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Immigrant Labour Market Outcomes and Skills Differences in Canada

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Introduction

For the past three decades, immigration has accounted for all of Canada's net population growth and is soon to become the only net source of growth in the labour pool (Downie, 2010). Meeting the employment needs of immigrants as well as addressing other challenges facing newcomers on the path to employment is a high priority of the Canadian government. The focus is on ensuring that newcomers integrate into the Canadian workforce and are responding to employers' increasing needs for skilled workers in certain sectors.

The lack of access to skilled talent is a major concern for many employers today, and there is a mismatch between available skills of current graduates and the skills required for the job (Vahey, 2000; Yuen, 2010; Boudarbat & Chernoff, 2012; Uppal & LaRochelle-Cote, 2014; Warman, Sweetman & Goldmann, 2015; Finnie, Mueller & Sweetman, 2018). At the same time, there is ample evidence that well-qualified immigrants face many barriers in the Canadian labour market, particularly those who are also racialized (See for instance Banerjee, Reitz & Oreopoulos, 2018). For more than a decade, scholars have examined the evidence on different dimensions of employment. For example, Reitz and Banerjee (2007) showed that starting in the late 1970s immigrant men earned about 13% less than their native-born counterparts in entry level jobs. Despite the growing focus on skills coupled with new sources of immigrants, the problem got worse. Immigrants entering Canada in the late 1990s earned 28% less than Canadian-born adults. The situation for immigrant women was even worse.

More recent research reinforced these findings and explored the ways in which the mechanics of the labour market create barriers (Banerjee, Verma & Zhang, 2018; Esmaeilzadeh, Ahamd & Naveed, 2018; Nadeau & Seckin, 2010; Oreopoulos, 2011; Papademetriou & Sumption, 2011; Coulombe, Grenier & Nadeau, 2014). Underemployment was a particularly noted issue accounting for the lower income. There was significant evidence of the devaluation of immigrants' experience and credentials through both underemployment and reduced wages. Between 1991 and 2001, one in four immigrants who held a university degree was working at a job requiring no more than a high school level of education and earning significantly less than their Canadian counterparts.

Aydemir and Skuterud (2005) suggested that a quarter to a half of the decline in the net earnings of immigrants can be explained by the lowered value of foreign experience. Uppal and LaRochelle-Cote (2014), and Premji and Shakya (2017), among others, provides further evidence that employment does not match immigrants' skills, pays below their skill level and tends to be precarious work (Premji & Shakya, 2017). This is tied to the devaluation of foreign-obtained credentials and mismatch of skills, which means that many immigrants are caught in the trap of low-wage, precarious survival jobs (Creese & Wiebe, 2012; Blit, Skuterud & Zhang, 2017; Cukier, Jeffery, Yap & McDonald, 2017; Reitz, Curtis & Elrick, 2014).

Studies have shown that while a substantial proportion of immigrants perceive discrimination in employment, racialized immigrants are more likely to perceive discrimination and those self-identifying as Black are far more likely to perceive experiencing it as often as those who self-identify as Chinese (Yap & Cukier, 2009). Research by Oreopoulos constructed an experiment that showed that job applicants with “foreign-sounding” last names were less likely to get called for job interviews than those with Anglo Saxon names, regardless of where they were born or their education. When the data was reanalyzed, those without foreign-sounding last names were more than twice as likely to receive a call back from small employers (under 500 employees), again reinforcing that the barriers are real (Banerjee, Reitz, & Oreopoulos, 2018; Oreopoulos & Dechief, 2012; Oreopoulos, 2009; 2011).

Other research has suggested that a focus on skills would help level the playing field. For example, some research suggests that language skills are associated with better labour market outcomes and that language skill gaps make immigrants less effective (Warman et. al, 2015). Warman, Webb and Worswick, (2019) conclude that immigrants with French or English as their mother tongue have significantly better employment outcomes. The implication is that immigrants with comparable skills in language should have comparable employment outcomes. Li and Sweetman (2014) found that adult immigrants from source country education systems who have higher average test scores experience higher returns on education in the Canadian labour market than their peers from other countries.

