Non-Linear Postsecondary Education Pathways and Credential Accumulation Across Canadian Provinces

Report presented to the Ontario Council for Articulation and Transfer (ONCAT)

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Context

This report presents results from the second phase of a project on non-linear PSE pathways and credential accumulations. In the first phase, we presented results for Canada overall and for Ontario which show that the level of the first completed credential is significantly related to the level of the highest credential to ever be obtained (St-Denis et al., 2021). In both Canada overall and Ontario specifically, we found that individuals who started postsecondary education (PSE) at a level below a bachelor's degree are less likely to complete a second credential (at any level) in comparison with individuals who graduate from a bachelor's degree as their first credential. In particular, they are less likely to ever compete a bachelor's program and a graduate or professional degree as their second or third credential.

We also found that the earnings advantage of bachelor's graduates varies depending on whether the bachelor's degree was obtained as a first or as a second credential. Specifically, the earnings advantage associated with completing a bachelor's degree as one's second credential after a trade/vocational or apprenticeship certificate or a college certificate or diploma is smaller than the earnings advantage associated with obtaining a bachelor's degree as one's first and only credential.

In this first report, we did not compare outcomes across provinces. However, education systems and policies differ, sometimes significantly so, from one province to the next. Tuition fees and overall costs of PSE attendance vary substantially (Statistics Canada, 2022; Usher, 2006), as does the size, structure, and mission of the college sector, including their mandate for transfer and articulation, and for supporting degree programs achievement (Fortin et al., 2022; Gallagher & Dennison, 1995; Skolnik, 2016, 2023). Within Ontario, research has also shown differences in transfer pathways across regions (Hillier et al., 2023; Sano et al., 2023). For those reasons, a comparative, inter-provincial analysis of PSE pathways appears relevant.

In this second phase, we replicate key analyses from the Phase 1 study, and produce results for Quebec, Western provinces and Atlantic provinces separately in order to allow for comparisons with Ontario. In doing so, we aim to highlight whether certain PSE credential accumulation pathways are more prevalent in some provinces than others. This could help identify policies or institutional settings that Ontario could learn from when developing transfer, articulation, and student mobility programs with specific objectives such as facilitating bachelor's degree attainment. We also aim to show whether the earnings disparities associated with various PSE credential accumulation pathways are larger in some provinces compared with others.

For further details on the Phase 1 report, *Non-Linear Postsecondary Education Pathways and Credential Accumulation*, as well as the key motivations and contributions of the study, readers are invited to refer to the ONCAT website.[1]

[1] The report from the first phase is the following: St-Denis, Xavier, Yacine Boujija, and Stephen Sartor. "Non-Linear Postsecondary Education Pathways and Credential Accumulation." Toronto, ON: Ontario

Overview of main results

In the rest of this introductory section, we present an overview of our main results. Our analysis produced the following three key findings.

First, we find only limited differences across provinces in the prevalence of various PSE credential accumulation pathways and in the earnings associated with them. Our evidence suggests that despite key policy and institutional differences across provincial education systems, Canadian provinces appear to share many challenges. We argue that this represents opportunity for policy experimentation and learning. It also calls for more systematic comparative perspectives and policy analyses in research on PSE pathways.

Despite these similarities, two key differences emerge from the findings:

1. In Ontario as well as Atlantic and Western provinces, respondents whose first credential is at the college level are significantly less likely than their Quebec counterparts to obtain a second credential at the bachelor's or graduate/professional level, and more likely to obtain a second credential at the trades, vocational, or apprenticeship level instead.

2. We find a substantially higher probability that Ontario respondents who obtain a bachelor's degree as their first credential subsequently obtain a graduate degree as their second credential, relative to Quebec bachelor's graduates (we find similar gaps for other provinces relative to Ontario, but the differences are not statistically significant in our multivariate regression models).

In the following sections, we present our findings in detail. We conclude this report with a discussion of the broader implications of these results.

