# Education trajectories and effects on labour market outcomes of women, and minorities: Evidence from the Education and Labour Market Longitudinal Linkage Platform (ELMLP)

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# Executive Summary

## Background

Canada faces acute labour shortages, spurring the need for an increase in training across several industries and geographies.

## Objectives and Research Questions

This report examines the demographic profile of apprentices in Ontario, the common transfer pathways from other PSE institutions into apprenticeship training, the sequencing of student pathways from entry through to the labour market, and destinations including completion of their program of study and labour market outcomes.

## Methodology

This report uses the Education and Labour Market Longitudinal Platform (ELMLP) developed by Statistics Canada, which allows us to construct various samples through the linkages provided. The samples include data constructed from the Postsecondary Student Information System, the Registered Apprentice Information System (RAIS) linked with the 2016 Canadian Census, and the RAIS linked with the T1 Family Tax File (T1FF). Our report is divided into two main parts. The first looks at entry into apprenticeships, whereas the second looks at completers.

The methods used include a sequencing analysis, a logistic regression to examine the predictors of completing a program of study among apprentices, and an OLS regression analysis to examine apprentices' labour market outcomes.

## Findings

Our findings demonstrate that most apprentices do not transfer from another type of PSE program and that a substantial number are non-visible minority, native-born men who are between the ages of 15 to 24. We also find that not only are major trades groups gender segregated, but a higher number of visible minority apprentices study female dominated trades.

In our analyses of the pathways in and out of apprenticeships we find that, while most enter into apprenticeships through employment, many end up re-entering the labour market without completing their apprenticeship training. Alternatively, the second most common pathway occurs in the jump from employment, to completion, to employment again. Further, through our Ordinary Least Squares regression results, we find that those who switch their program of study earn less than those who do not switch, suggesting that they either transferred to a lower-paying program, or that they may have encountered barriers during the transition. The results also illustrate a significant gender pay gap that is not explained by the covariates in the model. This suggests that factors other than gender segregation in the skilled trades and age impact the pay differential between men and women.

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# Acknowledgements

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# Introduction

While a growing body of literature looks at the labour market outcomes of apprentices in Canada (see Frank and Frenette 2019; Gunderson and Krashinsky 2015; Jin, Paul, and Haan, 2020), the pool of research examining entry into and out of various programs of study, the demographic profile of apprentices, and who is more likely to complete their training is much more limited. This is an important area of study, as developing and maintaining a skilled workforce in Ontario is essential for a robust economy equipped with opportunities for workers of various backgrounds (Paquin 2009; Winter 2020). Apprenticeship training programs and certifications, for instance, act as a means of providing skills and knowledge to future tradespeople, thereby allowing them to enter the labour market in lucrative employment positions. Tradespeople are a particularly important driving force for a healthy economy in Canada, as they are found in almost every industry (Statistics Canada 2020).

Nonetheless, skilled trades and apprenticeship training is a relatively rare pathway into the labour market in Canada (Skof, 2006). To contextualize this, the National Apprenticeship Survey (Ménard, Menezes, Chan and Walker, 2008) indicates that in 2007 only 12% of the Canadian labour force was employed in the skilled trades, while only 2% were officially registered as apprentices. Not only this, but the survey results also revealed that the majority of apprentices in Canada are registered after having worked for a number of years, rather than immediately upon exiting high school. In particular, the average age of Canadian apprentices is 30, while the average age at the time of registration is 28 (Jin et al., 2020).

These findings suggest that apprenticeship training is not a first-choice post-secondary destination for most high school graduates. Rather, although difficult to estimate in the absence of reliable data, it is likely that less than one percent of a graduating cohort enrolls in an apprenticeship program immediately after exiting high school.

Although there have been numerous attempts to increase participation in apprenticeships, especially during times of economic expansion, there has been relatively little success, especially amongst young Canadians. A 2013 survey of Canadian youth aged 13 to 17, for example, found that 53 percent of respondents identified a “university degree” as their first-choice post-secondary option, followed by 25% who identified achieving a “college diploma” as their goal. Comparatively, entering an apprenticeship program was mentioned by less than 20 per cent of the surveyed students (Canadian Apprenticeship Forum, 2013).

There are both systemic and individual reasons for the low uptake of apprenticeships in Canada. An important one, however, is that apprenticeship programs and training remain a hidden pathway for many individuals due to the clear academic bias present in post-secondary educational pathways, wherein much of the focus for both educators and parents remains on getting students enrolled in college and university (Sharpe and Gibson 2005). As the data above show, most young Canadians, as well as their parents, see university as the best method to achieve personal and economic success in a knowledge-driven economy. Lehmann, Taylor, and Wright (2014) have further argued that apprenticeship training has never been a central element

of Canada's system of labour force development, and that school-based vocational programs in high schools and community colleges play a more important role (Stewart and Kerr, 2010).

The marginal status of apprenticeships as a school-work-transition pathway is exacerbated by very low completion rates (Sharpe, 2003). According to the above-mentioned National Apprenticeship Survey, only 24,495 apprenticeship certificates were issued in Canada in 2007 (Ménard, Menezes, Chan and Walker, 2008). Further, in a 2004 report, the Canadian Apprenticeship Forum (2004) identified the overall negative image of careers in the trades, a lack of information about apprenticeship training, unwelcoming workplaces, and the lack of resources and regulations for apprenticeship training as reasons for low enrolment and completion in youth apprenticeships.

Yet, apprenticeships offer unparalleled opportunities for experiential learning, leading to the development of skills useful in many lucrative industrial sectors, while also offering wages throughout an apprentice's training (Sharpe and Gibson 2005). Moreover, apprenticeship programs offer an alternative for youth who would otherwise not attend post-secondary education to become formally certified which, in turn, can support a more successful transition not only from school to work, but also into adulthood (Wright, Lehmann, and Taylor 2020). Apprenticeships could, thus, not only fill skilled labour shortages, but also facilitate the economic integration of some of the most marginalized groups in Canada.

Given that few apprentices begin their programs immediately following high school, and that the average age at registration is 28, many apprentices may be taking divergent pathways through education and employment. Therefore, in this report, we investigate the common transfer pathways taken by apprentices from employment and other forms of post-secondary education into apprenticeship training, as well as their overall outcomes, including completion of their program and labour market destinations.

## Objectives

This report determines who pursues apprenticeships by examining differences across demographic groups, what pathways students take into apprenticeship training in Ontario, and the sequencing of events as they progress through their training. Moreover, our report examines the destinations of individuals exiting apprenticeship programs. In investigating the destinations of these individuals, we also include an examination of the drivers of completion of an apprentices' program of study as well as their labour market outcomes. We contribute to the body of literature on apprentices in Ontario by examining how these patterns differ for men, women, immigrants, Indigenous peoples, and visible minorities.

As such, our project seeks to address the following research questions:

1. Who pursues apprenticeship training and what are the pathways that students take into and through these programs (direct entry from high school, from employment, continued enrollment, or from other PSE institutions)?
2. What are the destinations of individuals exiting apprenticeships and what characteristics are associated with program completion? How do exits differ for men and women?
3. What are the labour market outcomes of individuals who were in apprenticeship training?

## Part 1: Pathways into apprenticeships

As outlined earlier, enrolment in apprenticeship programs is, generally, too low to fill skilled labour demands. For this reason, Milian and Munro (2020) argue that a more extensive credit transfer system would aid PSE institutions in handling these shifting demands within the labour market. On the other hand, however, recent literature also indicates that, as of recently, Ontario has made gains in terms of new registrants in apprenticeship programs (Statistics Canada 2020). Part of this can be explained by increased investments in infrastructure projects which, in turn, spurred an uptick in apprentices registering as plumbers, pipefitters, steamfitters, and refrigeration and air conditioning mechanics, in addition to those entering the construction industry (Statistics Canada 2020). Due to these differing findings, in what follows we examine differences in apprenticeship registration and entry pathways into apprenticeship programs in Ontario.

One particularly interesting factor to consider within this discussion is gender. For example, women may take divergent pathways into apprenticeship training, especially when compared to their male counterparts. In fact, a report by Finnie, Dubois, and Miyairi (2021) demonstrates that women, in their sample of three universities in Ontario and two Canadian colleges, accounted for a smaller proportion of younger direct entry students at the participating PSE institutions, while comprising a slightly higher proportion of older direct entry students (Finnie et al. 2017). Women in apprenticeship programs in 2006 were also found to be slightly older than men and fewer were apprentices in Red Seal trades (Frank and Jovic, 2017; Statistics Canada 2017). Additionally, Laryea and Medu (2010) show that women enter apprenticeship programs with higher levels of educational attainment than men. Thus, women could experience a higher degree of student mobility into various PSE institutions, including apprenticeship programs.

Similarly, immigrants also tend to enter apprenticeships at an older age (Arrowsmith 2018; Frank and Jovic 2017), which has important implications due to the general tendency of workers to retire at a younger age due to the physical nature of many trade industries (Lehmann, Taylor, and Wright 2014). What these findings suggest is that immigrant students may have a greater likelihood of mobility and/or divergent pathways into apprenticeship programs. In fact, visible minorities, in addition to reporting having experienced greater barriers to participating in apprenticeship programs and discrimination, also represent only 5 to 7% of all apprentices in Canada, compared with 16% of the total Canadian population (Canadian Apprenticeship Forum

2010). Unfortunately, however, due to cell size issues, our report could not delineate between these demographic groups. Nevertheless, our report contributes to this growing body of literature by examining the pathways into apprenticeships from other PSE programs, as these mobility trends are currently understudied.

## Data-PSIS

The Post-Secondary Information System (PSIS) is an administrative survey of public post-secondary institutions, and includes information for a multitude of programs, including trades, from 2009-2018 (prior to 2009, only selected provinces were included). This dataset includes primarily institution and program information, as well as some demographic characteristics such as age, gender, province of residence, and whether the respondent is an international student. The PSIS is a rich source of data that can be used for analyzing pathways to and from program types and across institutions, as well as information on completion and enrollment rates.

## Analytical Approach for Analyzing Transfers

Although our analysis was primarily done on the Registered Apprentice Information System, given our research focus being on apprenticeships, we were able to use the Post-Secondary Information System (PSIS) to examine whether individuals entered apprenticeship programs from other program types. To create our analytical sample, we used the PSIS from 2009-2017 and isolated all observations that indicated Ontario as the province of study. Next, we kept individuals aged 15-64, as this is the primary group that would attend post-secondary institutions and enter the labour market. This age range remained consistent with our samples from other datasets. We removed anyone with a missing person identifier, as well as any repeat person-year observations. Due to the low sample size of apprentices in our analytical sample, the PSIS was not suitable for answering most of our research questions. However, we were able to determine counts of individuals entering apprenticeships from seven broad program types across our study period.

Table 1- Pathways into Apprenticeships from Different Program Types

| Enrolled in apprenticeship in time t+1 | Basic education and skills program | Apprenticeship program | All career, technical, professional training, and their qualifying programs | Post career, technical or professional training program | Undergraduate program | Post Baccalaureate, graduate, health residency, and other programs | non-programs | total |
|---|---|---|---|---|---|---|---|---|
| non-apprentice enrolled | 24270 | 6700 | 1105660 | 62680 | 3329090 | 621090 | 399550 | 5549040 |
| enrolled in apprentice | 370 | 30460 | 2360 | 30 | 370 | 150 | 2500 | 36240 |
| total | 24640 | 37160 | 1108020 | 62710 | 3329460 | 621240 | 402050 | 5585280 |

Note: This table demonstrates unique individuals per year, across 2009-2017. Due to low cell counts, some categories had to be combined. Source: authors' calculations, PSIS

To determine whether individuals attended post-secondary programs prior to apprenticeship training, we lagged the program type variable (some of the categories were collapsed to ensure minimum cell counts were adhered to, as required by Statistics Canada's disclosure policies),

and created a cross tabulation between the lagged program variable (what individuals were enrolled in time t-1) and the apprenticeship variable.

### Results

From 2009-2017 in Ontario, Table 1 shows that there are only 36,240 individuals enrolled in apprenticeship programs. Of these, 2,500 were not in any program the year prior, suggesting that they entered apprenticeships from employment (or unemployment). Further, only 30 of these individuals were enrolled in post-career, technical or professional training programs prior to their apprenticeship. Comparatively, a slightly higher number of individuals (150) enrolled in apprenticeships after attending post-baccalaureate or health residency programs, followed by undergraduate programs (370), and basic education and skills training programs (370). The second largest category of transfers occurred in individuals who were enrolled in career, technical, and professional programs (trades), or their qualifying programs. Unsurprisingly, most of the individuals enrolling in an apprenticeship program were already enrolled in one in the year prior.

## Demographic characteristics of apprentices in Ontario

Our report seeks to examine whether there are any discernable differences in trends across minority and identity groups in terms of who enters apprenticeship training, as well as the types of trades pursued. While a limited body of literature looks at the apprenticeship program participation rates among immigrant and visible minority groups, research indicates that these groups, along with women, experience disadvantages and barriers in terms of access to apprenticeship training (Canadian Apprenticeship Forum 2010), as well as barriers to gainful and equitable employment (Anisef, Sweet, and Frempong 2003; Khattab, Miaari, and Mohamed-Ali 2020). While women have made some gains over time, they remained underrepresented in trades in 2016 (Statistics Canada 2016). In fact, Laryea and Medu (2010) show that only 10% of women in the National Apprenticeship Survey of 2007 were in trades. Further, women accounted for only 12% of all registrations in 2016, with 52% engaging in hairstylist and esthetician (27%), food services (16%), and early childhood educators and assistants (10%) programs. Even more discouraging is that women accounted for only 16% of all certifications completed in 2016 (Statistics Canada 2016). By comparison, 2,140 women completed apprenticeship training in food and service trades in 2007, accounting for approximately 77% of the total apprenticeship certifications completed by women in that same year (Statistics Canada 2022). Conversely, in 2007, men were most likely to complete apprenticeship programs in metal fabricating, motor vehicle and heavy equipment, and electrical, electronics, and related trades (Statistics Canada, 2021), which tend to be associated with higher pay than the female-dominated sectors.

