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The Impact of Short-duration Credentials After an Undergraduate Degree on Labour Market Outcomes

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by **Aimé Ntwari** and **Eric Fecteau**

Overview of the study

- Of the 102,865 graduates who earned an undergraduate degree from a public postsecondary institution in Canada before the age of 25 in 2010, 34,715 (33.7%) completed one or more additional educational qualification between 2010 and 2016, either a degree, a diploma, a certificate or a combination of various qualifications. Of these individuals, 5,370 (15.5%) completed only one additional postsecondary certificate or diploma, called a short-duration credential in this study: two-thirds (3,555) at the college level and one-third (1,815) at the university level. These 5,370 individuals are the focus of this study which measures the impact of a short-duration credential completed after a bachelor degree.
- BHASE (non-STEM) graduates were more likely to complete a short-duration credential after their undergraduate degree than STEM graduates. More than four fifths (82.7%) of graduates who obtained a short-duration credential had obtained their 2010 undergraduate degree in a BHASE field of study. This represented a 5.4 percentage points higher proportion compared to the proportion of BHASE graduates among the group without any additional short-duration credential.
- While one third (33.3%) of graduates with an additional short-duration credential earned their second qualification in the same field of study as their undergraduate degree, large outflows were observed in the fields of "Social and behavioural sciences" and "Arts and humanities" towards fields related to "Business and administration" (35.0% and 27.0%, respectively).
- Comparing two years before and two years after earning an additional short-duration credential, the proportion of graduates employed in "low value-added service industries" fell from 22.1% to 9.9%. Similarly, unionization rate was 42.4% two years after completion (+4.6 percentage points compared to two years before) and rate of participation in a pension plan was 46.5% (+16.3 percentage points compared to two years before).
- Although a large proportion of graduates who completed a short-duration credential started with a lower employment income and returned to school full-time, their median employment income two years before and two years after completing a short-duration credential rose faster, almost to the level of those who did not go back to school, in almost all fields of study.
- In 2017, graduates who had earned an undergraduate degree in 2010 but did not seek an additional short-duration credential earned more than those who had completed an additional short-duration credential between 2011 and 2016. However, this gap was mostly due to the starting level of employment income of both groups, and narrows if controlled for the other factors.

1. Introduction

Both in Canada and around the world, the labour market is constantly changing and requires the maintenance of skills and acquisition of knowledge focused on what is needed with the transformation of industries. These changes affect the behaviour of workers, not only in Canada, but in all developed and emerging countries. School-to-work transitions have become the subject of interest for employers, employees, students and decision-makers. To meet these labour market requirements, many Canadians supplement their post-secondary education with the addition of short-duration credentials, often seen as a specialization tool.

The contribution of short-duration credentials (certificates or diplomas), completed after undergraduate studies, to labour market outcomes is a subject of interest due to their increased popularity and also in terms of aligning skills with labour market needs. However, very few studies have analyzed the impact of short-duration credentials on the career advancement of bachelor's degree holders.

Using the Education and Labour Market Longitudinal Platform (ELMLP),[1] which creates an environment where administrative data from the Postsecondary Student Information System (PSIS) can be linked to other databases, this article examines the path followed by students under 25 years of age,[2] who obtained a first undergraduate degree at a public post-secondary institution in Canada in 2010, followed by a post-secondary short-duration credential (either a baccalaureate, a post-baccalaureate or a college certificate or diploma)[3] in the following six years. They are referred to as "short" as the typical length of these types of credentials is between one and two years.

The first section of this article analyzes the profile of graduates aged 25 and under with an undergraduate degree who completed an additional short-duration credential compared with those who did not complete any additional educational qualifications. Next, the article explores changes in location and field of study between the undergraduate degree and the short-duration credential. In the third section, the article provides an overview of the evolution of select employment quality indicators, including employment income. Finally, the last section presents factors that explain the largest variability in the employment income between the two groups.

2. Profile of undergraduate degree holders from public postsecondary institutions in Canada

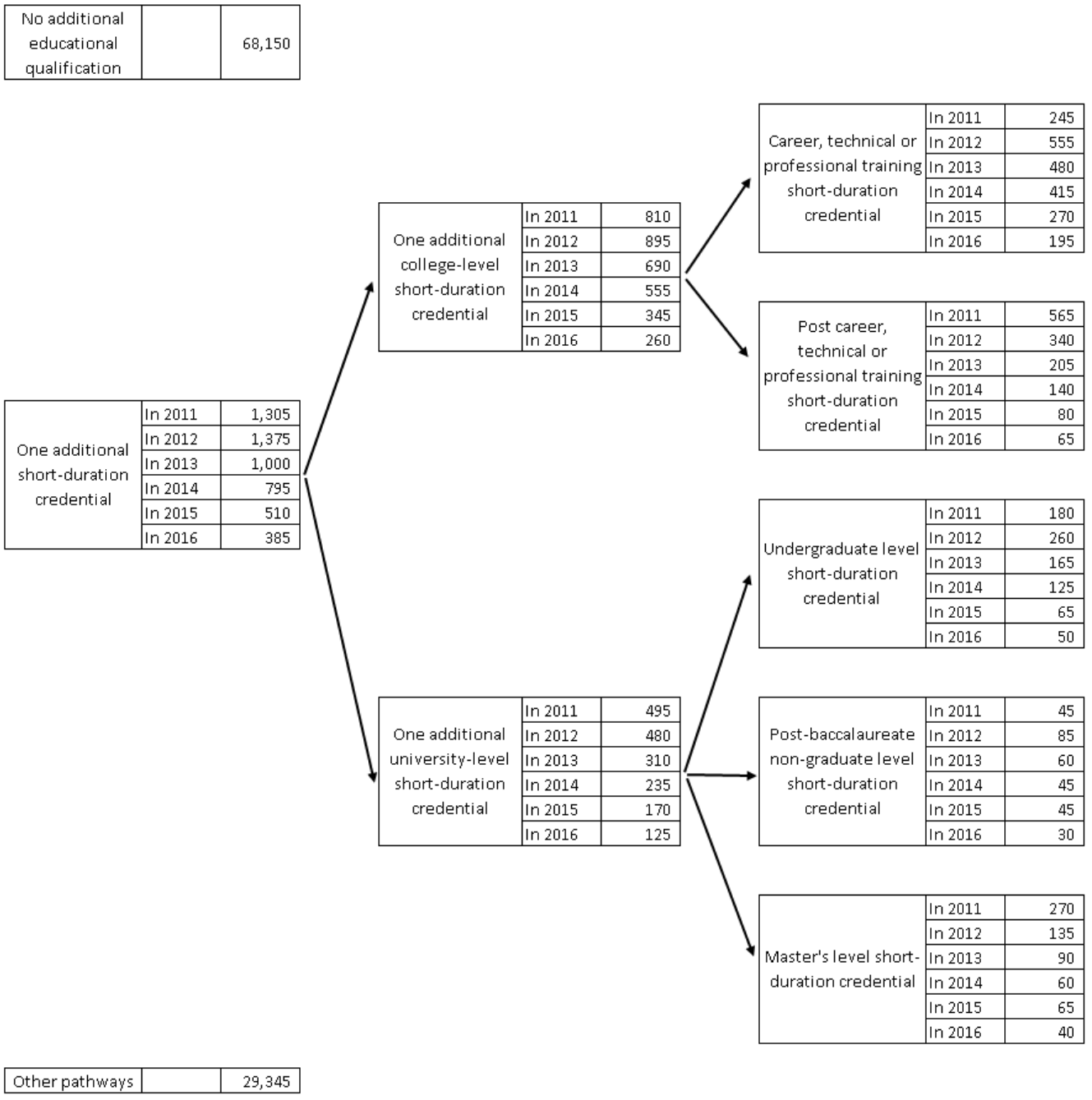
"Stackable credentials" is a term that is commonly used to describe the accumulation of educational qualifications. This concept invokes the image of assembly and alludes to LEGO blocks. Like building with LEGO, this stacking can be vertical, with students completing higher and higher levels of education (traditional paths); horizontal, with students accumulating credentials without any hierarchy, instead aiming to acquire different skills (non-traditional paths); or a combination of both.[4]