Council for Articulation and Transfer, July 28, 2021. https://www.oncat.ca/en/projects/non-linear-pse-pathways-and-credential-accumulation-statistical-portrait-and-evaluation

Data, sample, and measures

The data used in this study is the same as the data used in our Phase 1 report: Wave 3 of the Longitudinal and International Study of Adults (LISA). It was first conducted by Statistics Canada in 2012 among an initial sample of approximately 34,000 adult respondents (15+ years old), with Wave 3 being conducted in 2016.[2]

We rely on Wave 3 because of a unique feature of that data: its retrospective postsecondary education history module. This module collects data on the first four PSE certificates, diplomas or degrees completed by respondents (the level and field of study of each credential, its duration and start and completion date). Programs of study that were not completed are not covered by the module. For that reason, the Wave 3 PSE history module includes data on PSE credential accumulation but not directly on transfers.

Sample

We derive PSE pathway variables from the questions of the PSE history module of the Wave 3 of LISA on the number, level, and order of PSE certificates, diplomas and degrees reported by respondents.

We restrict our sample to respondents who were 35 to 59 years old in 2016, which corresponds to the 1956-1980 birth cohorts. We set an upper age bound to the PSE history variables at 35 years old in order to pool those birth cohorts together in the same analysis. Only the credentials completed by respondents before they turn 35 years old are included. This way, we observe the PSE pathways of all respondents from our selected birth cohorts over the same age range while also ensuring a long observation window for credential accumulation (from 18 to 35 years old, or 17 years). With these restrictions, our overall sample is approximately 4000 observations. Further discussion on these sample construction decisions is provided in the Phase 1 report.

This report provides a breakdown of the main results from Phase 1 separately for Ontario, Quebec, the Western provinces (British Columbia, Alberta, Saskatchewan, and Manitoba) and the Atlantic provinces (Newfoundland, Nova Scotia, New Brunswick, and Prince-Edward Island).[3] Each individual is assigned to their current province of residence, meaning that some individuals may reside in a province different than the province where they completed their PSE. Because we are interested in individuals who completed their PSE in Canada, we exclude immigrations who arrived in Canada after 15 years old.

[2] At wave 3, attrition (sample members not responding to the survey because of refusal, death, emigration, or non-contact) resulted in an overall smaller sample.
[3] Note that as with most Statistics Canada surveys, the territories are not included in the sampling universe and no results is available for this region of the country.

Measures of PSE pathways

The LISA variable capturing the level of each PSE credential uses 11 different categories, which we recode into four aggregate categories that capture the most relevant differences in levels:

1. Trades, vocational, or apprenticeship certificates or diploma, abbreviated as "TVA".
2. Certificates or diploma at the college, cégep[4], or other non-university level and at the university below bachelor's level[5], which we abbreviate as "college".
3. Bachelor's degrees.
4. Graduate and first professional degrees.

In most analyses presented in this report, we classify respondents into seven different types of PSE pathways based on the level of their first credential as well as the level of the highest credential ever achieved after that. For most respondents, this corresponds to the second credential, so we use "second credential" throughout the text for short. Nevertheless, a small share of respondents obtains more than two credentials.

The seven pathway categories of this classification are the following:

No.	**First credential**		**Second credential**
1.	Below bachelor's	→	None (completed PSE after first credential)
2.	Below bachelor's	→	Below bachelor's
3.	Below bachelor's	→	Bachelor's or more
4.	Bachelor's or more	→	None (completed PSE after first credential)
5.	Bachelor's or more	→	Below bachelor's
6.	Bachelor's or more	→	Bachelor's
7.	Bachelor's or more	→	Graduate or professional degree

For some regression models, sample size and disclosure risks are less restrictive, allowing us to distinguish between TVA and college certificates and diploma below the bachelor's level.

