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Postsecondary Education Credential Accumulation Pathways and the Intergenerational Reproduction of Inequalities

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

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Context

Education has long been identified as a key catalyzer of inequalities. For example, education can contribute to the reproduction of inequalities from one generation to the next (Aurini et al., 2020; Bourdieu & Passeron, 1964; Calarco, 2018; Lareau, 2003). This occurs when two conditions are met: 1) higher levels of educational attainment are associated with higher income; and 2) there is inequality in access to education based on social origins, meaning that children from more privileged families are more likely to achieve higher levels of education (Simard-Duplain & St-Denis, 2020).

On the other hand, research has also identified equalizing effects of postsecondary education (Hout, 1988; Mare, 1980; Torche, 2011). This research tends to show that inequality between bachelor's graduates with various family backgrounds tends to be smaller than the level of inequality between individuals with various family backgrounds observed in the overall population. In other words, this research tends to suggest that inequality between individuals of more or less privileged backgrounds would be stronger without the expansion of higher education observed in North America and Europe over the last few decades (Bloome et al., 2018; Pfeffer & Hertel, 2015). This equalizing effect can occur at the same time as inequalities in access to PSE occur, with one dynamic possibly counteracting the other. Those findings usually rely on data from the US. It is not clear to what extent they transpose onto the Canadian context. Moreover, they rely on cross-sectional measures of education that take into account the highest level of education attained by individuals, but not the specific pathways they may take into PSE.

The second shortcoming is especially consequential given two sets of findings in the Canadian context: first, different pathways through PSE are associated with substantial income disparities. For example, individuals who complete a bachelor's degree as their first credential and who pursue no further PSE tend to earn more than those who complete a college certificate or diploma before graduating from a bachelor's program (St-Denis et al., 2021; Walters, 2003). Second, family background appears to be associated with different dimensions of PSE pathways, especially graduating from a second PSE program after completing a first program (St-Denis et al., 2021).

In this report, we set out to explore whether differences in the likelihood of following certain PSE credential accumulation pathways depending on parental education contributes to the intergenerational reproduction of disadvantage among children of less educated parents.

Overview of main results

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

1. PSE does appear to have an “equalizer” effect when it comes to social mobility and the intergenerational transmission of disadvantage. Specifically, the employment income disadvantage faced by children of less educated parents once they become adults is smaller among PSE graduates than in the overall population. A smaller but statistically significant disadvantage does remain, however. This is particularly the case among children of non-immigrant parents.
2. Among PSE graduates in Ontario specifically and in Canada overall, there are significant differences in employment income levels driven by the specific credential accumulation pathways followed by individuals. Specifically, we observe an employment income advantage of 35 percent in Canada for those who graduate from a bachelor’s degree program as their first credential relative to those who graduate from a college program. In Ontario, that premium is over 45 percent. The income advantage associated with graduating from a bachelor’s program as one’s first PSE credential relative to other first PSE programs is larger among those who then pursue a graduate degree as a second credential. Meanwhile, there is also an income advantage for those who first graduate from a program below the bachelor’s level (college, trades, vocational or apprenticeship program) and who subsequently complete a bachelor’s degree, relative to those with the same first credential but who did not follow that pathway. In other words, there is substantial variation in the income advantage associated with different PSE pathways beyond income differences associated with the level of the first credential.
3. Individuals whose parents attended PSE are more likely to themselves follow certain types of PSE pathways, in particular pathways where a first credential below the bachelor’s level is followed by a bachelor’s degree as a second credential, and where a first bachelor’s degree is followed by a graduate degree or a second bachelor’s degree. These PSE credential accumulation pathways are all associated with an earnings advantage, as discussed in the previous point, and are not followed at the same rate by individuals of more versus less privileged backgrounds. At the same time, our results show that the largest differences emerge in terms of the first completed PSE program, and are visible but attenuated when it comes to further PSE credential accumulation.
4. Lastly, disparities in income between PSE graduates with different parental education levels are primarily accounted for by differences in the level of the first PSE credential obtained by children of different social origins (different parental education levels). In other words, children who participate to PSE are more likely to obtain a bachelor’s degree if they have a PSE-educated parent, and this is the primary driver of their higher earnings in adulthood relative to PSE graduates with less educated parents (who are more likely to graduate from college or trades, vocational, or apprenticeship

programs). In contrast, the pathways followed after the first credential play a much weaker role in accounting for the intergenerational transmission of disadvantage among PSE graduates in Canada and in Ontario. That said, since few individuals who obtain a credential below the bachelor's level subsequently obtain a bachelor's level, PSE credential accumulation beyond the first credential does not appear to play a corrective role or contribute to narrow earnings gaps between individuals of more versus less privileged social origins.

The rest of this report is structured as follows: first, we present our data and methods; second, we present our empirical results in detail; finally, we discuss the implications of our results for education policy and the development of transfer programs. We also point at avenues for further research.

Data, sample, and measures

The data used in this study data from 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 2016.¹ 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.

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 an earlier report using a similar sample (St-Denis et al., 2021).

In this report, we present results for Ontario². Because of our relatively small sample size, we also present results for Canada overall³. In doing so, we ensure that we have enough statistical power for our subgroup analyses. Because we are interested in individuals who completed their PSE in Canada, we exclude immigrations who arrived in Canada after 15 years old.

Measures of PSE pathways

The LISA variable capturing the level of each PSE credential uses 11 different categories. In our analysis, we use two classifications of PSE pathways. In a first classification, we use aggregate categories that capture the most relevant differences in levels for the first completed PSE program:

1. Trades, vocational, or apprenticeship certificates or diploma, abbreviated as “TVA”.

¹ 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.

² 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.

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.