There is a branch of research studying the relationship between literacy, numeracy, problem-solving skills and labour market outcomes. Green and Riddell (2003) used literacy scores in the 1994 International Adult Literacy Survey as a direct measure of literacy skills and found that cognitive skills have a positive influence on earnings. They also concluded that controlling for literacy skills reduced the effect of schooling on earnings by 30% at the median of the earnings distribution. Ferrer, Green and Riddell (2006) used the 1994 International Adult Literacy Survey (IALS) and the 1998 Ontario Immigrant Literacy Survey (OILS) and found no evidence that immigrants have different returns on literacy skills compared to those who were Canadian born. They reported that differences in literacy scores accounted for approximately two-thirds of the earnings difference between immigrants and Canadian-born. Hanushek, Schewerdt, Wiederhold and Woessmann (2015) compared numeracy skills among domestic-born individuals in 23 countries surveyed in the 2012 PIAAC. The result indicated that a 1% increase in numeracy results in an 18% increase in earnings. Truong and Sweetman (2018) suggested that a one-standard-deviation increase in basic computer skills (proxied by the problem solving in a technology-rich environment in the 2012 PIAAC) is associated with a 7% increase in earnings for both men and women. Their study also pointed to an interesting result that the Canadian labour market did not reward basic computer skills at different rate for immigrants and the Canadian-born.

Data and Methods

The Survey of Adult Skills (SAS), a part of the Programme for the International Assessment of Adult Competencies (PIAAC), measures adults' proficiency in key information-processing skills — literacy, numeracy and problem solving — and gathers information and data on how adults use their skills at home, at work and in the wider community. This survey is conducted in over 31 countries/economies and objectively measures the key cognitive and workplace skills needed for individuals to participate in society and for economies to prosper (OECD, 2016). For example, a review of scores in the US by the Migration Policy Institute suggested that while employment and earnings rose for American-born adults with proficiency on the test, this was not true of immigrants with low skill levels. The same study suggested that immigrants with internationally earned academic credentials had lower English literacy and numeracy scores than those with US-earned credentials. These scores alone did not, however, account for the disparity in employment outcomes. The study concluded that efforts to improve literacy and numeracy among immigrants should be intensified (Batalova & Fix, 2015).

Research on Canadian PIAAC results has focused on the country's below-average performance and claims that it is attributable to Canada's high proportion of immigrants (Parkin, 2015). However, closer analysis shows that Canadian-born test takers are among the worst globally, only scoring better than "native" test takers in Spain, Italy and Ireland (Levels, Dronkers & Jencks, 2017). While those who immigrated as adults score lower than Canadian-born test takers and while results vary according to mother tongue (CMEC, 2017), immigrants who came to Canada in their teens significantly outperform those born in Canada on both literacy and numeracy tests pulling the average scores up, not down. Levels et al. (2017) treat the skills scores as a dependent variable, comparing trends across jurisdictions and examining the underlying factors shaping skill scores. They conclude that demographic and socioeconomic characteristics, such as employment and language proficiency, explain about half of the cross-country variation in numeracy and literacy skills gaps. The study also suggests that there is a need for more research about starting points and trajectories of immigrants. Scholars have begun to use this data set to examine the degree to which disparities in labor market outcomes are driven by the skill sets of immigrants (for example see Stuckley & Munro, 2013; Heisz, Notten & Situ, 2015; Smith & Fernandez, 2017; Truong & Sweetman, 2018)

Our study uses this data to better understand the impact of literacy and numeracy skills on employment outcomes for immigrants. This provides a different angle to study immigrant labour outcomes based on objectively measured skill levels separate from other measures of human capital (e.g., educational attainment and field of study). The questions that informed the study were:

1. What is the impact of immigrant status on various employment outcomes?
2. What is the impact of various possible controlling factors such as demographics and human capital?

3. What is the impact of numeracy test scores?
4. What is the impact of literacy test scores?

To examine the effect of immigrant status on employment arrangement, this paper employs multinomial logistic (MNL) regression (Long & Freese, 2006) to estimate the probability that individuals will hold different employment arrangements. Multinomial logistic regression is a common method used when dependent variables are categorical, non-ordered and have more than two levels (see Seyfrit & Hamilton, 1992). The model estimates the effect that predictors have on the likelihood of a particular outcome occurring, relative to a “base” or reference category (for an example of its application, see Walters, Phythian & Anisef, 2007). In this case, the outcome (category) variable is employment arrangement, which can be unemployed, employed part time, employed full time or not participating in the labour force. Those are the four possibilities for the dependent variable.