[4] In our analyses, the "college" category for Quebec excludes two-year pre-university cégep programs because they include content that is part of the high school curriculum in Ontario and other provinces and are not intended to be terminal diploma. More importantly, they are a pre-requisite for access to undergraduate programs, which would artificially inflate the share of the Quebec samples with two PSE credentials. Instead, we focus only on technical cégep programs and other similar programs that are designed to prepare Quebec college graduates for entry on the job market (to that extent, these programs are similar to programs offered in Ontario colleges). We also exclude credentials with a standard duration below three months.

[5] These include non-degree university programs such as those related to entry into a profession without a prerequisite for a bachelor's degree.

Descriptive results

In Figure 1, we report descriptive results on PSE credential accumulation pathways by province or region. Results for Canada overall can be found in Figure 2.2 of the Phase 1 report. Two key results emerge:

1. Among respondents who obtained a bachelor's degree or more as their first credential, a larger share go on to obtain a graduate or professional degree in Ontario (33%) than any other province (26 to 28%).

   That said, a larger share of respondents with a bachelor's degree or more as their first credential complete a second credential at any level in the Atlantic provinces than in Ontario. In contrast with Ontario respondents, those from Atlantic provinces complete that second credential below the bachelor's level (16%) or at the bachelor's level (14% obtain a second bachelor's degree) rather than at the graduate/professional level.

   Finally, it is in Quebec where we find the highest share of respondents who graduate from a bachelor's program and complete their PSE at that stage (no credential accumulation), at 63% relative to 55% in Western provinces, 49% in Ontario, and 44% in Atlantic provinces.

2. Among respondents who obtain a first credential below the bachelor's level (TVA or college), we find relatively similar proportions of individuals with no further PSE credential in Ontario, the Western provinces, and the Atlantic provinces (around 70%).

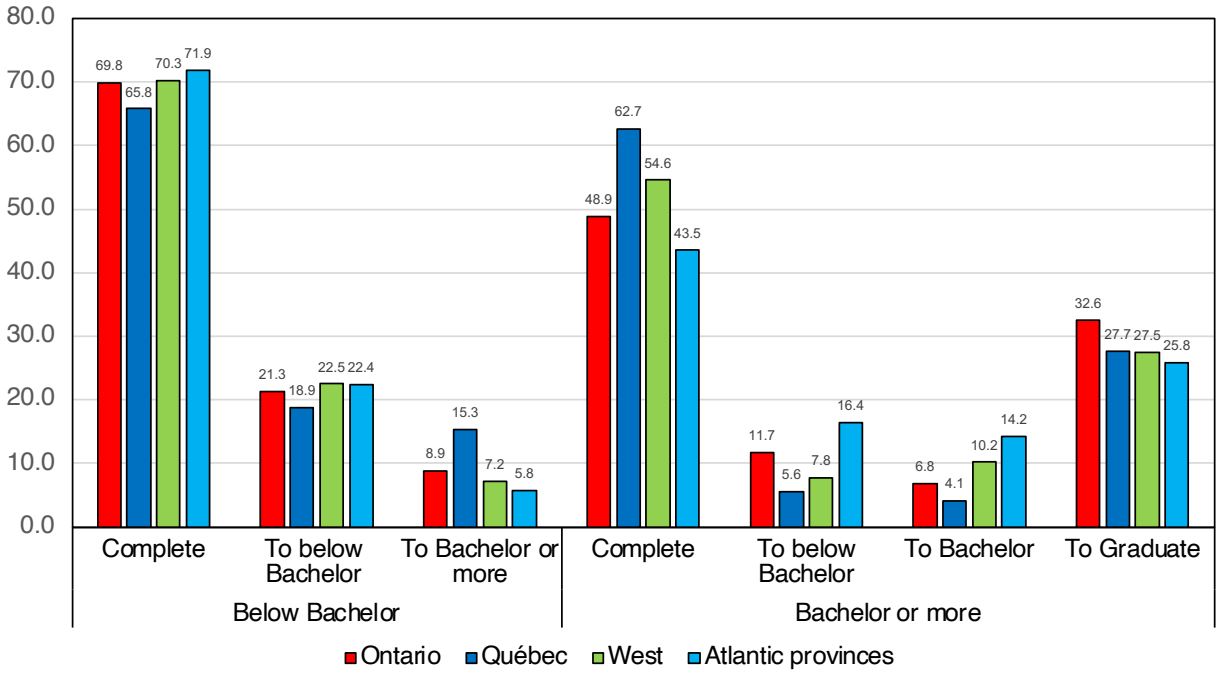
   In Quebec, that proportion is lower, at 66 percent. This is mostly driven by a large proportion of individuals who complete a bachelor's degree or more as their second credential after obtaining a first credential at the TVA or college level, at 15% in Quebec relative to 9% in Ontario, 7% in Western provinces, and 6% in the Atlantic provinces.