Of the 102,865[5] graduates who earned an undergraduate degree before the age of 25 in 2010 from a public postsecondary institution, 34,715 (33.7%) completed at least one additional educational qualification between 2010 and 2016, either a degree, a diploma, a certificate or a combination of various qualifications at the undergraduate, graduate or college level. The remaining 68,150 students did not earn any additional educational qualification.[6] Of those who completed an additional educational qualification, 15.5% (5,370) completed only **one** additional short-duration credential, either a college-level or university-level certificate or diploma, within the six subsequent years. The graduates who completed an additional short-duration credential are referred to as the "Bac+" group and those who did not earn any additional educational qualification are referred to as the "Bac" group. The focus on the "Bac+" group aims to measure the value added by a short-duration credential earned after an undergraduate degree on labour market outcomes.

Of the 5,370 graduates in the "Bac+" group, two-thirds (3,555) completed a short-duration credential at the college level and one-third (1,815) at the university level (Figure 1). Graduates in undergraduate degree programs were more likely to complete an additional short-duration credential in the first few years following completion of their undergraduate program in 2010. Of those in the "Bac+" group, 24.3% earned their second short-duration credential in 2011, 25.6% in 2012, 18.6% in 2013, 14.8% in 2014, 9.5% in 2015 and 7.2% in 2016.

1. For more information on the platform, see the technical reference guide: Labour market outcomes for colleges and university graduates, 2010 to 2015.
2. The age of 25 was chosen to approximate a cohort of students who earned their first bachelor's degree, in order to adjust for previous labour market experience or educational qualifications possibly earned earlier by older age groups.
3. In this article, short educational studies refer to programs that last generally one to two years full-time. The list of short programs is as follows: Career, technical or professional training (short credential, certificate and diploma), Post career, technical or professional training (short credential, certificate and diploma), Undergraduate program (certificate and diploma), Post-baccalaureate non-graduate program (certificate and diploma) and Master's-level program (certificate and diploma). Quebec CEGEP graduates with a technical program diploma leading to the labour market are included in the analysis, but pre-university CEGEP graduates are excluded.
4. Williamson, J. and Pittinsky, M., "Understanding the differences in what credentials are being stacked and why", May 2016.
5. This figure includes only graduates who earned an undergraduate degree as their highest level of education in 2010. Some bachelor's degree holders received more than one credential in 2010, but their highest level of education was an undergraduate degree. Those with more than one educational qualification in 2010 are excluded from the "Bac" and "Bac+" analysis.
6. The PSIS only contains data from Canadian public colleges and universities. All individuals who obtained an undergraduate degree in 2010 from private or international institutions are therefore excluded from this analysis and those who obtained their second educational qualification from a private institution would not be identified. Moreover, data from some colleges in Ontario (2011 to 2015) and the territories (2011) were not available, which could reduce the counts of those with undergraduate degrees who return to school. Data from colleges in Ontario, New Brunswick, Manitoba and certain colleges from the Territories are not available for 2010. This could have a slight impact on the cohort of bachelor graduates in 2010 for those who received an undergraduate degree from one of those colleges.

Figure 1
Distribution of graduates who were under 25 years of age when they earned an undergraduate degree in 2010, by type of additional short-duration credential and the year it was completed



Source: Statistics Canada. Postsecondary Student Information System (PSIS), 2009/2010 to 2015/2016 and T1 Family File (T1FF), 2011 to 2017 (subset compiled from linked microdata files, extracted June 19, 2019).

In general, women make up a larger share than men of undergraduate degree holders, and they made up an even larger share in the group of graduates with an additional short-duration credential. They represented 60.5% (41,240) of the "Bac" group, but 72.1% (3,870) of the "Bac+" group (Table 1), meaning that, compared with men, they had a greater tendency to pursue a short-duration credential, when not adjusting for other factors.

At the level of the province of study,[7] the distribution of members of the "Bac+" group was more or less comparable to that of "Bac" group, with the exception of British Columbia (4.3 percentage points higher) and Alberta (2.8 percentage points lower).

Graduates in BHASE (non-STEM)[8] fields of study had a higher propensity to pursue a short-duration credential after a first undergraduate degree since they formed a larger proportion of the group having acquired an additional short-duration credential, that is to say 82.7% of the "Bac+" group compared to a proportion of 77.3% of the "Bac" group. Within this group of BHASE graduates, graduates of "Social and behavioral sciences" displayed a particularly high propensity to acquire an additional short-duration credential since they represented 34.2% of the "Bac+" group compared to 21.2% of the "Bac" group; to a lesser degree, graduates of "Arts and Humanities" also had a relatively strong propensity to pursue an additional short-duration credential, since they formed 18.5% of the "Bac+" group but 12.7% of the "Bac" group.

Table 1
Distribution by gender, province of study and field of studies of the 2010 undergraduate degree

	"Bac" group		"Bac+" group	
	number	percent	number	percent
Gender				
Men	26,910	39.5	1,495	27.9
Women	41,240	60.5	3,870	72.1
Province				
Newfoundland and Labrador	810	1.2	45	0.8
Prince Edward Island	190	0.3	30	0.6
Nova Scotia	2,655	3.9	275	5.1
New Brunswick	1,610	2.4	115	2.1
Quebec	11,820	17.3	965	18.0
Ontario	34,825	51.1	2,650	49.4
Manitoba	1,730	2.5	105	2.0
Saskatchewan	1,530	2.2	80	1.5
Alberta	5,940	8.7	315	5.9
British Columbia	7,040	10.3	785	14.6
Field of study				
Science and science technology	7,610	11.2	790	14.7
Engineering and engineering technology	5,870	8.6	75	1.4
Mathematics and computer and information science	2,015	3.0	65	1.2
Business and administration	15,470	22.7	800	14.9
Arts and humanities	8,680	12.7	995	18.5
Social and behavioural sciences	14,450	21.2	1,835	34.2
Legal professions and studies	195	0.3	25	0.5
Health care	4,705	6.9	380	7.1
Education and teaching	6,160	9.0	215	4.0
Trades, services, natural resources and conservation	2,995	4.4	185	3.4

Note: All figures are randomly rounded to a multiple of 5. The province of study refers to the province of the institution at which the individual received their undergraduate degree in 2010.
Source: Statistics Canada. Postsecondary Student Information System (PSIS), 2009/2010 to 2015/2016 and T1 Family File (T1FF), 2011 to 2017 (subset compiled from linked microdata files, extracted June 19, 2019).