2. Certificates or diploma at the college, cégep⁴, or other non-university level and at the university below bachelor's level⁵, which we abbreviate as "college".
3. Bachelor's, graduate, and first professional degrees. Note that for first complete PSE program, we collapse bachelor's and graduate or professional degrees because few individuals obtain a graduate or professional degree as their first credential (in some provinces such as Quebec, entry into M.D. programs do not require prior undergraduate education; in this case one's first PSE credential can be a "graduate" degree).

In analyses not shown, we use the same aggregate categories to classify second, third or fourth credentials, but we distinguish between bachelor's degrees and graduate or professional degrees.

Finally, for our analyses focusing on sequences of credentials, we classify respondents into seven different types of PSE pathways. The categories are 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

Measure of social origins

Following many studies of social mobility and of the intergenerational transmission of disadvantage, we use parental education as our measure of social origins. Prior research has shown that parental education is a good proxy for the socioeconomic status of parents and is a key driver of educational inequalities that is also strongly

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.

correlated with other widely used measures of social origins, such as parental income (St-Denis & Renée, 2022).

The LISA questionnaire includes a question on the level of education of the father and the mother. Our measure of parental education is based on the attainment of the parent with the highest level of education. We use three categories: secondary education or less (“no PSE”); postsecondary education below university (“some PSE”); and university education. This relatively aggregated category accommodates credentials obtained abroad across a broad range of education systems, given that parents may have completed their education in another country.

Measure of child income

Our main measure of the socioeconomic status attained by children is total annual employment income in 2015 (LISA Wave 3 data is collected between January and June 2016, making 2015 the most recent full year of income that can be observed). This variable includes T4 income for employees, self-employment income as well as other types of personal income such as business income, commissions, and tips. In our model, we use the natural log of child income to ensure that our results are not driven by outliers (very high incomes). By using the log of income as a dependent variable in our models, the coefficients can be interpreted as percentage change or percentage differences.

As explained below, our regression models control for age and for employment history in 2015 to ensure that employment income differences between respondents are not driven by differences in accumulated work experience and on the number of weeks worked in 2015 or their part-time/full-time employment status of an individual.

Methods

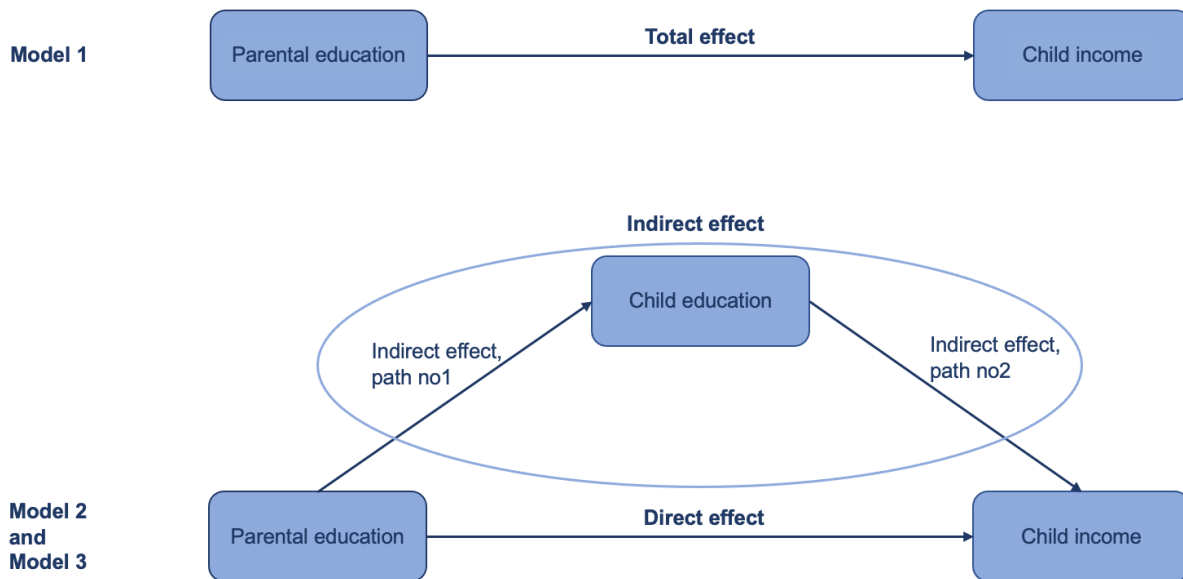
The main focus of this paper is to quantify the contribution of various types of PSE pathways to the intergenerational reproduction of disadvantage. To do so, we use a methodological approach based on mediation analysis and frequently implemented in studies of social mobility and intergenerational transmission (Björklund et al., 2017; Blanden et al., 2007; Blau & Duncan, 1967; Bowles & Gintis, 2002; Simard-Duplain & St-Denis, 2020; St-Denis & Renée, 2022).

To implement our approach, we estimate three main models.

1. The first model is a regression with child employment income as our dependent variable and parental education as our key independent variable. It provides us with an estimate of the total size of the relationship between parental education and child income (what we call the “total effect”). This model also controls for sex, age (quadratic term), region of residence (Ontario, Quebec, Western provinces, and Atlantic provinces) and immigration status. The descriptive statistics for the distribution of these variables is provided in the Appendix (Table A1).
2. The second model adds a variable capturing the level of the first PSE program completed by the respondent to the model 1 specification. Our approach relies on the comparison of the estimates of the relationship between parental education and child income obtained in the first and second model. Specifically, if the size of the coefficients for parental education are smaller in the second model, we can conclude that the relationship between parental education and child income is accounted for by our mediating variable. In other words, the difference in the size of the coefficients is a quantity that tells us what part of the “total” effect is accounted for by differences in the level of the first PSE credential between respondents with lower and higher parental education. This quantity is called the “indirect effect” because it tells us how much of the overall relationship between parental education and child income is channelled or operates through the first credential obtained by the respondent.
3. The last model replaces our initial child education variable (the level of the first PSE program completed, which is a variable that captures the start of one’s pathway into PSE) with a variable capturing with more nuances the PSE pathways followed by respondents after graduating from their first PSE program. That variable with seven category is described above. The results can be interpreted similarly to those from model 2, meaning that replacing our initial child education variable with our detailed PSE pathways variable will tell us whether a larger portion of the overall relationship between parental education and child income is channelled or operates through PSE pathway characteristics observed after graduation from a first PSE program. If the size of the parental education estimate is further reduced when using this new variable, we will conclude that the indirect effect of child education is driven not only by differences in the level of the first credential between respondents with various parental education levels, but also by the specific credential accumulation pathways followed by children or more or less educated parents.