Moreover, Laryea and Medu (2010) also find that Indigenous peoples are represented on par with their proportion of the Canadian population within trades. However, Indigenous peoples in trades are also older relative to their age distribution in the population, are less likely to have completed their high school education, and have less college education upon entry into an apprenticeship program than non-Indigenous apprentices (Laryea and Medu 2010). These findings have important implications for our report, as Indigenous apprentices may not be

transferring between PSE institutions and programs and, instead, may be seeking apprenticeship programs as an alternative form of PSE education.

On the other hand, visible minorities are clearly underrepresented within the trades, in that they account for only approximately 8% of all apprentices (Arrowsmith 2018). Moreover, visible minorities tend to be less aware of such training opportunities when compared to other demographic groups (Arrowsmith 2018), while more immigrant men are in female-dominated trades when compared to non-immigrant men (Frank and Frenette 2019). There are many possible reasons for this disparity, but a leading factor is likely Canada's human capital focused immigrant admission policies.

As a means of offsetting some of these trends, cooperative programs are available for newcomers to Canada. However, a recent report by Arrowsmith (2018) indicates that these groups are less likely to participate in targeted programs than Indigenous and visible minority apprentices and are often not aware of the availability of such programs. This could be due to a lack of information about trades programs, especially given that 53% of respondents indicated that they knew about apprenticeship programs in high school, as compared to only 32% of immigrants. What this suggests is that participation in apprenticeship programs is less likely for immigrant apprentices. Further, the necessity of employer sponsorship seems to be a hurdle for immigrants, as 25% of those within the sample stated that they had difficulty finding an employer to sponsor their apprenticeship (Arrowsmith 2018). Importantly, however, immigrants in Canada are predominately university-educated, which could contribute to these lower numbers.

### Data- RAIS and Census 2016

To further answer our research questions, we use a unique linked dataset from Statistics Canada. The Registered Apprenticeship Information System (RAIS) is an administrative survey collected by educational institutions across Canada. The RAIS contains educational, demographic, geographic, and trade information from 1998-2018. It is a useful tool for analyzing trade, apprenticeship, trade qualifiers, and red-seal endorsement information on both Canadian and international students. The RAIS can also be used to assess enrollment and completion rates across a variety of geographic and demographic information.

The 2016 Canadian Census of Population, on the other hand, is a detailed microdata file that has been used in a variety of research settings to answer a multitude of research questions, especially pertaining to detailed demographic and geographic information. The 2016 Census is a rich survey that allows researchers to determine trends among key groups of interest, such as Indigenous populations, immigrants, and visible minorities. The ELMLP, therefore, allows for a linkage between the RAIS and the 2016 Census, which allows researchers to answer detailed demographic questions about registered apprentices and trade qualifiers.

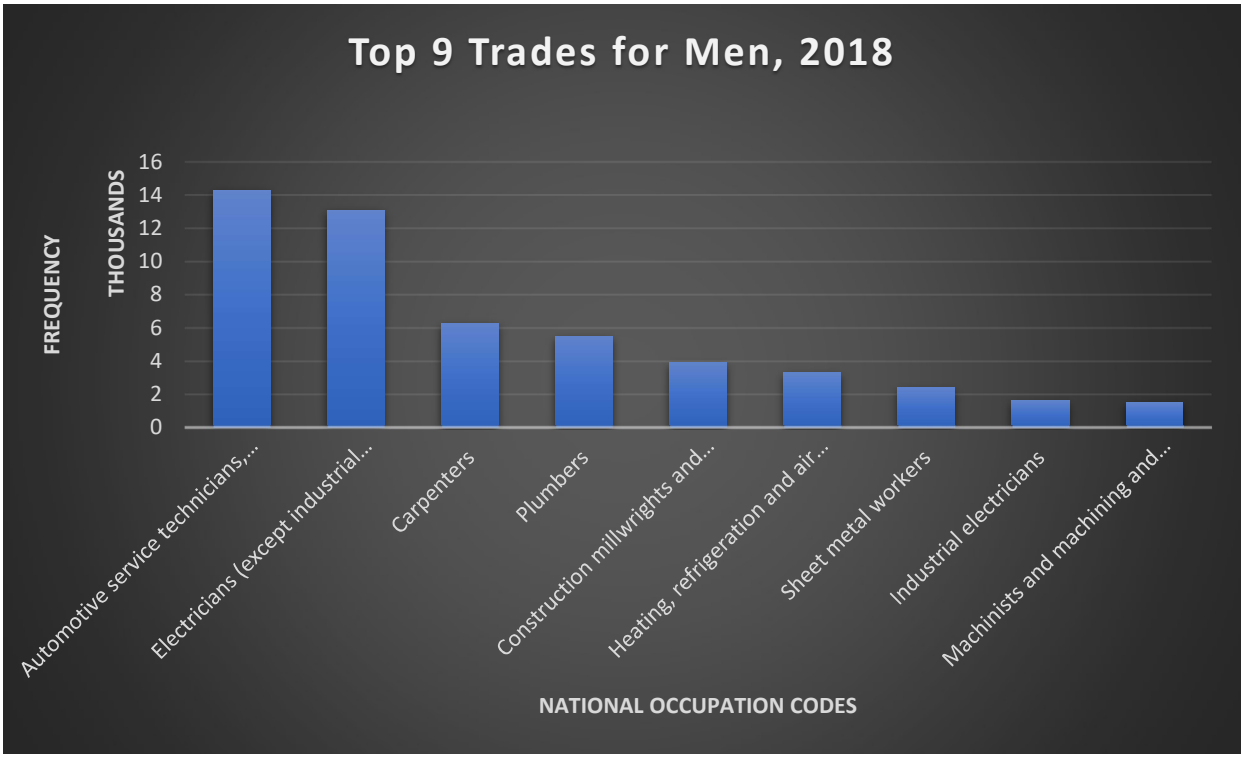
To determine the demographics of apprentices, we began by manipulating the RAIS file. We removed all duplicated entries by person-year by keeping the first occurrence of each unique combination. Given we were not interested in multiple program attendees, but rather their demographic information, keeping the first observation is an acceptable approach. Next, we isolated all Ontario records by keeping everyone who attended an Ontario institution from 2008-

2018 and kept persons in their primary working years, or rather, those between the ages of 15 and 64. Once the RAIS data was cleaned, we merged the Census 2016 file and kept persons who had information in both datasets. Due to the Census being a cross-sectional survey, we used this file exclusively for descriptive statistics and used only time invariant variables. Specifically, we generated cross-tabulations of registered apprentices by age, visible minority status, immigration status, sex, and red seal certification status. To combine the datasets, we used a many to one merge of our time-invariant variables of interest to keep the panel structure of the data. To determine the type of trade completed, we rely on the trade name variable available in the RAIS. Importantly, the use of weights is mandatory for the Census confidential micro dataset; thus, we used an individual level weighting variable found in the Census data to execute our calculations. All frequencies were rounded to base 10 or 100, per Statistics Canada's vetting policies.

## Results

We begin our descriptive analysis by examining the top nine trades across men, women, visible minorities, and non-visible minorities. All tables were calculated from the RAIS-Census merged file. To analyze the top ten trades across groups, we used their trade designation, per the RAIS, while the Census information was used to determine their visible minority status, as indicated in 2016.

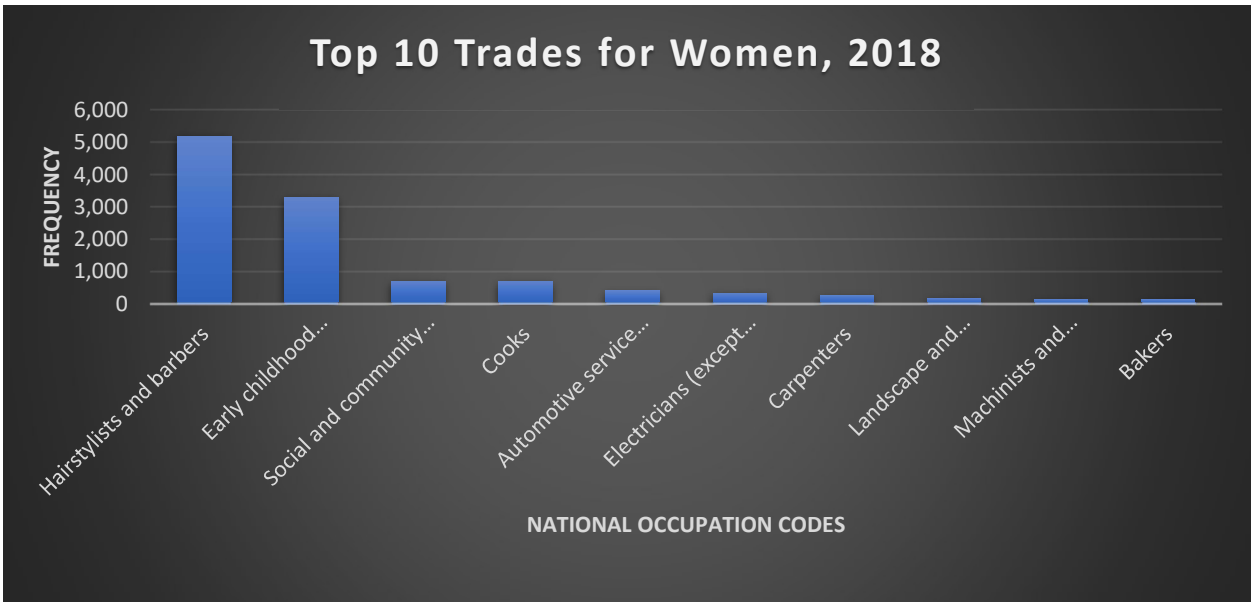
**Figure 1 - Top 9 Trades for men, 2018[1] The graph depicts the first entry into an apprenticeship program.**




Source: authors' calculations, RAIS-Census.

[1] Due to RDC policy regarding confidentiality, the 10th category for males had to be suppressed.

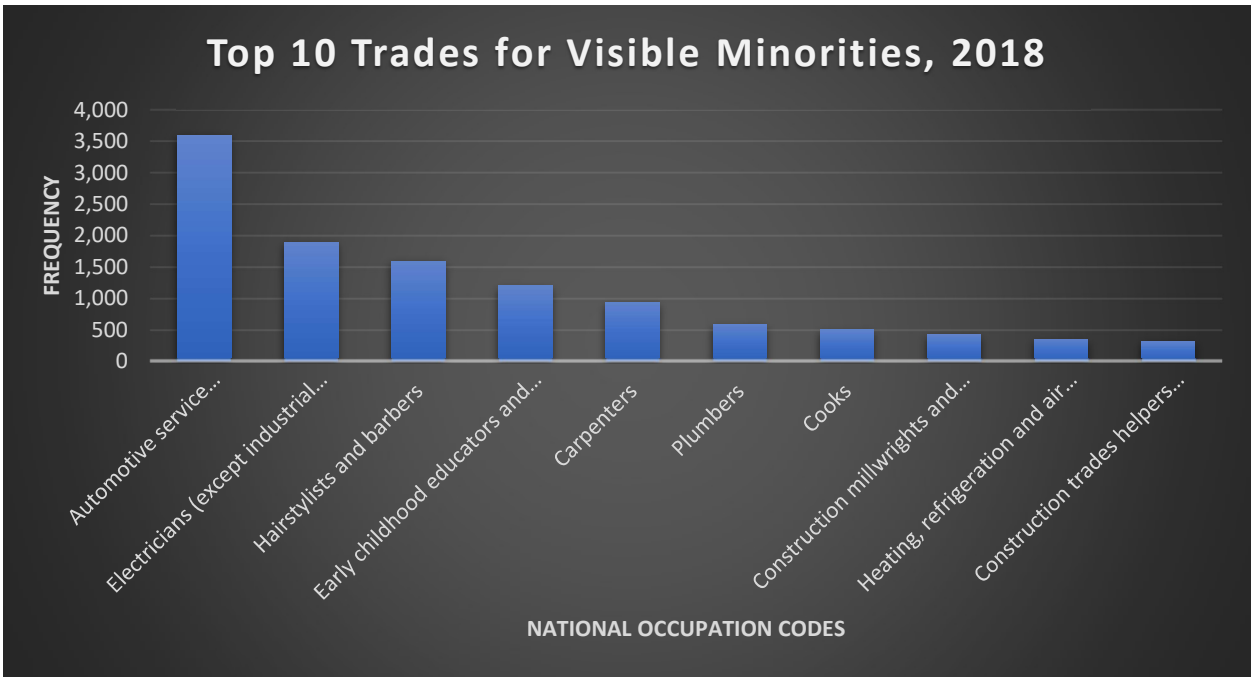
**Figure 2 - Top 10 Trades for Women in 2018. The graph depicts the first entry into an apprenticeship program.**




Source: authors' calculations, RAIS-Census.

As we can see from Figure 1, men primarily go into trades that prepare them for occupations in automotive services, electrical work, and carpentry, especially when compared to women (Figure2), who typically go into hairstyling, early childhood education, and social work. However, women still worked in automotive services and electricians, but do so at a lower rate than their male counterparts.