The multinomial logistical regression uses Maximum Likelihood Estimation of a series of equations of the form:

$$\Pr(Y_i = 1) = \frac{e^{\beta'_1 \cdot X_i}}{1 + \sum_{k=1}^{K-1} e^{\beta'_k \cdot X_i}}$$

.....

$$\Pr(Y_i = K - 1) = \frac{e^{\beta'_{K-1} \cdot X_i}}{1 + \sum_{k=1}^{K-1} e^{\beta'_k \cdot X_i}}$$

$$\Pr(Y_i = K) = \frac{1}{1 + \sum_{k=1}^{K-1} e^{\beta'_k \cdot X_i}}$$

Where the probabilities must sum to 1 and $K = 4$ in our case (for the four categories: unemployed, employed part time, employed full time or not participating in the labour force — the base case is employed full time and all other probabilities are estimated relative to that).

The β coefficients are estimated separately for each of the four categories and for each of the independent variables (x) for which there is a value for that category. These estimates are the average impact of each independent value on the probability for observations in that category. For example, the impact of age is estimated separately and simultaneously on the probability of being unemployed, employed part time or not in the labour force. Since full-time employment is the base case, these three probabilities are relative to

full-time employment. A negative value indicates a reduced probability while a positive value shows an increased probability of the specific outcome.¹

Our dependent variable (Y) is the probability of being unemployed. We are fully estimating across all four (K) employment outcome categories but focus on the results for unemployment. Based on previous literature on immigrant employment outcomes and other studies that have used the PIAAC, our independent variables (x) for which the coefficients (β) are estimated will be:

- Immigrant status
- PIAAC literacy skills score or numeracy skills score
- Female (male is the base case)
- Age (only those 22–59 are included)
- Age squared
- Years since migration (0 if not a migrant)²
- Years since migration squared
- Educational Attainment (high school is the base case)
 - Below high school
 - Postsecondary below university
 - Postsecondary with at least bachelor's degree
- For those with a bachelor's degree was it in a STEM³ field?
- For those with a bachelor's degree was it obtained outside Canada?
- Parental educational attainment⁴ (at least one with high school is the base case)
- Reported number of books in the house (range, under 101 is the base case)

1 For more information on how to interpret coefficients in multinomial logistic regressions, see Hamilton and Seyfrit (1993).

2 We follow the method defined in Aydemir and Skuterud (2005). This independent variable is not mean deviated and thus should be interpreted at the 0 year since migration.

3 STEM includes individuals who completed a degree in science, mathematics, computing, engineering, manufacturing and construction. This variable is created based on the self-reported fields of studies in PIAAC — b_q02c or bq01bca1.

4 Parental education is defined as the maximum education level of the two parents. If an individual's self-reported parental education is missing for at least one parent, the remaining parent's education information is used to categorize this variable.

Our initial model includes the immigrant status variable on its own. Subsequent models introduce control variables known to impact workforce outcomes in “blocks,” including basic demographic characteristics (age, sex, parental education). Common measures of human capital, including educational attainment levels and field of study, along with numeracy and literacy skills are introduced subsequently. This modeling approach allows us to estimate the effects of immigrant status, controlling for the broad array of variables correlated to labour market outcomes.⁵

1. Employment arrangement is run against just immigrant status — so what is the increase in probability of being unemployed, employed part time, or not in the labour force due to being an immigrant to Canada? (Model 1)
2. Then the model is run with numeracy skills included, and separately run with literacy skills included. The two skills are highly correlated so both can't be included in the model at the same time. The expectation is that the results will be highly similar for both skill sets. (Model 2)
3. Demographic controls are then added — age, sex, parental education (proxy for class). How did adding these change the base probabilities from Model 2? (Model 3)
4. Finally, human capital controls are added — educational attainment, STEM field of study and years since immigration. The demographic controls from Model 3 are retained. How did these new variables change the probabilities? (Model 4)

Immigrants accounted for 25.5% of the rounded sample of 20,100 respondents. The samples of immigrant and Canadian-born respondents were similar along many dimensions (see Table 1, results based on provided weights). The average age for both groups was 41.1 years. A slightly lower proportion of immigrant respondents were men (48.7% versus 50.4%). Immigrants were more likely to have a postsecondary degree (44.1% versus 24.4%) and more likely to have science, technology, engineering and math (STEM) education (27.8% versus 19.5 %). Immigrants were also more likely to have a parent with some postsecondary education (41.2% versus 35.3%). Canadian-born respondents were, however, more likely to have more than 200 books in the home.