Our approach is summarized in the chart below. The indirect effect is composed of two paths, each of which must be positive. Path no1 is the influence of parental education on child education (either the level of the first credential, in model 2, or the type of PSE credential accumulation pathway, in mode 3). Path no2 is the relationship between the different PSE pathways and earnings levels. In the empirical section, we provide evidence documenting the importance of each of these paths.

Chart 1. Direct and indirect paths for the influence of parental education on child income



Source: Authors.

Lastly, because we know that second generation immigrants (children born in Canada from immigrant parents) tend to have higher educational attainment than individuals of the third generation or more (children born in Canada from Canadian parents) and tend to have smaller differences in educational attainment based on social origins (Boyd, 2009; Boyd & Grieco, 1998), we also estimate models separately for second generation immigrants and for third generation immigrants or more.

Note that throughout the paper, when we refer to “effects”, we do so without implying a causal relationship between parental education and child income or the relationship between child education and other variables. There may be unobserved variables correlated with parental education and also explaining child education and income. Importantly, children with specific profiles may select into PSE, meaning that the income advantage associated with education may not be driven only by a causal effect of education, but also by a selection dynamic where children with abilities or aspirations leading to higher incomes are also those who are more likely to attend PSE and obtain

PSE credentials. In sum, our results should be interpreted as descriptive evidence capturing important patterns of statistical association, but not as evidence of the causal effect of specific variables that can quantify with precision the potential impact of specific policy interventions. Experimental or quasi-experimental research frameworks would be necessary to achieve such an objective. In contrast, our results help us quantify the size of inequalities as they are observed in the data and variables that appear to account for those differences. This can help design policy solutions that then need to be properly evaluated.

Results

The equalizing role of postsecondary education

As a first step in our analysis, we document the potentially equalizing effect of postsecondary education. In Table 1, we estimate the relationship between parental education and child income for two separate samples. The first one includes all respondents in the 1956 to 1980 birth cohorts except those who arrived in Canada after 15 years old. The second sample includes the subset of respondents from the first sample who have completed at least one PSE program. If the size of the relationship between parental education and child income is stronger in the overall population relative to the population of PSE graduates, we can conclude that social origins have a weaker influence on the socioeconomic status attained by children with some PSE than the population in general, or that PSE has an equalizer effect when it comes to the intergenerational transmission of disadvantage.

This is in fact what we find in Canada overall and in Ontario. For example, when comparing Model 1b (total population/full sample) and 2b (PSE graduates, or only respondents with at least one PSE credential) from the Ontario sample in Table 1a, we see that in the total population having a university-educated parent is associated with an advantage in terms of employment income of 37 percent relative to having a parent with a secondary education or less (no PSE); that advantage is approximately half as large when restricting the sample to PSE graduates only, at 22 percent. In other words, the influence of parental education on child income is weaker among PSE graduates than in the overall population. This detachment from social origins among PSE graduates is generally interpreted as evidence that PSE has an equalizer effect (Hout, 1988; Mare, 1980; Simard-Duplain & St-Denis, 2020; Torche, 2011). Results for models 1a and 2a show the same results but without controlling for the employment histories of respondents in 2015 and allow us to draw the same conclusion.

Table 1a. Estimates of relationship between parental education and child income in 2015 (natural log) for full sample and PSE graduates only (Canada and Ontario), 1956-1980 birth cohorts

	Canada				Ontario			
	Full sample		PSE only		Full sample		PSE only	
	Model 1a	Model 1b	Model 2a	Model 2b	Model 1a	Model 1b	Model 2a	Model 2b
Parental education								
No PSE (reference)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Some PSE	0.054	0.050	0.015	-0.003	-0.031	-0.014	-0.101	-0.134
University	0.301 ***	0.239 ***	0.190 ***	0.156 ***	0.490 ***	0.367 ***	0.298 ***	0.217 **
Controls	yes	yes	yes	yes	yes	yes	yes	yes
Employment history		yes		yes		yes		yes
Constant	4.983 ***	8.203 ***	4.196 ***	8.142 ***	4.677 **	7.152 ***	3.995 *	6.865 ***
R-squared	0.065	0.380	0.067	0.373	0.084	0.377	0.082	0.321
Adjusted R-squared	0.064	0.379	0.064	0.370	0.080	0.370	0.075	0.310

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

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

As a set of auxiliary results, we estimate the same models but separately for respondents who report having at least one immigrant parent (1.5 or 2nd generation immigrants⁶) and those who report no foreign-born parents. Due to sample size limitations, we are only able to produce those results for Canada. The results are shown in Table 1b. Our key finding is that the association between parental education and child income (models 1a and 1b) is slightly larger for the sample of children of non-immigrants than the overall Canadian sample (the coefficient for parental university education in model 1b is 0.239 for Canada overall and 0.290 for children of non-immigrants). It is also substantially larger than the sample of children of immigrants (the coefficient for parental university education in model 1b is 0.033 and is not statistically significant). This is evidence that social origins appear to have a weaker influence on socioeconomic status attainment among children of immigrants. In other words, social mobility appear stronger among this group, a finding in line with the existing literature (Boyd, 2009).

