The Big Short: Early Childhood Education Expansion in Post-Pandemic Canada

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Abstract:

The demand for early childhood educators is expected to grow as the Canadian economy recovers from the COVID-19 pandemic and Canadians continue to return to work. To support this transition, the federal government has signed bilateral agreements with Canada's territories and provinces to invest more than 30 billion dollars to create a "10 dollar a day" universal childcare system. This ambitious movement is a landmark in Canadian childcare, yet it is unclear whether Canada's current pipeline of early childhood education graduates is sufficient to meet this increased demand. Using data from the Education and Labour Market Longitudinal Linkage Platform (ELMLP) we find that early childhood education program graduates tend to be concentrated in relatively few provinces, come from primarily college backgrounds, and acquire considerably modest labour market outcomes. We investigate the career transition of ECE graduates and find that low pay is the primary reason for field exit among ECE professionals. Policy implications of this potential shortfall in the supply of ECE professionals is discussed.

1. Introduction

The past two years of the pandemic have underscored the necessity and importance of publicly available childcare for Canada's productivity and efficiency (Friendly et al., 2020). The government of Canada has acknowledged the need to provide universal, affordable, and high-quality childcare to Canadian families. Starting in 2021, the federal government made the commitment of a staggering $30 billion to bolster the early childcare sector over the next decade (Department of Finance Canada, n.d.; Childcare Resource and Research Unit, 2021).[1] The most prominent of this investment is a promise to enact a national $10-dollar-a-day childcare effort in collaboration with each of the provinces and territories. Following this ambitious announcement, however, Canada experienced a third, and then the fourth wave of COVID-19, followed by a federal election call in late 2021. The election threatened to halt the inertia Ottawa had generated to sign bilateral agreements with the provinces (Pacini-Ketchabaw & Prentice, 2021a). However, as of March 2022, the federal government has signed agreements with all territories and provinces.

The demand for early childhood educators is again growing as the economy recovers from the pandemic and most Canadians return to in-person work. Enrollments in childcare centres have recovered considerably from the earliest stages of the pandemic—an average of 43 children per centre in 2021 compared to eight children in 2020—signalling a gradual return to the pre-covid mean enrollment of 57 (Vickerson et al., 2022a). While persisting fears of the virus and the wider acceptance of remote work may cause some parents to keep their children out of traditional early learning and childcare (ELCC) in the short term, there is little doubt that there will be increasing demand for early childhood educators (ECE) due to the large federal expansion.

And yet the turbulence of the past two years has weakened Canada's supply of early childhood educators. A reported 58 percent of centres laid off either all of their staff or all but the director in the earliest stages of the pandemic (Friendly et al., 2021).[2] More troubling, however, is that more than a quarter of these centres had not hired back the staff lost during that first wave in the months that followed, which may have forced these ECEs into other career streams (Vickerson et al., 2022a). Subsequent waves of the pandemic have been slightly more promising for ECE workers with just under a third of centres experiencing layoffs, particularly as ECE centres have been deemed essential and permitted to stay operational. [3] However, it remains to be seen whether Canada is heading towards a shortage of ECE professionals, particularly in light of the

[1] To put this figure into perspective, prior to the massive disruptions caused by COVID-19, early childhood care and education programs in Canada were undergoing what was previously considered a significant development. In 2017 the federal and provincial governments adopted a multi-lateral framework to support Early Learning and Child Care (ELCC), focusing on improving the sector across the areas of accessibility, affordability, quality, flexibility, and inclusivity (see Childcare Resources and Research Unit, 2021). The first phase of this three-year bilateral agreement concluded just prior to the onset of the pandemic, in March of 2020, with an estimated $1.195 billion having been dedicated to the program.

[2] Between the period of March to May 2020, when most centres were closed after Canada experienced the first wave of the pandemic, 71 percent of ECE providers reported laying off some, or all their staff (see (Vickerson et al., 2022a)).

[3] With a national average of centres reporting layoffs at 29 percent, New Brunswick was the least likely to have laid off staff (14 percent of centres) and Alberta at the other end of the spectrum (40 percent of centres experiencing layoffs) (Friendly et al., 2021).

federal and provincial/territorial governments' commitments to the sector. All of the provinces and territories have committed to creating new ECE spaces in early learning and childcare centres as part of their agreement with the federal government. Alberta, for example, is planning to add 42,500 new full-time spaces by 2025-26 (Government of Alberta, n.d.-a), and British Columbia has committed to 30,000 within five years and 40,000 within seven years (Department of Finance Canada, n.d.). Yet to recruit enough educators for these new spaces and ensure the provision of high-quality childcare, training enough graduates and journeypersons in early childhood education becomes more than essential.

Staffing shortages are already a known issue in the childcare workforce. Concerns for staffing shortages were the single most commonly communicated worry among ECE operators in 2021—even greater than concerns for financial stability and operational capacities (Vickerson et al., 2022a). At least part of the issue can be attributed to the returns to careers in the ECE field, issues which the influx of support from the federal and provincial governments may be able to address. To that point, financial concerns ranked high among the issues reported among ECE employers, with over 40 percent of providers reporting difficulties meeting wage and salary costs, and another 21 percent experiencing difficulties affording benefits (Vickerson et al. 2022).

Yet an issue that has received virtually no acknowledgement among the public policy and academic communities is whether the pipeline of graduates from ECE higher education programs will be enough to meet the increased demand proposed by governmental investments in early childcare. To our knowledge, there exist no empirical assessments on whether graduation trends are signalling a labour shortage that will significantly undermine this revitalization of the sector.

Part of the problem is that the research community has struggled to get access to viable data on early childhood educators (Friendly et al., 2021; Beauregard et al., 2020). Statistics Canada employs several surveys that can measure graduates' labour market outcomes, such as the National Graduate Survey, though these traditional sources of data do not provide adequate detail to capture the proportionately small population of graduates in ECE-related programs specifically. However, using Statistics Canada's recently realized Education and Labour Market Longitudinal Linkage Platform (ELMLP), researchers have access to unprecedented precision regarding the school to work characteristics of Canadian graduate cohorts. With this data, we are able to examine graduates of early childhood education programs in ways that were never possible previously.

We therefore use the ELMLP data to focus on the following three research questions aimed at understanding the close future of early childhood education:

1. In Canada, which institutions and which provinces have historically trained the majority of early childhood education (ECE) graduates?
2. What are the demographic characteristics, or profile, of these ECE graduates and what are their earnings after entering the labour market?
3. What are the career and earnings trajectories among graduates of ECE programs? How quickly do these graduates enter into an ECE-related career after graduation? Do they remain in or exit from the ECE-related career over years? Is there an association between retention and exit behaviours and earnings?

2. Data

We utilize confidential administrative information from Statistics Canada's Education and Labour Market Longitudinal Linkage Platform (ELMLP). The ELMLP is a platform that allows researchers to access rich information about past cohorts of postsecondary students and registered apprentices linked to their education and training records and their Canadian tax files. For this analysis, we will use three administrative datasets contained within the platform: (1) the Post-Secondary Information System (PSIS), 2009-2018,[4] (2) the Registered Apprenticeship Information System (RAIS), 2008-2018, and (3) the tax records -T1 Family File (T1FF), 2004-2018.

When drawing from the PSIS 2009-2018 files, we target ECE graduates who have completed their program from 2010 to 2017[5,6] and document their sociodemographic profiles as well as the institutions they graduated from. Then we link these graduates to their longitudinal tax files to allow us to follow their career and earnings trajectories for a period of five years after graduation. Similarly, using records contained in RAIS,[7] we also explore Registered Early Childhood Education (RECE) journeypersons[8] who have completed apprenticeship programs and have received a certificate of qualification from 2009-2017 in this analysis.