Looking at the PIAAC skill test results, the average literacy score for immigrants was lower (256.4 versus 282.5), and there was a greater variation in the scores' standard deviation (55.5 versus 46.8). The average numeracy score for immigrants was lower (250.7 versus 273.8) again with a higher variance (61.8 versus 51.8). Overall, immigrants were less likely to be employed full time (62.2% versus 65.0% full time; 11.4%

⁵ All these models will be estimated using the provided survey weights and using the STATA statistical package.

versus 11.8% part time) and more likely to be unemployed (6.8% versus 5.3%) or not participating in the labour force (19.6% versus 18.0%).

Table 1: Summary Statistics

	All respondents	Immigrants	Canadians
Demographics			
Average age (22–59 years)	41.1	41.1	41.1
Average age at immigration		23.9	N/A
Years since migration		17.2	N/A
Proportion of men	50.0	48.7	50.4
Human Capital			
Education characteristics			
- Below high school	10.6	9.7	11.0
- High school diploma	21.2	17.3	22.6
- PSE below a bachelor's degree	38.7	28.9	42.1
- PSE at least a bachelor's degree	29.4	44.1	24.4
Proportion of individuals with STEM at postsecondary education	21.7	27.8	19.5
Proportion of individuals obtained highest educational attainment abroad	15.2	59.6	N/A
Proportion of individuals with			
- neither parent completed HS diploma	24.8	26.7	24.1
- at least one parent with HS diploma	36.6	30.8	38.5
- at least one parent with any PSE	36.8	41.2	35.3
- missing information on parental education	1.9	1.2	2.1
Number of books at home			
- <101 books	31.4	38.3	29.0
- 101–200 books	34.0	31.4	34.9
- >200 books	34.6	30.3	36.1
Average test scores			
Literacy	275.8	256.4	282.5
standard deviation	50.5	55.5	46.8
Numeracy	267.9	250.7	273.8
standard deviation	55.5	61.8	51.8
Employment status			
- full-time employed	64.2	62.2	65.0

	All respondents	Immigrants	Canadians
- part-time employed	11.7	11.4	11.8
- unemployed	5.7	6.8	5.3
- out of labour force	18.4	19.6	18.0

Findings

Tables 2 and 3 (see Appendix) present the results of the MNL regression estimation. Only the results for those who are unemployed (across the entire sample) are presented.⁶ Results are for Canadians completing the 2012 PIAAC aged 22 to 59. We focus on the impact of the probability of being unemployed while being an immigrant, but the results are for the more general population. The results for women are for all women in Canada, not just immigrant women.

The results for being unemployed and not being in the labour force are very similar so we will focus on the unemployed results.⁷ Everything has basically the same sign (positive/negative) and significance so the results for those not in the labour force are essentially the same as the results for the unemployed except that women are significantly more likely to not participate in the labour force.

Model 1 – Base Model

The column labelled “Model 1” is repeated for convenience in both Appendix Tables 2 and 3. This shows the raw impact on unemployment from being an immigrant. The significant and positive result (0.292, $p < 0.05$) shows that without considering any additional factors, the probability of being unemployed (relative to being full-time employed) is greater for immigrants. Interpretation of MNL results is generally restricted to sign (positive or negative) and significance and is seen as the impact (increase when positive, decrease when negative) on the probability if all other variables are held constant. To help with interpretation, relative risk ratios (RRR) were estimated. They provide a more informative estimate of the impact on the probability but do not provide more generally interpretable results.⁸ The RRR results for Model 1 show that without any controls immigrants are 34% more likely to be unemployed than the non-immigrant population.

⁶ We also have results for part-time workers. They are not included here but are available from the authors on request. Most of the results are not statistically significant. What is significant is that a person is more likely to be part time if female and less likely to be part time as they get older. Those with a postsecondary STEM degree are also less likely to be working part time. Immigrant status or years since migration are not significant.

⁷ Results for not participating in the labour force are in the appendix.

⁸ RRR results are available from the authors on request.

Table 2 presents the results when the average score for literacy skills is included, and Table 3 presents the same results for numeracy skills.⁹ Both cannot be estimated in the same regression because they are highly correlated. The results shown in columns Model 2, Model 3 and Model 4 are different between the two tables, but are very similar. The results will be discussed based on Table 2 (literacy) with any significant differences noted for the numeracy results, as these will not be discussed separately.