Furthermore, when comparing model 1b and 2b, we find a weaker equalizer effect among children of non-immigrants (a decrease of 23 percent, from 0.290 to 0.223) than among the overall Canadian population (for which we found a 28 percent decrease). Based on these findings, we conclude that there is greater social mobility among children of immigrants and weaker intergenerational transmissions of disadvantage. This is true for PSE graduates, suggesting that some dimensions of PSE pathways could be the source of important disadvantages among children of less educated parents who are not immigrants (i.e., substantial inequalities persist among this group of PSE graduates based on social origins).

Table 1b. Estimates of relationship between parental education and child income in 2015 (natural log) for full sample and PSE graduates only (children of immigrants and of non-immigrants), Canada, 1956-1980 birth cohorts

	Children of non-immigrant parents				Children of immigrant parents			
	Full sample		PSE only		Full sample		PSE only	
	Model 1a	Model 1b	Model 2a	Model 2b	Model 1a	Model 1b	Model 2a	Model 2b
Parental education								
No PSE (reference)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Some PSE	0.051	0.052	0.014	0.010	0.091	0.051	0.043	-0.056
University	0.331 ***	0.290 ***	0.222 ***	0.223 ***	0.192	0.033	0.094	-0.078
Controls	yes	yes	yes	yes	yes	yes	yes	yes
Employment history								
Constant	4.868 ***	7.989 ***	4.537 ***	7.920 ***	6.652 ***	10.020 ***	3.324	8.984 ***
R-squared	0.065	0.383	0.065	0.372	0.077	0.414	0.099	0.447
Adjusted R-squared	0.064	0.381	0.062	0.369	0.065	0.401	0.083	0.430

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

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

⁶ Second generation immigrants are individuals born in Canada from immigrant parents; the 1.5 generation includes individuals born outside of Canada (and whose parents are also born outside of Canada) but who arrived in Canada in childhood. Our sample includes no first-generation immigrants (born in Canada and arrived in Canada in adulthood) because one of our key sample restrictions excludes respondents who arrived in Canada after 15 years old.

To summarize our findings, we find evidence of higher levels of social mobility, or weaker levels of intergenerational reproduction of inequalities, among PSE graduates than the population in general. That said, we still find a large and statistically significant association between parental education and child income, meaning that even among PSE graduates, having a university-educated parent translates into a large and statistically significant advantage in terms of employment income in adulthood. For example, Ontario PSE graduates with university-educated parents have employment income 22 percent higher than Ontario PSE graduates with parents without any PSE (as per model 2b, Table 1). The transmission of disadvantage from less educated parents to their children is even larger among non-immigrants parents.

In the next sub-sections, we explore whether the specific credential accumulation pathways of our sample of PSE graduates can account for this source of disadvantage. Specifically, we ask whether some PSE pathways are associated with higher employment income than others, and if these high-paying pathways are more likely to be completed by children of more educated parents.

Credential accumulation pathways as drivers of income inequality among PSE graduates

In our analysis, we aim determine to what extent income inequality between PSE graduates emerge in the first stage of PSE pathways (the level at which individuals enter PSE). We also seek to determine to what extent they are further driven by decisions made after obtaining a first PSE credential, such as attending graduate school versus a college program after a bachelor's degree, or such as completing a bachelor's program after graduating from college or entering the labour market immediately after college with no further PSE.

In order for PSE pathways to contribute to the intergenerational reproduction of inequalities, two conditions must be met: on one hand, some PSE pathways must be associated with higher employment income levels than others (path no2 in Chart 1); and on the other hand, children with more highly educated parents must be more likely to follow those higher-paying PSE pathways (path no1 in Chart 1). In this sub-section, we focus on documenting the first condition.

To do so, we provide two pieces of empirical evidence. First, estimate the relationship between the level of the first PSE credential (the "entry" credential in an individual's pathway in PSE) and employment income (path no2). Those results are reported in Table 2, for both Ontario and Canada overall. Second, we estimate the relationship between a variable categorizing individuals based on their full PSE pathway and employment income (path no1), discussed in the next subsection.

Focusing on Ontario, the main results are the following (note that they are broadly similar to the results for the sample covering all Canada):

1. For models estimating the relationship between the first PSE credential and income, we find an advantage in employment income of approximately 45 percent for bachelor's graduates relative to graduates from college. The gap between college graduates and graduates from trades, vocational and apprenticeship programs is much smaller and not statistically significant.
2. For models documenting the relationship between full PSE credential accumulation pathways and income, we find a consistent advantage for pathways that include graduating from a bachelor's program relative to those who complete a college program and pursue no further PSE (our reference category). For example, we find an income advantage for those who completed a bachelor's degree and pursued no further education and those who then went on to complete a college or a trades/vocational/apprenticeship program, of 38 and 36 percent respectively according to model 2b. For those who complete a second bachelor's degree or a graduate degree, the advantage is substantially higher. Previous research showed that individuals with university-educated parents were more likely to follow those last two pathways (St-Denis et al., 2021). Finally, those who completed a bachelor's program after a first PSE credential below the bachelor's level experience a 25 percent income advantage in model 2b. That coefficient is not statistically significant. However, the same coefficient for the Canadian sample is of a similar size and is statistically significant. It is possible that we are simply lacking statistical power in the Ontario sample given the relatively small share of individuals who follow that PSE pathway (St-Denis et al., 2021).

These findings indicate that some PSE pathways are associated with large income advantages, confirming the role of path no2 in the indirect effect (see Chart 1). Note that such results are presented here for context, as a first stage of our analysis. A more thorough analysis unpacking the relationship between PSE pathways and earnings is presented in an earlier report (St-Denis et al., 2021).