We can complement these results with other contextual element (see Figure A1 for complete results): we find the highest share of completion of at least one PSE program in Ontario at 65%, with the share of respondents from other provinces with at least one PSE credential varying between 57% (Atlantic provinces) and 59% (Quebec and Western provinces). The share of the overall population who obtain a first credential at the bachelor's level is also substantially higher in Ontario than in other regions, at 31%. This is followed by Western provinces (23%), Quebec (21%), and Atlantic provinces (19%). That said, because of the high share of TVA and college graduates who obtain a bachelor's degree as their second+ credential in Quebec, the share the population who ever obtained a bachelor's degree (as either their first, second, third or fourth credential) is 34% in Ontario, followed by Quebec at 27%, Western provinces at 26%, and the Atlantic provinces at 21%.

These differences may be driven both by the characteristics of provincial PSE systems and policies and by labour market dynamics. They may also be driven by differences in

the sociodemographic composition of the population of each province, which we address in the next section by estimating multivariate regression models.

Figure 1. Credential accumulation pathways from 18 to 35 years old by geography



Source: Statistics Canada, Longitudinal and International Study of Adults (LISA), Wave 3 (2016).
Note: The percentages show the distribution of various PSE pathways among those with a first credential at each of the two levels. They sum to 100 percent within the “Below bachelor’s” category and within the “Bachelor’s or more” category.

Multivariate regression results

PSE credential accumulation pathways across Canadian provinces and regions

This section reports results from regression models. These models allow us to test whether the differences observed in Figure 1 are statistically significant and whether they hold once we account for differences in the sociodemographic composition of the population of various provinces. Specifically, multivariate regression models help us disentangle whether our descriptive results may be driven by differences in the educational policies and institutions of each province or simply by differences in the observed sociodemographic characteristics of students from one province to the next (e.g., older average age of students or lower share of immigrant students in some provinces than others). To account for this last source of variation, our regression models control for age (squared), gender, immigration status, visible minority status, marital status, and parental education level.[6]

Table 1 reports average marginal effects from multinomial logistic regression models. In plain language, the results reported in the figure show us the gaps in the probability of following a given pathway in each province relative to Ontario. Here, Ontario is the "reference province". Regression coefficients reported in that table can be interpreted as differences in probability points (a 0.01 probability points gap is equivalent to a 1 percentage point gap).

The results are largely consistent with the descriptive estimates of Figure 1. First, Quebec college graduates are less likely to complete a second credential at the TVA level, and more likely to graduate from a bachelor's or graduate program as their second credential compared with Ontario. These differences are large (around 5 percentage points) and statistically significant. In other words, Quebec and Ontario individuals who obtain a college certificate or diploma as their first credential are equally likely to obtain a second credential, that second credential is likely to be obtained at a higher level (upwards credential accumulation) in Quebec than Ontario. No statistically significant differences are found in other provinces.