3. Descriptive analysis

3.1 Which institutions have historically trained the majority of ECE graduates?

Table 1 lists the institutions in Canada that have trained ECE graduates in 2017 (the most recent cohort available in our data). We report the institution names and how many ECE students have

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[4] Information of 2009 to 2018 are available for all provinces in PSIS. However, 2005-2008 are only available for maritime provinces.

[5] Due to the design of the PSIS, the reporting year cycle is from May to April rather than a calendar year period from January to December. Therefore, two consecutive reporting years in PSIS are required to cover a completed graduate cohort who graduate from January to December in a given year. For example, graduate cohort 2010 is derived from both PSIS 2009 (May 2009 - April 2010) and PSIS 2010 (May 2010 - April 2011). In this case, graduate cohorts 2009 and 2018 are incomplete and excluded from this analysis.

[6] A graduate might obtain multiple credentials in the same year and these credentials could be either ECE-related or not. In our analytical sample, we focus on graduates who have obtained ECE credentials only because people who have also obtained credentials in other fields might have different career goals compared to those with only ECE credentials. Additionally, among graduates with multiple ECE credentials in the same year, we follow four steps suggested by Statistics Canada to break the tie in order to include only one record per graduate for a given cohort. "Step 1: Keep the record with the highest PSIS program type, e.g. graduate program level is retained over undergraduate level. Step 2: If program types are the same, then keep the record with the highest PSIS credential type, e.g. degree is retained over diploma. Step 3: If credential types are also the same, but one educational qualification is in the field of study of 'Education' then it is retained over the other fields of study. Step 4: If credential types are also the same, but neither educational qualification is in the field of study of 'Education' then one of the fields of study is chosen at random." For more details, see (Statistics Canada, 2020b)

[7] The reporting year cycle in RAIS is based on a calendar year period. Therefore, the RECE journeypersons cohorts 2009-2017 are derived through the same years in RAIS (2009-2017).

[8] "Journeypersons, for the purposes of these indicators, are defined to be apprentices who have successfully completed their entire apprenticeship programs and have received a certificate of qualification." (see Statistics Canada, 2020a)

graduated from each institution by program type: college program, above college and below bachelor, and bachelor program. Since the majority of ECE graduates are from institutions providing a college program, the full list of these institutions is included in Appendix Table 1. Table 1 only reports the top 10 institutions providing a college program in the interest of brevity. Table 2 presents the institution that has provided the most ECE graduates (the top school) in each province in 2017.

Table 1: List of institutions providing ECE programs in 2017 by program type (only top 10 institutions are reported for college programs)

Institution Name	Number of ECE graduates
College Programs	
George Brown College of Applied Arts and Technology	340
Algonquin College of Applied Arts and Technology	220
Mohawk College of Applied Arts and Technology	210
Humber College of Applied Arts and Technology North Campus	190
Bow Valley College	180
Fanshawe College of Applied Arts and Technology	170
Conestoga College of Applied Arts and Technology	170
Centennial College of Applied Arts and Technology	170
Saskatchewan Polytechnic - Parent Institution	160
CÉGEP Marie-Victorin	140
Rest of institutions	3680
Above College and Below Bachelor	
Université Montréal - Parent Institution	200
Université du Québec Montréal	170
Université du Québec Trois-Rivières	90
Université Sherbrooke	30
Humber College of Applied Arts and Technology North Campus	30
Mohawk College of Applied Arts and Technology	<30
Langara College	<30
Bachelor Programs	
Ryerson University - Parent Institution	350
University of Guelph - Parent Institution	100
University of Toronto - Parent Institution	70
Brock University - Parent Institution	30
University of British Columbia - Parent Institution	
Capilano University	
Mount Royal University	140 (combined)
University of Victoria	
Concordia University	

Conestoga College of Applied Arts and Technology
University of Winnipeg - Parent Institution
Simon Fraser University
York University - Parent Institution

Sources: Post-Secondary Information System (PSIS) 2016-2017
Notes: This table lists institution names as well as the number of ECE graduates in 2017 by program types. For institutions in italic, the number of graduates in 2017 for each institution cannot be released due to confidentiality rules. The figure reported in the table is a grouped number.

Table 2: Institution provided the most ECE graduates (Top 1) in each province in 2017

Institution Name	Province	Number of ECE graduates
Bow Valley College	Alberta	180
Capilano University	British Columbia	80
Red River College - Parent Institution	Manitoba	110
New Brunswick Community College - Parent Institution	New Brunswick	110
College of the North Atlantic - Parent Institution	Newfoundland and Labrador	<30
Nova Scotia Community Colleges (NSCC) - Parent Institution	Nova Scotia	50
Ryerson University - Parent Institution	Ontario	350
Holland College - Parent Institution	Prince Edward Island	<30
Université Montréal - Parent Institution	Quebec	200
Saskatchewan Polytechnic - Parent Institution	Saskatchewan	160

Sources: Post-Secondary Information System (PSIS) 2016-2017
Notes: This table lists top institute in each province which has the most ECE graduates in 2017. For Newfoundland and PEI, the number of graduates in each province cannot be released due to confidentiality rules.

Understanding the geographical distribution of graduates within a province is important as the role of geographic distance to school has a strong effect on the probability of attending in Canada (Frenette, 2002). Luckily the pandemic has increased the ability of post-secondary universities in providing online education which will be paramount to make sure that the supply of ECE graduates are located in the communities in which they are demanded. Table 3 shows the average number of ECE graduates per year by province. As shown, Ontario and Quebec are the two provinces that have trained the majority of ECE graduates every year, 2,880 in Ontario and 2,170 in Quebec, which counts for 78.7 percent of the ECE graduates in Canada per year. Interestingly, those two provinces only have 60.9 percent of children under six in Canada so they are graduating a higher percentage of ECE's compared to their level of children. This could to due to a higher percentage of parents opting to send their young children into childcare and the demand for ECEs in the education system within the provinces or it could be due to the capacity to train the number of educators that is demanded.

Table 3: Average number of ECE graduates per year

	Average number of graduates	Percentage of Graduates	Percentage of Children	Difference
Panel A: ECE college/university programs				
Alberta	390	6.07%	13.74%	7.67%
British Columbia	450	7.01%	12.33%	5.32%
Manitoba	140	2.18%	3.94%	1.76%
New Brunswick	150	2.34%	1.80%	-0.53%
Newfoundland and Labrador	<30	< 0.47%	1.13%	-
Nova Scotia	40	0.62%	2.28%	1.66%
Ontario	2880	44.86%	38.02%	-6.84%
Prince Edward Island	<30	< 0.47%	0.36%	-
Quebec	2170	33.80%	22.86%	-10.94%
Saskatchewan	130	2.02%	3.52%	1.50%
Panel B: Registered ECE				
Ontario	370	100%		

Sources: Post-Secondary Information System (PSIS) 2009-2018; Registered Apprenticeship Information
System (RAIS) 2010-2017; Statistics Canada Table 39-10-0041-01
Notes: For Newfoundland and PEI, the average number of graduates per year in each province cannot be released due to confidentiality rules.

3.2 Who are ECE graduates likely to be?

Table 4 presents a demographic snapshot of ECE graduates and RECE journeypersons who completed the degree or apprenticeship. On average, college ECE graduates complete their certificates at an older age than those who complete a university ECE degree. Additionally, RECE journeypersons typically complete their apprenticeships at an older age than both college and university ECE graduates. We see that women are significantly dominant in this field (under five percent are men), which is consistent with other studies in this area (Halfan 2021). This disproportion among women and men is true for both ECEs and RECEs. Immigrants and international students are underrepresented, especially at the university level among ECEs.[9] About 50 percent of college ECE graduates are married/common-law (including whether they were ever married or common-law) by one year after graduation. This proportion is even higher among college ECE graduates in Quebec (62 percent) and RECE journeypersons in Ontario (74 percent). Also, about two-thirds of graduates are parents with at least one child by one year after graduation. High proportions of graduates in parenthood and being married/common-law is likely due to the fact that ECE graduates are typically older than graduates from other fields (an overall average of roughly 27 years old). Over half of ECE graduates hold multiple jobs one year after graduation, and this high proportion might suggest that newly ECE graduates typically start

[9] Immigration status is not collected among RECE journeypersons.

with multiple part-time jobs when entering the labour market after graduating. This level of multiple jobs is much higher than the Canadian average. In particular, based on the Labour Force Survey, in 2018, 6.8 percent of employed women held more than one job and this proportion is a bit lower among employed men (4.7 percent) (Fulford & Patterson, 2019). Part-time workers are more likely to hold multiple jobs and the rate is more than twice as high as that of full-timers. Regardless, the large number of multiple job holders in this occupation is staggering.