"Engineering, computer and information science" graduates were under-represented among graduates who acquired an additional short-duration credential, representing 8.6% of the "Bac" group but only 1.4% of the "Bac+" group. According to 2016 census data,[9] graduates in this field of study (as well as those in the health field) were the most likely to work in jobs closely related to their field of study. Therefore, there may be a correlation between not having a job related to one's field of study and pursuing an additional short-duration credential.

7. The province for the "Bac" and "Bac+" groups refers to the province of the institution at which the individual received their undergraduate degree in 2010.
8. STEM includes science, technology, engineering, and mathematics and computer sciences and BHASE includes business, humanities, health, arts, social science, education, legal studies, trades, services, natural resources and conservation.
9. Statistics Canada. "Education in Canada: Key results from the 2016 Census", November 2017.

3. Comparison of the characteristics of the first and second educational qualifications

We have previously seen that graduates of certain fields of study are more likely to acquire an additional short-duration credential. To what extent, however, do they acquire this new credential in a similar or different field of study? The data shows that it seems to vary depending on the field of study associated with the first educational qualification. However, the distribution pattern of the second field of study could also be linked to the provision of short-duration credentials by institutions which could be more frequent in certain fields, in order to meet the needs of the labor market.

Of the graduates in the "Bac+" group, one-third (33.3%) obtained their short-duration credential in the same field of study as their 2010 Undergraduate degree.[10] This proportion was much higher for some specific fields of study such as "Health care" (86.8%) or "Business and administration" (75.0%). Individuals in the fields of "Arts and humanities" (12.5%), "Mathematics and computer and information science" (16.7%), "Science and science technology" (17.1%), and "Engineering and engineering technology" (20.0%) generally completed their short-duration credential in a different field of study.

Table 2
Profile of the field of study transition between the first and second educational qualifications

Field of study of the 2010 undergraduate degree	Total "Bac+" group	Short-duration credential in the same field of study	Short-duration credential in a different field of study	Same field of study rate
	number			percent
Science and science technology	790	135	655	17.1
Engineering and engineering technology	75	15	60	20.0
Mathematics and computer and information science	60	10	50	16.7
Business and administration	800	600	200	75.0
Arts and humanities	1,000	125	875	12.5
Social and behavioural sciences	1,835	405	1,430	22.1
Legal professions and studies	25	10	15	x
Health care	380	330	50	86.8
Education and teaching	215	115	100	53.5
Trades, services, natural resources and conservation	190	45	145	23.7
Total	**5,370**	**1,790**	**3,580**	**33.3**

x suppressed to meet the confidentiality requirements of the *Statistics Act*

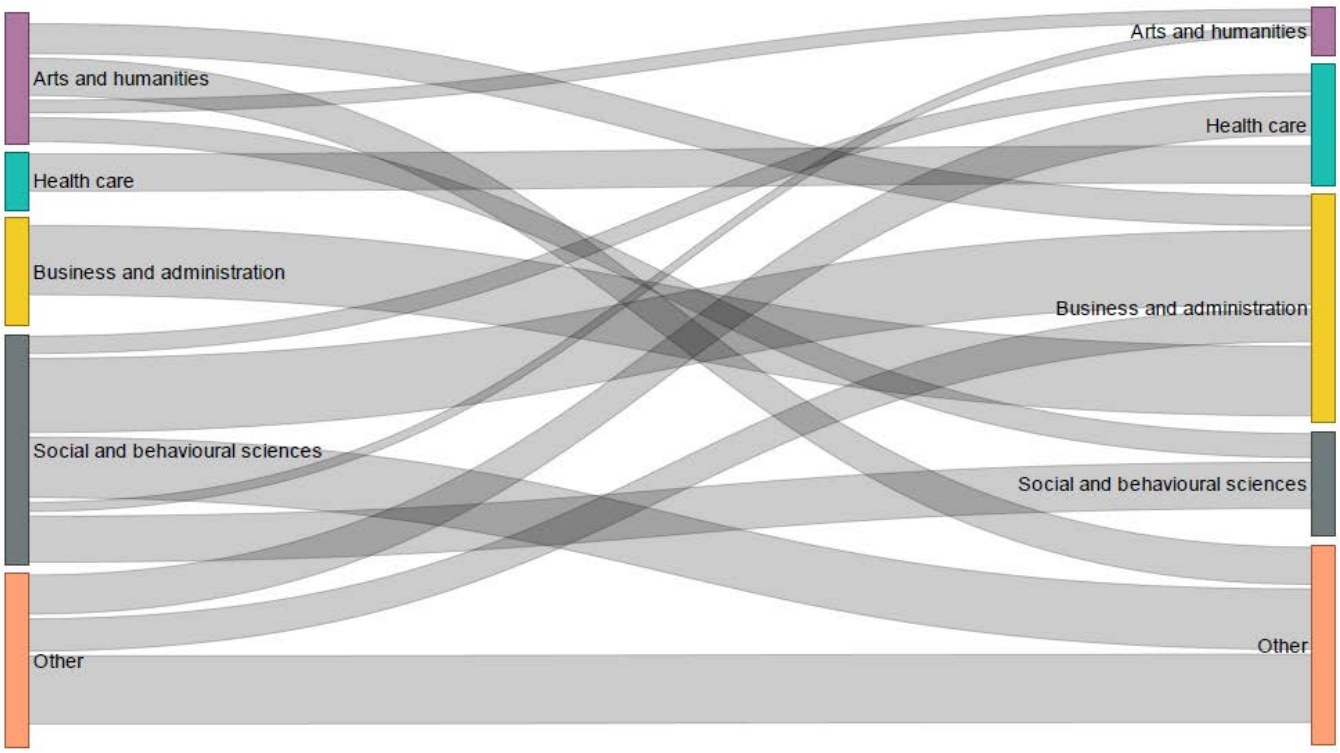
Note: All figures are randomly rounded to a multiple of 5. Percentages are based on rounded counts. Due to low counts and rounding, the percentage for "Legal professions and studies" is not shown.

Source: Statistics Canada. Postsecondary Student Information System (PSIS), 2009/2010 to 2015/2016 and T1 Family File (T1FF), 2011 to 2017 (subset compiled from linked microdata files, extracted June 19, 2019).