Second, we focus on those who graduate from a bachelor's program as their first credential. The probability of completing a second credential is 23 percentage points higher in Ontario than Quebec. This is driven by lower probabilities for bachelor's graduate in Quebec of completing a second credential at any level except for the TVA level, meaning that Quebec Bachelor's graduates are less likely to also complete a

[6] Another advantage of regression models is that they allow us to disaggregate our results by detailed credential level. For first credentials, we are able to differentiate between the trades, vocational and apprenticeship level (TVA) and the college, other non-university and university below bachelor's level. We do not disaggregate between bachelor's degrees and professional or graduate degrees for first credentials because very few individuals obtain the second category of degree as their first credential (for obvious reasons that these programs usually require a first credential). For second credentials, we report results with the same differentiation between the two categories of below bachelor's credentials, and between bachelor's degrees and graduate or professional degrees.

college certificate or diploma, a second bachelor's degree, or a graduate degree than Ontario Bachelor's graduates (net of differences in sociodemographic characteristics).

This difference may be driven by several factors, including differences in unobserved sociodemographic characteristics between Quebec and Ontario Bachelor's graduates. That being said, one plausible explanation is that in Quebec, Bachelor's programs allow entry into many professions such as law, medicine, and teaching, whereas in Ontario and other Canadian provinces, access to such professions often requires completing a bachelor's degree first, before completing a professional degree.

No statistically significant differences are found for other provinces relative to Ontario, with two exceptions. In Western provinces, Bachelor's graduates are significantly less likely to complete a second credential at the college level than in Ontario. In Atlantic provinces, Bachelor's graduates are significantly more likely to complete a second bachelor's level than in Ontario. Importantly however, net of differences in the sociodemographic characteristics of the population in each province, there is no statistically significant difference in the probability of completing no further PSE after a first credential in Ontario, the West, and the Atlantic provinces.

Table 1. Probability of obtaining a second credential at different levels relative to Ontario, by level of first credential

	Level of second credential				
Level of first credential	TVA certificate or diploma	College certificate or diploma	Bachelor's degree	Graduate or professional degree	Completed PSE after first credential
Ontario (reference)					
TVA	-	-	-	-	-
College	-	-	-	-	-
Bachelor's or more	-	-	-	-	-
Québec					
TVA	-0.059	0.007	0.007	-0.003	0.048
College	-0.04 *	-0.017	0.055 **	0.044 **	-0.041
Bachelor's or more	-0.007	-0.072 ***	-0.049 **	-0.096 *	0.226 ***
Western provinces					
TVA	0.008	0.013	0.019	0.009	-0.05
College	-0.027	0.028	0.01	-0.018	0.007
Bachelor's or more	0.004	-0.048 **	0.038	-0.044	0.049
Atlantic provinces					
TVA	0.007	0.011	-0.008	-0.009	-0.001
College	-0.033	0.011	-0.022	0.005	0.039
Bachelor's or more	0.006	0.025	0.074 **	-0.051	-0.055

Source: Statistics Canada, Longitudinal and International Study of Adults (LISA), Wave 3 (2016)
Legend: *** p<0.01; **p<0.05; *p<0.1

Relationship between PSE credential accumulation pathways and earnings

To conclude our empirical investigation, we focus on earnings differences associated with each PSE credential accumulation pathways. We do so by estimating a linear regression providing estimates of the earnings advantage experienced by respondents observed with a given PSE pathway relative to those who obtain a first credential below the bachelor's level and complete no further PSE (no credential accumulation). Our

sample includes both employees and self-employed workers. We exclude from our sample all individuals who did not work in 2015 or reported only working part-time for part of the year.

Our dependent variable is the log of annual earnings (employment income from all sources) in 2015. Our key independent variable is the PSE credential accumulation pathway variable used in Figure 1. The reference category is respondents who obtain a first credential below the bachelor's level and complete no further PSE. In other words, the baseline regression coefficients we report in the first line (Ontario) of Table 2 show the earnings advantage of respondents who followed a given PSE pathway relative to those in the reference category.

In addition, we estimate whether the size of the earnings advantages vary across provinces or regions. To do so, our regression interacts our key independent variable with our geography variable. In simple terms, the output from lines 2 to 4 of Table 2 (coefficients for Quebec, Western provinces, and Atlantic provinces) show the difference in the size of the earnings advantage associated with a given pathway between a given province or region and Ontario. A positive coefficient means that the advantage for a given pathway is larger in the province relative to the earnings advantage observed for that pathway among Ontario respondents.