Model 2 – Immigrant Status and Skills Score

When skills score is included with immigrant status, immigrant status is no longer significant but skills score (for either literacy or numeracy) is negative and significant — the higher someone’s score, the less likely the probability that they will be unemployed (literacy: -0.447, $p < 0.001$; numeracy: -0.532, $p < 0.001$). Immigrant status is still positive to unemployment (0.049) but not statistically significant. Given that no other controls are included and that on average immigrants have lower scores, immigrants are still more likely to be unemployed. These results indicate that lower skills scores relate to higher unemployment for everyone and that the effect of this is strong enough to overwhelm immigrant status. Low-skilled immigrants have higher unemployment — just like everyone else — but they don’t face additional (significant) unemployment risk from being an immigrant, other than the increased risk from having a lower average skill score.

Model 3 – Demographic and Family Control Factors

The addition of demographic factors (gender, age, age-squared, parental education, number of books) shows that age and age-squared are significant with those who are older having a lower probability of being unemployed (-0.169, $p < 0.001$) but with decreasing returns (0.002, $p < 0.001$ for age-squared). As a reminder, the sample only includes those aged 22 to 59. Being female is not associated with a greater probability for unemployment. While not reported here, the results (available from the authors on request) do show being female is significantly related to higher probabilities of working part time and not participating in the labour force. Parental education is not statistically significant. Individuals from households with over 200 books are less likely to be unemployed (-0.331, $p < 0.05$). The same general trend appears when numeracy skills are considered (-0.297, not significant). Again, immigrant status is not significant in these estimates, but literacy and numeracy skill scores remain negative and significant (literacy: -0.422, $p < 0.001$; numeracy: -0.510, $p < 0.001$). The reasoning is the same as previously discussed. Without additional controlling factors, lower skills are associated with greater probability of unemployment, but immigrant status doesn’t add additional risk beyond the already lower average skill scores.

⁹ All plausible values and replicates were taken into account to derive coefficients and jackknifed standard errors as suggested by Statistics Canada. The Mowat Centre used the *Repest* package to generate these results.

Model 4 – Human Capital Control Factors

With the addition of individual human capital characteristics (years since migration, age-squared, educational attainment, STEM field, foreign degree), more of the variation in unemployment is explained and, as expected, the additional controls result in accounting for differences so that immigrant status is significantly and positively associated with an increased probability of being unemployed (literacy: 1.507, $p < 0.001$; numeracy: 1.476, $p < 0.001$). The RRR results¹⁰ show that with the controlling factors included, immigrants are 3.5 times more likely to be unemployed; everything else held constant (same for literacy and numeracy). The MNL estimates continue to show that higher skills scores reduce the probability of unemployment (literacy: -0.267, $p < 0.01$; numeracy: -0.368, $p < 0.001$), but with the additional controls, the impact isn't as great since some of the other human capital measures are accounting for more individual differences. Being female remains insignificantly related to unemployment probability. Age and age-squared are, as before, with higher ages being associated with lower unemployment probability (literacy: -0.143, $p < 0.001$; numeracy: -0.145, $p < 0.001$) but with decreasing returns to the age benefit (literacy: 0.002, $p < 0.001$; numeracy: 0.001, $p < 0.001$). Years since migration shows a similar pattern: The longer an immigrant has been in Canada, the lower the probability that she/he is unemployed. However, that effect also decreases over time. The results for literacy and numeracy are -0.114, $p < 0.001$ and 0.002, $p < 0.01$ (identical for both).

For educational attainment, not having a high school diploma increases the probability of being unemployed (literacy: 0.568, $p < 0.01$; numeracy: 0.512, $p < 0.01$) while having some postsecondary is negative to unemployment probability but not significant. Having at least a bachelor's degree is associated with a lower probability of unemployment but only for literacy skills (-0.480, $p < 0.05$). It is negative but not significant when numeracy skills are considered. The implication is that strong numeracy skills may result in less dependence on the degree credential for employment outcomes. However, that is not the case for STEM degrees which, when present, lower the probability of unemployment (literacy: -0.411, $p < 0.01$; numeracy: -0.343, $p < 0.05$). Having a foreign-granted degree is not significantly related to unemployment probability, but is negative. Given that nearly 60% of immigrants with a degree have it from abroad, the positive relationship between immigrant status and unemployment probability already accounts for much of that variation. This result could be seen as shading the immigrant status result: being an immigrant greatly increases probability of unemployment; having a foreign degree slightly decreases the probability. Since the result is not significant, nothing definitive can be said about this. The result is counterintuitive and may be explained within the entire context of the MLN estimation and is something that could be investigated

¹⁰ RRR results are available from the authors on request.

further especially in the skills context considered here. None of the other factors (family characteristics, number of books) are significant in either the literacy or numeracy results.