3.3 Earnings Profiles of ECE and RECE professionals

Previous literature has shown that ECE salaries are lower than other female-dominated professions requiring comparable education and training and are far below the average Canadian salary (McCuaig et al., 2022). Our estimates in Figure 1 presents the average annual earnings of ECE graduates one year after graduation for each graduate cohort 2010-2017 by program type and find similarly low levels of earnings. The earnings are deflated with a base year in 2016. The first year after graduation for different cohorts refers to different calendar years. For instance, 2011 is the first year after graduation for cohort 2010, while 2012 is the first year for cohort 2011. The earnings of college ECE graduates one year after graduation are relatively stable across all cohorts (about $26,000) and lower than university ECEs and RECEs. The earnings of university ECEs are the highest (about $36,000) and stable across cohorts 2010-2013. Then the earnings increase for cohort 2014 and decrease significantly for cohort 2016. This may be due to the last of the full day kindergarten rollout in Ontario schools in which they were hiring new ECEs.The earnings of RECEs are stable (about $31,300) across most cohorts and increase for cohort 2017.

Figure 1: Average earnings at 1-year after graduation, by program type

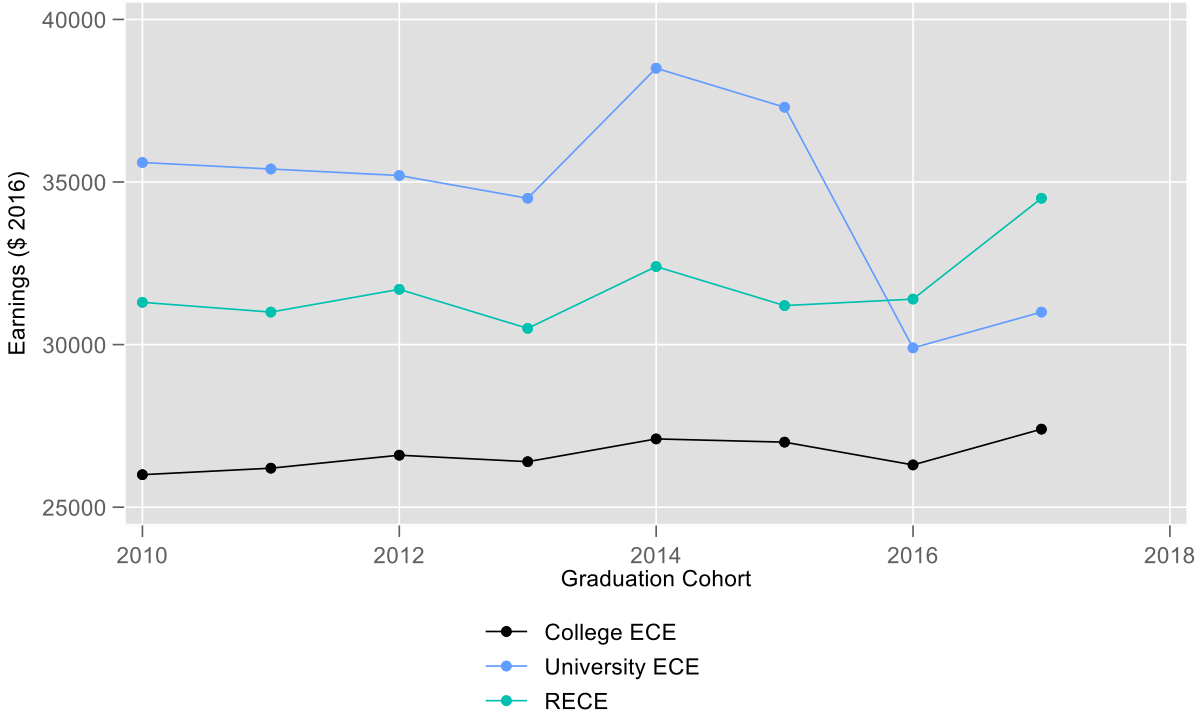
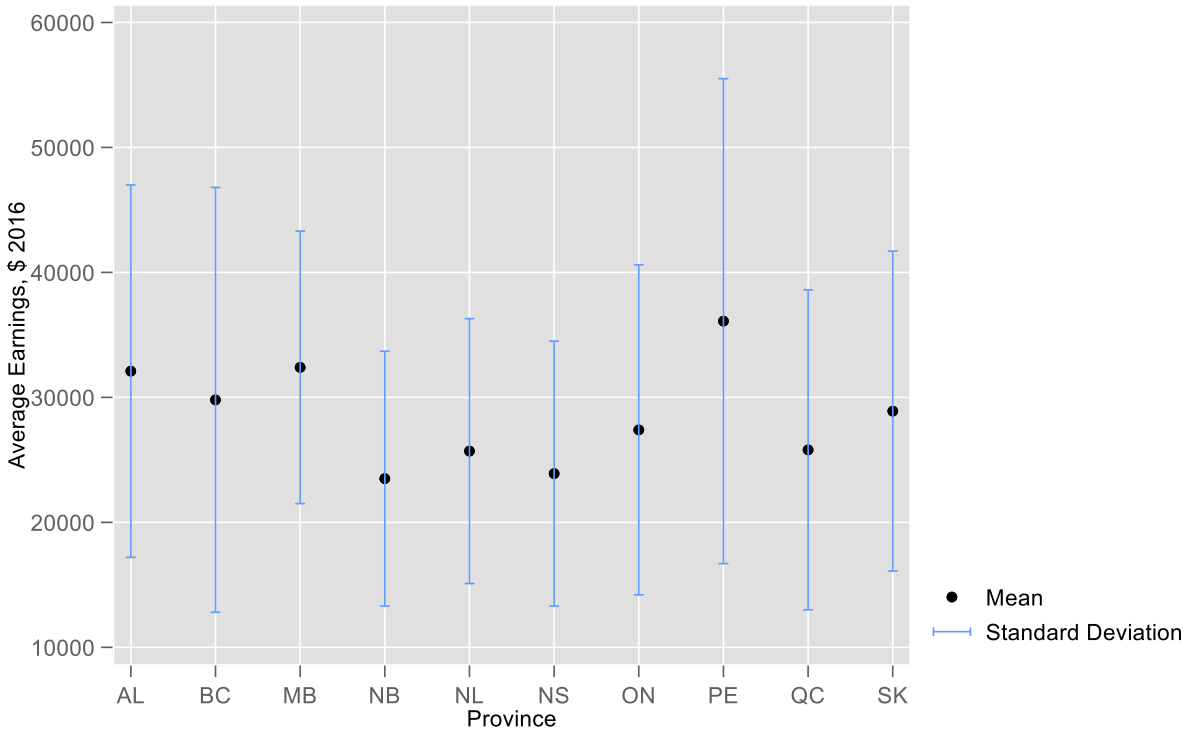


Figure 2 presents the average earnings and standard deviation bands at one year after graduation of ECE graduates by province. This figure does not include RECE wages in Ontario to make the data more comparable across provinces. ECE graduates in PEI have the highest average earnings (about $36,100), followed by Manitoba and Alberta (about $32,400 and $32,100, respectively). The average earnings of ECE graduates in Ontario and Quebec are $27,400 and $25,800, respectively. ECE graduates in New Brunswick and Nova Scotia have the lowest earnings (about $23,500 and $23,900, respectively). All provinces have fairly large variations across the sector with average standard deviation of $13,240 a year.