Our models control for employment patterns in 2015 (whether employed full-time, full-year or other employment patterns involving part-time work or employment for part of the year only) and total work experience in years. They also control for the following set of sociodemographic characteristics: age (squared), gender, immigration status, visible minority status, marital status, and parental education level.

The coefficients from our key independent variable and the interaction coefficients are reported in Table 2, with p-values denoting statistical significance reported using star signs.[7] First, we find no statistically significant earnings advantage associated with credential accumulation pathways among respondents who obtain a first credential below the bachelor's level in Ontario, meaning that graduating from a TVA, college, or bachelor's program as a second credential after a first credential at the TVA or college level is associated with no additional annual earnings.

Note that even if the coefficient does not meet conventional statistical significance levels, we observe a 28% earnings advantage for those who complete a bachelor's degree after obtaining a first credential below the bachelor's level. Once administrative data sources with large sample sizes such as the Employment and Longitudinal Labour Market Platform (ELMLP) will provide long-enough observation windows, researchers

[7] Because our dependent variable is expressed as the log of earnings, the coefficients on the key independent variable are earnings advantages in percentage. In other words, a coefficient of 0.10 for a given pathway indicates a 10% earnings advantage for that pathway relative to the reference category, or more specifically, annual earnings 10% higher for respondents who followed a given PSE pathway relative to those who obtained a first credential below the bachelor's level and completed their PSE at that level.

will be able to test whether the absence of statistical significance is an artifact of the small sample size of the LISA or whether it is robust to the availability of a larger number of observations.

Second, in Ontario all pathways with a bachelor's degree or more as a first credential are associated with an earnings advantage relative to the reference category. That said, the size of that advantage is substantially larger for those who accumulate two credentials at the bachelor's level or higher (second credential at the graduate or professional level).

Finally, we turn to comparisons between Ontario and other provinces. We find few statistically significant differences. The earnings advantage associated with a bachelor's degree (and no further PSE) is smaller by 26 percentage points in Atlantic provinces than Ontario, which may explain why respondents from this region tend to pursue further PSE after a first bachelor's level credential (see Figure 1). The advantage associated with a second bachelor's degree is also significantly smaller in all provinces compared with Ontario (30 to 40 percentage points smaller). This last group of respondents who accumulate two bachelor's degrees is small (4 to 14% of all first credential bachelor's graduates depending on the province), and it is unclear what may drive the much larger earnings advantage for this group in Ontario.

One non-statistically significant result is also worth noting. The earnings advantage for respondents who completed a bachelor's degree or more after a college or TVA certificate or diploma is 20 percentage points larger in Quebec than in Ontario, which would mean that their earnings converge with their Quebec peers who complete their bachelor's degree as their first credential (and purse no further PSE). Figure 1 and regression results from the previous subsection showed a higher probability of following that pathway in Quebec than in other provinces. The earnings results further highlight the potential for policy learning from the Quebec college sector when it comes to facilitating bachelor's level graduation among those who follow non-linear pathways. That said, analysis relying on a large sample size (for example, from the ELMLP) would be necessary in order to determine whether the absence of statistical significance is only due to the small sample size of our dataset.

Table 2. Relationship between PSE credential accumulation pathway and 2015 annual earnings by geography

	Below Bachelor, complete (reference)	Below Bachelor, to below Bachelor	Below Bachelor, to Bachelor+	Bachelor+, complete		Bachelor+, to below Bachelor		Bachelor+, to Bachelor		Bachelor+, to Graduate	
Ontario (reference group)	-	0.03	0.28	0.47	***	0.41	**	0.81	***	0.70	**
Difference relative to Ontario coefficient											
Québec	-	-0.06	0.20	-0.01		-0.27		-0.30	**	-0.11	
Western provinces	-	-0.21	-0.09	-0.16		-0.09		-0.38	***	-0.19	
Atlantic provinces	-	0.13	-0.25	-0.26	**	-0.02		-0.42	***	-0.11	