The results show that:

- Immigrants have higher unemployment (overall).
- When just controlling for skill level (measured using the international objective standard), the results for skill level are significant and show decreased probability of unemployment with increased skill (literacy or numeracy) but immigrant status is not significant.
- However, when combined with the other controlling factors (demographics and human capital), immigrant status and skill level are both significant. With all controls included, immigrants are 3.5 times more likely to be unemployed than non-immigrants with everything else held constant.¹¹
- Skill level with demographic and human capital controls has an influence on immigrant employment outcomes.

The goal of this research was to use this new PIAAC data set to learn something new about immigrant employment outcomes and skills. What we learned is that demonstrated skill level should also be taken into account along with demographic, family and human capital factors when considering immigrant labour outcomes. By using this more advanced technique (MNL) combined with this data set, we were able to look at labour market outcomes as discrete possibilities and investigate the impact of selected factors on each of those labour market outcomes. We found that being an immigrant results in a much higher probability of being unemployed even after a wide variety of factors were controlled for, including objectively measured skill level (literacy or numeracy).

¹¹ Based on the RRR results which are not reported in detail here but are available from the authors on request.

Conclusion

This paper examined the impact of a variety of factors on the likelihood of employment of immigrants compared to Canadian-born workers. Using the PIAAC assessment of basic skills, including literacy and numeracy (OECD, 2016), we compared employment outcomes of immigrants and the Canadian-born. We also explored the impact of other demographic factors (age, sex, parental education) as well as human capital controls (educational attainment, fields of study and years since immigration).

Our study found that immigrants were 3.5 times more likely to be unemployed compared to Canadian-born adults even when skill levels, demographics and human capital are taken into account. Among immigrants, the probability of being unemployed decreases with a standard deviation increase in skills controlling for other factors, such as age, years since immigration, education and particularly having a degree in STEM.

While skill level and education advance prospects for immigrants, the gap between immigrants and Canadian-born adults reinforces the results of other research, which suggest that significant barriers exist for immigrants. While being female increases the probability of not being in the labour force, it is not a significant differential for being unemployed. While test scores tend to correlate positively to higher levels of education, the impact of skill scores on employment outcomes is significant only within the broader context of the demographic and human capital controlling factors.

These findings raise a number of questions that should be further explored.

1. What are the mechanics that account for the positive impact of skill test scores on immigrant outcomes? How are employer recruitment and screening processes assessing skills?
2. Are there other relationships between factors underlying the results? For example, does place of origin have an impact on the pattern of employment outcomes?
3. Several dimensions of skills are not captured by the current test — i.e., verbal communication skills. How can we identify and measure the impact of these?
4. Are employers discriminating based on names and other markers as a proxy for written, verbal and language communications skills?

The policy implications of these findings should be further explored. For example,

1. New approaches to skills assessment might provide an alternative to other forms of credential assessment and credits for immigrants.

2. Microcredentials, which offer credentialing and “proof” of specific skills at a much more finely grained level than a typical certificate or degree credential, might offer an alternative to detailed skills testing.
3. More rigorous and specific assessments of skill testing outcomes could increase accountability of service-providing organizations that have uneven outcomes in terms of supporting immigrant skills development to improve employment outcomes.

While other research has shown that there is a relationship between test scores and labour market outcomes measured by income (e.g., Ferrer, Green & Riddell, 2006; Truong & Sweetman, 2018; Hanushek, Schewerdt, Wiederhold & Woessmann, 2015), there are clearly significant gaps between the probability of employment for immigrants and Canadian-born adults. Additionally, our research shows that numeracy and literacy scores are highly correlated, but when only numeracy scores are considered the impact of a postsecondary degree is not a significant influence on immigrant employment outcomes. This reinforces arguments that testing for competencies could be an alternative to assessing international credentials. The findings also reinforce previous research suggesting that international credentials are undervalued.