Figure 2: Average earnings at 1-year after graduation, by province

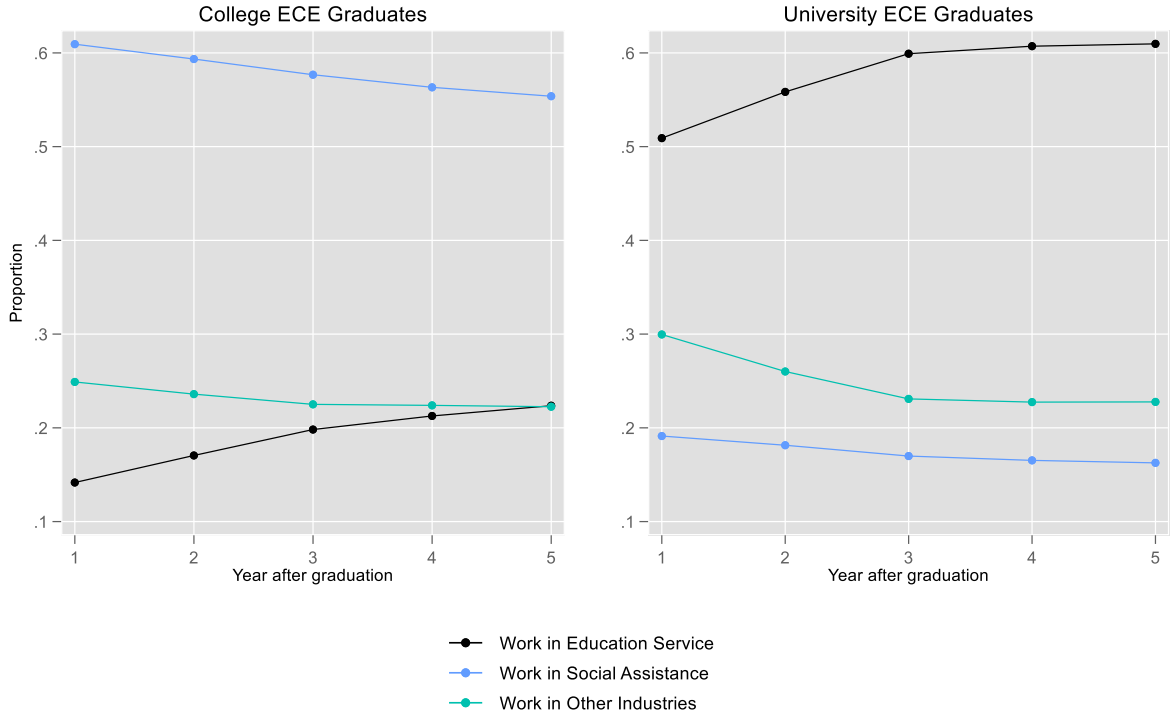


3.4 Where do ECE professionals find careers after completing their studies?

We next investigate the career trajectories of ECE graduates over a period of five years to gather insights on the recruitment and retention of the childcare workforce. Figure 3 presents the career trajectories of ECE graduates (university ECEs and college ECEs, separately) after graduation. Specifically, we track the likelihood of graduates working in the education service industry, social assistance industry, or moving to a career outside of these two areas over a five-year timeframe.[10] For clarification, childcare centers are included in the social assistance industry category.

[10] Our data, the ELMLP, only provides 2-digit of the North American Industry Classifications Systems (NAICS) code which does not allow us to further investigate the detailed industries. The National Occupational Classification (NOC) does not exist in the ELMLP.

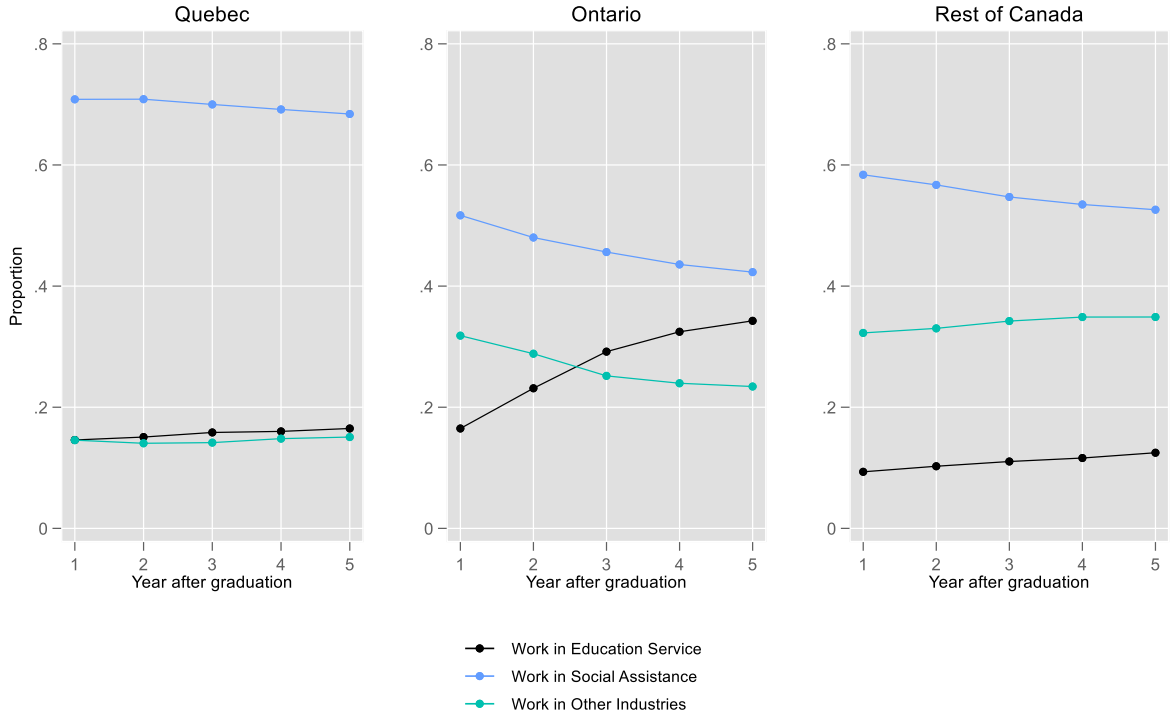
Figure 3: Career trajectories of ECE graduates after graduation



We see that more than 60 percent of college ECE graduates transition into the social assistance industry after graduation and the rest enter the education service or other industries. However, the likelihood of working in the social assistance industry decreases over time while the likelihood of working in the education service increases. This suggests that college ECEs might initially find work in a childcare center right after graduation but may later exit the sector in favour of the education service industry. The story is quite different among university ECE graduates. For instance, more than half of the university ECEs enter the education service industry right after the graduation, with the remaining proportions divided among social assistance or other industries. University educated ECEs are also more likely to move into education service roles over time, with the probability of working in social assistance decreasing over a five-year period.