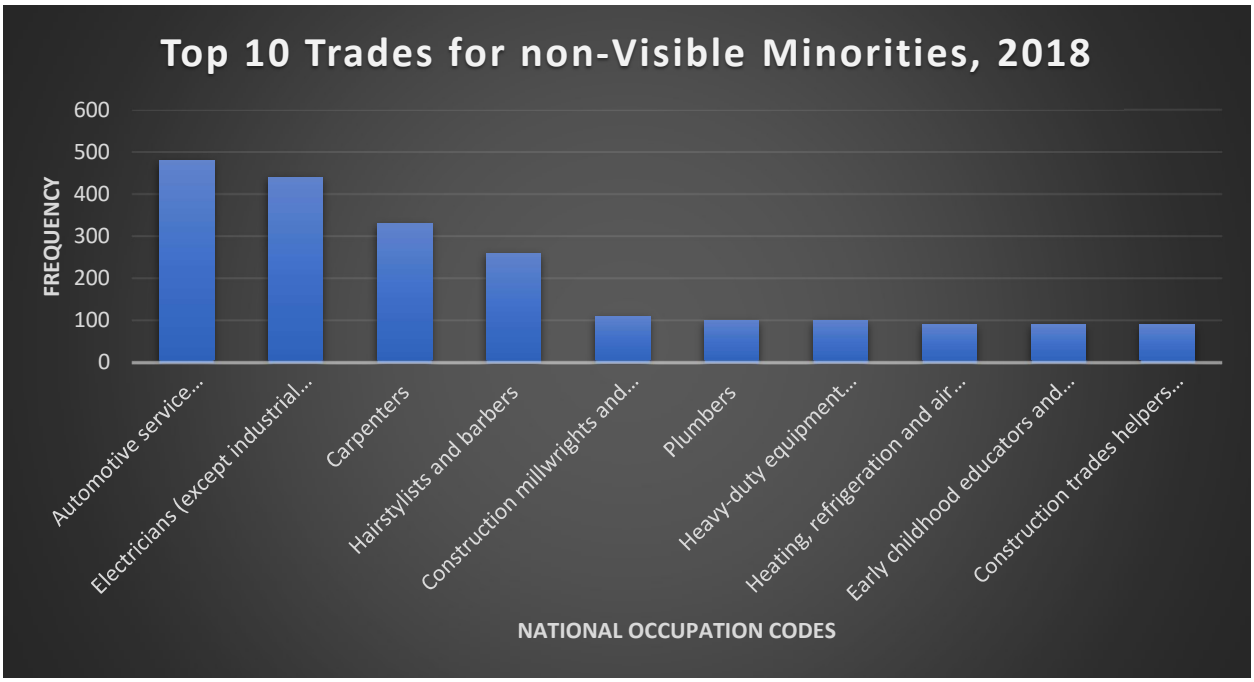
**Figure 3 - Top 10 Trades for Visible Minorities, 2018.**




Source: authors' calculations, RAIS-Census.

Interestingly, when examining the top ten trades for visible minorities, we see a pattern similar to that experienced by men (Figure 1), where their top two trades prepare them for work in automotive services and electrical work. The next two categories, however, are more akin to the outcomes from women in Figure 2, wherein hairstylists and early childhood education are the third and fourth largest categories. This could be due to the fact that we did not disaggregate visible minority group by gender.

**Figure 4 - Top 10 Trades for non-Visible Minorities, 2018.**

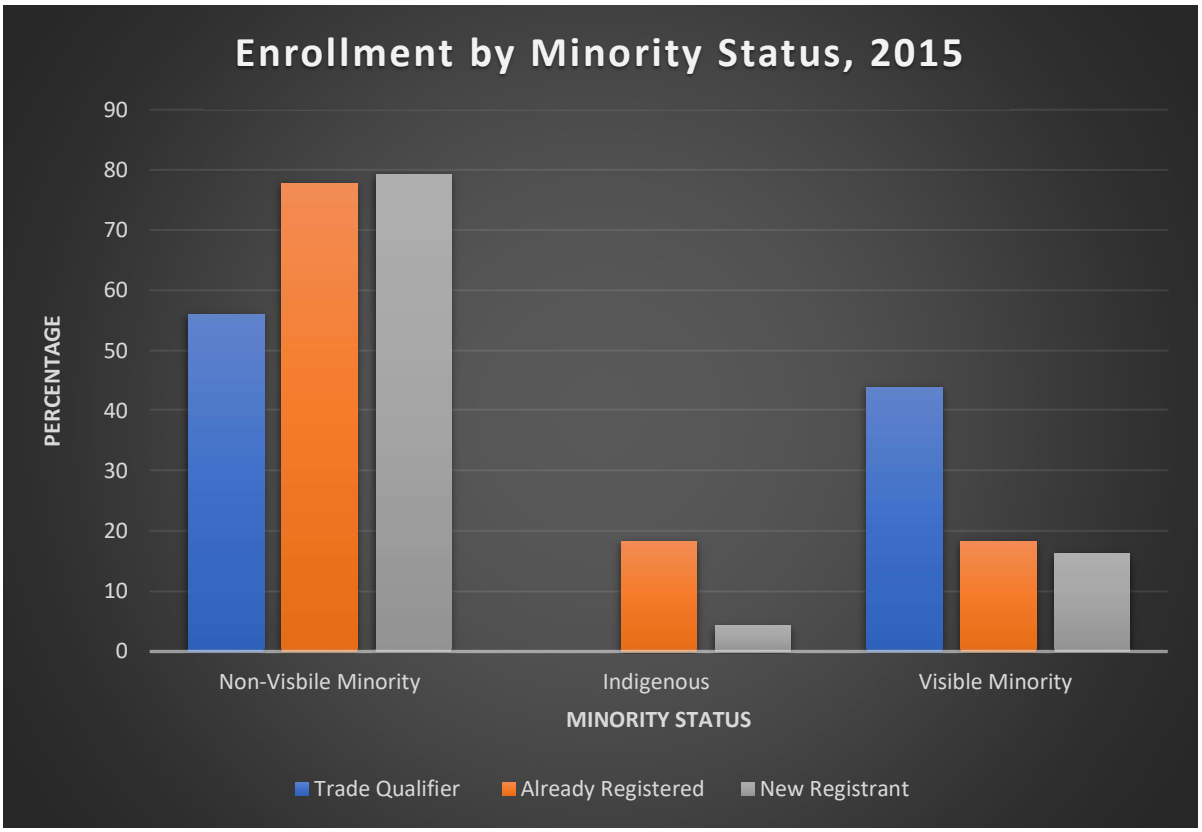



Source: authors' calculations, RAIS-Census

Comparing Figure 3 (visible minorities) with Figure 4 (non-visible minorities), we see that the pattern remains largely unchanged across the top two categories, which could point to the fact that differences in trade certification lay primarily across gender differences, not visible minority status. However, given there are more men in trades than women, we see more predominantly male trades such as construction, plumbing, and heavy-duty mechanics in Figure 4. Importantly, the larger counts among visible minorities are likely due to differences in the top ten trades. That is, for visible minorities, the overwhelming majority go into a few key trades, while non-visible minorities are more dispersed across the major trades groups. In other words, the top ten trades for visible minorities capture most of their chosen trades whereas, for non-visible minorities, the counts of individuals are more spread out across the 206 trades groups.

Our next set of tables examine demographic groups across three enrollment statuses: trade qualifiers, current registrants, and new registrants.

**Figure 5 - Enrollment by Minority Status, 2015.**

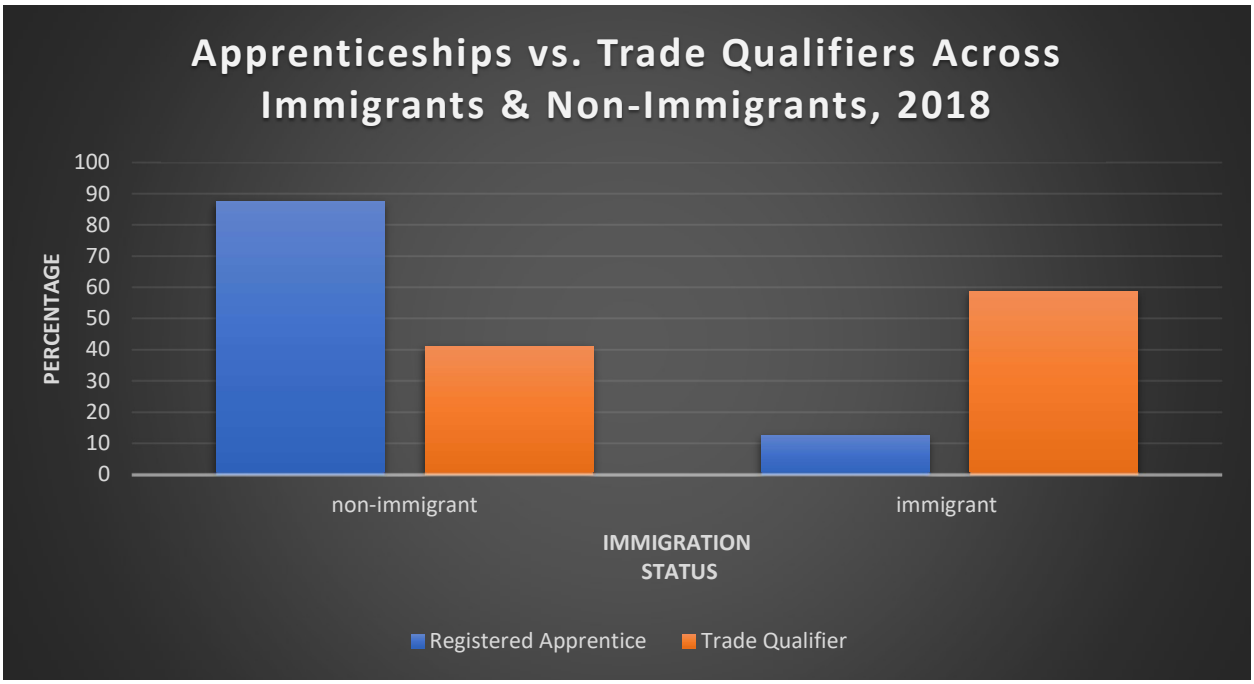



Source: Authors' calculations, RAIS-Census.
Note: There were no trade qualifiers in the data for the Indigenous group in 2015.

Further, Figure 5 shows that most of the individuals in our sample are current registrants who do not identify as a visible minority. This is unsurprising, as much of the sample are non-visible minority men. Also noteworthy is that trade qualifiers make up the smallest group of all enrollment statuses, pointing to the fact that people typically choose to attend a trades program and pursue an apprenticeship, rather than challenge the program[2]. Figure 5 also shows significantly lower frequencies of Indigenous persons across all enrollment status.

**Figure 6 -Apprenticeship vs. Trade Qualifiers across Immigrants and non-Immigrants**

[2] Trade qualifiers are those who receive their certificates by challenging the examination without finishing formal training.

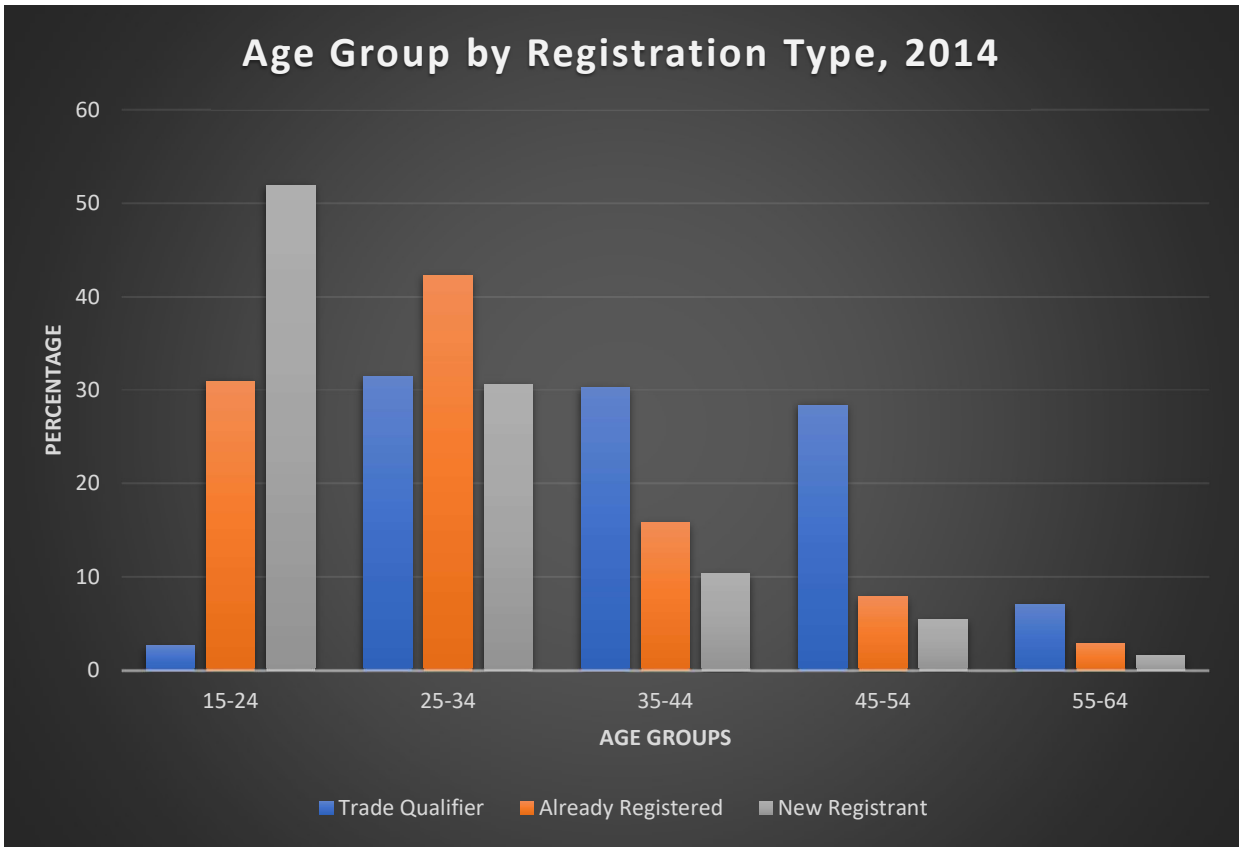



Source: Authors' calculations, RAIS-Census.