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Appendix

Table 1: Multinomial Logistic Results (Literacy)

	Dependent variable: Subjective employment status Regression model: Multinomial Logistic			
	Constant model	Literacy is included		
	Model 1	Model 2	Model 3	Model 4
Full-time employment	Base outcome			
N (rounded)	20,100	20,100	20,100	20,100
χ^2	24.80	406.17	35030264.61	35030837.03
Unemployed	Model 1	Model 2	Model 3	Model 4
Immigrant	0.292* (0.120)	0.049 (0.126)	0.069 (0.127)	1.507*** (0.287)
Literacy Score		-0.447*** (0.060)	-0.422*** (0.067)	-0.267** (0.082)
Female			0.178 (0.108)	0.141 (0.112)
Age			-0.169*** (0.038)	-0.143*** (0.040)
Age ²			0.002*** (0.000)	0.001** (0.000)
Years since migration				-0.114*** (0.029)
Years since migration ²				0.002** (0.001)
- Below HS				0.568** (0.178)
- PSE below university				-0.165 (0.173)
- PSE at least a bachelor's degree				-0.480* (0.210)
Individuals with STEM degree at PSE				-0.411** (0.154)
Individuals graduated with a foreign degree				-0.327 (0.244)
Family Characteristics				
- Neither of parents completed HS			0.299 (0.153)	0.197 (0.150)
- (Any) PSE education is the highest between the two parents			0.034 (0.148)	0.109 (0.153)
- Individuals missing parental education			0.514 (0.357)	0.351 (0.353)
101–200 books			-0.014 (0.139)	0.016 (0.139)
> 200 books			-0.331* (0.155)	-0.291 (0.155)
Constant	-2.508*** (0.056)	-2.497*** (0.055)	1.299 (0.692)	0.829 (0.738)

* p < 0.05; ** p < 0.01, *** p < 0.001, **** p < 0.0001
Standard errors in parenthesis.

Table 2: Full Results — Literacy

	Dependent variable: Subjective employment status Regression model: Multinomial Logistic			
	Constant model	Literacy is included		
	Model 1	Model 2	Model 3	Model 4
Full-time employment	Base outcome			
N (rounded)	20,100	20,100	20,100	20,100
χ^2	24.80	406.17	35030264.61	35030837.03
Part-time	Model 1	Model 2	Model 3	Model 4
Immigrant	0.015 (0.094)	-0.043 (0.096)	-0.012 (0.095)	0.398 (0.272)
Literacy score		-0.118* (0.046)	-0.142** (0.053)	-0.056 (0.061)
Female			1.310*** (0.090)	1.215*** (0.094)
Age			-0.225*** (0.030)	-0.220*** (0.031)
Age ²			0.003*** (0.000)	0.003*** (0.000)
Years since migration				-0.020 (0.023)
Years since migration ²				0.000 (0.000)
- Below HS				0.249 (0.147)
- PSE below university				0.065 (0.107)
- PSE at least a bachelor's degree				-0.255* (0.127)
Individuals with STEM degree at PSE				-0.526*** (0.120)
Individuals graduated with a foreign degree				-0.014 (0.199)
Family characteristics				
- Neither parent completed HS			0.036 (0.098)	0.000 (0.098)
- (Any) PSE education is the highest between the two parents			-0.026 (0.086)	0.025 (0.086)
- Individuals missing parental education			0.177 (0.303)	0.110 (0.299)
101–200 books			0.000 (0.086)	0.012 (0.086)
> 200 books			0.244* (0.098)	0.269** (0.099)
Constant	-1.707*** (0.036)	-1.688*** (0.037)	1.918*** (0.568)	1.891** (0.582)
Unemployed	Model 1	Model 2	Model 3	Model 4
Immigrant	0.292* (0.120)	0.049 (0.126)	0.069 (0.127)	1.507*** (0.287)
Literacy Score		-0.447*** (0.060)	-0.422*** (0.067)	-0.267** (0.082)
Female			0.178 (0.108)	0.141 (0.112)