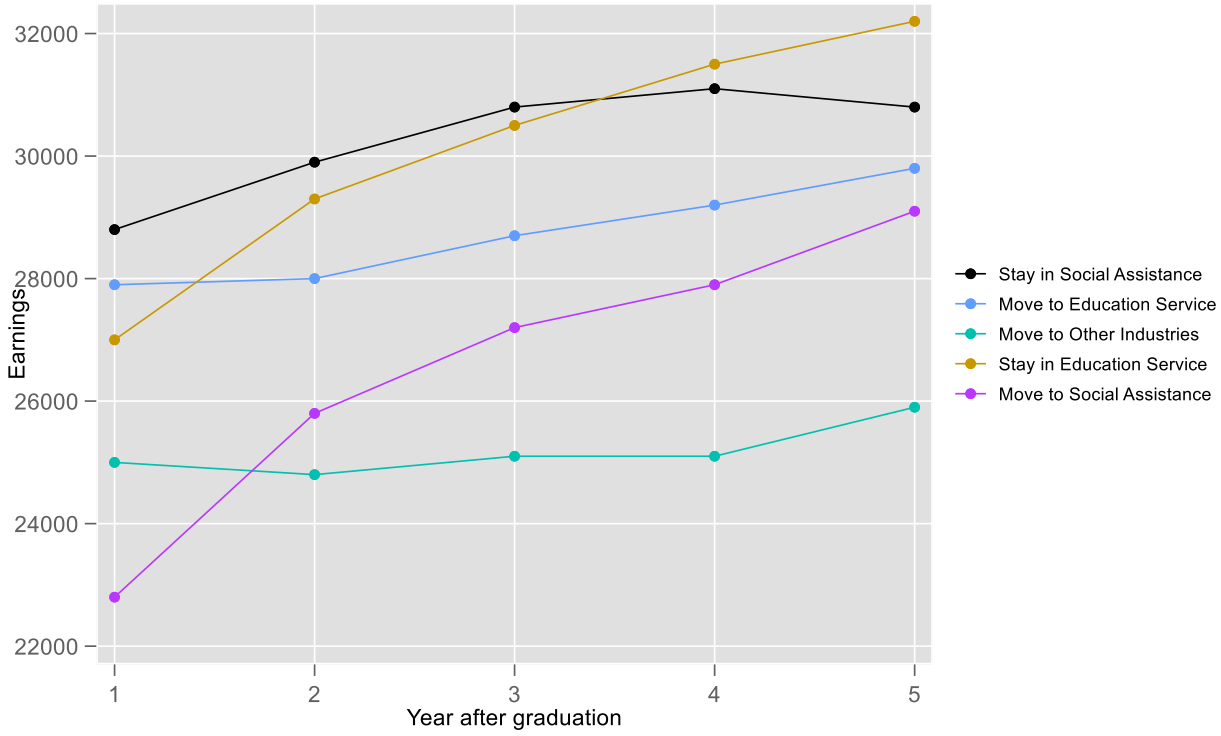
Since the vast majority of ECE graduates tend to come from college programs, we next explore the career pathways of college ECE graduates by province. In Figure 4 we see that the previously identified trend of graduates moving from social assistance to education services industries is mainly driven by Ontario, and to a lesser extent the remaining provinces aside from Quebec. Alternatively, career trajectories in Quebec appear to be quite stable over time for ECE graduates.

Figure 4: Career trajectories of college ECE graduates after graduation, by Province



One of the primary reasons that college ECE graduates might exit the social assistance industry in favour of employment in education services could be attributable to earnings growth between sectors. We therefore explore this possibility in Figure 5, where we present the average earnings trajectories of college ECEs based on their career pathways for a period of five years after completing their studies.

Figure 5: Earnings trajectories of ECE graduates after graduation, by career path



Social assistance careers appear to be the most lucrative directly after completing studies, surpassing educational services and "other" industry roles. However, earnings trajectories appear to change this advantage over time. Graduates that remain in the social assistance industry for the entire five-year period see earnings growth for the first three years, which levels off before dropping between years three and five. While initially lower paying, roles in education services or "other" industries surpass the social assistance category after roughly three years and demonstrate a more promising earnings trajectory. This trend may suggest that the promise of better career perspectives could be a factor in the decision to exit. However, it should be noted that regardless of the destination, leavers have lower earnings than those who stay in their initial choice which may take a period of time to recover from. [11]

For those ECE professionals who stayed in the social assistance industry up to five-year after graduation, their earnings were the highest one year after graduation and kept increasing over time, only dropping at the four-year mark. However, for those who were working in the social

[11] We encourage caution when interpreting these findings as we do not disentangle the length of time graduates stayed in their career prior to moving to a new path, which could potentially bias earnings. We expect that the earnings penalty experienced by graduates that move careers is the result of time lost in a given field—which we presume will diminish or disappear as graduates spend more time in their new careers. In most cases these earnings differences are relatively minor; however, leaving the field to pursue "other" industries appears to be a particularly low-paying trajectory with earnings that are markedly lower than any of the other pathways identified in Figure 5. In this case, the knock-on effect of this earnings penalty may be more detrimental the longer it takes a graduate to recover from a career change.

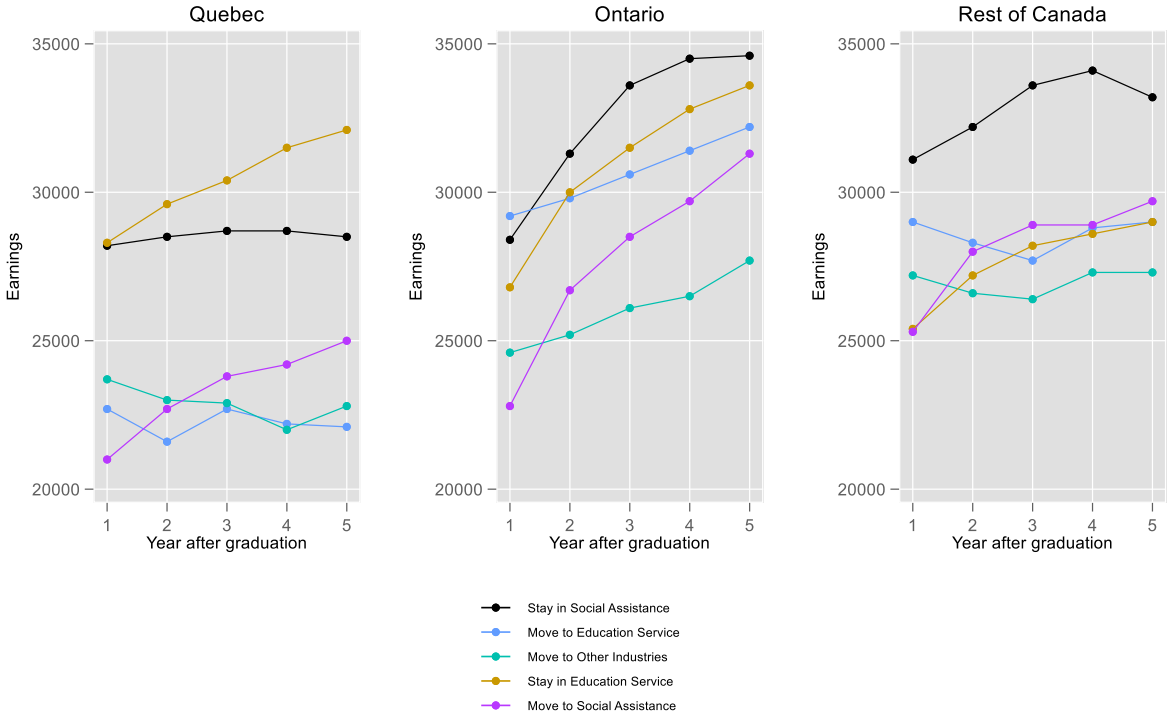
assistance but moved to the education service, their earnings kept increasing through the five-year time period. This might suggest the behaviours of exiting from the social assistance and moving to the education service are driven by the fact that the latter industry could have better career perspectives. College ECEs staying in the education service or other industries experience significant earnings growth as well and their earnings even surpass those who stayed in the social assistance after 3-year after graduation.

It is surprising that ECE graduates in social assistance roles are among the highest earners, given the attrition from the field we observed previously. There are two possible explanations for this trend. On the one hand, social assistance roles appear to offer the greatest salaries right out of college, which could be attractive to new graduates. This attraction could wane as salary increases stagnate over time, and the absence of attractive alternative opportunities in other social assistance roles. Education service roles may therefore offer more attractive long-term gains that cause professionals to leave social assistance careers to seek longer-term opportunities.