To determine immigrant status, we used the 2016 Census variable that indicates whether someone is a permanent resident or non-permanent resident (these two categories were combined into one to satisfy Statistics Canada's policy on cell counts). Figure 6 shows that immigrants go into trades—whether as trade qualifiers[3] or registered apprentices—at much lower rates than their naturalized or Canadian-born counterparts. However, immigrants follow the same pattern as Canadian-born or naturalized citizens in that they tend to register as trade qualifiers in significantly lower numbers than as registered apprentices.

**Figure 7 - Age Group by Enrollment Status, 2014.**

[3] Trade qualifiers are those who receive their certificates by challenging the examination without finishing formal training.

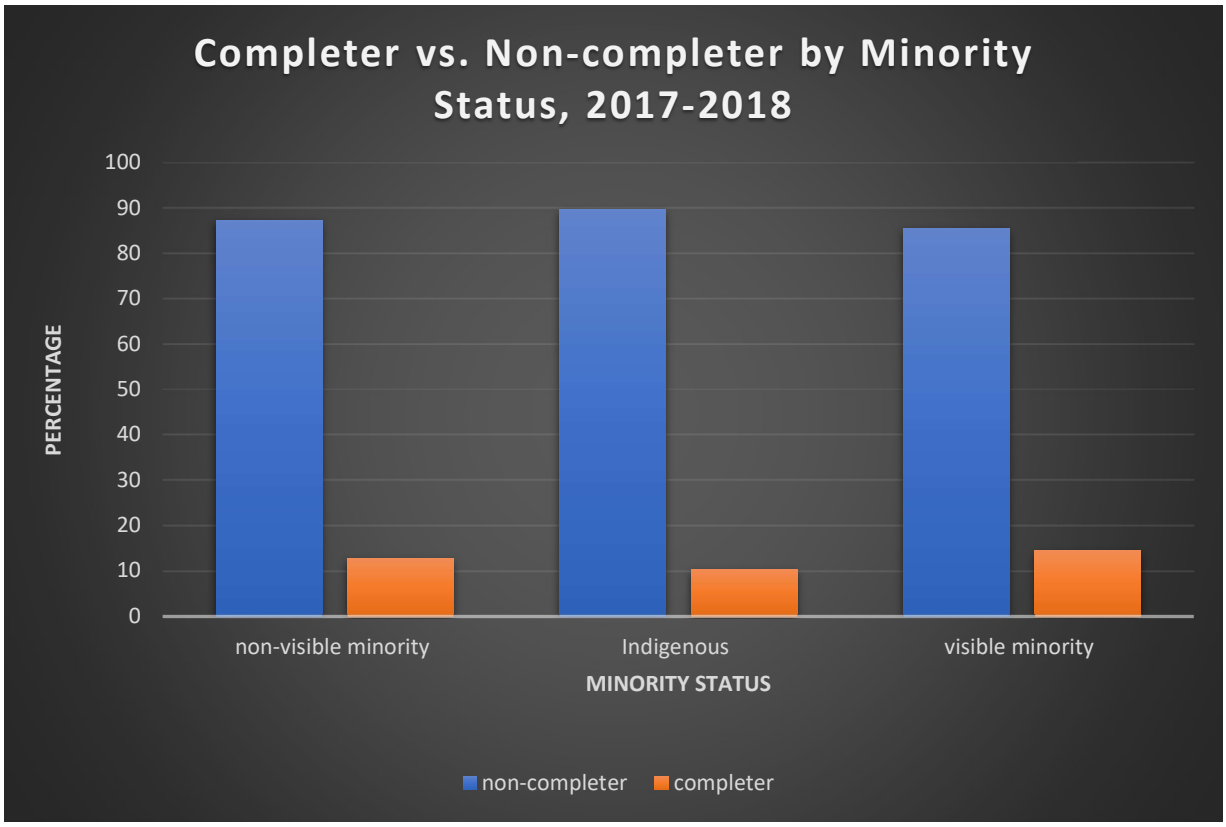



Source: Authors' calculations RAIS-Census

To examine enrollment status by age, we look across years to ascertain whether trades enrollment has increased, decreased, or remained stagnant.[4] Overall, the majority of new registrants are in the 15-24-year-old category, followed by the 25–34-year-old category. This finding makes sense, given that trades certifications (and other credentials) are used as a pathway into the labour market and tend to be pursued by people in their primary working years. Across years, we can see that the trend largely remains the same, to the exception of 2013, where we see a spike in currently registered individuals, especially in the 25–34-year-old group. What this may point to is lower levels of completion rates in 2013. As such, we now turn to completion rates across our demographic groups of interest.

**Figure 8 - Completers vs. non-Completers by Minority Status, 2017-2018.**

[4] Due to low cell counts, we were only able to report from 2008-2014 figures.

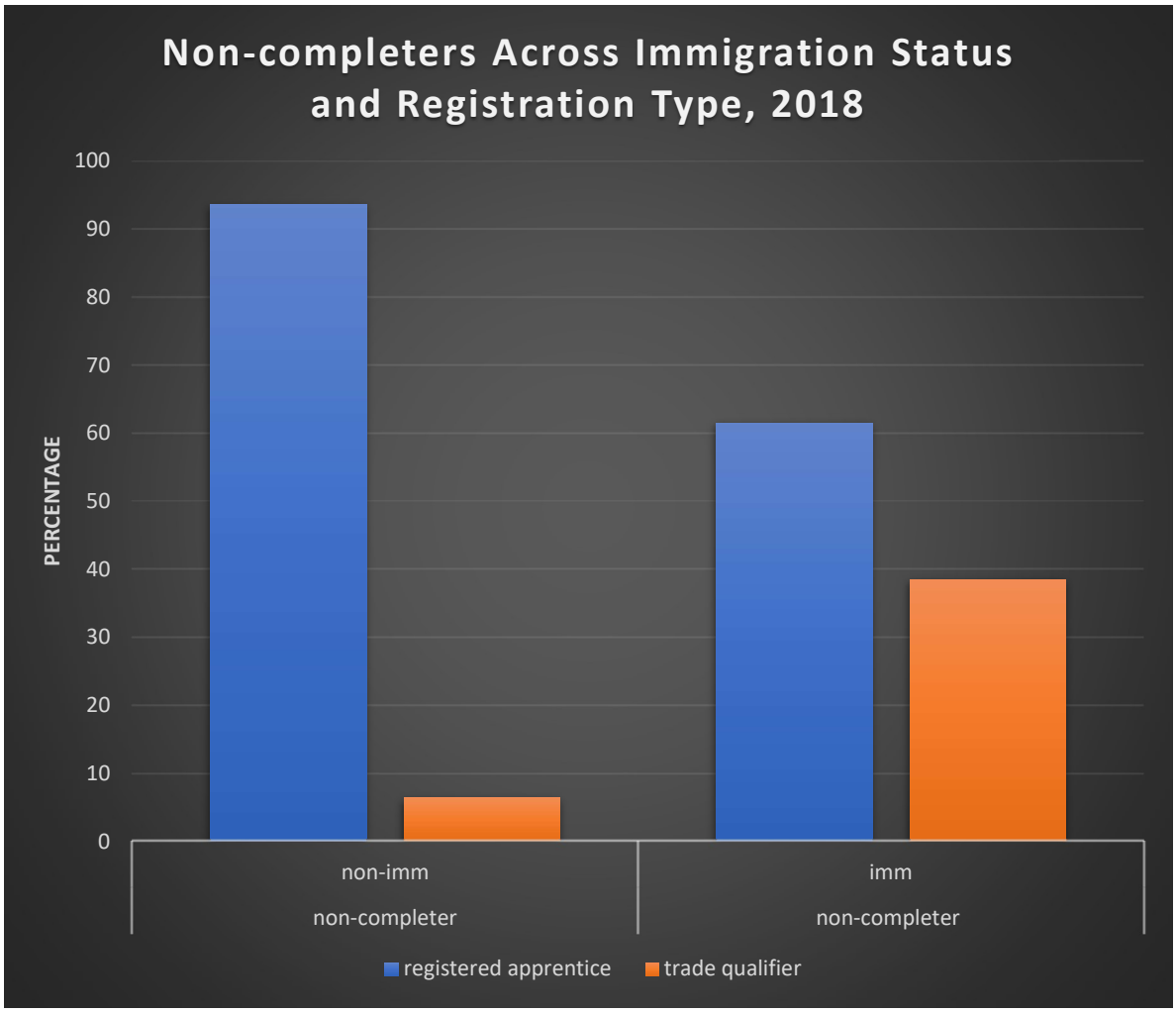



Source: authors' calculations RAIS-Census.

Figure 8 shows completion rates across two-year intervals and minority status.[5] We define a completer as anyone who received a certification—whether with a red seal or not, including trade qualifiers. Defined here is that the proportion of non-completers has declined from 2008-2018, but so have overall completion rates. As was suggested in Figure 5, Figure 8 confirms once again that not only do Indigenous persons comprise the smallest category, but their trends also follow a pattern similar to that of visible minorities and non-visible minority individuals. In other words, there are more non-completers in the data than those who successfully finish their program and receive certification.

**Figure 9 - Completers Across Immigration Status and Registration Type, 2018. Note: there were no trade qualifiers who completed in 2018 in the data, 100% of completers in both immigrant and non-immigrant categories are registered apprentices.**

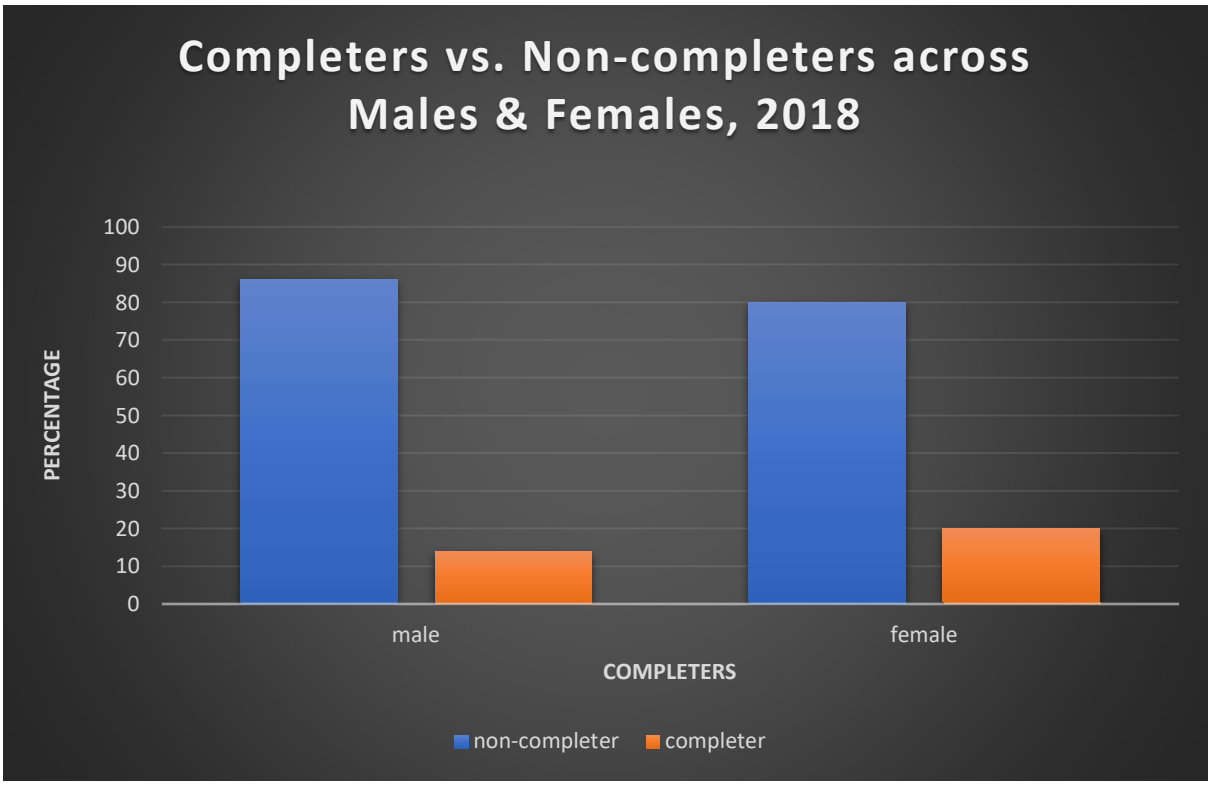
[5] Due to low cell counts, we had to report these findings across grouped years.




Source: authors' calculations, RAIS-Census.

As we have seen in previous tables, immigrants have not only the lowest proportions of entry in apprenticeship programs, but also show significantly lower rates of completion than non-immigrant Canadians. Additionally, trade qualifiers represent an exceedingly small portion of individuals when compared to registered apprenticeships.