If we compare the fields of study of the first and short-duration credential, large outflows are also observed in "Social and behavioural sciences" and in "Arts and humanities" toward fields of study related to "Business and administration". Of the 1,830 graduates in the "Bac+" group who earned their undergraduate degree in "Social and behavioural sciences" in 2010, 640 graduates (35.0%) completed their short-duration credential in "Business and administration", and 165 (9.0%) in "Health care". Similarly, of the 1,000 graduates in the "Bac+" group who earned their undergraduate degree in "Arts and humanities" in 2010, 270 (27.0%) completed their additional short-duration credential in "Business and administration", and 220 (22.0%) in the field of "Social and behavioural sciences" (see figure 2 and table 3).

10. The term "same field of study" is defined in this article as having both educational qualifications within the same two-digit sub-grouping of the STEM and BHASE groupings variant of the Classification of Instructional Programs (CIP) Canada 2016.

Figure 2
Profile of the transition between the first and second fields of study



Note: This profile of transition of the field of study between the first and the second educational qualification is based on the counts of table 3 and displays only important transition pathways. The width of the line increases with the flow of graduates in each pathway.
Source: Statistics Canada. Postsecondary Student Information System (PSIS), 2009/2010 to 2015/2016 and T1 Family File (T1FF), 2011 to 2017 (subset compiled from linked microdata files, extracted June 19, 2019).

Table 3
Profile of the transition between the first and second fields of study

Field of study of the 2010 undergraduate degree	Field of study of the additional short-duration credential	Graduates	% of the field of study
		number	percent
Arts and humanities	Arts and humanities	125	12.5
Arts and humanities	Health care	55	5.5
Arts and humanities	Business and administration	**270**	27.0
Arts and humanities	Social and behavioural sciences	**220**	22.0
Arts and humanities	Other	330	33.0
Health care	Arts and humanities	5	1.3
Health care	Health care	**330**	86.8
Health care	Business and administration	10	2.6
Health care	Social and behavioural sciences	5	1.3
Health care	Other	30	7.9
Business and administration	Arts and humanities	25	3.1
Business and administration	Health care	30	3.8
Business and administration	Business and administration	**600**	75.0
Business and administration	Social and behavioural sciences	55	6.9
Business and administration	Other	90	11.3
Social and behavioural sciences	Arts and humanities	95	5.2
Social and behavioural sciences	Health care	165	9.0
Social and behavioural sciences	Business and administration	**640**	35.0
Social and behavioural sciences	Social and behavioural sciences	**405**	22.1
Social and behavioural sciences	Other	525	28.7
Other	Arts and humanities	50	3.7
Other	Health care	345	25.5
Other	Business and administration	290	21.4
Other	Social and behavioural sciences	80	5.9
Other	Other	590	43.5

Note: All figures are randomly rounded to a multiple of 5.

Source: Statistics Canada. Postsecondary Student Information System (PSIS), 2009/2010 to 2015/2016 and T1 Family File (T1FF), 2011 to 2017 (subset compiled from linked microdata files, extracted June 19, 2019).

Regarding the transition between provinces of study between the first and second educational qualifications, we see that the majority (90.2%) of graduates remained in the same province for both of their graduations (see table 4).

Table 4
Profile of the provincial transition between the first and second educational qualifications

Field of study of the 2010 undergraduate degree	Total "Bac+" group	Short-duration credential in the same province	Short-duration credential in a different province	Same province rate
	number			percent
Newfoundland and Labrador	50	25	25	50.0
Prince Edward Island	25	15	10	x
Nova Scotia	275	160	115	58.2
New Brunswick	115	50	65	43.5
Quebec	965	950	15	98.4
Ontario	2,650	2,510	140	94.7
Manitoba	105	80	25	76.2
Saskatchewan	80	60	20	75.0
Alberta	315	250	65	79.4
British Columbia	790	745	45	94.3
Total	**5,370**	**4,845**	**525**	**90.2**

x suppressed to meet the confidentiality requirements of the *Statistics Act*

Note: All figures are randomly rounded to a multiple of 5. Percentages are based on rounded counts. Due to low counts and rounding, the percentage for Prince Edward Island is not shown.

Source: Statistics Canada. Postsecondary Student Information System (PSIS), 2009/2010 to 2015/2016 and T1 Family File (T1FF), 2011 to 2017 (subset compiled from linked microdata files, extracted June 19, 2019).

4. Evolution of select employment quality indicators before and after obtaining the second educational qualification

Tax data available in the T1 Family File (T1FF) can be used to measure the added value of obtaining a short-duration credential by examining some employment quality indicators in the "Bac+" group both two years before and two years after obtaining the additional credential.[11]

One of these employment quality indicators is the proportion of workers in "low value-added service industries"[12] that, on average, offer lower wages and fewer benefits than jobs in other sectors. In total, the proportion of bachelor graduates from 2010 who obtained an additional short-duration credential between 2013 and 2015 and who worked in low value-added service industries fell from 22.1% two years before obtaining the short-duration credential to 9.9% two years after (Table 5). Similarly, the unionization rate increased by 4.6 percentage points from 37.8% to 42.4% two years before and two years after obtaining the short-duration credential. Also, the rate of participation in a pension plan increased by 16.3 percentage points compared with the periods two years before and two years after obtaining the short-duration credential. The same statistics for the "Bac" group over the same period show that these changes are due mostly to the additional short-duration credential and not only to additional experience in the labour market.

Table 5
Distribution by the industrial sector, the unionization rate and the rate of participation in a pension plan over a five-year period

	Bac+		Bac	
	2 years before 2nd qualification	2 years after 2nd qualification	2012	2016
	percent			
Industrial sector				
Goods-producing industries	4.7	6.4	10.5	11.1
Low value-added service industry	**22.1**	**9.9**	11.0	8.3
High value-added service industry	30.2	36.6	39.4	38.3
Educational services	9.9	11.6	11.8	12.9
Health care and social assistance	12.8	14.0	9.8	9.2
Public administration	15.1	18.0	12.0	14.0
Unknown	5.2	3.5	5.5	6.1
Unionization rate				
Had union contributions	37.8	42.4	35.9	37.7
Had no union contributions	62.2	57.6	64.1	62.3
Rate of participation in a pension plan				
Participated in a pension plan	30.2	46.5	37.0	46.3
Did not participate in a pension plan	69.8	53.5	63.0	53.7

Note: All numbers are randomly rounded to a multiple of 5. Percentages are based on rounded counts.

Source: Statistics Canada. Postsecondary Student Information System (PSIS), 2009/2010 to 2015/2016 and T1 Family File (T1FF), 2011 to 2017 (subset compiled from linked microdata files, extracted June 19, 2019).

