009; Guimond 2003). Intergenerational ethnic mobility results from a change in ethnic affiliation between parents and their children, with the parent(s) not having the same ethnic affiliation as the child(ren). This mobility does not imply any change in ethnic group for an individual, and is based on comparing the ethnic identity of an individual with that of his/her parents.

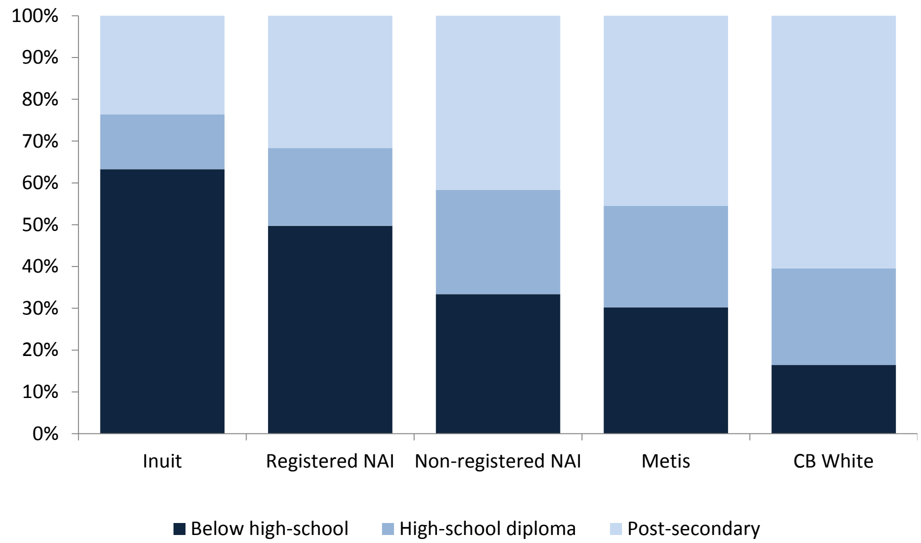

Figure 1. Education composition by population group, ages 25–64, 2012 (Demosim projection).

A simple way of quantifying the contribution of educational differences to the gaps in labour force participation consists in standardizing the Aboriginal groups to resemble the education distribution of CB Whites. Following this approach, one calculates the labour force participation rate that would be obtained if the Aboriginal population had the same education composition as the reference group of CB Whites. The remaining differences cannot be attributed to education, but stem from differences in labour force participation within each education group.

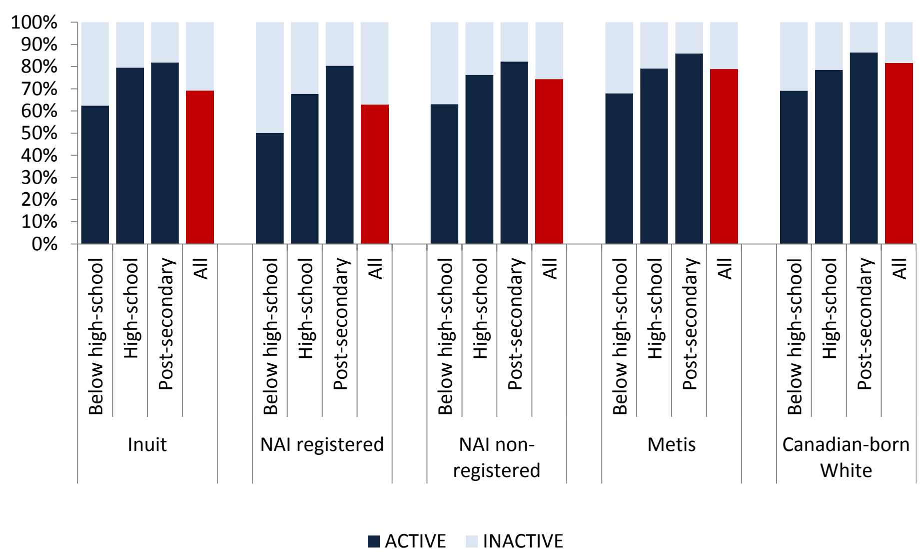

Figure 2. Labour force participation by population group and education, ages 25–64, 2012 (Demosim projection).

Table 1. Labour force participation gaps between Aboriginal peoples and CB Whites, ages 25–64, 2012 (Demosim projection).

	Labour force participation rate	"Total gap (compared to CB White)"	Gap attributable to educational differences	Remaining gap	Proportion of gap attributable to educational differences
Inuit	69.2%	12.5%	8.9%	3.6%	71.2%
NAI registered	62.9%	18.8%	9.5%	9.2%	50.8%
NAI non-registered	74.3%	7.4%	3.4%	4.0%	45.7%
Metis	78.9%	2.8%	2.5%	0.3%	89.3%
CB White	81.7%				

As displayed in Table 1, the relative contribution of education differences to the gap in labour force participation is highest for Métis, followed by Inuit, registered NAI, and unregistered NAI. In absolute terms, closing the educational gaps would have the biggest effect for registered NAI, theoretically moving up labour force participation by 9.5 percentage points.

The Demosim Population Projection model[5]

Demosim is a microsimulation model designed for detailed population projections. It was developed at Statistics Canada in partnership with Human Resources and Skills Development Canada (HRSDC), Aboriginal Affairs and Northern Development Canada (AANDC), Canadian Heritage (PCH), and Citizenship and Immigration Canada (CIC). Using the micro-data file from the Canadian Census of Population (20 per cent sample[6]) as its starting point, Demosim produces dynamic population projections at the level of the provinces, territories, census metropolitan areas, and selected smaller geographies.

Demosim includes a number of individual characteristics going beyond the typical age-sex classification of classic population projections: visible minority group, place of birth, generation status, Aboriginal identity, highest level of educational attainment, and labour force participation, among others. It does so by simulating events such as births, deaths, migrations and changes in level of education, according to various population growth scenarios. Initially created in 2004 and on-going, the model has been used over time to generate projections of the Canadian population's ethno-cultural composition (Statistics Canada 2010), the Aboriginal population of Canada (Statistics Canada 2011) and the Canadian labour force (Martel et al. 2011).

Microsimulation removes the technical restrictions of more traditional population projections produced by cohort-component models. Compared to such cell-based approaches, microsimulation does not model population groups (e.g., people of the same age and sex) and changes in the sizes of those groups, but rather simulates a large sample of individuals which together represent society.

5. The first paragraph of this description is heavily based on the presentation of Demosim on Statistics Canada's website http://www.statcan.gc.ca/microsimulation/demosim/demosim-eng.htm. For a more detailed description of the model, including methods and assumptions, please consult both Statistics Canada 2010 and Statistics Canada 2011.
6. The initial population size in Demosim equals the Canadian population. This was done by cloning the persons in the 20 per cent sample according to their sampling weight. As a consequence, due to the large scale of the simulation, Monte Carlo variability can be ignored at the aggregation level of this study, as presented results are virtually identical when repeating the simulation (with a different random number stream).