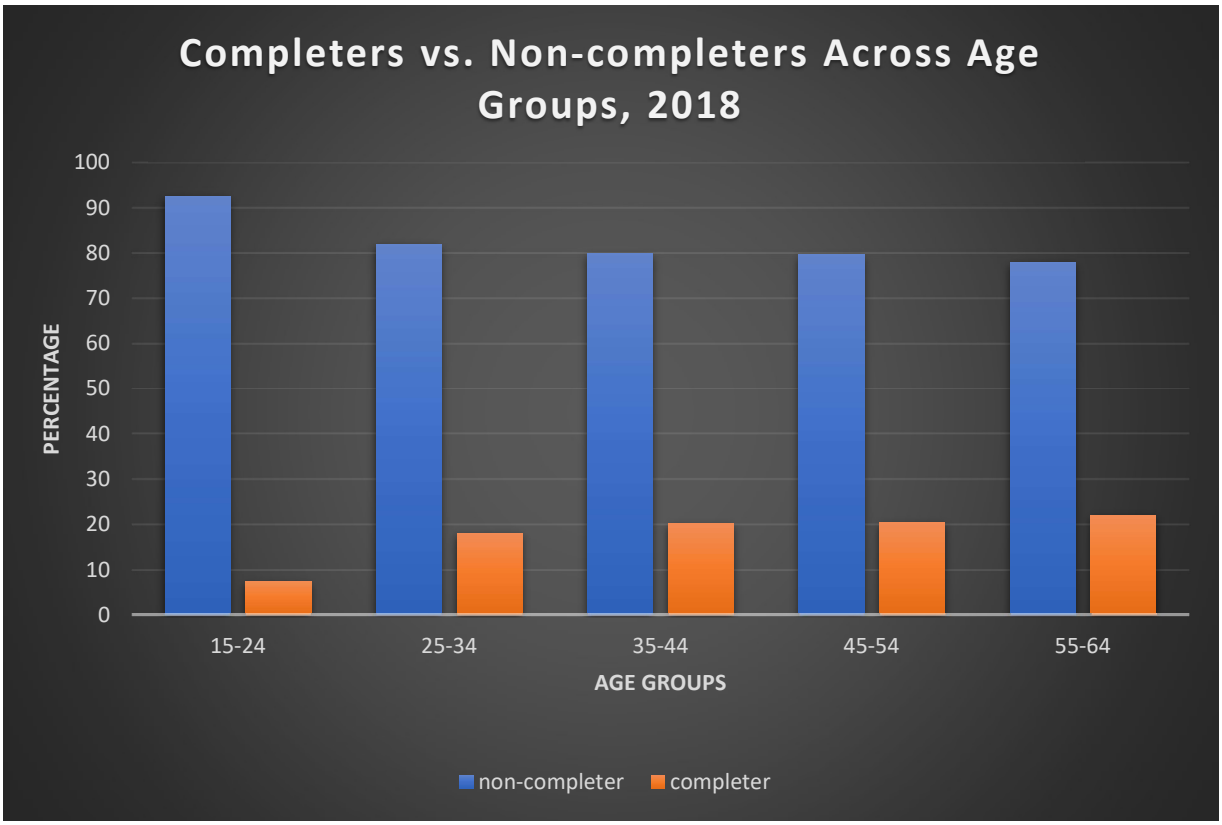
**Figure 10 - Completers vs. non-Completers by Gender, 2018.**




Source: authors' calculations, RAIS-Census.

Figure 10 offers non-completer versus completer rates across both sexes. Here, fewer individuals complete an apprenticeship or trade qualification than those who do not. It is possible that, in some instance, individuals may choose to leave training and come back, or complete it over a longer span of time. Thus, it is likely that these individuals are continuing in their program over time. Interestingly, although we see more women in the data in 2012-2013, that trend gradually decreases from 2014-2018. With respect to rates, Figure 10 shows that women have a slightly higher rates of completion as compared to men.

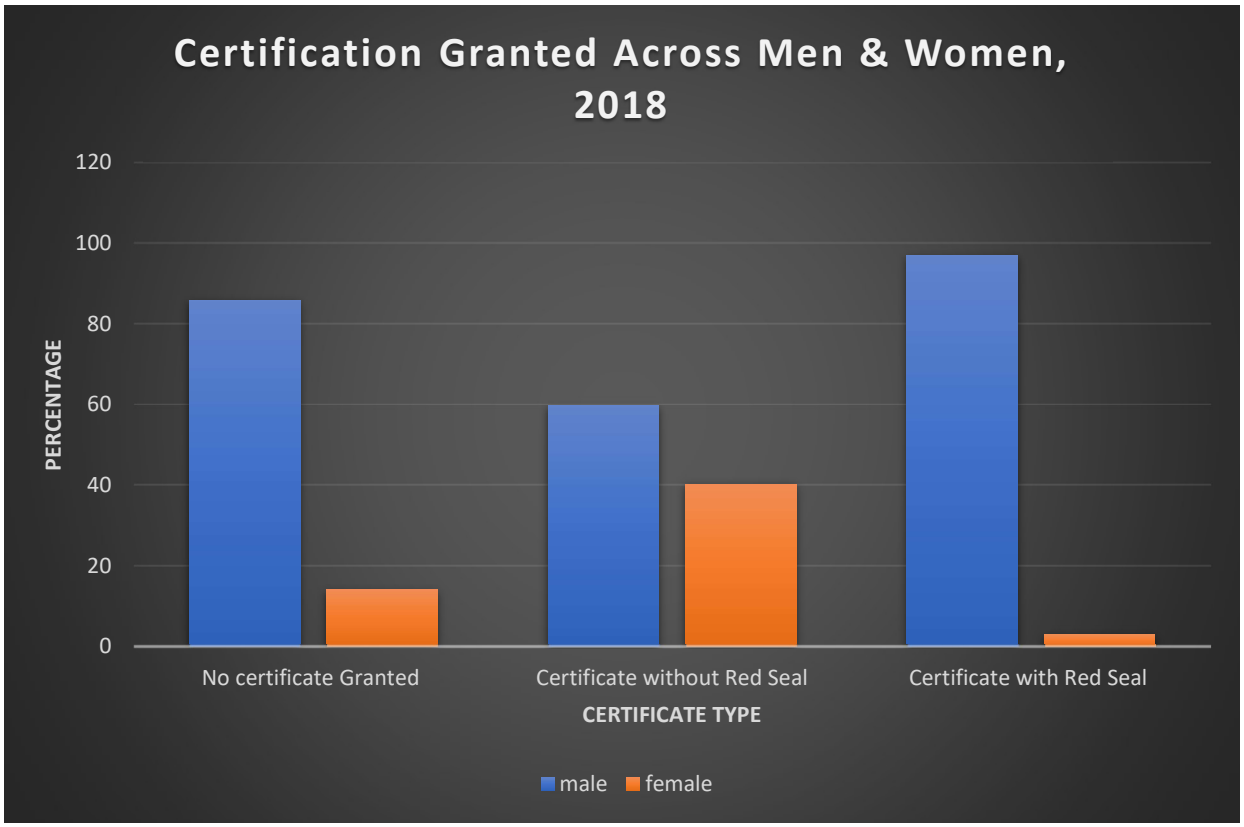
**Figure 11 - Completers vs. non-Completers Across Age Groups, 2018.**




Source: authors' calculations, RAIS-Census.

With respect to age (Figure 11), we see trends similar to those in Figure 10, wherein there are considerably more non-completers than completers across our study period. Further, individuals aged 15-24 and 25-35 represent the largest groups across both completers and non-completers, but we can clearly see that young adults ages 25-35 have higher instances of completing their certification over any other category. Interestingly, we see higher frequencies of non-completers aged 15-24 from 2008-2011, but from 2012 onwards, that trend changes and we now see more non-completers in the 25-35 age category, until the point that the two groups have similar non-completion rates in 2018. For many of the years presented, we see a comparable number of people who are in the 35-44 age groups receiving trades certification, pointing to possible re-training later in adulthood.

**Figure 12 - Certifications Granted Across Men & Women, 2018.**




Source: authors' calculations, RAIS

Finally, in Figure 12, we examine whether a certificate was granted, and whether that certification is with a red seal endorsement. Consistent with our previous findings, most of the individuals in our data were not granted a certificate, with this trend applying to both men and women. Across all years, to the exception of 2013, men were granted more red seal endorsed certificates than non-red seal. For women, the opposite is observed, wherein women received trades certification without Red Seal endorsements more often than those with a Red Seal endorsement, with this trend being observed across all years.

## Sequence of progress through training

Research on student entry into apprenticeship programs reveals different patterns than that of traditional PSE institutions, such as college or university. For example, apprentices typically enter training programs at an older age (Jin et al., 2020) than university students (Statistics Canada 2010). There could be several reasons for this trend. First, despite the presence of apprenticeship grants in Canada (Government of Canada 2021), direct entry from high school into apprenticeship programs remains a difficult pathway for Canadian youth (Sharpe and Gibson 2005). In fact, the overemphasis on traditional PSE institutions by counselors and high school administrators has resulted in a mismatch between students' expectations and their educational outcomes (Sharpe and Gibson 2005). Moreover, students who do not complete their high school education have no direct pathway into PSE (Sharpe and Gibson 2005), meaning apprenticeship programs may have a higher concentration of these students. As such, entry into

apprenticeship programs seem to be more divergent than pathways taken into traditional PSE. As such, a key aspect of our report is the investigation of entry into apprenticeship programs and students' progress in their training program.

## Part One Conclusion and Limitations

The main findings of our descriptive analysis demonstrate that, currently, apprenticeships are not integrated into a PSE transfer system. In other words, very few apprentices enter their program after having attended university, college, or other PSE institutions. Our pathway analysis, using PSIS, shows that, aside from apprenticeship continuers, the majority of new apprentices entered from non-programs (i.e., employment), followed by entrants from career/technical programs. This suggests that many across statuses do not involve school-school transitions, but instead a transfer from work to school.

Demographically, non-minority men continue to enroll in trades in higher numbers relative to other groups, such as women and visible minorities. Interestingly, we show that, although women enroll in lower numbers, their completion rates are slightly higher than their male counterparts. However, men have much higher rates of completing a red seal trade, pointing to a potential mobility component associated with the training they most often enroll in. For instance, industries such as oil and gas and forestry often require tradespersons to either work outside their home province or move to areas where these jobs are available. Lastly, our analysis demonstrates that, overall, Indigenous persons are enrolling in lower numbers as compared to non-visible minority men. We also continue to see evidence of gendered occupations, as evidenced through our top ten trades across men and women. Taken together, the completion rates of all groups, year over year, is low relative to the number of persons who continue to be enrolled.

With respect to limitations, we were unable to create a linkage between the PSIS and the RAIS due to Statistics Canada policy, which would have allowed us to have a more detailed account of transfers between PSEs. Thus, although we attempted to determine pathways to and from apprenticeships using the PSIS, due to low numbers of apprentices in this data, we were unable to obtain more detailed counts than those provided in Table 1. Further, our completer indicator demonstrates the overall graduation rate, relative to those who continue to be enrolled and those who may have dropped out during the school year. As well, we were not able to provide more detailed breakdowns of visible minority status due to additional confidentiality rules of the Census files. Finally, we presented data for the most recent year available, as no interesting time trend was present in the data over our study period.

## Part Two: Completers and labour market outcomes

Apprenticeship training offers lucrative career options for those who do not want to attend traditional PSE institutions. As such, our report also examines the destinations of apprenticeship students, including completion of training programs. Overall, past research shows that certification completion rates are low in registered apprenticeship programs (Jin et al. 2020). This could be due, in part, to higher rates of student mobility when compared with more traditional PSEs, or it may be linked to issues related to transferring credits across PSE institutions. What these findings demonstrate is the need to fully examine the mechanisms through which this occurs. For example, Jin et al. (2020) assess the apprenticeship training, certification rates, and labour market outcomes of respondents enrolled in apprenticeship programs and find that, since 2008, very few completed their program. Rather, of those who enrolled, 20% left the apprenticeship program, 64% remained enrolled, and only 16% had obtained their certification.

Nonetheless, exit pathways out of apprenticeship training programs are not always linear in terms of labour market outcomes. For instance, Jin et al. (2020) investigated rates of certification completion among apprentices in Canada and found that an increasing number of apprentices took longer than the time allotted for their program, while 20% left their program of study without completion. Even after doubling the standard time allotment for program completion, only 36% of apprentices completed their certification (Jin et al. 2020). These findings are particularly concerning given the higher rates of employment and pay experienced by those who complete their studies (Frank and Jovic 2017). Part of this may be linked to the requirement for individuals enrolled in apprenticeship training to complete a set number of working hours within their field of study.

Many of these apprentices, however, have prior work and class experience in a trade and, as a result, may attempt to obtain credit for this prior experience. Those students who receive credit for in-class or on-the-job training completed prior to registering in an apprenticeship program are shown to be 13% more likely to successfully complete their certification (Jin et al. 2020). Further, those who worked in an industry closely related to their program of study were even more successful in reaching completion, with 38% of apprentices completing their certification, as compared to only 32% of those working in industries unrelated to their trade (Jin et al. 2020). This finding is important in the context of credit transfers in Ontario as students able to transfer their credits may also be more successful in obtaining their degree, diploma, or certification. As well, it is also worth noting that, of the individuals who discontinued their enrollment in apprenticeship programs between 2011 and 2013, 13% were re-enrolled by 2015 (Frank and Jovic 2017). As a result of these findings, and due to the non-linear nature of exit pathways out of apprenticeship programs, our report will examine the individual-level predictors of completion among apprentices in Ontario, in addition to their labour market outcomes.