Table 2. Estimates of the association between PSE pathway and employment income in 2015 (natural log), 1956-1980 birth cohorts

	Canada				Ontario			
	Model 1a	Model 2a	Model 1b	Model 2b	Model 1a	Model 2a	Model 1b	Model 2b
First PSE credential								
Trades, vocational or apprenticeship	-0.176 **		-0.149 *		-0.061		-0.086	
College (reference)	0.000		0.000		0.000		0.000	
Bachelor's degree	0.369 ***		0.346 ***		0.462 ***		0.445 ***	
Credential accumulation pathways								
Below bachelor's only (reference)		0.000		0.000		0.000		0.000
Below bachelor's to below bachelor's		0.008		-0.028		0.099		0.036
Below bachelor's to bachelor's		0.269 **		0.271 ***		0.234		0.249
Bachelor's only		0.371 ***		0.355 ***		0.346 **		0.382 ***
Bachelor's to below bachelor's		0.364 ***		0.304 ***		0.442 **		0.357 *
Bachelor's to bachelor's		0.461 ***		0.451 ***		0.817 ***		0.857 ***
Bachelor's to graduate		0.616 ***		0.539 ***		0.735 ***		0.628 ***
Controls								
	yes	yes	yes	yes	yes	yes	yes	yes
Employment history								
			yes	yes			yes	yes
Constant	4.429 ***	4.200 ***	8.271 ***	8.114 ***	3.711 *	3.436	6.553 ***	6.366 ***
R-squared	0.098	0.103	0.401	0.405	0.106	0.122	0.349	0.359
Adjusted R-squared	0.096	0.099	0.398	0.401	0.099	0.110	0.338	0.344

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

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

The influence of parental education on postsecondary education pathways

In order for PSE pathways to play a role in the intergenerational transmission of disadvantage, there must be a relationship between family background (parental education, in our case) and the PSE pathways of children (path no1 of the indirect effect in Chart 1). For that reason, this section reports the share of individuals with different parental education levels who obtain a first credential at a given level (Table 3a) and who follow different PSE pathways (Table 3b). Due to sample size limitations, we do not report results by immigration status in this subsection. We note in passing that approximately half of the Ontario sample, and the same proportion for the overall Canada sample, has at least one parent who attended PSE (see Table A1 for the detailed breakdown).

In table 3a, we report the share of individuals in our sample who obtained their first PSE credential at different levels, by parental education. In Ontario, we find evidence of a strong relationship between parental education and the education achieved by their children, in line with existing findings from the literature (Chow & Guppy, 2021; Finnie & Mueller, 2008; Simard-Duplain & St-Denis, 2020). For example, while 20 percent of individuals whose parents did not have a PSE credential graduated from a bachelor's program, 44 percent of those whose parents had a PSE credential obtained a bachelor's degree. We find the reverse pattern for individuals with no-PSE parents.

Table 3a. Percentage of individuals with first credential at different levels, by parental education (Canada and Ontario), 1956-1980 birth cohort

First credential	Canada		Ontario	
	No PSE	PSE	No PSE	PSE
No PSE	50	25	46	22
Trade, vocational or apprenticeship	13	10	8	7
College, cegep or other non-university	22	27	25	28
Bachelor's degree	15	37	20	44
Total	100	100	100	100

Source: Longitudinal and International Study of Adults (2016) wave 3, Statistics Canada.

Note: Percentages may not sum to 100 due to rounding.

Do we find the same patterns for PSE pathways beyond the first credential? Table 3b suggests that this is the case. The "Total" columns report the share of individuals who followed different PSE pathways, by parental education. The "Conditional" columns calculate the share of individuals among those obtaining a first PSE credential at a given level (either below bachelor's or at the bachelor's level) who then pursued one of three credential accumulation pathways. The "conditional" results help us understand how pathways may differ by parental education among those who have already completed the first step of their pathway into PSE at a given level.

Again, we focus on the Ontario results. We find that parental education is related to the PSE pathway of their children. For example, 7 percent of all individuals whose parents had no PSE obtained a graduate degree (or a second bachelor's degree) after obtaining a bachelor's degree as their first credential. Meanwhile, this was the case for 18 percent of individuals whose parents had attended PSE.

In addition, we can compare outcomes among graduates of a given first credential level by focusing on the "conditional" column. Here, we find that among those who obtained a first credential below the bachelor's level, 70 percent of individuals whose parents did not have PSE and 69 percent of those whose parents had attended PSE did not obtain any further credential. However, differences emerge in the remaining 30 percent of such graduates from below bachelor's programs. Among those with parents without PSE, 24 percent had then obtained another credential below the bachelor's level and 6 percent went on to obtain a bachelor's degree or more. On the other hand, among those with parents who had attended PSE, the shares were 20 percent and 11 percent respectively.

Table 3b. Percentage of individuals following different PSE credential accumulation pathways, by parental education (Canada and Ontario), 1956-1980 birth cohort

Credential accumulation pathways	Canada				Ontario			
	Parental education							
	No PSE		PSE		No PSE		PSE	
	Total	Conditional	Total	Conditional	Total	Conditional	Total	Conditional
No PSE	50		25		47		22	
Below Bachelor's only	26	72	24	65	23	70	24	69
Below Bachelor's to below Bachelor's	7	19	8	22	8	24	7	20
Below Bachelor's to Bachelor's	3	8	5	14	2	6	4	11
Bachelor's only	8	57	19	50	11	55	20	47
Bachelor's to below Bachelor's	1	7	4	11	2	10	5	12
Bachelor's to Bachelor's or to Graduate	5	36	15	39	7	35	18	42
Total	100		100		100		100	

Source: Longitudinal and International Study of Adults (2016) wave 3, Statistics Canada.