Source: Statistics Canada, Longitudinal and International Study of Adults (LISA), Wave 3 (2016)

Legend: *** p<0.01; **p<0.05; *p<0.1

Discussion and conclusions

In this report, we extended key findings from the report *Non-Linear Postsecondary Education Pathways and Credential Accumulation* (2021) by providing a comparison between Ontario, Quebec, Western provinces, and the Atlantic provinces. Our aim was to identify possible differences in the PSE credential accumulation pathways and the earnings advantages associated with them in various provinces. Overall, we find only limited differences across provinces, suggesting that there may be room for policy experimentation and policy learning between PSE institutions and provincial stakeholders interested in student mobility, articulation, and transfer. That said, we do find a few important differences that may also point at some best practices Ontario PSE stakeholders could learn from.

As a first key difference, we show that Ontario individuals whose first credential is at the college level are significantly less likely than their Quebec counterparts[8] to obtain a second credential at the bachelor's or graduate/professional level, and more likely to complete a second college credential instead. This is an important insight. It suggests that there may be lessons to learn from the collegial education system in Quebec for Ontario and other Canadian provinces. Specifically, are transfers and articulation programs more flexible in the Quebec college system, allowing for more timely completion of a first credential at this level (which encourages subsequent entry into a bachelor's program)? Are there specific channels that allow credit transfer from completed college programs to bachelor's programs in Quebec that facilitate such an upward credential accumulation pathway? Future work could aim to identify which element found in the Quebec collegial education system could be adapted in the Ontario context.

The earnings analysis shows no statistically significant advantage to completing a second credential at the bachelor's level among those who obtain a first credential below the bachelor's level. Therefore, the importance of that pathway should not be over-emphasized. That said, the (non-statistically significant) earnings advantage coefficient is still large and our Phase 1 report using the larger Canada-level sample did find a statistically significant advantage. As such, this credential accumulation pathway should be explored in future research in parallel with PSE pathways that involve a college-to-university transfer. More generally, these findings suggest that government agencies and PSE stakeholders and institutions could gain from further exploration of articulation programs facilitating bachelor's degree graduation after entering PSE at the college or TVA level.

Beyond the significant difference between the credential accumulation pathways of Ontario and Quebec college graduates, we found substantially higher probability that Ontario bachelor's graduates who obtain a bachelor's degree as their first credential subsequently obtain a graduate degree as their second credential, relative to Quebec

[8] As explained in the Data section, our analyses, the "college" category for Quebec excludes two-year pre-university cégep programs. See that section for further details on the motivation behind this decision.