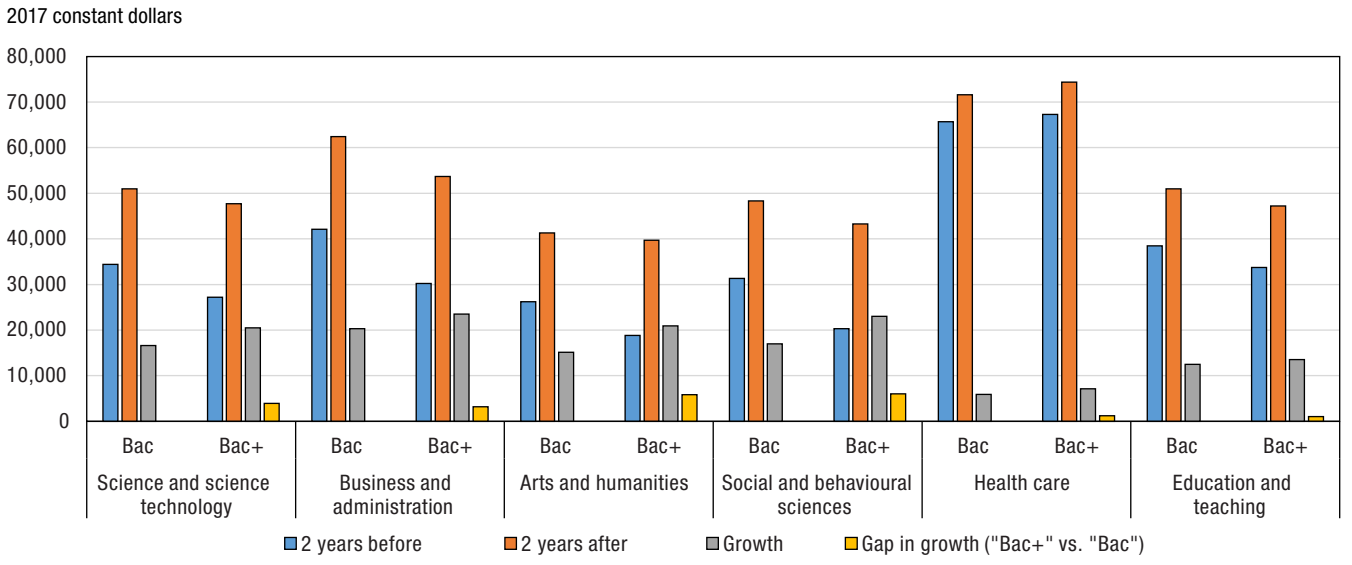
Overall, for employment income, there is an increase in employment income for graduates holding an additional short-duration credential between the two points in time.[13] For illustrative purposes, the following results focus on the "Bac+" group who obtained their short-duration credential in 2013 and the results for the 2014 and 2015 cohorts are available in **Appendix B**.

11. See **Appendix A** for more information on the methodology used in this section.
12. This grouping was also used in Morissette (2008). Although not all jobs in these industries are low-skilled, the salaries and benefits are generally lower in these industries than in others, and the positions are more likely to require fewer skills. According to the 2012 Labor Force Survey, the average hourly wage for all employees aged 15 and over was $23.55, while it was $13.63 in the accommodation and food services industry and $17.70 in the wholesale and retail industries. Unionization rates were lowest in the wholesale and retail (13.9%) and accommodation and food services (6.9%) sectors, compared with 31.3% for all paid workers. Morissette, René. "Earnings in the last decade", *Perspectives on Labour and Income*. Statistics Canada catalogue No. 75-001-X, Vol. 9 (2008), No. 2.
13. See **Appendix A** for the "employment income". It should be noted that the data do not provide any indication of whether the employment was full-time or part-time or whether the graduate was employed for part or all of the year. The new data set on postsecondary graduates also does not provide information on the number of hours worked during the year, nor does it indicate whether the employment was in the same field of study. Members of the "Bac+" group who obtained their second academic credential in 2013 were selected for the main analysis due to sample size. See **Appendix B** for similar results for members of the "Bac+" group who earned their short-duration credential in 2014 and 2015, including a table with the mean instead of the median.

Two years before obtaining their additional short-duration credential, graduates in the "Bac+" group began in most fields of study, except for "Health Care", with a lower median employment income, but obtained a very similar median employment income to the "Bac" group two years after obtaining their short-duration credential. Members of the "Bac+" group thus seem to be catching up to their counterparts in the "Bac" group, although a large number of members in the "Bac+" group interrupted their labour market path by returning to school full-time for at least one year.[14] It is important to note that the fact that lower employment income may be a factor in encouraging graduates to complete an additional short-duration credential.

Analysis of employment income by the field of study of the first educational qualification shows that there is a wide variation in the value added by the additional short-duration credential. For example, in the "Arts and Humanities" field of study, those who obtained their additional short-duration credential in 2013 doubled their employment income (111% increase) between the two periods, while the members of the "Bac" group from the same field of study, had an increase of 58%. Likewise, members of the "Bac+" group in the "Science and technology of science" field of study increased by 75% for the 2013 cohort, compared to 48% for the "Bac" group.

Chart 1
Median employment income by the field of study, two years before (2011) and two years after (2015) obtaining their additional Ashort-duration credential for the "Bac+" group, and over a five-year period for the "Bac" group



Note: All amounts are expressed in 2017 constant dollars.
Source: Statistics Canada. Postsecondary Student Information System (PSIS), 2009/2010 to 2015/2016 and T1 Family File (T1FF), 2011 to 2017 (subset compiled from linked microdata files, extracted June 19, 2019).

5. Employment income progression

The income progression between 2011 and 2017 for both groups was examined further by dividing their income into quartiles. The top 25% of earners are categorized in Q4 while the lowest 25% of earners are categorized in Q1.

As shown in Table 6, the 2011 employment income distribution shows that nearly 72% of the members of the "Bac+" group are found in the two lower quartile comparatively to 49% for graduates with no additional educational qualification. However, in 2017, the gap had narrowed significantly as those proportions had reached 64.2% and 49.2% respectively.

14. More than four-fifths of the "Bac+" group who had tax information each year between 2011 and 2016 returned to school full-time for at least one year between 2011 and 2016, inclusively. Less than one-quarter of the "Bac" group returned to school full-time between 2011 and 2016, inclusively. Graduates in the "Bac" group who return to school do so either without completing their studies or at private institutions that are not included in the PSIS.

Table 6
Distribution of the "Bac" and "Bac+" group by their revenue quartile in 2011 and in 2017

		Revenue Quartile			
		Q1	Q2	Q3	Q4
Group	Year	percent			
"Bac"	2011	23.9	24.9	25.6	25.6
	2017	24.8	24.4	25.2	25.6
"Bac+"	2011	45.4	26.4	14.5	13.8
	2017	27.8	36.4	21.9	13.9

Note: Only graduates who filed their income taxes, who did not return to school full time and who did not have self-employment income in 2011 and in 2017 are included.

Source: Statistics Canada. Postsecondary Student Information System (PSIS), 2009/2010 to 2015/2016 and T1 Family File (T1FF), 2011 to 2017 (subset compiled from linked microdata files, extracted June 19, 2019).