On the other hand, the decision to leave social assistance careers may be driven by factors other than earnings. For example, Halfan (2021) has identified an overall devaluation of the childcare workforce. Therefore, it may be that education service roles, and those careers outside of ECE, offer greater intangible benefits to quality of life that surpass the modest earnings advantages available in social assistance pathways.

Given that the vast majority of ECE graduates come from Ontario and Quebec, we separate these provinces to examine whether there are different characteristics in the pathways of their ECEs. In Figure 6 we see considerable variation in trajectory by province. In Ontario earnings trajectories are roughly similar between the two pathways, with a slightly greater earnings trajectory in the social assistance category that levels off towards the end of the five-year period. This is contrasted by Quebec, and the rest of Canada, where we see stark differences in earnings trajectories depending on the career stream chosen by the graduate.

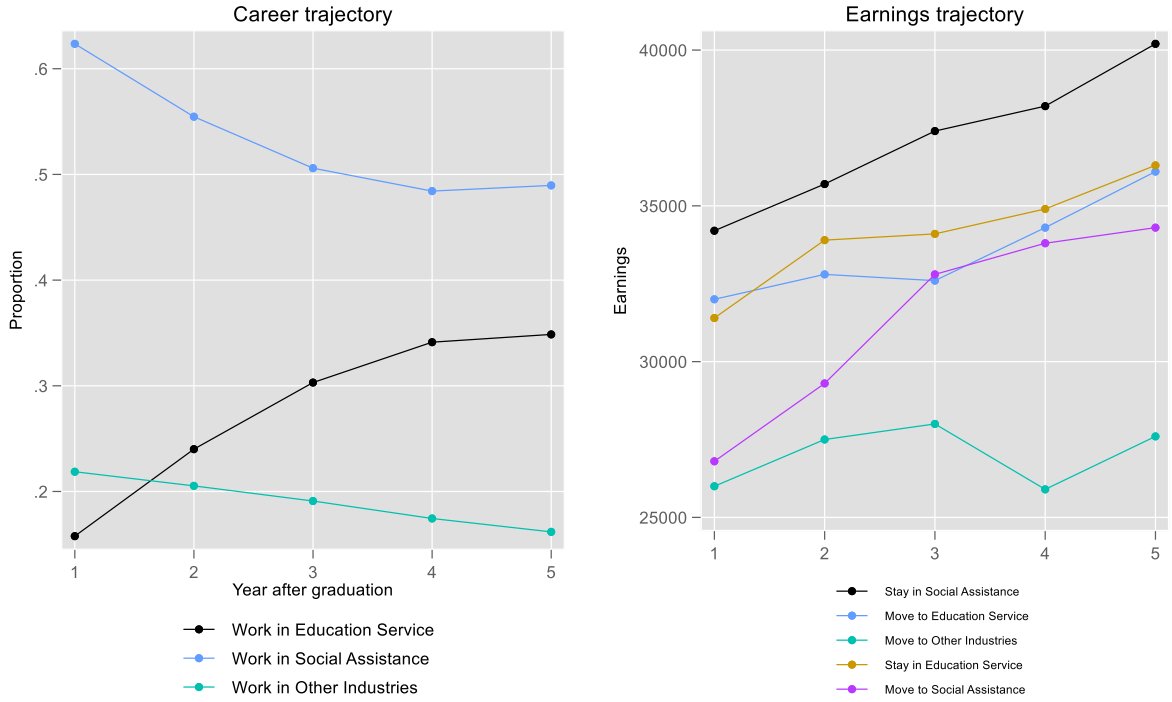
Figure 6: Earnings trajectories of college ECE graduates after graduation, by Province



In Quebec, where both social assistance and education service categories earn the same at year one, this quickly changes with significantly greater earnings growth in education services. We suspect this trend is largely driven by the province's control over the social assistance sector. The earnings for social assistance careers remain relatively stable in the province—leading to a sizable gap by year five. The inverse is true for the rest of Canada, however, where ECEs working in social assistance have markedly higher earnings than those in education service or "other" industry roles. While these earnings do appear to decay after year four, the returns are still markedly higher than any of the other career pathways.

Figure 7 shows the career and earning trajectories of RECEs in Ontario. The career trajectory of RECEs is similar to those college ECEs in Ontario. Greater shares of graduates enter social assistance jobs right after graduation but start to exit and move to education-related careers over a five-year period. The earnings trajectory of RECEs differs from the college ECEs in Ontario, however, particularly as RECEs in social assistance do not experience the drop in earnings is observed for ECEs after year four.

Figure 7: Career and earnings trajectories of RECEs after graduation



4. Regression analysis

In this section, we employ regression modelling to further investigate the recruitment and retention of the childcare workforce as well as what factors contribute to these behaviours.[12] First, we use equation 1 to analyze the likelihood of entering the social assistance industry right after graduation after controlling related factors.

$$y_i = \alpha_0 + \alpha_1 X_i + \gamma P_i + \delta C_i + \epsilon_i \qquad (1)$$

Where y_i is a dummy variable (either 1 or 0) indicating the likelihood of working in the social assistance industry one year after graduation. X_i is a set of related variables which includes ECE graduates' age, marital status, and number of children one year after graduation, as well as gender, immigrant status, program type, and fields of study. P_i are province indicators and C_i are cohort indicators. Table 5 presents the regression results based on the linear probability model (LPM) and Logit model.

[12] We only focus on ECE graduates rather than RECEs in the regression analysis because many of the variables included in the model, such as immigration status and program type, are either not available or not applicable in the RAIS data.

Table 5: Likelihood of entering the social assistance industry at 1-year after graduation

	LPM	Logit
Age	-0.011***	-0.048***
	(0.004)	(0.018)
Age squared	0.000*	0.000*
	(0.000)	(0.000)
Female	0.076***	0.366***
	(0.027)	(0.127)
Above college but below bachelor	-0.163***	-0.728***
	(0.021)	(0.095)
Bachelor degree	-0.331***	-1.525***
	(0.021)	(0.119)
Above bachelor	-0.411***	-2.523***
	(0.029)	(0.266)
ECE for special need	0.032	0.232
	(0.069)	(0.317)
Kindergarten/preschool	0.117***	0.639***
	(0.039)	(0.175)
Childcare provider	0.070***	0.351***
	(0.025)	(0.128)
Permanent resident	0.074***	0.325***
	(0.016)	(0.073)
International students	-0.028	-0.111
	(0.074)	(0.315)
Widowed	-0.007	-0.041
	(0.080)	(0.360)
Divorced/separated	-0.024	-0.107
	(0.021)	(0.092)
Single	0.005	0.022
	(0.011)	(0.052)
1 child	-0.009	-0.048
	(0.012)	(0.055)
2+ children	-0.026**	-0.123**
	(0.011)	(0.049)
NL	-0.12	-0.509
	(0.169)	(0.692)
PE	-0.022	-0.274
	(0.037)	(0.257)
NS	0.025	0.098
	(0.058)	(0.240)
NB	0.05	0.213

	(0.035)	(0.144)
QC	0.220***	0.993***
	(0.011)	(0.050)
MB	0.228***	1.021***
	(0.026)	(0.133)
SK	0.138***	0.587***
	(0.031)	(0.139)
AB	0.009	0.04
	(0.023)	(0.094)
BC	0.032*	0.133*
	(0.018)	(0.081)
Cohort 2011	-0.019	-0.088
	(0.013)	(0.061)
Cohort 2012	-0.028**	-0.135**
	(0.013)	(0.060)
Cohort 2013	-0.032**	-0.152***
	(0.012)	(0.059)
Constant	0.641***	0.561
	(0.078)	(0.361)
N	11480	11480
R-squared	0.119	
Adjusted R-squared	0.117	
Pseudo R-squared		0.093
Chi-squared		1043.200