Note: The "Total" columns represent the percentage of individuals in each credential accumulation pathway category by parental education. It sums to 100 (percentages may not sum to 100 due to rounding). The "Conditional" columns represent the percentage of individuals at a given first credential (below Bachelor's, or Bachelor's) who follow one of the three credential accumulation pathways (no more PSE or another PSE credential at a given level). These are the percentages of individuals in each category of second credential conditional on having achieved a first credential at a given level.

Our interpretation of these results is that in Ontario, the same proportion of graduates from PSE programs below the bachelor's level go on to complete a second credential. However, this second credential is almost twice as likely to be a bachelor's degree for children of PSE-educated parents (11 percent) than those of non-PSE-educated parents (6 percent). As we have seen in the previous subsection, this pathway is associated with a large earnings advantage relative to the other pathways followed by those who obtain a first credential below the bachelor's level.

Meanwhile, among those graduating from a bachelor's program as their first PSE credential, we also find important differences by parental education: 55 percent of those without PSE-educated parents do not pursue further PSE and 35 percent obtain a second credential at the bachelor's or graduate level. Those proportion is substantially different for those with PSE-educated parents at 47 percent and 42 percent

respectively. This last group of individuals with a more privileged family background is more likely to follow the PSE pathways associated with the larger earnings advantage (bachelor's to bachelor's or bachelor's to graduate).

In other words, we document the importance of path no1 (see Chart 1) both in terms of the level of the first credential and the more detailed PSE pathways on which we focus in this study. In the second case, the differences by parental education are not as large. In the next sub-section, we seek to determine to what extent PSE pathways, channelled through the two paths we documented here, contribute to the intergenerational reproduction of income disadvantage for children of less educated parents.

The intergenerational reproduction of inequalities among graduates from PSE programs

In this sub-section, we aim to show to what extent the different likelihood of following a specific PSE pathway depending on parental education can account for the intergenerational reproduction of disadvantage among children of less educated parents. Results are presented in Tables 4a for Canada overall and 4b for Ontario. Models with suffix “b” are the same as those with suffix “a” except for the addition of an employment history control that captures employment patterns in 2015. In what follows we focus on results for Ontario and specifically on models that control for the employment history of respondents. Note that in models using the sample for Canada overall and those not controlling for employment history most coefficients on parental education keep a similar size and the overall results point to similar conclusions. In sum, our findings do not seem to be primarily driven by the annual employment history of respondents or by results specific to Ontario.⁷

Models 1a and 1b simply reproduce models 2a and 2b from Table 1 in order to provide a reference point. The model 1 coefficients on parental education at the university level represents what we call a “total effect” of intergenerational transmission, or the relationship between parental university education and child income. As explained in the methods section, it is driven by two elements: first, differences in educational attainment between children of university educated parents and the reference groups (the “indirect effect”, or the relationship between parental education and child income that is channelled through child education); and second, by other factors that are unrelated to the educational attainment of children with different parental education levels (the “direct effect”).

⁷ In Appendix Table A2, we estimate models with the same specification as table 4a, but using total income before taxes (but including transfers) instead of employment income as a dependent variable. The results are almost identical.

Table 4a. Estimates of the total and direct relationship between parental education and child income in 2015 (natural log), Canada, 1956-1980 birth cohorts

	Model 1a	Model 2a	Model 3a	Model 1b	Model 2b	Model 3b
Parental education						
No PSE (reference)	0.000	0.000	0.000	0.000	0.000	0.000
Some PSE	0.015	-0.034	-0.028	-0.003	-0.048	-0.044
University	0.190 ***	0.042	0.021	0.156 ***	0.018	-0.000
First PSE credential						
Trades, vocational or apprenticeship		-0.174 *			-0.149 **	
College (reference)		0.000			0.000	
Bachelor's degree		0.358 ***			0.340 ***	
Credential accumulation pathways						
Below bachelor's only (reference)			0.000			0.000
Below bachelor's to below bachelor's			0.008			-0.028
Below bachelor's to bachelor's			0.267 **			0.272 ***
Bachelor's only			0.367 ***			0.355 ***
Bachelor's to below bachelor's			0.363 ***			0.308 ***
Bachelor's to bachelor's			0.451 ***			0.446 ***
Bachelor's to graduate			0.605 ***			0.534 ***
Controls	yes	yes	yes	yes	yes	yes
Employment history				yes	yes	yes
Constant	4.196 ***	4.395 ***	4.190 ***	8.142 ***	8.268 ***	8.131 ***
R-squared	0.067	0.099	0.103	0.373	0.401	0.405
Adjusted R-squared	0.064	0.096	0.099	0.370	0.398	0.401

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

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

Table 4b. Estimates of the total and direct relationship between parental education and child income in 2015 (natural log), Ontario, 1956-1980 birth cohorts

	Model 1a	Model 2a	Model 3a	Model 1b	Model 2b	Model 3b
Parental education						
No PSE (reference)	0.000	0.000	0.000	0.000	0.000	0.000
Some PSE	-0.101	-0.131	-0.118	-0.134	-0.169 *	-0.156
University	0.298 ***	0.148	0.110	0.217 **	0.061	0.033
First PSE credential						
Trades, vocational or apprenticeship		-0.046			-0.080	
College (reference)		0.000			0.000	
Bachelor's degree		0.417 ***			0.421 ***	
Credential accumulation pathways						
Below bachelor's only (reference)			0.000			0.000
Below bachelor's to below bachelor's			0.101			0.034
Below bachelor's to bachelor's			0.218			0.238
Bachelor's only			0.324 *			0.374 ***
Bachelor's to below bachelor's			0.410 **			0.344 *
Bachelor's to bachelor's			0.741 ***			0.806 ***
Bachelor's to graduate			0.679 ***			0.598 ***
Controls	yes	yes	yes	yes	yes	yes
Employment history				yes	yes	yes
Constant	3.995 *	3.715 *	3.460	6.865 ***	6.570 ***	6.407 ***
R-squared	0.082	0.114	0.128	0.321	0.355	0.364
Adjusted R-squared	0.075	0.105	0.113	0.310	0.342	0.347