As a consequence of simulating individuals, microsimulation allows for any level of detail, and for modelling of people in their family context—the latter used in Demosim to transmit characteristics like ethnicity and language over generations. (For a more detailed introduction of microsimulation in the social sciences and population projections, see, e.g., Spielauer 2010 and Imhoff and Post 1998.) Like for all projection models, there exists a trade-off between the additional randomness introduced by additional variables (potentially compromising the prediction power of a model) and miss-specification errors, caused by models that are too simplified.[7] In the context of most micro-simulation models, the list of variables in Demosim is kept short, leading to aggregate projections that are generally similar to those obtained by traditional population projections, while adding valuable detail. Within Statistics Canada, this ability makes Demosim a valuable tool for survey weighting and survey validation.

Simulating labour force participation in Demosim[8]

Labour force participation is simulated by annually imputing an activity status to each individual living in a Canadian province. The imputation is based on participation rates constructed in two stages. First, a participation rate is selected according to the simulated individual's age, sex, highest level of education, and province of residence. These participation rates are drawn from the Labour Force Survey (LFS), and assumptions are made about their future evolution.

Second, this rate is increased or decreased using a ratio to take into account other characteristics—namely, immigrant status, period of immigration, membership in a visible minority group, and Aboriginal identity. The ratios are calculated using participation data from the 2006 Census, and vary for each combination of age, sex, and education level. Ratios are calculated for Canada as a whole, and then applied to each province, under the assumption that the gap between persons belonging to a visible minority group and the rest of the population, for example, does not vary from one province to another. (For a more detailed discussion of assumptions underlying the labour force module of Demosim, see Martel et al. 2011.)

The scenario selected for this study is based on a *recent trends in participation rates* assumption. It takes the changes observed at the national level over the 10 years between 1999 and 2008, and extrapolates them for the next 10 years. Thus, for all age groups between 15 and 79 years, a linear extrapolation of trends, mostly upward, was applied until 2018. After 2018, the rates are held constant to the end of the projection period.

While these overall trend scenarios affect all simulated individuals regardless of their ethnicity, resulting in a universal upward trend of participation rates, relative differences between ethnicities, as observed from the 2006 Census, are assumed to persist over time. In the context of the present study, this means that we can isolate the effect of changes in education on labour force participation.

7. For a discussion of this point, see Imhoff and Post (1998: 109). One of the main reasons why the prediction power of microsimulation models can diminish with complexity is the fact that microsimulation models generate their own explanatory variables when run into the future, each additional explanatory variable requiring an extra set of Monte Carlo experiments, with a corresponding increase in Monte Carlo randomness. Thus "...extending a correctly specified model will increase the specification randomness: the model will continue to be unbiased, in the sense that it will on average produce the expected value of the future population, but its random variation around this expected value will increase. An extremely elaborate model may be perfectly specified, but its specification bias may be so large that the projection results give no information whatsoever about the future course of the population" (Imhoff and Post 1998: 111).
8. This chapter is heavily based on Martel et al. (2011).

While we account for composition effects resulting from altered education, we do not alter relative differences in labour force participation between ethnic groups for given education levels.

Modelling education in Demosim

Like in the labour force model, the modelling of education follows the general idea of applying a proportional model, separating general trends from relative inter-group differences. Differing from the labour force model, which reassigns a labour force status to each individual each year, the education module explicitly simulates education progressions using a longitudinal model.

Due to data limitations, we are not able to estimate models from one single data source, but rather have to find indirect ways to combine the detailed cross-sectional information of the Census with longitudinal information from a separate source. For the (longitudinal) modelling of education biographies, we have identified the General Social Survey (GSS) of 2001 as the best available data source.[9]

The following gives an overview on the modelling approach; a more detailed description is available in Spielauer (2011). In spite of the technical and computational challenges, the resulting model is highly transparent from a user's perspective, with all parameters having an easy interpretation and supporting scenario building.

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 and 20), second-chance graduations (attained between ages 21 and 25), and adult graduations;
- Two simultaneous models for the first post-secondary diploma—either a non-university post-secondary graduation or a university certificate, diploma, or degree at bachelor's level (or above); and
- 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 birth 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 piecewise-linear trends (allowing to model the generally steeper trends in post-secondary graduations for birth cohorts after 1960; see the section "Overall trends" below).

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 indirect alignment approach. The idea is to find relative factors (log odds) for each birth 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 summarized as follows.

- We assume that cohort trends estimated from 2001 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 6 longitudinal models;

9. Unfortunately, the 2006 Family Transitions cycle of the GSS, which otherwise collected almost equivalent data, did not collect dates of graduation other than for the highest education attained, and thus could not be used for modelling education transitions.

- 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.[10] 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 fact, the factors found were satisfactory in this sense (Spielauer 2011);
- In a second alignment round, we then search for an additional set of factors for each ethno-cultural group (again by birth cohort, sex, and place of birth). This additional alignment leads to an exact match of the modeled educational composition with Census data for each ethno-cultural group. A necessary assumption of this step is that for a given birth 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 birth cohorts and ethno-cultural groups (but can vary between sex and place of birth). The latter is a strong assumption, as Aboriginal peoples have different timing patterns of educational attainment. We address this problem by limiting our analysis to age groups older than 24.
- In a third round, we search for factors of inter-provincial differences for all Canadian-born people. The necessary underlying assumption for this step is that there are no interaction effects between province and ethno-cultural group, i.e., that the relative differences between groups found in the second alignment round are constant over provinces. This is an assumption found similarly in the models for labour force participation.

The logic of this approach is most easily displayed for high school graduation. 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(age, cohort):*

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

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

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

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

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

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:*

10. The simulation algorithm can be thought of as trying (and narrowing down) possible alignment factors that reflect the odds ratios within a feasible range set between 1:100 and 100:1 until a virtually exact solution is found.

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

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 (for a more detailed discussion, see Spielauer 2011).

The proportional model type is very convenient for the development of scenarios, as it allows distinguishing between assumptions concerning future overall trends for each of the distinguished graduation types and assumptions on the future evolvement of inter-group differences.

Scenarios

Overall trends

Similar to the labour force model, future educational trends in Demosim's baseline projection scenario are an extrapolation of past trends for a period before levelling them off. Being based on six separate graduation types, assumptions had to be made for each of them (separately by sex and Canadian versus foreign-born). Concerning high-school graduation, observed values[11] are used for birth cohorts up to 1986, continued by a (logarithmic) trend for another 5 years, and continued by half of this trend until levelling off for birth cohorts 1995 and later. For all post-secondary graduation types, projections start for birth cohorts 1982 and later, following a linear trend until 1985, half this trend until 1990, and one-fourth of the initial trend until 1995, where rates level off. These assumptions were chosen in order to level off average post-secondary graduation rates at levels already observed today for the visible minorities with the highest educational attainments (i.e., most Canadian-born Asian minority groups), thereby preventing the model from converging towards universal university graduation.

Figure 3 illustrates the trends for three selected graduation types. Recent trends have become very flat already for *first-chance* (i.e., age 16–21) *high-school graduation*, while they remained almost linear and steep for post-secondary graduations of birth cohorts 1960 and onwards. For allowing comparison with the following scenarios for Aboriginal peoples, trends are displayed in log odds,[12] with the 1996+ birth cohorts of CB Whites used as a reference category.