To measure the return on investment of the short-duration credential, we analyze the evolution of the employment income of members of the "Bac" and "Bac+" groups by comparing how graduates of the two groups progressed within the income quartiles between 2011 and 2017 (see table 7). This method consists in marking individuals in each quartile to track them over time.

Table 7
Quartile transition matrix of the "Bac" and "Bac+" groups between 2011 and 2017

				2017			
			Counts	Q1	Q2	Q3	Q4
	Quartile	Group	number	percent			
2011	Q1	"Bac+"	725	**37,4**	**41,9**	16,3	4,4
		"Bac"	7,155	**45,4**	**29,8**	17,0	7,9
	Q2	"Bac+"	420	**22,0**	**41,0**	22,5	**14,5**
		"Bac"	7,460	**27,4**	**35,4**	25,1	**12,1**
	Q3	"Bac+"	230	19,9	32,5	29,9	17,7
		"Bac"	7,650	15,9	22,9	33,8	27,4
	Q4	"Bac+"	220	15,9	13,2	30,9	40,0
		"Bac"	7,660	12,2	10,1	24,2	53,5

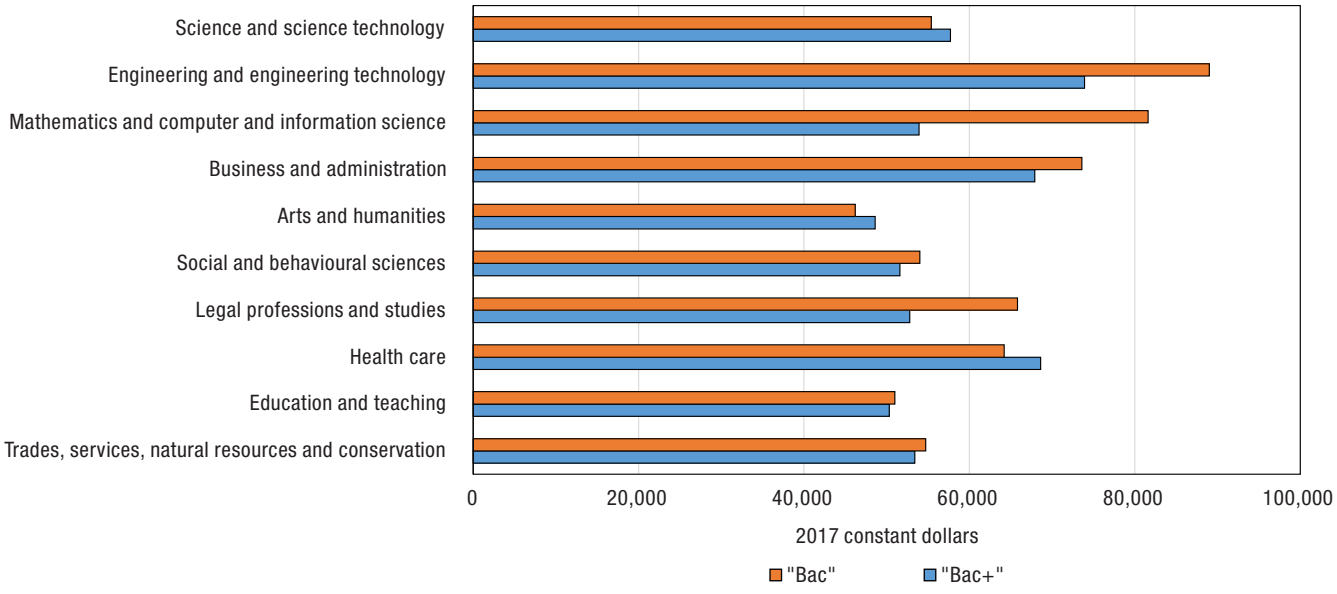
Note: Only graduates who filed their income taxes, who did not return to school full time and who did not have self-employment income in 2011 and in 2017 are included.

Source: Statistics Canada. Postsecondary Student Information System (PSIS), 2009/2010 to 2015/2016 and T1 Family File (T1FF), 2011 to 2017 (subset compiled from linked microdata files, extracted June 19, 2019).

To show that the additional short-duration credential had a positive impact on the income progression between 2011 and 2017 for the "Bac+" group comparatively to the "Bac" group, a test of independence was performed at each level of pre-results (quartiles of 2011) and the post-results (income quartiles of 2017). This analysis[15] made it possible to affirm that a positive impact on employment income happened after the completion of an additional short-duration credential for the graduate with employment income mostly for those who were situated in the two lower quartiles.

15. This gives an X2 of 97.7 (51.6+10.5+19.9+15.6) with 12 degrees of freedom, for a $p < 0.00001$ value. It is not possible to conclude that the transition matrix is equal.

Chart 2
Mean employment income in 2017 (7 years after earning the undergraduate degree) for the "Bac" and "Bac+" groups by field of study



Note: All amounts are expressed in 2017 constant dollars.
Source: Statistics Canada. Postsecondary Student Information System (PSIS), 2009/2010 to 2015/2016 and T1 Family File (T1FF), 2011 to 2017 (subset compiled from linked microdata files, extracted June 19, 2019).

Despite the fact that the 2010 graduates who had acquired an additional short-duration credential after their undergraduate degree showed a catch-up in terms of employment earnings distributions, as well as some improvement in conditions of their employment, in comparison with their counterparts who had no additional qualifications, the gap in the average employment income remained after 7 years. A difference in employment income of around 26% was still observable in favour of graduates without additional educational qualifications. This difference does not, however, take into account the differences in demographic and educational characteristics observable between the two groups, which could partly explain this difference.

The difference between the employment incomes of the two groups was broken down using the Blinder-Oaxaca method[16] in order to quantify the proportion of the difference that can be explained by the differences in the characteristics such as age, gender, province of residence, and the time elapsed between the undergraduate degree and the additional short-duration credential (the composition effect) and the difference that can be attributed to an additional short-duration credential or other unobservable characteristics between the two groups, such as talent, motivation, better language, numeracy and writing skills, to name a few. This decomposition reveals that the difference of 26% is largely explained by the different composition in terms of socio-demographic characteristics such gender, original field of study, province of residence and the level of income the first year after graduation, of the two groups. Thus, 18 of the 26 percentage points (or 69% of the difference between both groups), are attributable to the different demographic and educational characteristics between the two groups, mainly due to the fact that the "Bac" group already earned higher employment income at the starting point.

16. Oaxaca, R. "Male-Female Wage Differentials in Urban Labor Markets". *International Economic Review*. Vol. 14, No. 3 (1973), 693-709; Blinder, A.S. "Wage Discrimination: Reduced Form and Structural Estimates", Journal of Human Resources. Vol. 8, No. 4 (1973), 436–455. For more information on the methodology, see Appendix A.