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

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

In models 2 and 3, we attempt to quantify the role of PSE pathways as a mechanism for intergenerational transmission. In model 2, we focus on the first step or entry stage of PSE pathways: the level of the first PSE program ever completed. We implement our approach by adding that variable to our model and by then considering the change in the coefficient for parental university education between model 1 and model 2. In Table 4b, we see that the coefficient shrinks by 72 percent, from 0.217 in model 1b to 0.061 in model 2b; we also see that the model 2b coefficient is not statistically significant. We interpret this as evidence that 72 percent of the relationship between parental university education and child income can be accounted for by the fact that children of university-educated parents are more likely to obtain a first PSE credential at levels associated with higher pay, such as a bachelor's degree or more (see previous sub-section). In other words, the direct effect of parental university education on child income is only 28 percent of the total effect, while the indirect effect operating through our driven by the level of the first obtained PSE credential accounts for 72 percent of the total effect.

Next, we ask whether differences in PSE pathways according to parental education can account for a further portion of the total effect. To do so, model 3 replaces the first PSE credential used in model 2 by the detailed PSE pathway variable described in the data section. This variable categorizes respondents on the basis of their first and second (or higher) credential. This would allow us to determine whether any remaining direct effect can be accounted for not only by the level of the first PSE credential, but the credential accumulation pathways followed afterwards. Note that model 2b of Table 4b suggests that there is little room for this channel to operate because the level of the first credential already accounts for almost three quarter of the total effect. Moreover, the remaining association between parental university education and child income (a coefficient of 0.061) is not statistically significant. That said, we can see in model 3 that the coefficient is halved relative to model 2. In sum, our results suggest that differences in PSE pathways play a small additional role as a driver of income inequality based on parental education relative to an explanatory model that only focuses on the level of the first credential.

Finally, Table 5 replicates our analysis, but for children of non-immigrant parents and children of immigrant parents separately. Our results are broadly the same, with the level of the first credential accounting for most of the relationship between parental education and child income in the sample of children of non-immigrants, and detailed PSE pathways accounting for a smaller additional share of that relationship. Given the absence of significant estimates for parental education at any level (including university education) in model 1 among children of immigrants, we draw no conclusions on whether PSE pathways can account for any of that non-significant coefficient.

Table 5. Estimates of the total and direct relationship between parental education and child income in 2015 (natural log) by immigration status, Canada (1956-1980 birth cohorts)

	Model 1a	Model 2a	Model 3a	Model 1b	Model 2b	Model 3b
Children of non-immigrant parents						
Parental education						
No PSE (reference)	0.000	0.000	0.000	0.000	0.000	0.000
Some PSE	0.014	-0.030	-0.026	0.010	-0.028	-0.027
University	0.222 ***	0.076	0.044	0.223 ***	0.091	0.060
First PSE credential						
Trades, vocational or apprenticeship		-0.123 *			-0.089 *	
College (reference)		0.000			0.000	
Bachelor's degree		0.351 ***			0.331 ***	
Credential accumulation pathways						
Below bachelor's only (reference)			0.000			0.000
Below bachelor's to below bachelor's			0.102			0.077
Below bachelor's to bachelor's			0.249 **			0.308 ***
Bachelor's only			0.333 ***			0.340 ***
Bachelor's to below bachelor's			0.352 ***			0.273 **
Bachelor's to bachelor's			0.440 ***			0.439 ***
Bachelor's to graduate			0.702 ***			0.606 ***
Controls	yes	yes	yes	yes	yes	yes
Employment history				yes	yes	yes
Constant	4.537 ***	4.718 ***	4.449 ***	7.920 ***	8.037 ***	7.846 ***
R-squared	0.065	0.093	0.103	0.372	0.395	0.403
Adjusted R-squared	0.062	0.090	0.098	0.369	0.392	0.399
Children of immigrant parents						
Parental education						
No PSE (reference)	0.000	0.000	0.000	0.000	0.000	0.000
Some PSE	0.043	-0.012	-0.012	-0.056	-0.107	-0.097
University	0.094	-0.042	-0.043	-0.078	-0.204	-0.183
First PSE credential						
Trades, vocational or apprenticeship		-0.478			-0.375 **	
College (reference)		0.000			0.000	
Bachelor's degree		0.352 ***			0.369 ***	
Credential accumulation pathways						
Below bachelor's only (reference)			0.000			0.000
Below bachelor's to below bachelor's			-0.517			-0.490
Below bachelor's to bachelor's			0.406 *			0.062
Bachelor's only			0.445 ***			0.375 ***
Bachelor's to below bachelor's			0.367			0.579 ***
Bachelor's to bachelor's			0.374 *			0.382 **
Bachelor's to graduate			0.365 *			0.327 **
Controls	yes	yes	yes	yes	yes	yes
Employment history				yes	yes	yes
Constant	3.324	3.834	2.917	8.984 ***	9.279 ***	8.683 ***
R-squared	0.099	0.156	0.165	0.447	0.496	0.502
Adjusted R-squared	0.083	0.137	0.138	0.430	0.477	0.479

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

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

Conclusion

In this report, we set out to explore the contribution of unequal access to various PSE credential accumulation pathways to the intergenerational reproduction of inequalities. One of the key findings is that the level of entry into PSE has substantial influence on whether individuals end up accumulating credentials that are highly rewarded on the labour market; and this dynamic can account for a substantial part of the relationship between social origins (parental education) and socioeconomic status (employment income).