Past and projected differences in educational attainment

One of the central findings of the analysis underlying Demosim's education module is the pronounced and remarkably persistent relative differences in graduation probabilities between most of the 16 ethnicities distinguished in the model. This means that most ethnicities followed the same cohort trends while maintaining relative differences between each other (expressed as odds ratios). This high persistence in relative differences is a very convenient observation when designing projection scenarios, and provided the rationale for Demosim's baseline education scenario, which keeps relative differences constant in the future. Exceptions to this general pattern are the Black population (where the gap nar-

11. Technically, "observed" data points consist of the estimated value plus the first-round alignment term.
12. Odds ratios can be interpreted like betting quotes. For example, if the cohort trend moved from −1 for the 1940 birth cohort to 0 for the 2000 birth cohort, as observed for high-school graduations in Figure 4, you would bet exp(−1) : exp(0)—equivalent to 1:2.72—that it is the younger person who graduated from high school, if you know that only one of both did. As displayed in Figure 5, the relative differences in high-school graduation rates between CB Whites and Aboriginal groups are in about the same 3:1 range.

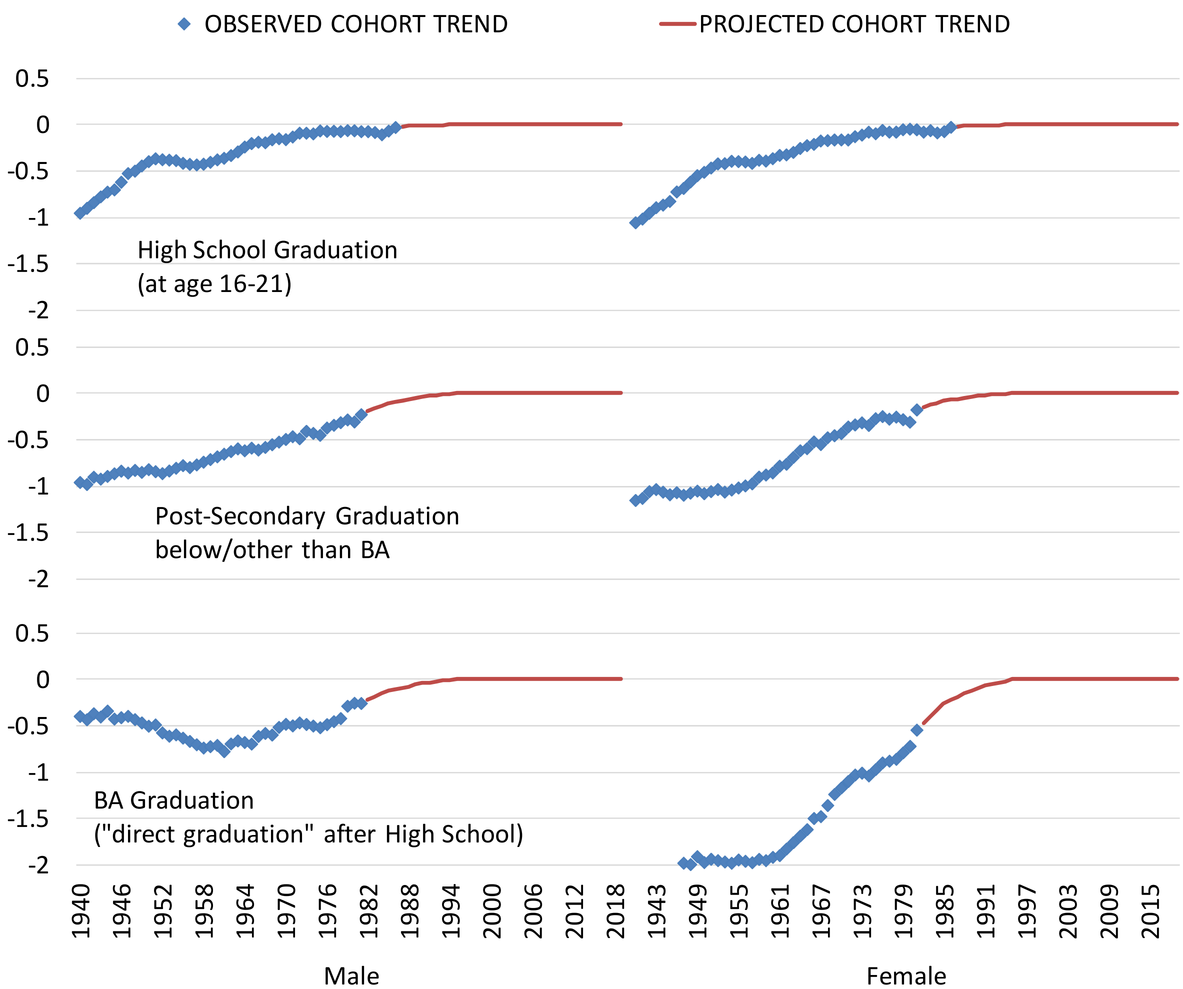

Figure 3. Cohort trends for selected graduation types (log-odds, reference 1996+, CB Whites).

rowed considerably) and both non-registered and—to a larger extent—registered NAI, for whom the gap increased, partly counterbalancing the educational expansion experienced by the rest of the population for birth cohorts 1960 and later. In contrast, the Métis and Inuit populations follow the typical pattern.

Technically, this analysis comprises the second-round alignment, as outlined above: we searched for cohort series of relative 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 separate ethno-cultural groups, with further breakdowns by sex. The full result of this exercise is available in the form of 168 cohort-series of alignment factors in Spielauer (2009); in this section, we limit ourselves to highlighting some of the main patterns of relevance for Aboriginal peoples.

The following graphs on high-school graduation of Aboriginal groups emphasize the central findings of this analysis. All four Aboriginal groups have negative log-odds compared to the reference group of Canadian-born Whites, i.e., lower graduation rates. The range of differences between groups shows no differences due to gender. A negative cohort trend can be found for registered NAI; in size, this group-specific trend almost exactly outbalances the general upward trend in the Non-Aboriginal population.

Figure 4 displays the log-odds as observed in the past, and the three scenarios designed for the future; the scenarios will be discussed in more detail below.

Demosim differentiates two distinct post-secondary education levels, while underlying models distinguish between three simultaneous respectively linked processes. Graduation from a non-university post-secondary program and 'direct' graduation from university are modeled 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.