6. Conclusion

This study shows that among the 102,865 graduates who completed an undergraduate degree in 2010 before the age of 25, 5,370 (5.2%) also completed an additional short-duration credential (certificate or diploma) while 66.3% had not completed further educational qualification six years after the bachelor's degree. Two thirds (3,555) completed the short-duration credential in college and the remaining third (1,815) at university. Overall, women graduates had a higher propensity to pursue an additional certificate or diploma after their bachelor's degree, as did those in BHASE (non-STEM) field of study.

This study also shows that graduates who completed an additional short-duration credential (certificate or diploma) saw employment quality indicators improve once their short-duration credential was completed. Indeed, even though graduates who had obtained an undergraduate degree in 2010, but who did not go to school to complete an additional short-duration credential, earned on average more than those who had obtained one additional short-duration credential between 2011 and 2016, those who did complete an additional short-duration credential had higher gains in employment income and an improvement in the level of unionization and participation in a pension plan. The global gap is largely explained by the starting level of employment income of both groups and is narrowed if there are controls for the other factors. For some fields of study, we see a tendency toward increased employment income for those who had an additional short-duration credential, compared with those who entered and remained in the labour market. Thus, graduates who completed an additional short-duration credential saw a greater increase in earnings than their counterparts who did not have additional educational qualifications, and nearly closed the gap.

Further studies could be conducted to understand why those with undergraduate degrees returned to school in non-traditional paths (e.g. obtaining a college diploma). Some factors, such as the school path, average undergraduate grades, availability of jobs in the chosen field of study, and even personal characteristics might lead some graduates to continue their studies.

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7. Bibliography

BLINDER, A. S., "Wage Discrimination: Reduced Form and Structural Estimates", *Journal of Human Resources*, vol. 8, no. 4 (1973), 436–455.

BOX, G. E. P. and COX, D. R., "An Analysis of Transformations"*, Journal of the Royal Statistical Society, Series B (Methodological)*, vol. 26, No. 2 (1964), 211-252.

HIDIROGLOU, M. A., and BERTHELOT, J.-M., "Statistical editing and imputation for periodic business surveys". *Survey Methodology*, 12 (1986), 73–83.

MORISSETTE, R. "Earnings in the last decade"*, Perspectives on Labour and Income*. Statistics Canada catalogue No. 75-001-X, Vol. 9 (2008), No. 2.

OAXACA, R., "Male-Female Wage Differentials in Urban Labor Markets". *International Economic Review*, vol. 14, no. 3 (1973), 693–709.

STATISTICS CANADA, "Education in Canada: Key results from the 2016 Census", November 2017.

WILLIAMSON, J. and PITTINSKY, M., "Understanding the differences in what credentials are being stacked and why", May 2016.

8. Appendix A: Methodology

The Postsecondary Student Information System (PSIS) provides detailed annual information on enrolments and graduations from Canadian public postsecondary institutions (universities and colleges) by the field of study and by certain demographic variables. However, PSIS data do not provide information on the graduate's labour market outcomes, such as employment income. However, some of this information is available in administrative data sets such as tax data files.

Statistics Canada's Education and Labour Market Longitudinal Platform (ELMLP) is based on the Postsecondary Student Information System (PSIS), the Registered Apprenticeship Information System (RAIS) and tax data from the T1 Family File (T1FF). Note that other data sets are also available in the Platform to fill gaps in data and provide a better understanding of the pathways of students and apprentices, their transitions to the labour market and outcomes over time.

The current study uses PSIS and tax data to present results for the 2010 cohort of bachelor's degree graduates. The class of 2010 is the first available series with sufficient quality in terms of coverage and very low potential bias in linkage to tax information. The analysis focuses on individuals who earned a bachelor's degree before the age of 25 to approximate a cohort of students who earned their first bachelor's degree in order to adjust for educational qualifications possibly earned earlier by older age groups.

Educational qualification is derived by combining two Postsecondary Student Information System (PSIS) variables: program type and credential type. Note that Medicine, Dentistry, Veterinary medicine, Optometry, Pharmacy and Law degrees reported as "Undergraduate degrees" or "Post-baccalaureate non-graduate degrees" are regrouped as "Professional degrees." "Post-baccalaureate non-graduate degrees" in the fields of Education and Social work are regrouped with "Undergraduate degrees". For more information, consult the Classification of programs and credentials - professional degree variant.

Employment quality indicators

Employment quality indicators available in the ELMLP include industrial sector, unionization rate, and the rate of participation in a private pension plan. They are sourced from income tax return data contained in the T1 Family File (T1FF). Industries are defined using the North American Industry Classification System (NAICS) for Canada (for more information, see Statistics Canada's industry classification). This article identifies the main industry of wage-earners as the industry on the T4 slip with the highest wages and salaries (Box 14 for the T4 slip). The industry can be derived using the employer information on the T4 slip for most wage-earners. In addition, with income tax data, it is possible to determine the approximate rate of unionization using the proportion of graduates who reported union dues (line 212 of the T1 form). Also, the number of graduates participating in a private pension plan can be estimated using the proportion of graduates reporting contributions to a registered pension plan (line 207 of the T1 form).

In order to be able to assess these measures two years before and two years after the short-duration credential, we focus on a sub-group of the "Bac+" group who obtained their second qualification in 2013, 2014 or 2015. A period of two years was chosen since programs leading to short-duration credentials are typically between one and two years in duration. This allows for comparison of this group of graduates just before they start the program leading to their second credential and just after they return to the labour market.

Median and mean employment income

"Salaries, wages and commissions", also called "employment income", includes employment pay and commissions, as indicated on the T4 information slips, training allowances, tips, gratuities and royalties. It also includes tax-exempt employment income earned by registered Indians. Any form of self-employment income is excluded. The elements of employment income are salaries and wages (line 101 on the T1 form), other employment income (line 104 of the T1 form) and Indian exempt income (derived from information provided on the Determination of Exemption of an Indian's Employment Income form).

The median employment income analysis (and the mean in **Appendix B**) of the members of the "Bac+" group, who obtained a short-duration credential in 2013 (in the text) or in 2014 and 2015 (in **Appendix B**) is done individually to allow for a comparison with a comparison group from the "Bac" group. For example, the members of the "Bac+" group who obtained their short-duration credential in 2013 are compared to the comparison group (the "Bac" group) in 2011 (two years before) and in 2015 (two years after), even if the comparison group did not obtain a short-duration credential during the period. The same type of analysis and comparison is done for the "Bac+" group who obtained their short-duration credential in 2014 and in 2015.

Blinder-Oaxaca decomposition

The variables retained in the model are the field of study associated with the undergraduate degree, gender, and a binary variable indicating whether a graduate took full-time studies after obtaining a degree. The Box-Cox transformation[17] of the endogenous variable was needed to better adjust the model to the data. The natural logarithm of the employment earnings was used as an endogenous variable. In addition, to reduce the influence of extreme values on the model, the outlier variables were detected and processed using the Hidiroglou-Berthelot method.[18] This method examines the distribution of the values of the given variable and identifies the values that exceed a certain threshold as outliers. The threshold value was calculated as follows for each field of study: $HB_{bound} = Q_2 + 25*\left(Q_3 - Q_2\right)$ where Q_2 and Q_3 are the median and the third quartile, respectively.