The main implication of this finding is the following: interventions that can support most efficiently PSE's role as an equalizer are likely to be those targeting obstacles that students from disadvantaged backgrounds face in terms of entry into bachelor's programs. This may include transfer programs from college to university, among a broad range of other interventions. The results presented in this report suggest that a greater focus of college-to-university transfer programs on disadvantaged students (those with less educated parents) could contribute to increasing social mobility in Ontario and in Canada, especially among those with non-immigrant parents.

Meanwhile, this report shows a minimal contribution of PSE credential accumulation to the intergenerational transmission of disadvantage after the first credential. This may be because few individuals who enter PSE at the college or trades, vocational, or apprenticeship level end up completing a bachelor's or graduate program. Indeed, past research has shown that credential accumulation pathways are highly dependent on the level of the first credential, with few individuals following non-linear pathways that lead to a bachelor's graduation as a second credential (St-Denis et al., 2021).

The small impact of credential accumulation on the intergenerational transmission of disadvantage is also related to the fact that those who complete a bachelor's degree as their second credential after a credential below the bachelor's level are more likely to come from more privileged families in the first place. In this case, PSE credential accumulation can be seen as playing a corrective course for more privileged youth more frequently than a stepping stone for less privileged individuals, a trend documented elsewhere (Bukodi, 2017; Bukodi et al., 2021). This has important implications for the development of transfer and articulation programs from an equity perspective.

The first piece of empirical evidence presented in this paper (Table 1) shows that PSE may play an equalizer role in Canada, and in Ontario specifically. However, for the reasons stated in the previous paragraphs, we also conclude that pathways through PSE may contribute to the reproduction of inequality from one generation to the next. Policy interventions targeting later stages of PSE pathways, such as credential accumulation, should be designed to ensure that students from disadvantaged backgrounds receive the necessary level of support to complete programs associated with advantageous labour market outcomes. In many cases, this means a bachelor's degree. However, completing a bachelor's program as a second credential may

represent a particularly challenging obstacle for some in terms of time, financial cost, and other resources. This may require designing new policy and program interventions.

Limitations and future research

A few limitations of our analysis should be mentioned, especially in relation to sample size and the information available in the LISA data. Our data did not allow us to use more detailed PSE pathways variables. For example, we did not integrate information on the location of studies at the infra-provincial level, timing as a dimension of PSE pathways (second credentials obtained at a younger versus older age), or life course events associated with credential accumulation (job loss followed by a return to PSE, etc.).

Importantly, we were not able to distinguish between individuals who completed their first credential following a transfer or after dropping out or stopping out from another PSE program and those who completed the first PSE program they ever started. Using larger administrative data sources such as the Education and Labour Market Longitudinal Platform (ELMLP) offers promising options. At the time of designing this study, only a few years of data were available (2009 to 2018 approximately), which was not enough to observe PSE pathways involving more than one credential or a transfer as well as meaningful labour market outcomes (income inequalities start deepening and becoming visible only after 30 years old, and are substantially attenuated when comparing young graduates). In contrast, the LISA allowed us to document the PSE and employment pathways of a reasonably large sample of around 4000 respondents when they were 18 to 35 years old. Researchers now have access to a larger number of years in the ELMLP. Analytical approaches similar to the one implemented in this report are becoming possible, with more detailed information on transfers and other dimensions of PSE pathways and a much larger sample size that would allow for disaggregated analyses focusing on specific population subgroups.

Appendix

Table A1. Distribution of sociodemographic characteristics in the sample, in percentages (1956-1980 birth cohorts)

	Canada	Ontario
Age (mean)	49	49
Gender		
Men	49	50
Women	51	50
Province		
Ontario	35	
Québec	26	
West	31	
Atlantic	8	
Parents' immigration status		
both parents born in Canada	83	73
at least one parent not born in Canada	17	27
Parental education		
No PSE	51	50
Some PSE	27	27
University	23	23

Source: Longitudinal and International Study of Adults (2016) wave 3, Statistics Canada.

Table A2. Sensitivity checks: results using total income in 2015 (natural log), Canada, 1956-1980 birth cohorts

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Parental education										
No PSE (reference)			0.000	0.000	0.000			0.000	0.000	0.000
Some PSE			0.047	0.005	0.010			0.038	0.003	0.005
University			0.201 ***	0.042	0.020			0.170 ***	0.033	0.011
First PSE credential										
Trades, vocational or	-0.159 **			-0.155 *		-0.104 *			-0.101 *	
College (reference)	0.000			0.000		0.000			0.000	
Bachelor's degree	0.420 ***			0.411 ***		0.378 ***			0.371 ***	
Credential accumulation pathways										
Below bachelor's only (reference)		0.000			0.000		0.000 .			0.000
Below bachelor's to below bachelor's		-0.046			-0.046		-0.047			-0.047
Below bachelor's to bachelor's		0.297 ***			0.294 ***		0.292 ***			0.291 ***
Bachelor's only		0.439 ***			0.435 ***		0.392 ***			0.389 ***
Bachelor's to below bachelor's		0.242 *			0.238 *		0.221 **			0.219 **
Bachelor's to bachelor's		0.451 ***			0.446 ***		0.409 ***			0.406 ***
Bachelor's to graduate		0.664 ***			0.658 ***		0.568 ***			0.564 ***
Controls										
	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Employment history										
Constant	9.348 ***	9.154 ***	9.079 ***	9.306 ***	9.133 ***	12.257 ***	12.119 ***	12.139 ***	12.225 ***	12.107 ***
R-squared	0.106	0.114	0.059	0.106	0.114	0.341	0.349	0.306	0.341	0.349
Adjusted R-squared	0.103	0.111	0.057	0.103	0.110	0.338	0.345	0.303	0.338	0.345

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

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

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