Relative factors for non-university post-secondary graduations were found to follow similar patterns but with less variation between the Aboriginal groups (not shown). In contrast, we found very

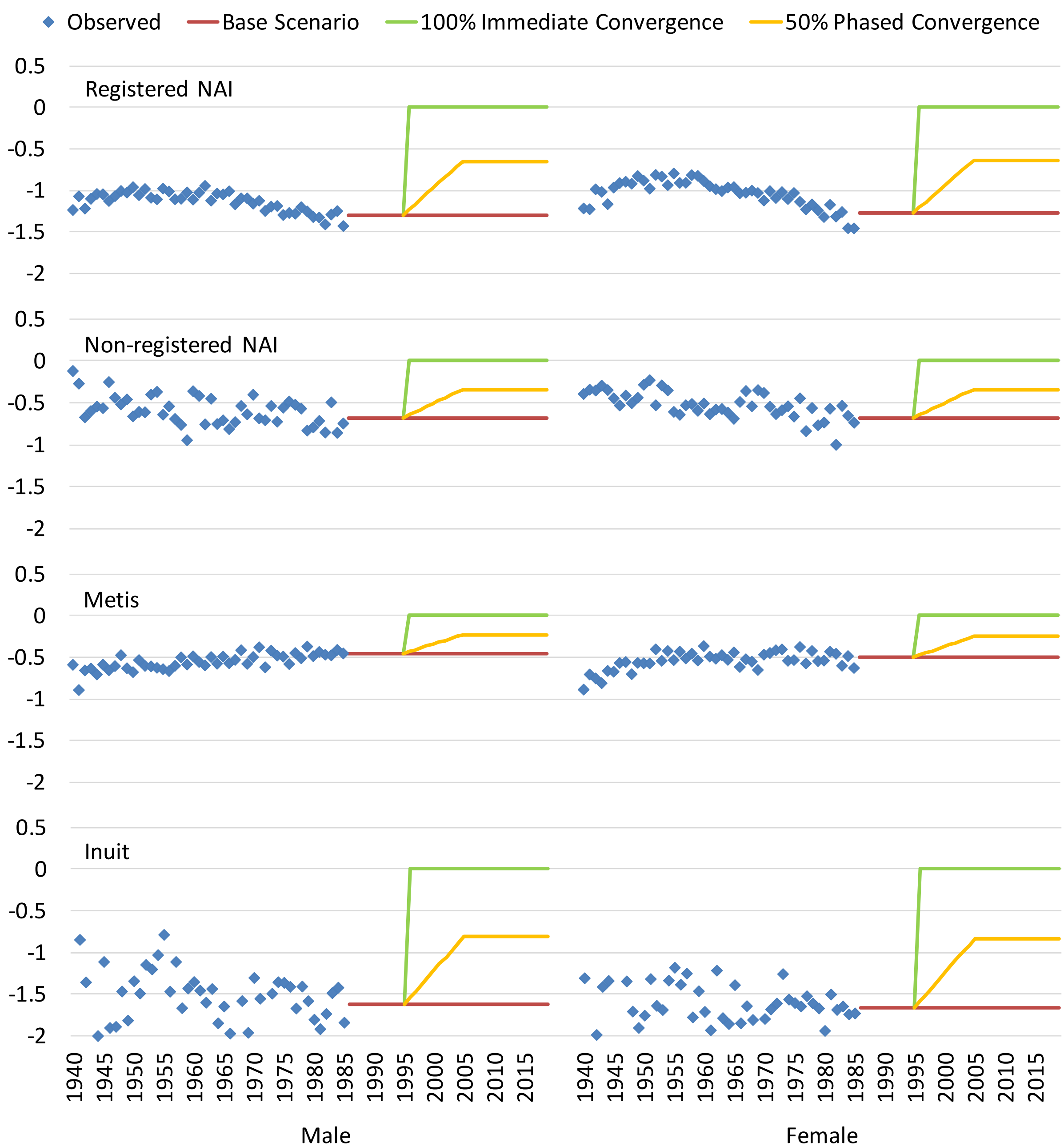

Figure 4. Relative differences (log-odds) in high-school graduation compared with CB Whites.
See footnote 11 for interpretation.

pronounced negative log-odds for university graduations (Figure 5). Again, there are pronounced negative trends for registered NAI, and to a lesser extent non-registered NAI. The negative trend is steepest for females, counterweighing the equally steep general trend of females in university graduations.

Future scenarios assume constant relative differences between groups, averaging the observations of the ten most recent birth cohorts for birth cohorts up to 1995. For cohorts born 1996 and later, we have created three scenarios:

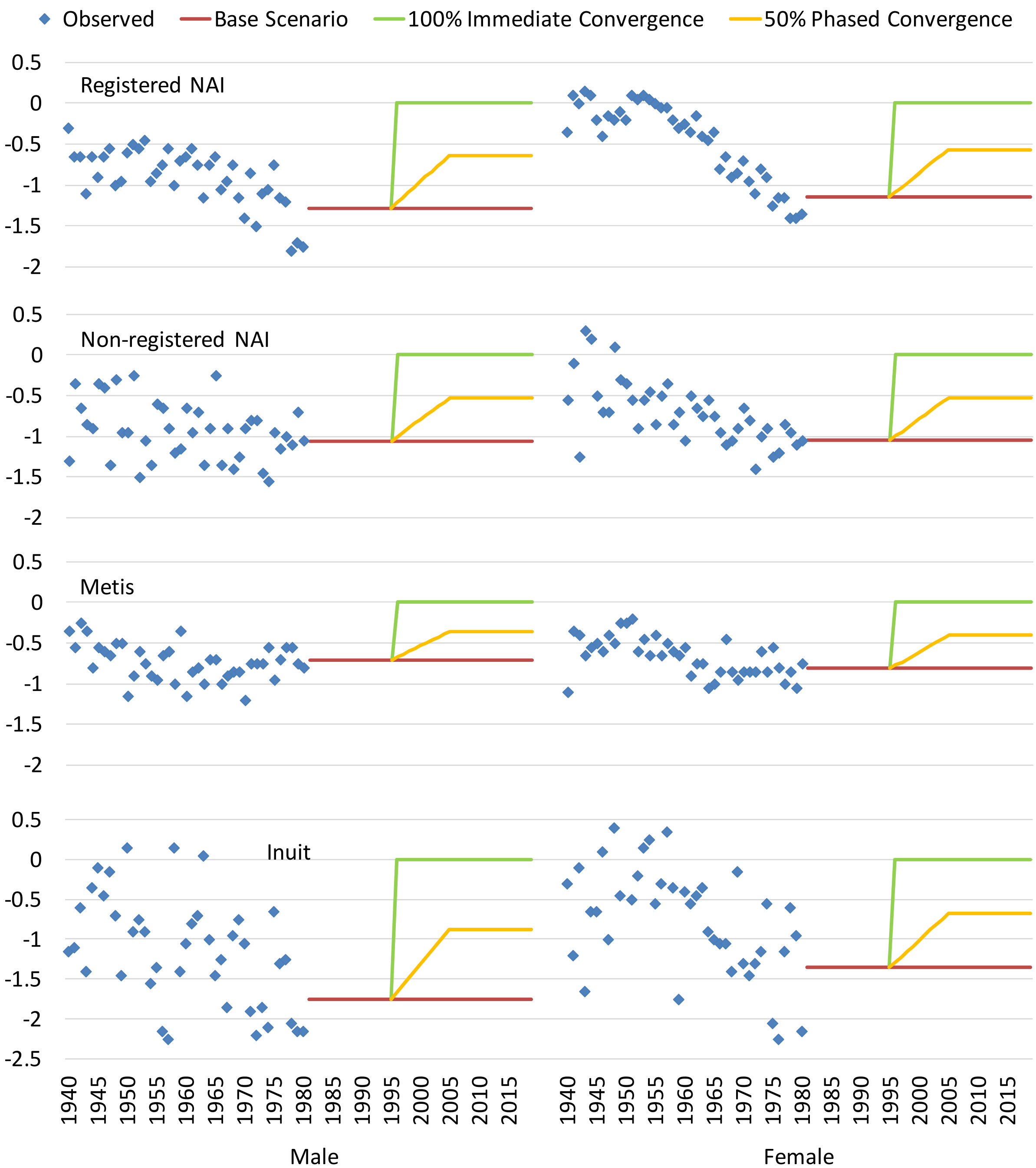

Figure 5. Relative differences (log-odds) in university graduations.