The employment income gaps between individuals in the "Bac" group and those in the "Bac+" group for the "employment income" variable were decomposed using the Blinder-Oaxaca method:

$$Y_j = X_j\beta_j + \varepsilon_j,\ E\left(\varepsilon_j\right) = 0,\ j \in \left\{Bac, Bac^+\right\}$$

The difference between the means $R = \overline{Y}_{Bac} - \overline{Y}_{Bac^+} = \overline{X}_{Bac}\hat{\beta}_{Bac} - \overline{X}_{Bac^+}\hat{\beta}_{Bac^+}$ can be decomposed into three factors $R = \left(\overline{X}_{Bac} - \overline{X}_{Bac^+}\right)' \hat{\beta}_{Bac^+} + \overline{X}'_{Bac^+}\left(\hat{\beta}_{Bac} - \hat{\beta}_{Bac^+}\right) + \left(\overline{X}_{Bac} - \overline{X}_{Bac^+}\right)'\left(\hat{\beta}_{Bac} - \hat{\beta}_{Bac^+}\right)$, the differences between exogenous factors, the difference between coefficients and an interaction term between the two, respectively.

$\overline{Y}$: Mean of the square root of employment income

$\overline{X}$: Vector of regressors mean

This decomposition can also be written as:

$R = \left(\overline{X}_{Bac} - \overline{X}_{Bac^+}\right)' \beta^* + \left[\overline{X}'_{Bac}\left(\hat{\beta}_{Bac} - \beta^*\right) + \overline{X}'_{Bac^+}\left(\beta^* - \hat{\beta}_{Bac^+}\right)\right]$, the part explained and the part not explained by the model, respectively.

Where β^* is a set of reference coefficients. The Oaxaca and Blinder method proposes: $\beta^* = \hat{\beta}_{Bac}\ and\ \beta^* = \hat{\beta}_{Bac^+}$

i.e. choose as basic average income in the model what a member of the "Bac" group would have received when submitted to the conditions of someone in the "Bac+" group, or vice versa.

17. Box, G. E. P. and D. R. Cox. "An Analysis of Transformations", *Journal of the Royal Statistical Society, Series B (Methodological)*. Vol. 26, No. 2 (1964), 211–252.
18. Hidiroglou, M. A., and J. M. Berthelot. "Statistical editing and imputation for periodic business surveys". *Survey Methodology*, 12 (1986), 73–83.

9. Appendix B

Table B1
Median employment income of the "Bac" and "Bac+" group by the year in which the short-duration credential was obtained and the field of study, two years before and two years after their additional short-duration credential

		2013		2014		2015	
		"Bac"	"Bac+"	"Bac"	"Bac+"	"Bac"	"Bac+"
		2017 constant dollars					
Science and science technology	2 years before	34,400	27,200	41,000	18,000	44,500	x
	2 years after	51,000	47,700	54,200	46,900	57,700	x
Engineering and engineering technology	2 years before	59,200	x	66,900	x	72,600	x
	2 years after	81,500	x	82,600	x	87,600	x
Mathematics and computer and information science	2 years before	48,200	x	54,700	x	60,900	x
	2 years after	69,800	x	74,500	x	77,600	x
Business and administration	2 years before	42,100	30,200	48,000	45,900	53,600	45,000
	2 years after	62,400	53,700	65,500	57,100	70,300	55,400
Arts and humanities	2 years before	26,200	18,800	31,500	18,400	35,700	25,100
	2 years after	41,300	39,700	43,700	38,000	46,700	50,400
Social and behavioural sciences	2 years before	31,300	20,300	37,800	26,000	42,100	31,500
	2 years after	48,300	43,300	50,900	41,400	54,100	43,200
Legal professions and studies	2 years before	31,700	x	40,100	x	43,900	x
	2 years after	55,100	x	57,000	x	59,700	x
Health care	2 years before	65,700	67,300	68,200	68,600	69,700	66,500
	2 years after	71,600	74,400	71,900	78,500	71,600	65,200
Education and teaching	2 years before	38,500	33,700	43,800	x	47,800	40,900
	2 years after	51,000	47,200	53,100	x	55,100	55,700
Trades, services, natural resources and conservation	2 years before	38,600	x	44,500	x	48,200	x
	2 years after	51,900	x	54,000	x	55,400	x

x suppressed to meet the confidentiality requirements of the *Statistics Act*

Note: All amounts are expressed in 2017 constant dollars.

Source: Statistics Canada. Postsecondary Student Information System (PSIS), 2009/2010 to 2015/2016 and T1 Family File (T1FF), 2011 to 2017 (subset compiled from linked microdata files, extracted June 19, 2019).

Table B2
Mean employment income of the "Bac" and "Bac+" group by the year in which the short-duration credential was obtained and the field of study, two years before and two years after their additional short-duration credential

		2013		2014		2015	
		"Bac"	"Bac+"	"Bac"	"Bac+"	"Bac"	"Bac+"
		2017 constant dollars					
Science and science technology	2 years before	35,600	30,900	41,600	24,100	x	x
	2 years after	52,100	45,400	54,500	47,800	x	x
Engineering and engineering technology	2 years before	x	x	x	x	x	x
	2 years after	x	x	x	x	x	x
Mathematics and computer and information science	2 years before	x	x	x	x	x	x
	2 years after	x	x	x	x	x	x
Business and administration	2 years before	41,700	28,600	49,000	43,000	55,600	45,100
	2 years after	65,900	53,100	69,200	60,100	75,200	57,700
Arts and humanities	2 years before	27,000	20,600	31,600	23,900	35,600	28,300
	2 years after	41,000	37,900	43,700	36,200	47,500	49,100
Social and behavioural sciences	2 years before	31,600	23,400	37,300	26,100	41,900	32,400
	2 years after	48,700	44,500	51,200	41,400	55,300	45,100
Legal professions and studies	2 years before	x	x	x	x	x	x
	2 years after	x	x	x	x	x	x
Health care	2 years before	61,000	59,100	63,600	66,700	64,100	59,800
	2 years after	64,800	71,100	64,700	76,200	65,000	62,500
Education and teaching	2 years before	37,800	31,400	42,000	40,700	44,800	39,900
	2 years after	47,500	44,300	49,100	52,200	51,000	51,800
Trades, services, natural resources and conservation	2 years before	38,000	26,500	x	x	x	x
	2 years after	51,400	39,400	x	x	x	x

x suppressed to meet the confidentiality requirements of the *Statistics Act*

Note: All amounts are expressed in 2017 constant dollars.

Source: Statistics Canada. Postsecondary Student Information System (PSIS), 2009/2010 to 2015/2016 and T1 Family File (T1FF), 2011 to 2017 (subset compiled from linked microdata files, extracted June 19, 2019).