Sources: Post-Secondary Information System (PSIS) 2009-2014 linked to T1FF 2011-2018

Note: * for p<0.10, ** for p<0.05, and *** for p<0.01

Robust standard errors in parentheses

The regression results are consistent with those findings from the descriptive analysis. For example, ECE graduates with a degree/certificate higher than a college program are less likely to work in the social assistance industry right after graduation. ECE graduates with a field of kindergarten/preschool or childcare provider are more likely to enter the social assistance industry. The likelihood decreases as age increases and females are more likely to pursue this pathway compared to males. Immigrants are more likely to enter compared to Canadians. Current marital status has no significant impact on the likelihood but having multiple children decreases the likelihood compared to those without children.[13]

[13] We also analyze the likelihood of entering the education service category after graduation as well as what factors have contributed to this likelihood. The results are consistent with our descriptive analysis as well. For instance, ECE graduates with a bachelor or higher degree are more likely to enter the education service industry. ECE graduates with an "ECE regular" specialty are more likely to enter this industry. The likelihood increases as age increases (but at a diminishing rate). Females are slightly less likely to enter compared to males and immigrants are

Then, we focus on ECE graduates who were working in the social assistance industry one year after graduation and follow them over a period of five years. We use a survival analysis, which estimates a hazard function, to examine the effects of related factors on the behaviours of exiting the social assistance industry. A survival analysis estimates the likelihood that ECE graduates may exit from the social assistance industry during a stretch of time (similar methods are used in Bridges et al, 2011; Singer & Willett, 2003). In our case, the model is specified as follows:

$$h_i(t) = h_0(t)\exp\left(b_1x_1 + b_2x_2 + \cdots + b_px_p\right) \qquad (2)$$

Where $h_0(t)$ is the baseline hazard at time *t* and *t* represents the survival time. $h_i(t)$ is the hazard function for ECE graduate *i* determined by a set of covariates. $x_1, x_2, \ldots, x_p$ are a set of covariates such as gender, age, and marital status described above. The baseline hazard indicates the value of the hazard if all the covariates are equal to zero. The coefficients $b_1, b_2, \ldots, b_p$ measures the effects of these covariates on the hazard rate of exiting from the social assistance at time *t*.

Table 6 presents the impacts of related factors on the hazard rate of exiting from the social assistance within five years after graduation.[14] ECE graduates with higher initial earnings (earnings one year after graduation) are significantly less likely to leave this industry within five years. This is consistent with the previous studies (Beach & Flanagan 2007; Flanagan et al., 2013; Halfan 2021) which indicates that low pay is the main reason of workers leaving this field. The exit hazard increases as ages increases (but at a diminishing rate). ECE graduates with a degree higher than a college program are significantly more likely to leave compared to graduates with a college degree. Compared to the reference group (graduates with no child), ECE graduates with one child are significantly less likely to leave.[15] These findings are consistent across provinces.[16] The p-value of the test of the proportional-hazards assumption are larger than 0.10 which suggests that there is no violation of the proportionality assumption.[17]

less likely to enter compared to Canadians. Singles are less likely to enter compared to married graduates while having multiple children increases the likelihood.

[14] To ease the interpretation of results, we report coefficients rather than hazard ratios (exponentiated coefficients).

[15] We conduct a couple of robustness checks regarding including different forms of time-varying variables such as marital status and number of children in the hazard rate models. For instance, following Allison (2010), we specify marital status in different formats and include them in the model: (1) whether the ECE graduate is currently married in year t, (2) whether the ECE graduate is married in year t-1, and (3) whether the ECE graduate has changed the marital status within t years. The results are consistent across different specifications. Same thing for number of children.

[16] Provinces and graduate cohorts are stratified in all specifications because the baseline hazard could be different across provinces and cohorts. Marital status is further stratified in ON to meet the proportionality assumption test.

[17] The tests of the proportional-hazards assumption assume homogeneity of variance across each level of the covariate of interest. Models do not violate this assumption can estimate overall (pooled) variance–covariance matrix. See (Kalbfleisch & Prentice 2002).

Table 6: Hazard of exiting from social assistance industry within 5 years after graduation by province

	Canada	QC	ON	ROC
Initial Earnings ($1000)	-0.020***	-0.031***	-0.012***	-0.022***
	(0.002)	(0.004)	(0.003)	(0.004)
Age	0.069***	0.088*	0.037	0.064
	(0.022)	(0.048)	(0.030)	(0.043)
Age squared	-0.001***	-0.001**	-0.001	-0.001*
	(0.000)	(0.001)	(0.000)	(0.001)
Female	0.068	0.011	0.172	-0.163
	(0.155)	(0.348)	(0.212)	(0.271)
Above college but below bachelor	0.278**	0.405**	0.418*	0.453
	(0.128)	(0.159)	(0.230)	(0.339)
Bachelor degree	0.469***	2.185***	0.360***	0.785
	(0.110)	(0.485)	(0.124)	(0.614)
Above bachelor	0.696**	2.008**	0.858***	-39.657***
	(0.282)	(0.916)	(0.255)	(0.937)
ECE for special need	0.482	-	0.283	-
	(0.314)	-	(0.383)	-
Kindergarten/preschool	-0.12	0.113	-	-
	(0.312)	(0.394)	-	-
Childcare provider	0.28	0.645**	0.245	-0.748
	(0.180)	(0.318)	(0.244)	(0.750)
Permanent resident	0.053	-0.009	0.133	-0.118
	(0.082)	(0.135)	(0.114)	(0.246)
International students	-0.157	-32.198***	0.669**	39.257***
	(0.342)	(0.515)	(0.284)	(0.384)
Married or Common-law (Ref. group)			-	
			-	
Widowed	0.138	1.233**	-	0.331
	(0.422)	(0.547)	-	(1.046)
Divorced/separated	0.092	0.263	-	0.18
	(0.115)	(0.195)	-	(0.247)
Single	0.091	0.107	-	0.291**
	(0.059)	(0.106)	-	(0.123)
1 child	-0.133**	-0.176	-0.058	-0.247*
	(0.061)	(0.119)	(0.086)	(0.130)
2+ children	-0.007	-0.097	0.096	-0.12

	(0.053)	(0.111)	(0.071)	(0.115)
Test of proportional-hazards assumption				
P-value	0.132	0.793	0.625	0.909
N	6570	3200	2130	1240
Pseudo R-squared	0.006	0.015	0.003	0.019
Chi-squared	154.344	4215.699	48.113	15981.436

Sources: Post-Secondary Information System (PSIS) 2009-2014 linked to T1FF 2011-2018

Note: * for p<0.10, ** for p<0.05, and *** for p<0.01

Robust standard errors in parentheses

Provinces and graduate cohorts are stratified in all specifications, while marital status is further stratified in ON.

Table 7 presents the impacts of related factors on the hazard rate of existing from the social assistance within five years after graduation for college ECE graduates and university graduates, separately. The results are consistent with those in Table 6. For instance, the initial earnings significantly decrease the exit hazard while age increases the hazard. ECE graduates with a higher degree are significantly more likely to leave compared to graduates with a college degree. ECE graduates with one child are significantly less likely to leave.