- *Baseline* scenario: Education progression follows the projected trends of Demosim. The relative differences between Aboriginal groups and the reference group (Canadian-born Whites) stay constant. This is the scenario used in all previous published projections. Note that these assumptions do break the downward trend where such a trend was observed. This leads to increases in educational attainment following the general trends for birth cohorts 1986 (1982 for post-secondary graduations) up to the 1995 birth cohorts, where all processes level off.
- *Immediate 100% convergence* scenario: All Aboriginal people born in 1996 and after have the same education progression rates as Canadian-born Whites. This is an extreme scenario to highlight the theoretically fastest and complete closure of the education gap.
- *Phased 50% convergence* scenario: Starting with people born in 1996, over 10 years, the gap between the Aboriginal and CB White populations is gradually reduced to 50 per cent. Note that the slope of these upward trends is in range of the historic upward trends for the majority of the population. This scenario models a delayed educational expansion, at the pace observed in other groups earlier.

None of the three scenarios is intended to produce a forecast of future education trends of Aboriginal peoples, but are stylized what-if settings for the study of how alternative assumptions affect the educational composition and labour force participation in the future.

Results

In this section, we study the effect of the alternative assumptions on education trends on the evolution of future labour market participation rates of Aboriginal peoples, as well as the size and education composition of their workforce. For this analysis, we have chosen a period view, drawing the timelines of change for the calendar years 2011 up to 2056. The analysis is limited to persons aged 25–64, the 25-year cutoff selected to isolate from the effects of increased school attendance on labour force participation.

Changes in education

As depicted in Figure 6, the proportion of the population aged 25–44 graduated from high school will stay at current levels in the baseline scenario, while there is still an upward trend for the 45–64-year age group, as younger, higher-educated cohorts renew the population. The latter effect is not present for registered NAI who did not participate in the educational expansions for cohorts born after 1960.

For both convergence scenarios, assumed increases in education would not become visible immediately, as the school-age population affected by the change still has to reach age 25 (and, respectively, 45). In the immediate convergence scenario, for the younger age group, the transition process is finished by 2041, and for the older age group, accordingly, 20 years later. (The phased convergence scenario takes yet another 10 years to fully unfold.) Note that education in Demosim operates on a provincial level. This leaves the education rates of Inuit peoples staying below the average value of CB Whites, as their population is concentrated in Territories with generally lower education attainments.

Figure 7 shows the proportion of the population with a post-secondary education. In contrast to high-school graduation, upward trends are also present in the baseline scenario.

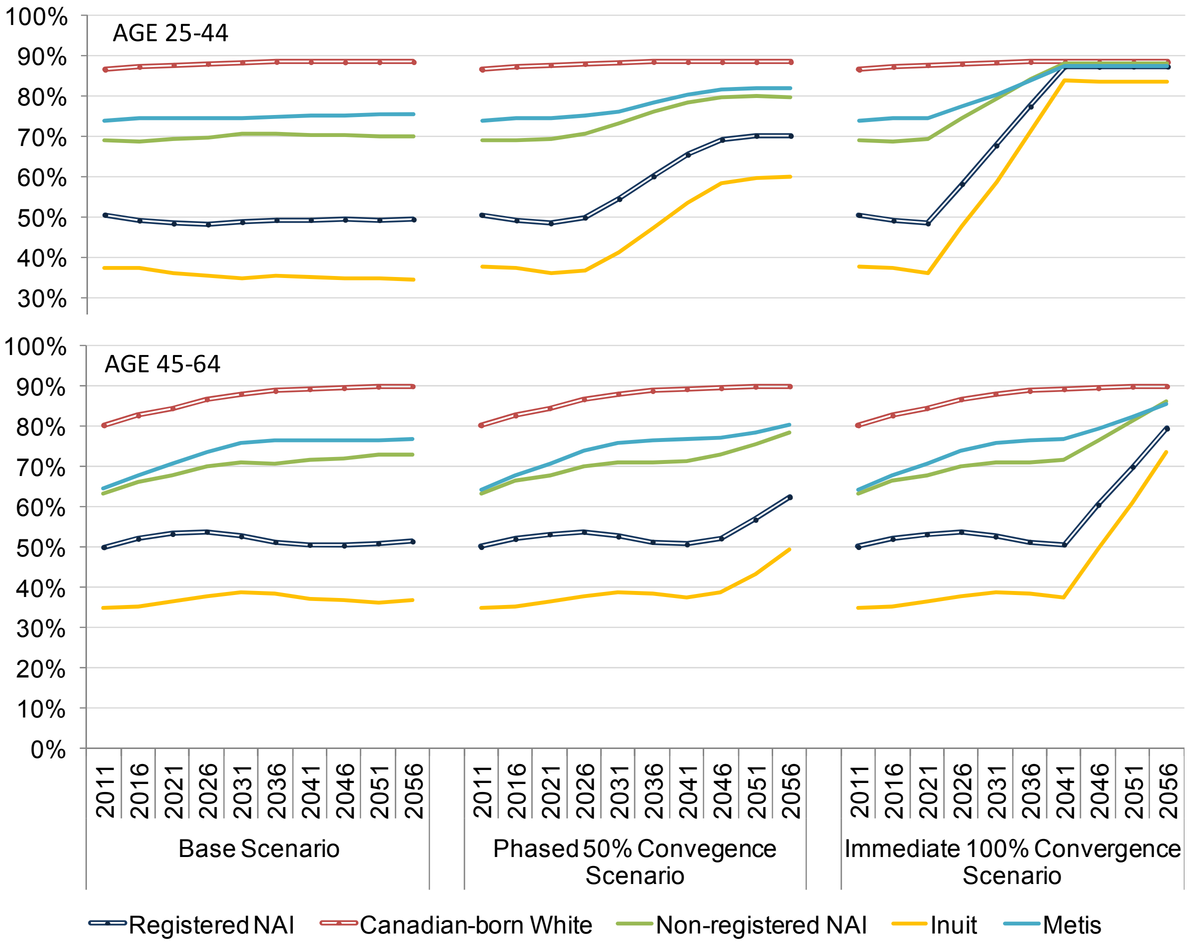

Figure 6. Proportion of population graduated from high school.