Some researchers argue that increasing the number of skilled tradespersons can facilitate the growth of the middle class (Holzer 2017); however, a push to expand sectors associated with the skilled trades may only be beneficial for some people. For instance, there is a large body of literature that demonstrates that women face inequality in the labour market in comparison to

men, yet less is known about women in trades and apprenticeship programs (Frank and Frenette 2019). Although women are not considered a minority group, they have been identified as disadvantaged with regards to labour market inclusion (Ferguson 2016). This is surprising, given that women are generally more educated than men (Ferguson 2016). In this way, participation in apprenticeship programs could reduce the inequalities experienced by women within the labour market, especially considering that researchers demonstrate that the returns for vocational training are at least on par with those for academic education (Statistics Canada 2019). However, previous studies have also found that female-dominated trades are associated with lower earnings, despite having similar levels of employment (Boothby and Drewes 2010). In fact, the literature demonstrates that women in trades earn less than men, despite having higher levels of education when they begin an apprenticeship (Laryea and Medu 2010). As well, there seems to be an earnings premium for men in the skilled trades that does not exist for women (Boothby and Drewes 2006), with women registered in male-dominated apprenticeship programs having lower median hourly wages than their male counterparts (Frank and Frenette 2019).

Moreover, research shows that apprentices register for their program at approximately 28 years of age (Paul, Jin, and Haan 2022, forthcoming), which is older than students in other PSE institutions. These age differences have important implications for earnings, as income has been shown to increase significantly one year after completing certification (Paul et al. 2022, forthcoming). Also investigated is the association between self-employment and earnings, as studies show that entrepreneurship is growing more common among tradespeople, wherein only 9% of tradespersons were self-employed in 1987 compared to 15% in 2007 (Pyper 2008). And finally, we investigate how Red Seal Trades are associated with income as prior work has established that Red Seal certificates tend to pay more (Finnie et al. 2021). Our proposed research will build upon the findings outlined above by using administrative data that follows individuals across time to establish a more robust connection between apprenticeships, student mobility, certification completion, and inclusion in the Canadian labour market.

To complete this report, we access the confidential ELMLP datasets through Western University's Research Data Center (RDC). Given the confidential nature of the data, researchers must adhere to strict rules and vetting procedures. As such, some of the information is redacted to ensure confidentiality of respondents across all datasets. Where necessary, we indicate that the specifics of the data or augmentation process must remain private and, thus, cannot be reported. The datasets we used to answer our research questions were the PSIS, RAIS, Census of Population 2016, and the T1FF. All data manipulation and analyses were conducted using Stata 17. We examine each dataset in closer detail below, followed by the methods used in each analysis.

## Data RAIS-T1FF

The Registered Apprenticeship Information System (RAIS) is an administrative survey collected by educational institutions across Canada. The RAIS contains educational, demographic, geographic, and trade information from 1998-2018. As such, the RAIS is a useful tool for analyzing trade, apprenticeship, trade qualifiers, and red-seal trades information on both

Canadian and international students and can be used to assess enrollment and completion rates across a variety of geographic and demographic factors.

The T1 Family File (T1FF) is a longitudinal census of all Canadian tax filers from 1982-2018. The T1FF is a rich source of income data primarily used by researchers to study the labour market outcomes of Canadians. In particular, the T1FF holds key income data such as employment earnings, union dues, social assistance payments, and other financial data such as dividends, capital gains/losses, and grant and scholarship funding. Further, the ELMLP allows for a linkage between the RAIS and T1FF files, which allows for longitudinal examinations of labour market outcomes across many years and demographic groups.

## Sequence Analysis Methods

In terms of our methodology, we complete a sequence analysis of the most common pathways to and from apprenticeship training using the RAIS-T1FF file from 2007-2018. Importantly, due to the RAIS data beginning in 2008, we include a person's 2007 tax record to determine their status a year prior to attending a trades program. Additionally, the last available year within both the T1FF and the RAIS was 2018.

Sequence analyses are useful for determining patterns found in panel data and can shed light on historical trends used to answer economic or sociological questions. To determine the most common pathways into and out of apprenticeships, we code a six-level sequencing variable indicating the following discrete groups: whether a respondent is employed (determined by their T1FF record and if the respondent's T4 (employment) income is over $1000); whether a respondent is still in the program (determined by information provided through the RAIS and a record indicating current enrollment, but not completion); whether the respondent successfully completed their program (determined by the information provided through the RAIS and a record indicating they have successfully completed their program); whether the respondent dropped out (determined by the information provided through the RAIS and a record indicating they have discontinued the program); whether the respondent in unemployed (determined by their T1FF record and if their T4 employment income is under $1000); and whether the respondent entered an apprenticeship program as a high school student (determined by the age variable for those aged 15-19 within the RAIS as a proxy for high school). Although we kept only the first person-year record in this merged RAIS-T1FF file, we confirmed that an overwhelming majority of respondents in the data did not have multiple yearly entries.

Due to software restrictions imposed at the RDC, we were unable to obtain the necessary Stata files to visually present our findings. Furthermore, the software available to us only allowed for a simple examination of pathways found in our data. Nonetheless, we were able to determine the top 20 most common and longest sequences across observations.

## Sequence Analysis Results

Overall, the most common sequence in our data indicates that people enter apprenticeships from employment, followed by seven years of enrollment, and dropping out prior to returning to employment (about 7,000 respondents). The next two most common sequences were similar to

the first, but with individuals spending either two or five years in an apprenticeship program prior to dropping out and resuming employment. The fourth most common pattern was to successfully complete the program after being employed in the previous year before resuming employment (about 6,200 respondents). What this fourth sequence might indicate is that either these are trade qualifiers, or they were attending a trades program prior to this. However, our study period did not capture this. Moreover, the next four patterns (sequences five through eight) in our analysis indicate that respondents engaged in employment (about 3,700 and 2,700 respondents, respectively), followed by one to four years of enrollment, then successful completion before returning to employment. Worth noting, however, is that the top 20 patterns did not include anyone who was in high school (as indicated by the respondent's age) or unemployed, indicating that neither of these states are frequent enough among individuals in the data to be captured by the sequencing analysis.

## Logistic Regression Methods

To prepare the RAIS for merge with the T1FF, we used a methodological approach identical to that taken for the merge with the 2016 Census. In other words, we kept the first person-year record for individuals attending an Ontario institution between 2008-2017. In order to confirm that the first observation of each individual was comparable to the entire RAIS file, with respect to proportions across trades and key demographics, we checked the proportions across trades before and after keeping the first record. We then merged the T1FF files from 2007-2018 to capture the year before and after attending an apprenticeship program, as well as their labour market outcomes in the time periods of t-1 and t+1. Overall, we kept everyone with a record in both time periods (except for the first and last years) in the RAIS and T1FF. What we develop then is an analytical sample comprised of tax filing apprentices across our study period.

## Models

We run two models on the RAIS-T1FF to answer the following questions: "who completes apprenticeships?" and "what are their labour market outcomes?" For the first question, we run a logistic regression, with a dependent variable for 'completer,' which is a binary variable indicating whether someone completes an apprenticeship program. The logistic regression can be expressed as:

$$\text{Log}\left(\frac{\mathcal{P}_\text{i}}{1-\mathcal{P}_\text{i}}\right) = \beta_0 + \beta_1 X_{1,i,t} + \cdots + \beta_k X_{k,i,t}\ ;\ \forall\ i \in \{1, \ldots n\} \qquad \text{Equation (1)}$$

Where the set $\beta = \{\beta_0, \beta_1\ \ldots \beta_k\}$ defines the regression coefficients for all the independent variables in our model. We denote the $k$ independent variables as $X_i = \{X_{1,i,t} \ldots\ X_{k,i,t}\}$ in which the observations are indexed by $i \in \{1, \ldots, n\}$. We define the dependent variable, *completer*, by $y_{i,t};\ \forall i \in \{1, \ldots n\}$. Further, the probability of an individual completing their program is denoted by $\mathcal{P}_\text{I}$ , given our set of covariates. All variables in the model are expressed as fixed effects. Importantly, weights were not applied to this model, as both the RAIS and T1FF are census files and, as such, do not require weights, per RDC rules. After missing observations were dropped by Stata through the modelling process, the logistic regression was inclusive of over 925,000 observations.

As defined previously, our dependent variable, completer, is a binary indicator for whether someone completes an apprenticeship program. Individuals who were granted a certificate, with or without a Red Seal, as either a journeyperson or registered apprentice *and* whose status indicates successful completion of the program are coded as 1. Cases that did not meet this definition were coded as 0. We exclude trade qualifiers from this sample, as this particular class of tradesperson does not require attendance or practice through an educational institution.

Our focal independent variable is whether someone went into a trades program directly from high school. On this end, we use age as a proxy for high school, which we coded as 1 if a person falls between the ages of 15-19, and 0 otherwise, where the reference is not in high school. We further lag this variable to determine whether the individual was in high school the year prior. In addition to our focal independent variable, we also include a number of controls. Sex is included as a male/female dummy, where female is the reference. Marital status is included as a three-level dummy variable indicating whether someone is single (reference), married/common-law, or divorced/widowed. Age of respondent is grouped into five ten-year categories: 15-25 (reference), 26-35, 36-45, 46-55, and 56-65. Presence of children is included as a binary variable, where 1 denotes an individual has children (reference), and 0 denotes there are no children present. Union membership was lagged (t-1) and coded as 1 if the observation had union dues above $1.00 (reference) and 0 if no union dues were reported. Further, the presence of self-employment income is included as a binary dummy, where 1 indicates that a person has self-employment income (reference) and 0 indicates that they do not.[6] We also include whether someone was enrolled in a Red Seal trade by coding a binary dummy where 1 indicates the respondent was enrolled in a Red Seal trade (reference), while 0 indicates that they were not. Using an existing variable in the data, we then determine the endorsement of the certificate, where 1 indicates that the certificate is only Red Seal endorsed (reference), 2 indicates that the certificate is both Red Seal and non-Red Seal endorsed, and 3 indicates that the certification is only non-Red Seal endorsed. We further control for year as a fixed effect, with 2009 being the reference. It is important to note that, because of lagged variables (which creates a missing value in time t-1), we do not have estimates for the year 2008. Lastly, we control for the National Occupational Classification (NOC) groups by including 73 groups. These were collapsed from the original roughly 500 groups, with the reference category being conference and event planners. In line with previous research, we use NOC codes as proxies for trades certificates (see Haan, Jin, and Paul 2022, in press). For ease of interpretation, we report all coefficients in odds ratios (ORs).

## Results

Based on the regression results (see Appendix I for regression output), those who are entering trades directly from high school have a significantly lower likelihood of program completion (OR=0.04). Further, women have a slightly higher probability of completion over men (OR=1.01), and married individuals have the highest probability of completion (OR=1.34), followed by divorced individuals (OR=1.01), as compared to single people. However, the coefficient for divorced individuals failed to reach statistical significance, indicating it is not

[6] The self-employment variable was pre-coded in the data and indicated whether someone claimed self-employment income or not. Thus, we did not indicate any dollar amount cut-offs.

statistically different from single individuals. With respect to age, and consistent with our results for individuals coming from high school, people aged 26-35 have the highest chance of completion, followed by those aged 36-45 (OR=1.10), then those aged 46-55 (OR=1.05), as compared to the reference group of persons aged 15-25. In this way, it appears that the likelihood of completion peaks between 26-35 before slowly decreasing, with those aged 56-65 having the lowest probability of completion (OR=0.92) compared to the younger generations. Also consistent with the findings for age, we see that the presence of children results in a decreased probability of completion (OR=0.88) when compared to childless individuals.

Interestingly, but unsurprisingly, belonging to a union in time t-1 results in a greater likelihood of completion (OR=1.29) over those who did not work in a unionized environment. Given that many trades are unionized, this finding makes sense. Comparatively, those with self-employment income have a decreased chance of completion (OR=0.78), possibly due to the time commitment it takes to run a business.