Table 7: Hazard of exiting from social assistance industry within 5 years after graduation by program

	College ECE	**University ECE**
Initial Earnings ($1000)	-0.019***	-0.016*
	(0.002)	(0.009)
Age	0.057**	0.107
	(0.022)	(0.173)
Age squared	-0.001***	-0.002
	(0.000)	(0.003)
Female	0.039	1.143
	(0.161)	(0.814)
Above college but below bachelor	0.431***	-
	(0.123)	-
Above bachelor	-	0.396
	-	(0.334)
ECE for special need	0.966**	-
	(0.388)	-
Kindergarten/preschool	0.319	-1.152*
	(0.397)	(0.645)
Childcare provider	0.902***	0.059
	(0.308)	(0.286)

Permanent resident	0.074	-0.889*
	(0.083)	(0.532)
International students	-0.186	
	(0.348)	
Widowed	-	1.920
	-	(1.227)
Divorced/separated	-	-0.624
	-	(1.216)
Single	-	0.165
	-	(0.281)
1 child	-0.121*	-0.105
	(0.062)	(0.338)
2+ children	-0.004	0.175
	(0.055)	(0.225)
Test of proportional-hazards assumption		
P-value	0.311	0.338
N	6390	170
Pseudo R-squared	0.007	0.045
Chi-squared	139.790	22.227

Sources: Post-Secondary Information System (PSIS) 2009-2014 linked to T1FF 2011-2018
Note: * for p<0.10, ** for p<0.05, and *** for p<0.01
Robust standard errors in parentheses
Provinces and graduate cohorts are stratified in all specifications, while marital status is further stratified in ON.

5. Discussion

The purpose of this paper has been to profile ECE graduates in the wake of the federal and provincial commitment of more than $30 billion to support early learning and childcare. Using administrative data, we have provided a snapshot of the yearly supply of entrants to the ECE field, as well as their sociodemographic characteristics and expected career pathways. This evidence is helpful when charting a course forward as early learning and childcare expands to meet the targets of 2025 and beyond.

We find that the overwhelming proportion of ECE program graduates come from Ontario and Quebec (roughly 45 and 34 percent respectively) with a significantly smaller proportion coming from the remaining provinces. These are predominantly Canadian citizen women, the majority of which are over the age of 25 and are parents to at least one child. This is a potentially problematic trend for the labour supply of early childhood educators for two reasons. First, graduates tend to gravitate towards urban centres when they complete their education (Corbett, 2005a; Tremblay, 2001; Zarifa et al., 2019a). Given that two of Canada's largest economic centres are producing the largest shares of graduates, there are concerns that these graduates may

not disperse to the other provinces that need them—especially if they have ample opportunities to find employment locally while finishing their education (Finnie, 2004a). Workers also tend to become less portable once they get married and have children (Finnie, 2004a). These characteristics signal a potential problem for ensuring ample supplies of ECE graduates fulfill the staffing needs of other provinces, particularly if remuneration for those jobs is not strong enough to incentivize graduates to relocate.

This potential staffing issue is more apparent when we consider the future demands for ECE staff in light of the federal and provincial governments' recent investments on the sector. If the federal government's commitment to a $10 dollar a day childcare system meets its five-year target, we will need far more graduates than we are currently producing. We can expect a deficit in the number of qualified candidates to fill the spaces intended across the remaining provinces.

Currently, one of the few incentives to relocate outside of Ontario or Quebec is due to the fact that provinces like PEI, Alberta, and Manitoba pay staff in ECE centres measurably more than in Ontario and Quebec (a real dollar difference of between $6,000 to $10,000 on average depending on the province). Though this premium does not exist in provinces like New Brunswick and Nova Scotia (areas where ECEs make less than Ontario and Quebec), and it is difficult to say whether the modest increase in earnings over Quebec and Ontario would outweigh the costs of relocating, especially if this means uprooting ones' family.

When we talk of needing staff to fill childcare spaces, we are really talking about college graduates to fill these roles—unless we incentivize university graduates to shore up this shortfall, our regression modelling indicates that the majority of university graduates are unlikely to end up in ECE centres. Policy in this area should therefore focus on a two-pronged recruitment strategy. On the one hand, efforts should be taken to significantly bolster college-level enrollments in ECE programs. Encouraging out-of-work workers, or those displaced by the pandemic to consider careers in the ECE field might serve as one avenue to improving the numbers needed to meet the 2025-26 targets. On the other hand, communicating ECE spaces as a viable pathway for university graduates (with appropriate incentive to balance the higher cost of a university education) could be another avenue to ensuring that the supply of ECE professionals is able to meet labour demands.

Yet in either case, we have identified that employment in social assistance industries (including ECE centres) tends to decay over time, with participation in education services and other industries serving as attractive alternative pathways. Moreover, given that the majority of ECE workers are parents, and with earnings that barely outweigh the average cost of childcare in many provinces, ECE professionals with children may be forced to weigh the costs of working to childcare costs—which could cause some professionals to leave the labour market to raise children. These sector exits are a potentially serious problem considering the future demands expected in the social assistance sector. Policies therefore need to address retention as much as recruitment if we are to ensure a sustainable workforce of ECE professionals.

Our analyses indicate that low earnings in the childcare workforce are a major driver to the decision to exit the sector. Although our descriptive modelling indicated that wages do grow somewhat over time, in real dollars these figures are woefully low—earnings that are well below

the national average (Beach 2013; Statistics Canada, 2020b) .[18] Our work, therefore, is another contribution to an already established literature indicating the negative effect low wages have on recruitment and retention in the childcare workforce (Beach & Flanagan 2007; Flanagan et al., 2013; Halfan 2021).

The low pay of ECE professionals is also a signal for a wider issue, which is the perceived devaluation of the childcare workforce (Halfan 2021). If earnings are a signal for the recognition and value we place on a vocation, then these low earnings signal a lack of recognition for childcare workers that can influence job satisfaction and performance. ECEs have been shown to be largely invisible when developing childcare policy responses, especially in the context of COVID-19 (Goelman et al., 2000; Richardson et al., 2021). These feelings in turn can devalue the quality of care, and have been found to create work environments and staff perceptions that have a predictable and statistically significant impact on program quality and staff-child interactions (Goelman et al., 2000).

The choice to publicly fund early learning and childcare is a sound one and is expected to generate an estimated $17 to $29 billion per year in productivity as both parents can participate in the labour market (Stanford, 2020). This productivity is sorely needed as Canada recovers from the financial costs of the pandemic and fights to maintain its international position. Yet to see that these policy efforts are successful, we need to ensure that the jobs that are created in the childcare sector are good jobs that attract qualified and passionate educators.

It is therefore essential that the significant financial investments being made in the ELCC sector not only consider increasing the number of childcare workers, but also prioritize improving the quality and social standing of those jobs. This would mean enforcing higher starting salaries as we have identified from our hazard models that doing so could markedly improve retention. It might be helpful to consider salaries that are more competitive with the provincial or national average, and benefits that are competitive with the total rewards offered in comparative fields. Doing so, we anticipate fewer labour market or industry exits and may incentivize cross-provincial mobility to areas which are likely to be in the greatest need for ECE staff by 2025.

6. Conclusion

This report serves as an important first step to identifying possible labour shortages as Canada enters a new era of federally subsidized childcare. As the country continues to finalize agreements and works to put in place the infrastructure of this change, further study will be required to continue to monitor the supply of ECEs and the effectiveness of this new system. In the immediate short term, further study could continue to analyze subsequent waves of ELMLP data as they become available to see whether the supply of ECE graduates improves to the levels the country is expected to require. At the time of writing, the Canadian Research Data Centre Network is expecting the release of the next wave of data that will offer greater insights on the supply and labour market outcomes of ECE graduates up to the year 2020. Certainly, it will be especially important to monitor this demographic throughout the waves of Canada's response to

[18] For more details, see (Akbari et al., 2020)

the coronavirus to observe how, and in what ways, the pandemic has influenced graduate pathways.

Yet there are limitations to this data that are necessary to acknowledge. First, sample restrictions among university ECEs and registered early childhood educators (RECEs) mean that our analyses are primarily pertinent for college-level ECE graduates. Future study should attempt to pursue the school to work transitions of university educated ECEs. Second, data collection within the ELMLP is still relatively recent, although the earliest education records are from 2009, systematized reporting across the provinces is unavailable until the following years. Therefore, with each release of subsequent ELMLP waves we expect the precision of results to improve.

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