Changes in labour force participation rates

Labour force participation of CB Whites is projected to stay stable at around 90 per cent for the younger age group, and to increase for 45–64-year-olds, pushing up labour force participation for the full 25–64 age range from 80 to 85 per cent (Figure 8). In the base scenario, this trend is only followed by non-registered NAI and Métis, while it stays flat, or even slightly decreases, for registered NAI and Inuit peoples. The latter mostly results from the distinct demographic patterns for these groups, including faster population growth in provinces with generally lower education and labour force participation, and faster relative growth of age groups with lower labour force participation (below 30 and above 60 years of age).

The pace of increases in labour force participation rates resulting from the two alternative scenarios of educational improvements is slow, with first significant increases not to be expected within 20 years in the case of the phased convergence. Immediate full convergence obviously leads to faster and more pronounced effects.

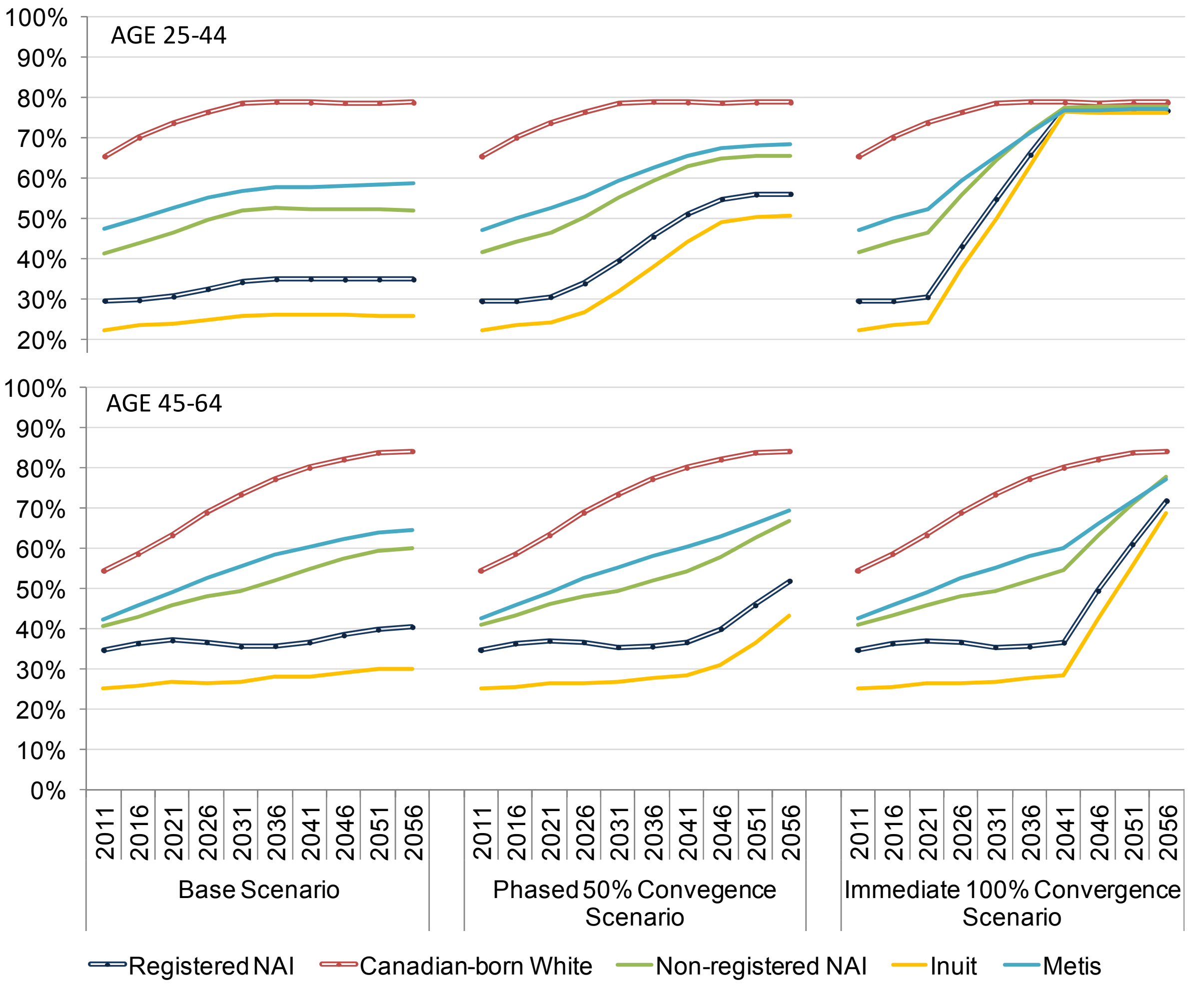

Figure 7. Proportion of population with postsecondary education.

Changes in size and educational composition of the Aboriginal peoples' workforce

The high population growth observed for Aboriginal peoples makes Aboriginal workers an over-proportionally growing sector of the labour force. In this sense, all changes in labour force participation rates are magnified by population growth in absolute terms. Education-induced increases in labour force participation also dramatically alter the education composition within the Aboriginal work force; increases therefore not only concern the number of workers but also their human capital.

In the *baseline scenario*, the number of Aboriginal people aged 25–44 active in the labour market would increase from 269,000 to 356,000 (+32%) in the next four decades. In the *phased 50% convergence scenario*, this increase would be 41 per cent; and in the *immediate full-convergence scenario* 46 per cent, which means an education-induced increase of the size of the labour force by 24,000 and 37,000 workers aged 25–44, respectively (Figure 9). In both convergence scenarios, all increases in the size of the labour force are driven by people with post-secondary education, the number of people with lower education diminishing both relatively but also in absolute numbers. In other words, while projected improvements lead to up to 37,000 additional people aged 25–44