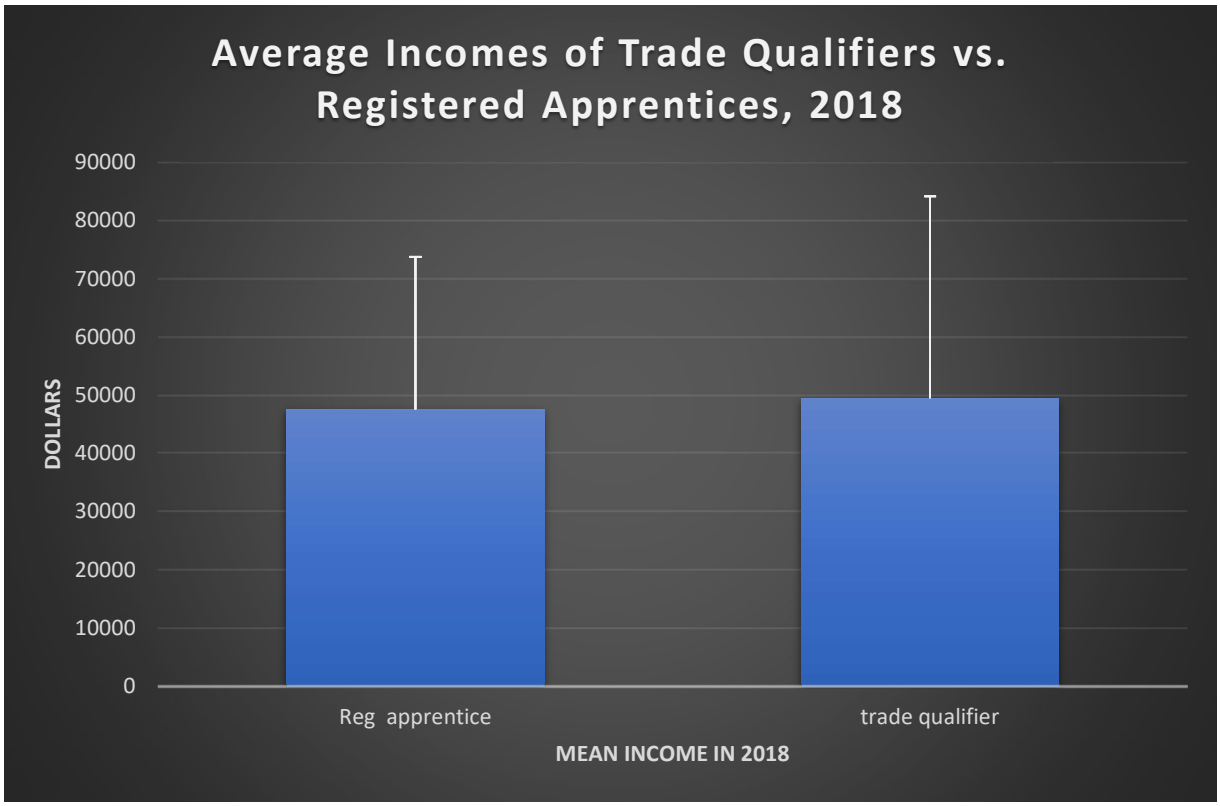
Further, Red Seal trades show interesting trends. First, participating in a Red Seal program in time t-1 results in a higher probability of completion, albeit only slightly (OR-1.07), as compared to those who did not attend a Red Seal trade. Next, when looking at the impact of endorsement, individuals who are enrolled in a program wherein the Red Seal endorsement is optional have the highest probability of completion (OR=1.21), followed by only non-Red Seal endorsed programs (OR=1.19), as compared to those in only Red Seal programs.

Although we used the NOC codes as controls, an interesting finding from the regression results indicates that no one completed a certification in other technical and co-ordinating occupations in motion pictures, broadcasting, and the performing arts during the study period. Furthermore, jewellers, jewellery and watch repairers and related occupations have the highest probability of completing (OR=35.4), followed by electronics assemblers, fabricators, inspectors, and testers (OR=5.36), then chefs (OR=5.32), and hairstylists and barbers (OR=4.19), as compared to the reference category of conference and event planners. Comparatively, the lowest probability of completion is found among the following trades: drillers and blasters in surface mining, quarrying and construction (OR=0.09), concrete finishers (OR=0.15), and aircraft mechanics and inspectors (OR=0.30), as compared to the reference category. Across years, the probability of completion is higher for all years in comparison to 2009, with 2018 having the highest predicted probability of completion (OR=2.03).

## Data- RAIS-T1FF

To determine the labour market outcomes of completers, we return to the RAIS-T1FF dataset described above.

**Figure 13 - Average Incomes of Trade Qualifiers vs. Registered Apprentices, 2018. Standard Deviation indicated by the error bars.**




Source: authors' calculations RAIS-T1FF

We begin exploring labour market outcomes by descriptively analyzing the average incomes across trade qualifiers and registered apprentices. Figure 13 shows a clear pattern of trade qualifiers consistently earning more money than registered apprentices up until 2018, where the two groups are mostly similar. Given that trade qualifiers have already worked, their experience likely accounts for the differences in wages. Interestingly, while we see the incomes of trade qualifiers decrease from 2008-2018, the opposite is demonstrated for registered apprentices, wherein their incomes gradually increase across the study period.

## Ordinary Least Squares Analysis

For this next section, we take advantage of the panel structure of the RAIS-T1FF merge to run a random-effect model, which groups individual respondents across years, thereby resulting in robust standard errors. This model was inclusive of approximately 1,252,000 observations, grouped by person identifier and year as the time component, totalling about 342,000 different respondents for an average of just under four years of data per person. The r-squared of the overall model is 0.24, indicating that about 24% of the variability in logged income is explained through our set of covariates. Further, the r-squared within panels explains about 9% of the variability in logged income, while around 30% of the between panels variation in logged income is explained. This can be interpreted as there being more between-group variation (i.e., across people) than what can be seen between years of data for one person (within person variation). In other words, most of the variability of logged income is explained by individual

differences, rather than person-specific changes over time. The ordinary least squared regression can be expressed as:

$$y_{i,t} = \alpha + \beta_1 X_{i,t} + \beta_2 X_{i,t} + \cdots + \beta_k X_{i,t} + \nu_i + \epsilon_i \qquad \text{Equation (2)}$$

where $y_{i,t}$ is the logged income of a respondent across 2007-2018. To determine labor market outcomes of apprentices, we use the total employment income of the respondent, as per their T4 income, any self-employment income they may have claimed, as well as other employment income.[7] We use all positive incomes, bottom coded at $0.00 and scale all dollar amounts by year to 2018 constant dollars prior to logging.

Our main independent variable, completer, is coded as 1 (reference) if a certificate was granted, with or without a Red Seal designation, to either a journeyperson or registered apprentice and their status indicates successful completion of the program with a certificate granted. Cases that did not meet this definition were coded as 0. As was the case previously, we exclude trade qualifiers from this sample, as this particular class of tradesperson does not require attendance or practice through an educational institution. Further, we code a transfer variable by lagging a person's NOC and examining whether they are different in time t, as compared to time t-1. This allows us to determine whether transferring from one program to another results in more or less income. Next, we include a number of controls. Sex is a male/female dummy, where female is the reference. Marital status is included as a three-level dummy variable indicating whether someone is single (reference), married/common-law, or divorced/widowed. Ages of respondents were grouped into five ten-year categories for 15-25 (reference), 26-35, 36-45, 46-55, and 56-65. Presence of children is included as a binary variable, where 1 denotes an individual has children (reference) and 0 denotes no children. Union membership was lagged (t-1) and coded as 1 if the observation had union dues above $1.00 (reference) and 0 if no union dues were reported. Presence of self-employment income was included as a binary dummy, where 1 indicates that a person has self-employment income (reference) and 0 indicates that they do not.[8] We include whether someone was enrolled in a Red Seal trade by coding a binary dummy where 1 indicates the respondent was enrolled in a Red Seal trade (reference) and 0 indicates that they were not. We then use an existing variable in the data to determine the endorsement of the certificate where 1 denotes a Red Seal only endorsed (reference), 2 denotes both Red Seal and non-Red Seal endorsed, and 3 denotes only non-Red Seal endorsed. Year as a fixed effect is also included, with 2009 as the reference. It is important to note that, because of lagged variables (which creates a missing value in time t-1), we do not have estimates for the year 2008. Finally, we control for the National Occupational Classification (NOC) groups by including 73 groups which were collapsed from the original roughly 500, where the reference category is conference and event planners.

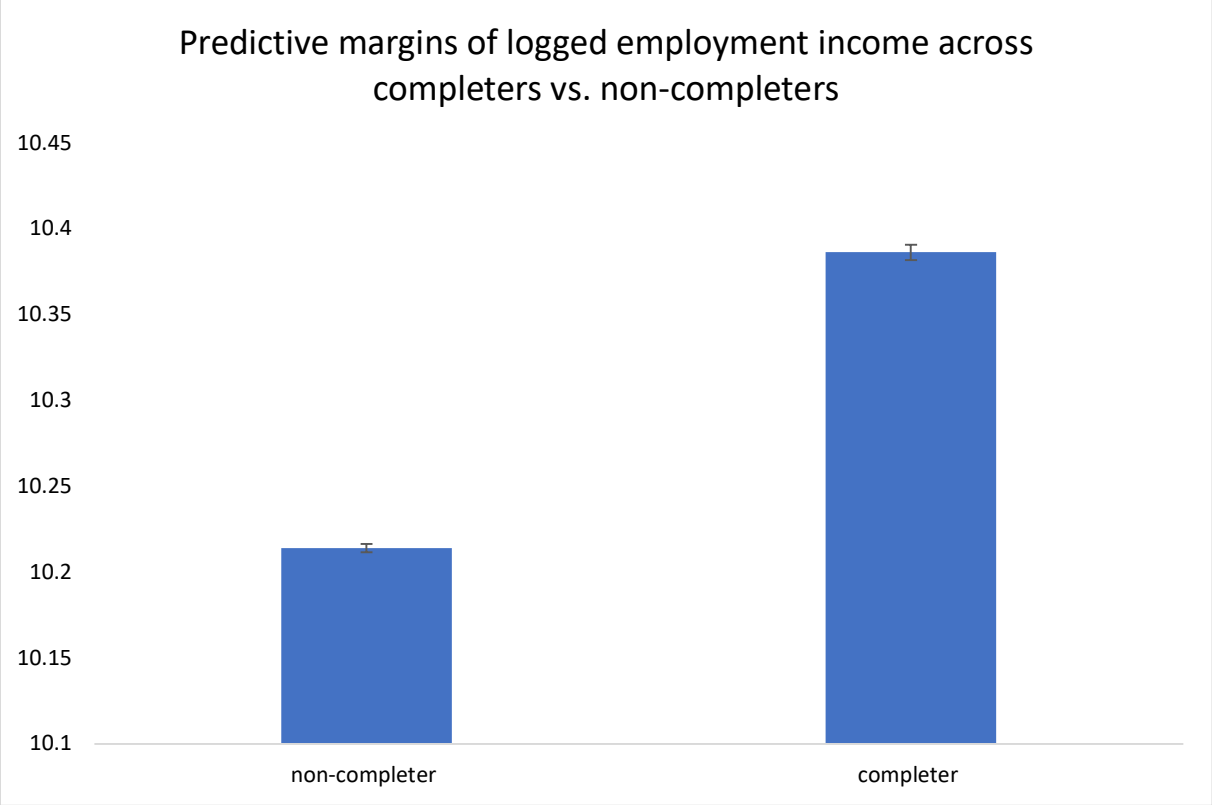
[7] Other employment income refers to any taxable income received through the course of employment, such as gratuities, but that are not indicated on the T4.

[8] This variable was pre-coded in the data indicating whether someone claimed self-employment income or not. Thus, we did not indicate any dollar amount cut-offs.

## Regression Results

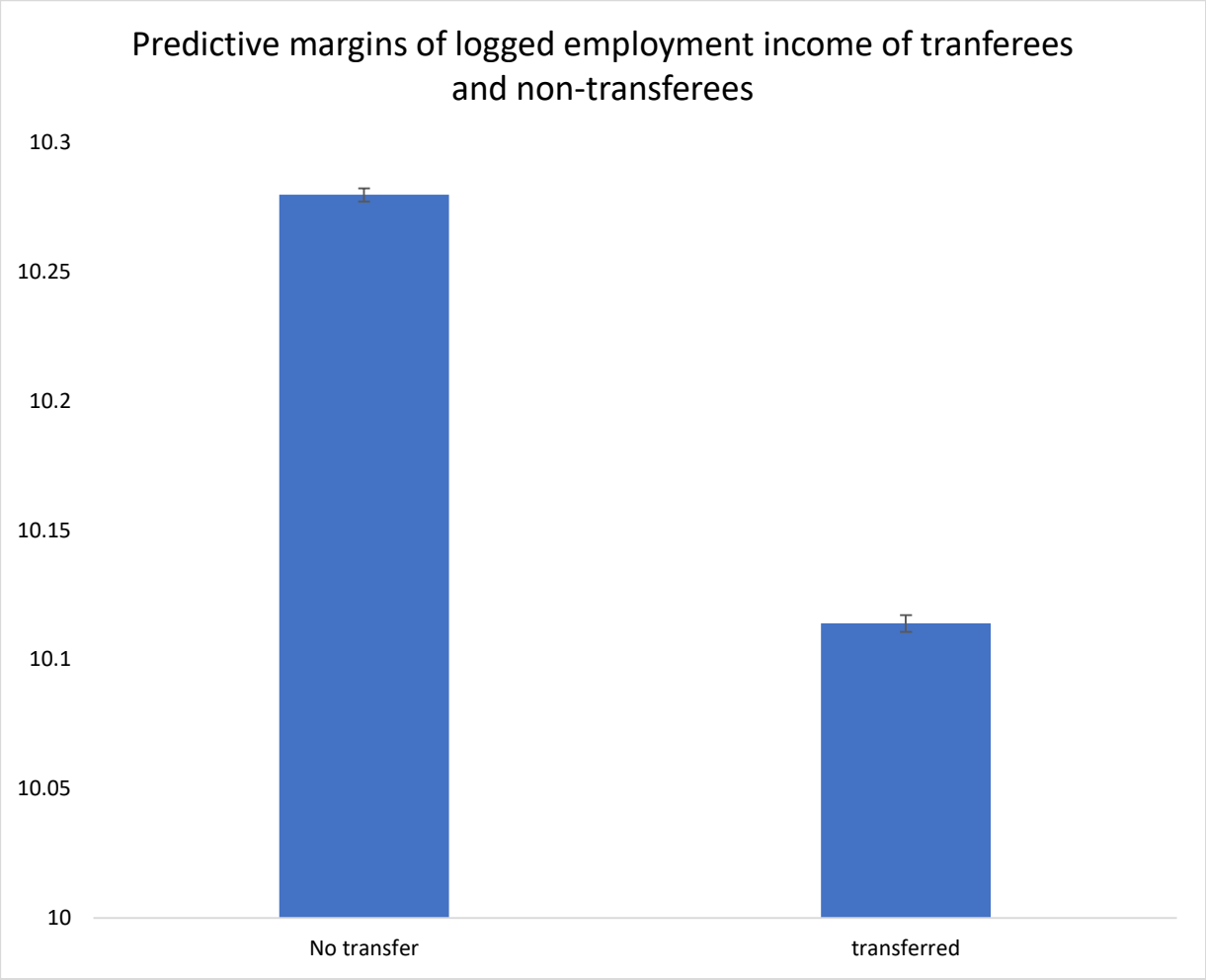
Overall, our regression results (see Appendix II for regression table) show that completers make just under 19% more than non-completers, on average (see Figure 14). Further, individuals who switch programs, thereby resulting in a different NOC classification, make around 15% less than those who stay in their original program or within the same NOC grouping (see Figure 15). Married and common-law individuals make, on average, 16% than their single counterparts, while the divorced group earn approximately 7% more in employment earnings. This finding makes sense, as dual income earnings will claim higher incomes than their single-earner counterparts. We also see a notable gender wage gap for tradespeople, wherein women make almost 24% less than their male counterparts (see Figure 16). In terms of age, individuals aged 26-35 earn 19% more than those aged 15-25, while slightly older individuals enjoy the largest earnings premium. In particular, those aged 36-45 and 46-55 make 25% and 23% more than those aged 15-25, respectively, net of the control variables in the model. On the other hand, the oldest individuals in our sample, or those aged 56-65, make 5% less than the reference group of people aged 15-25. Additionally, the presence of children results in a decrease in earned income of just under 11%, as compared to individuals without kids.