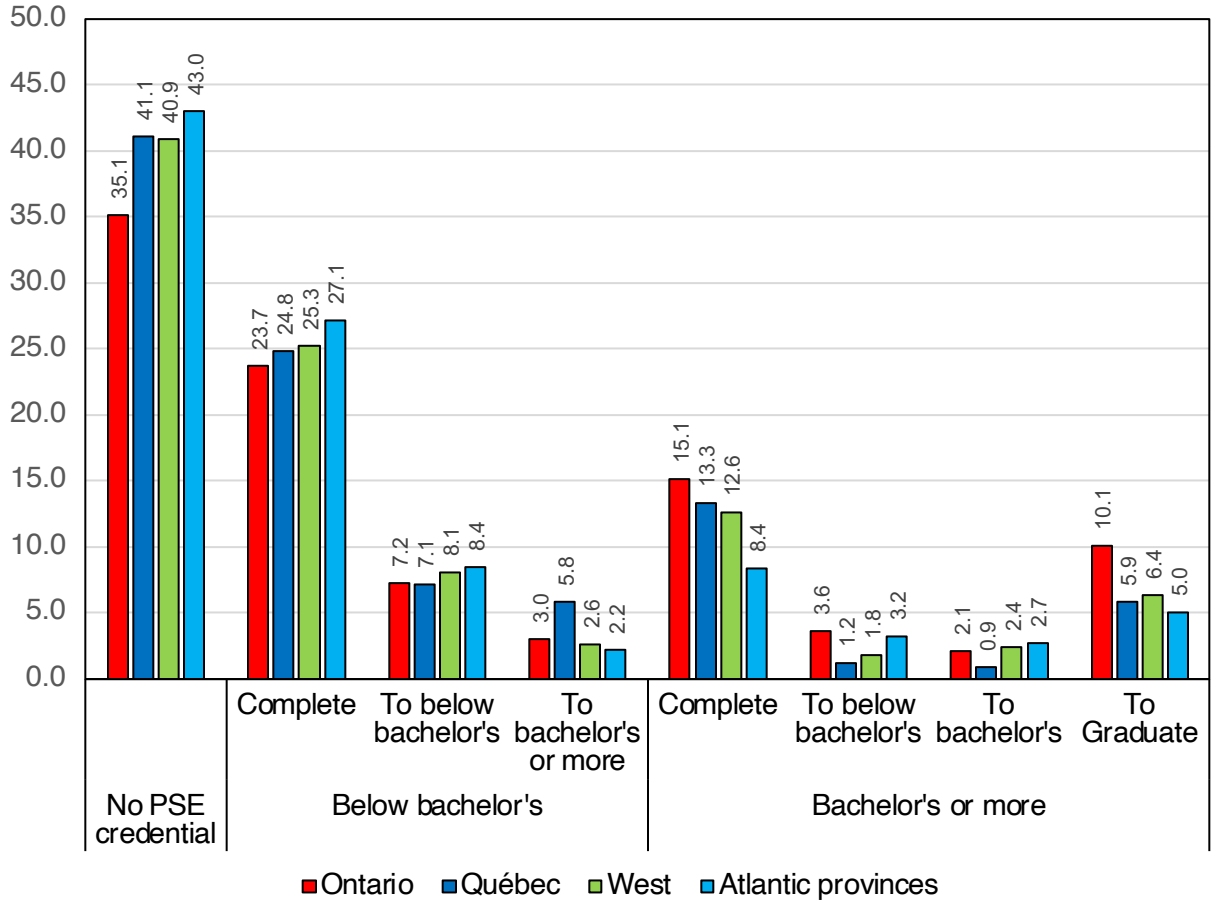
Bachelor's graduates. Here, one explanation may relate to requirements for entry into certain professions, as explained above. Another explanation may be that certain Ontario policies and programs facilitate timely graduation, including efficient transfer programs from one bachelor's program to another. A more detailed comparison of the pathways of Ontario and Quebec bachelor's students could provide useful insights.

Finally, the limited differences found between Ontario and Canadian provinces outside of Quebec suggest that many Canadian provinces may face similar challenges when it comes to the pathways of students in PSE. For that reason, education policy stakeholders including Councils on Articulation and Transfer (CATs) from different Canadian provinces may gain from more frequent and structured interactions. Federal systems have been found to represent fertile grounds for policy experimentation and learning in sectors such as healthcare (Maioni, 1997). The same may be true for PSE policy.

Looking forward, further attention may be granted to comparisons across provinces in analyses of PSE pathways, especially with large administrative datasets such as the ELMLP. As of January 2024, data from the Postsecondary Information System (PSIS), the source of administrative data on student pathways in PSE developed by Statistics Canada (and integrated to the ELMLP), provides data from around 2009 to 2021 for all Canadian provinces. This would allow researchers to study credential accumulation pathways over observation windows long enough to include non-linear trajectories including, for example, transfers and interruptions. The larger sample sizes of administrative datasets will allow future research to explore in depths the patterns first identified in this report.

Appendix

Figure A1. Credential accumulation pathways from 18 to 35 years old by geography, including those without PSE



Source: Statistics Canada, Longitudinal and International Study of Adults (LISA), Wave 3 (2016).
Note: The percentages sum to 100% for all categories of a given province.

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