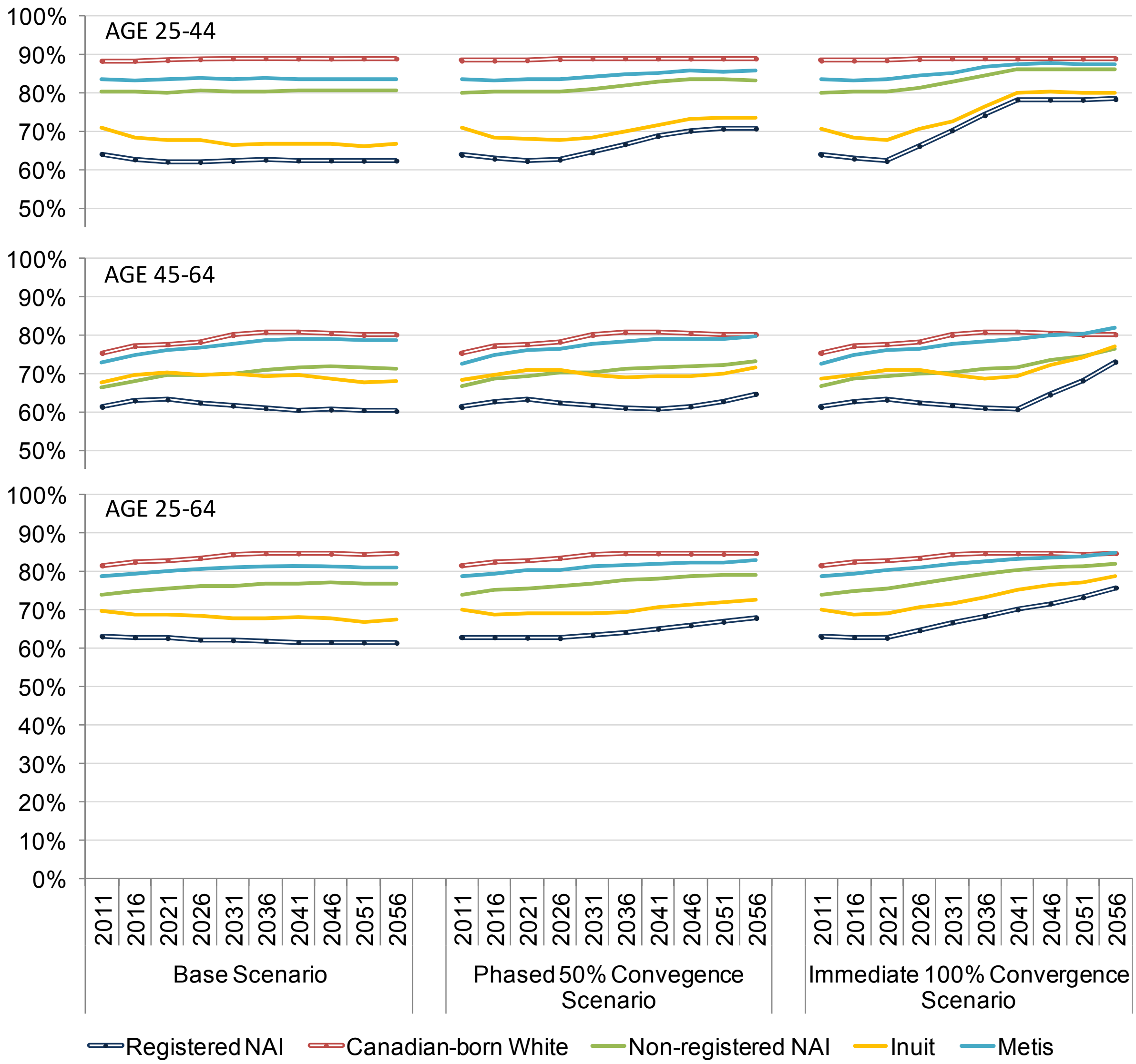

Figure 8. Labour force participation rates.

in the workforce, the number of workers with a post-secondary education would increase by up to 132,000.

Given the slow pace of population renewal, the education-induced increase in the Aboriginal labour force of people aged 45–64 would start later but follow similar patterns (Figure 10).

For the whole age range of 25–64 years old, the *baseline scenario* projects an increase of the Aboriginal labour force from currently 450,000 to 657,000 people (+46 per cent) over the next four decades (Figure 11). In the *phased 50 per cent convergence scenario*, an additional 39,000 persons would be in the workforce (+55 per cent). In the case of *immediate 100% convergence*, the number of additional workers would be 80,000 (+64 per cent).

While the Aboriginal population will increase substantially over the next decades, increases in educational attainment would lead to a decrease in the size of the Aboriginal population without post-secondary education. Comparing the Aboriginal workforce as projected by the three scen-

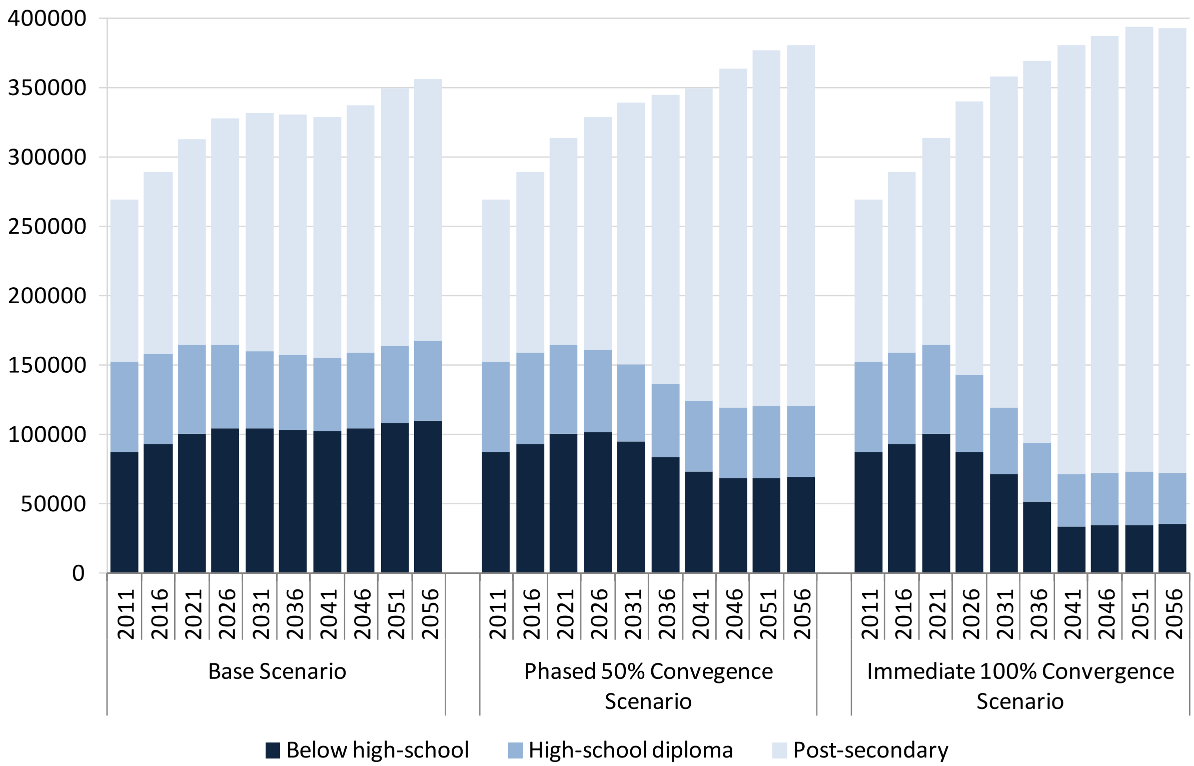

Figure 9. Aboriginal peoples' labour force by education, ages 25–44.