**Figure 14 - Predictive margins of logged employment income across completers and non-completers.**



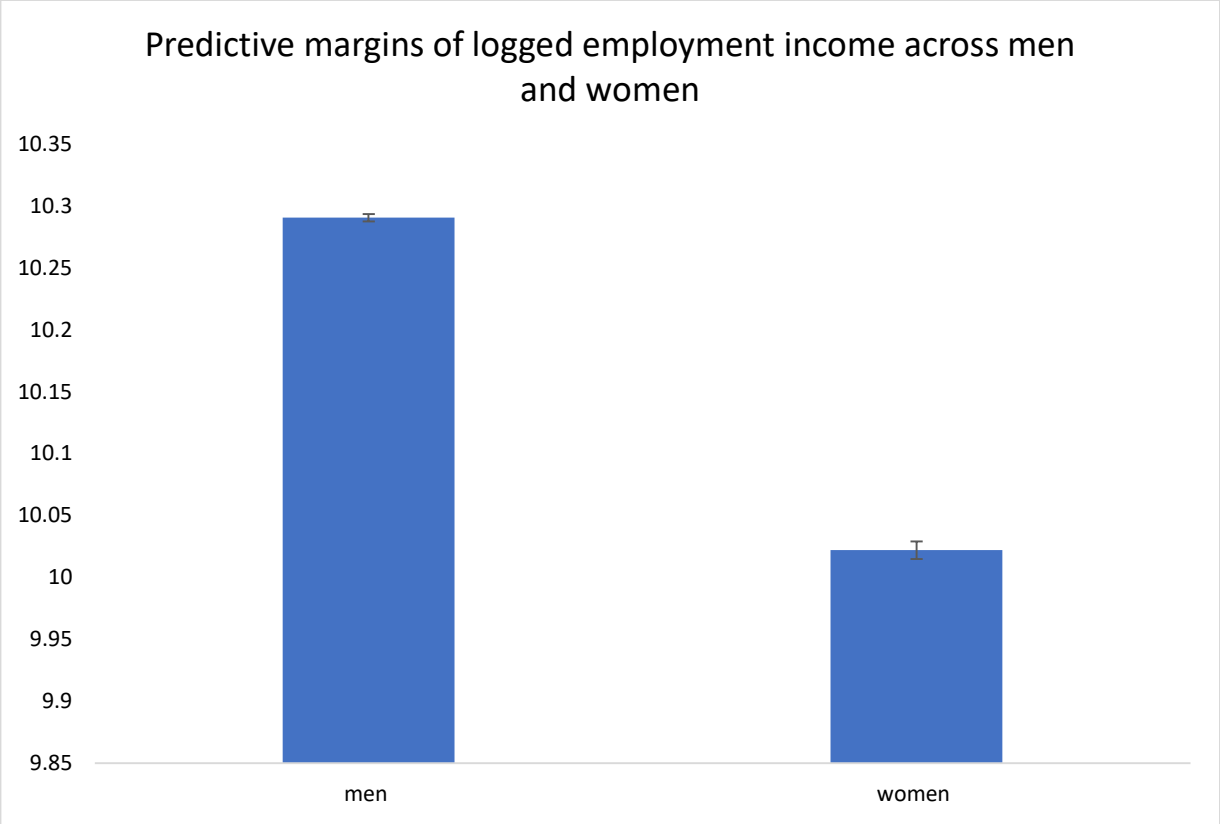

Source: authors' calculations RAIS-T1FF.
Note: Whisker plots denote 95% Confidence Interval

**Figure 15 - Predictive margins of logged employment income across transferees and non- transferees.**




Source: authors' calculations RAIS-T1FF.
Note: Whisker plots denote 95% Confidence Interval

**Figure 16 - Predictive margins of logged employment income across men and women.**




Source: authors' calculations RAIS-T1FF.
Note: Whisker plots denote 95% Confidence Interval

With respect to union involvement, tradespeople who have declared union dues on their tax return have, on average, around 30% more in employment earnings than those that are not associated with a union. Self-employed individuals, on the other hand, have just under 21% less declared earnings than those who do not report self-employment wages. Further, trade qualifiers earn 6% more than apprentices, however this finding makes sense given that trade qualifiers are admitted into the certification program based on years of experience in their particular trade. Also interesting is that those enrolled in Red Seal trades show a slight disadvantage in terms of employment earnings, at about 4% less compared to those not in a Red Seal program. However, we do not observe much of a difference with respect to the type of endorsement on a person's certificate. In particular, individuals who have both Red Seal and non-Red Seal endorsements make 0.6% less than individuals who hold a Red Seal only endorsed certificate, while those with only a non-Red Seal endorsement make just over 1% more employment income, as compared to the reference group. Lastly, with respect to yearly trends, we observe that, from 2009 to 2013, individuals reported making less income, on average, when compared to 2008. However, from 2014-2018, tradespeople made more, on average, as compared to 2008. Given that the effects of the 2008 recession were observable for several years post-crash, our findings indicate that trades in Ontario were affected from 2009-2013, but recover economically post-2013, which follows the business cycle trend that is known to exist over this period.

## Conclusion and Limitations

Overall, this report documents a number of key considerations within the realm of trades and apprenticeships in Ontario. Amongst these is an outline of the demographic groups most likely to pursue apprenticeship training, the type of trades pursued by these groups, the transfers most common among those who enter apprenticeships, and the destinations of apprentices once they leave their training program. Through our analyses, we have shown that, while most students do not transfer into apprenticeship training from another program, those that do transfer come from a bachelor's program or a basic education and skill training program. Further, our results confirm that trades are gender segregated, yet more visible minorities study female-dominated trades than non-visible minorities. In saying this, however, it is worth noting that most apprentices are non-visible minority, native-born men. Additionally, most individuals register for apprenticeship training between the ages of 15 and 34.

Moreover, another interesting finding occurred within our sequencing modelling, wherein the most common pathway was those who were engaged in employment, dropped out, and then re-entered the labour market later. The second most common pathway, however, was those who worked in paid employment, completed their certification, and returned to work.

Finally, our OLS regression results indicate that those who switch their program of study earn less, on average, than those who remain in the same program of study. As well, there exists a substantial gender pay gap. Thus, the pathways taken by apprentices have major implications for labour market outcomes which, in turn, points to a few directions for policy. In particular:

1. Policies aimed at supporting students who transition between programs of study within apprenticeship training are essential as these students appear to suffer from an earnings disadvantage
2. The implementation of such transfer programs should include a consideration of the types of credit transfers common among apprentices, which is a limitation of our study.
3. Canada's current focus on recruiting high human capital immigrants may be inadvertently reducing the number of people that might pursue an apprenticeship.

Of importance is that our results rely heavily on descriptive measures and multivariable methods that cannot establish causal pathways. Nevertheless, our results show that the Ontario Council on Articulation and Credit Transfer is a much-needed program to help apprentices navigate through program changes. In sum, we lack a clear picture of who enters apprenticeship training. In addition, research has yet to fully parse out the pathways taken into apprenticeship training among students in Ontario, the likelihood of completing apprenticeships, as well as journeypersons labour market outcomes. An investigation of these phenomena can inform Ontario's credit transfer system and help decrease the barriers faced by students, particularly among marginalized groups.

Nonetheless, there are a number of limitations within this study that are worth noting. For one, due to computational requirements, and Statistics Canada policy, we were unable to complete the sequence analysis and, as such, our findings could not be presented in a visual format. In terms of our regression models, we model the graduation rate per year, which means that everyone who

did not graduate in year *t* is still enrolled in the program. Therefore, our non-completer category is comprised of both dropouts and continuers. Additionally, we do not know the labour market outcomes of those who dropped out and did not complete the program. Given that these individuals would no longer be in the RAIS sample, it is difficult to determine their long-term financial position relative to those who did complete their program. This is especially true for any estimates post-2018, as this is the last year of the T1FF available to us at that time. Lastly, we were unable to include visible minority status in our regressions because there is no possible linkage between the Census and the RAIS-T1FF merged file we created. This was not clear to us as we began our analysis, and there was no indication on Statistics Canada's data website that these linkages were not allowed.[9] As such, we miss a potentially important subset of the population, which is something worth examining further in future studies.

[9] https://www.statcan.gc.ca/en/microdata/data-centres/data

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# Appendix I- Logistic Regression Results

| | Probability of Completing | | Probability of Completing |
|---|---|---|---|
| High School (ref=not in high school) | -3.193*** | Red seal & non-red seal endorsed (ref=red seal endorsed only) | 0.195*** |
| | (0.0967) | | (0.0277) |
| Female (ref=male) | 0.0188 | Only non-red seal endorsed | 0.178*** |
| | (0.0143) | | (0.0325) |
| | | Years (ref=2009) | |
| Married/Common law (ref=single) | 0.293*** | 2010 | 0.00997 |
| | (0.00820) | | (0.0172) |
| Divorced | 0.0112 | 2011 | 0.200*** |
| | (0.0183) | | (0.0168) |
| Ages (ref=15-25) | | 2012 | 0.186*** |
| 26-35 | 0.260*** | | (0.0167) |
| | (0.00877) | | |
| | | 2013 | 0.274*** |
| 36-45 | 0.0985*** | | (0.0166) |
| | (0.0124) | | |
| | | 2014 | 0.524*** |
| 46-55 | 0.0533** | | (0.0163) |
| | (0.0164) | | |
| | | 2015 | 0.252*** |
| 56-65 | -0.0775** | | (0.0166) |
| | (0.0285) | | |
| | | 2016 | 0.395*** |
| Children (ref=no children) | -0.119*** | | (0.0170) |
| | (0.00731) | | |
| | | 2017 | 0.405*** |
| Union Dues (ref=no union dues) | 0.255*** | | (0.0172) |
| | (0.00807) | | |
| | | 2018 | 0.711*** |
| Self-employed (ref=not self-employed) | -0.242*** | | (0.0172) |
| | (0.0151) | | |
| In a Red Seal Trade (ref=not in a red seal trade) | 0.0742** | Constant | -3.647*** |
| | (0.0228) | | (0.288) |
| Observations 925000 | | | |

Source: authors' calculations
RAIS-T1FF.
Standard errors in parentheses
* $p < .05$, ** $p < .01$, *** $p < .001$
Note: NOC Groups not reported

# Appendix II- OLS Regression Results

| | Logged Employment Income | | Logged Employment Income |
|---|---|---|---|
| Completer (ref=non-completer) | 0.172*** (0.002) | Red-seal trade (ref=non-red-seal) | -0.044*** (0.006) |
| Transferred (ref=no transfer) | -0.166*** (0.002) | Red-seal endorsed trade (ref=only red seal endorsed) | |
| | | Red seal & non-red seal endorsed trade | -0.006 (0.004) |
| Marital Status (ref=single) | | | |
| Married/common law | 0.150*** (0.002) | Only non-red seal endorsed | 0.013* (0.006) |
| Divorced | 0.072*** (0.004) | Years (ref=2008) | |
| | | 2009 | -0.220*** (0.003) |
| Female (ref=male) | -0.269*** (0.004) | | |
| | | 2010 | -0.163*** (0.003) |
| Ages (ref=15-25) | | | |
| 26-35 | 0.182*** (0.002) | 2011 | -0.117*** (0.003) |
| 36-45 | 0.226*** (0.003) | 2012 | -0.063*** (0.003) |
| 46-55 | 0.211*** (0.004) | 2013 | -0.031*** (0.003) |
| 56-65 | -0.005 (0.007) | 2014 | 0.005 (0.003) |
| Children (ref=no children) | -0.114*** (0.002) | | |
| | | 2015 | 0.043*** (0.003) |
| Union Dues (ref=no union dues) | 0.259*** (0.002) | | |
| | | 2016 | 0.057*** (0.004) |
| Self-employed (ref=not self-employed) | -0.225*** (0.003) | | |
| | | 2017 | 0.116*** (0.004) |
| Trade qualifier (ref=registered apprentice) | 0.058*** (0.005) | | |
| | | 2018 | 0.166*** (0.004) |
| | | Constant | 10.303*** (0.078) |
| Observations 1,252,000 | | | |

Source: authors' calculations RAIS-T1FF.

Standard errors in parentheses
$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$
Note: NOC Groups not reported