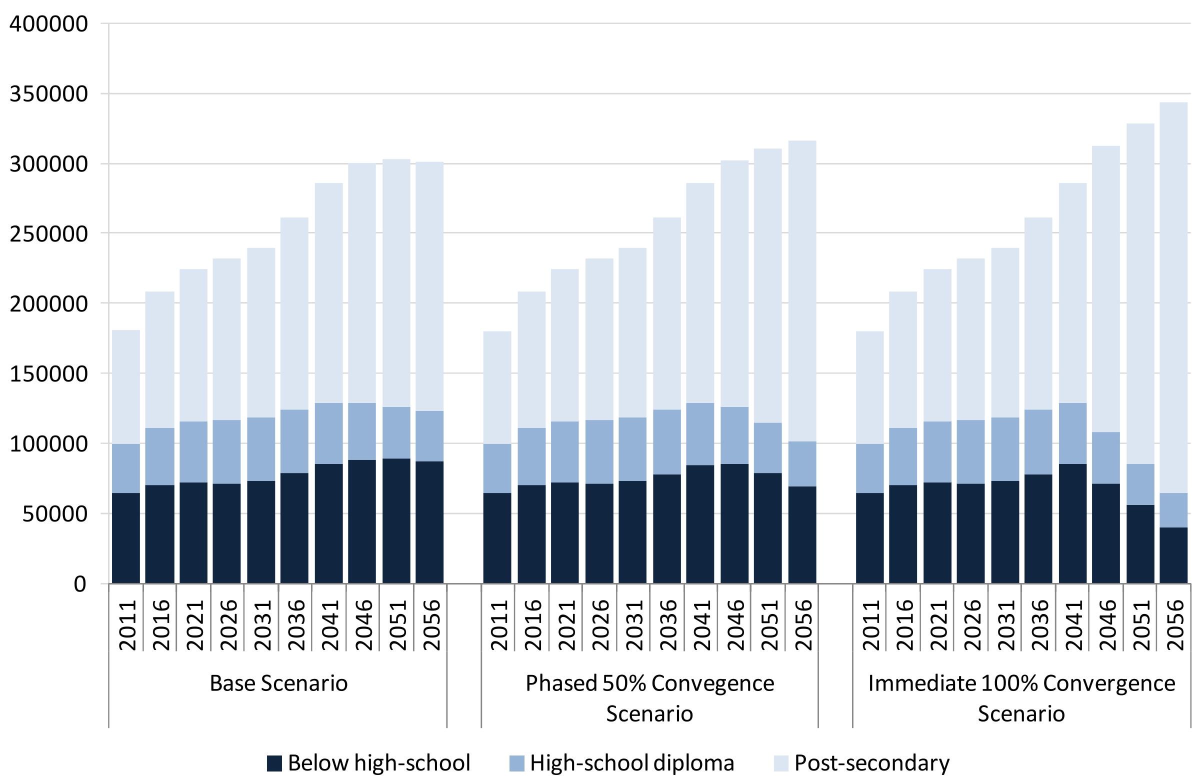

Figure 10. Aboriginal peoples' labour force by education, ages 45–64.

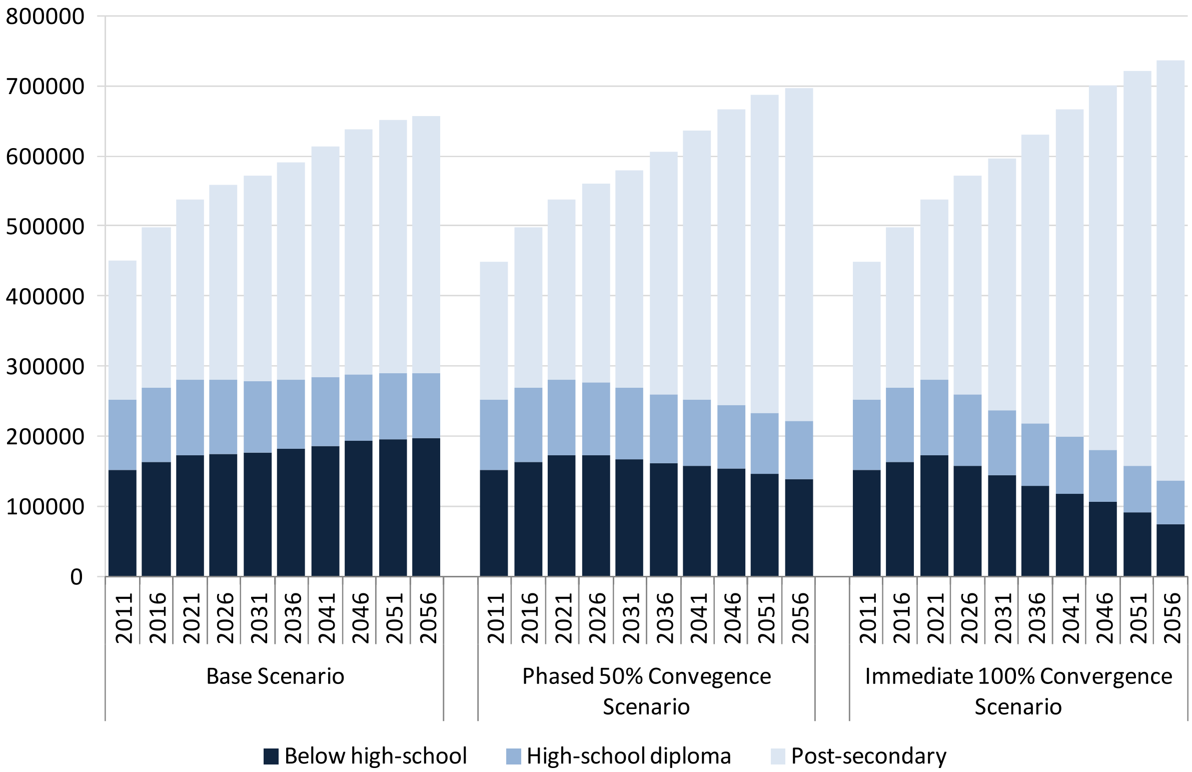

Figure 11. Aboriginal peoples' labour force by education, ages 25–64.

arios for 2056, we find considerable differences concerning its education composition. While a *phased 50% convergence* would increase the overall size of the Aboriginal workforce by 39,000 people, the number of participants with post-secondary education would increase by 107,000. In the *immediate 100% convergence scenario*, the number of Aboriginal workers with post-secondary education in the 2056 labour force would be 600,000, which is 234,000 more people than in the base scenario.

Summary and conclusions

This study aimed at quantifying the impact of educational attainments on the future labour force participation of Aboriginal peoples. Using Statistics Canada's Demosim population projection model, we were able to simulate alternative scenarios of educational change and the resulting effects on the future labour force until 2056.

While about half of the observed difference in labour force participation rates between Aboriginal and Canadian-born White peoples can be attributed to educational differences, the patterns are very different for different groups. The contribution of education differences to the gap in labour force participation is highest for Métis, followed by Inuit, registered NAI, and unregistered NAI. In absolute terms, closing the educational gaps would have the biggest effect for registered NAI, theoretically moving up labour force participation by 9.5 percentage points.

Following a *medium growth–recent trend* scenario, over the next four decades, population growth of Aboriginal peoples would result in a 46-per-cent increase in size of its labour force, if relative educational differences persist. In education scenarios that close the educational gap, this number would increase to almost 64 per cent. In absolute terms, this means up to 80,000 additional workers.

At the same time, composition of future Aboriginal peoples' labour force would be dramatically different, with up to 234,000 additional people in the Aboriginal labour force having a post-secondary education.

Besides this huge impact of potential educational improvements on the future labour force, the changes are a slow gradual process, as successive young school-age cohorts yet have to enter the labour market and renew the workforce.

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