	Dependent variable: Subjective employment status Regression model: Multinomial Logistic			
	Constant model	Literacy is included		
	Model 1	Model 2	Model 3	Model 4
Age			-0.169*** (0.038)	-0.143*** (0.040)
Age^2			0.002*** (0.000)	0.001** (0.000)
Years since migration				-0.114*** (0.029)
Years since migration ^2				0.002** (0.001)
- Below HS				0.568** (0.178)
- PSE below university				-0.165 (0.173)
- PSE at least a bachelor's degree				-0.480* (0.210)
Individuals with STEM degree at PSE				-0.411** (0.154)
Individuals graduated with a foreign degree				-0.327 (0.244)
Family characteristics				
- Neither parent completed HS			0.299 (0.153)	0.197 (0.150)
- (Any) PSE education is the highest between the two parents			0.034 (0.148)	0.109 (0.153)
- Individuals missing parental education			0.514 (0.357)	0.351 (0.353)
101–200 books			-0.014 (0.139)	0.016 (0.139)
> 200 books			-0.331* (0.155)	-0.291 (0.155)
Constant	-2.508*** (0.056)	-2.497*** (0.055)	1.299 (0.692)	0.829 (0.738)
Not in Labour Force	Model 1	Model 2	Model 3	Model 4
Immigrant	0.130 (0.077)	-0.020 (0.075)	0.058 (0.076)	1.392*** (0.202)
Literacy Score		-0.290*** (0.035)	-0.302*** (0.041)	-0.133** (0.048)
Female			0.959*** (0.071)	0.955*** (0.073)
Age			-0.402*** (0.023)	-0.383*** (0.024)
Age^2			0.005*** (0.000)	0.005*** (0.000)
Years since migration				-0.098*** (0.015)
Years since migration ^2				0.001*** (0.000)
- Below HS				0.527*** (0.124)
- PSE below university				-0.285** (0.110)
- PSE at least a bachelor's degree				-0.610*** (0.120)
Individuals with STEM degree at PSE				-0.237* (0.101)

	Dependent variable: Subjective employment status			
	Regression model: Multinomial Logistic			
	Constant model	Literacy is included		
	Model 1	Model 2	Model 3	Model 4
Individuals graduated with a foreign degree				-0.192 (0.138)
Family characteristics				
- Neither parent completed HS			0.138 (0.087)	0.033 (0.090)
- (Any) PSE education is the highest between the two parents			-0.053 (0.089)	0.022 (0.089)
- Individuals missing parental education			0.515** (0.182)	0.384* (0.190)
101–200 books			-0.044 (0.083)	-0.014 (0.088)
> 200 books			0.175* (0.085)	0.225* (0.091)
Constant	-1.285*** (0.034)	-1.258*** (0.034)	6.129*** (0.476)	5.805*** (0.487)

Table 3: Multinomial Logistic Results (Numeracy)

	Dependent variable: Subjective employment status			
	Regression model: Multinomial Logistic			
	Constant model	Numeracy is included		
	Model 1	Model 2	Model 3	Model 4
Full-time employment	Base outcome			
N (rounded)	20,100	20,100	20,100	20,100
χ^2	24.80	654.63	35030400.73	35030907.66
Unemployed	Model 1	Model 2	Model 3	Model 4
Immigrant	0.292* (0.120)	0.055 (0.125)	0.068 (0.126)	1.476*** (0.287)
Numeracy Score		-0.532*** (0.064)	-0.510*** (0.069)	-0.368*** (0.083)
Female			0.073 (0.104)	0.074 (0.111)
Age			-0.170*** (0.039)	-0.145*** (0.041)
Age^2			0.002*** (0.000)	0.001** (0.001)
Years since migration				-0.114*** (0.029)
Years since migration ^2				0.002** (0.001)
- Below HS				0.512** (0.173)
- PSE below university				-0.151 (0.173)
- PSE at least a bachelor's degree				-0.415 (0.212)

	Dependent variable: Subjective employment status			
	Regression model: Multinomial Logistic			
	Constant model	Numeracy is included		
	Model 1	Model 2	Model 3	Model 4
Individuals with STEM degree at PSE				-0.343* (0.154)
individuals graduated with a foreign degree				-0.345 (0.241)
Family characteristics				
- Neither of parents completed HS			0.291 (0.153)	0.197 (0.150)
- (Any) PSE education is the highest between the two parents			0.071 (0.147)	0.126 (0.152)
- Individuals missing parental education			0.477 (0.350)	0.327 (0.348)
101 - 200 books			0.014 (0.138)	0.038 (0.139)
> 200 books			-0.297 (0.156)	-0.261 (0.156)
Constant	-2.508*** (0.056)	-2.513*** (0.057)	1.310 (0.700)	0.849 (0.741)

* p < 0.05; ** p < 0.01, *** p < 0.001, **** p < 0.0001

Standard errors in parenthesis.

Table 4: Full Results — Numeracy

	Dependent variable: Subjective employment status			
	Regression model: Multinomial Logistic			
	Constant model	Numeracy is included		
	Model 1	Model 2	Model 3	Model 4
Full-time employment	Base outcome			
N (rounded)	20,100	20,100	20,100	20,100
χ^2	24.80	654.63	35030400.73	35030907.66
Part-time	Model 1	Model 2	Model 3	Model 4
Immigrant	0.015 (0.094)	-0.083 (0.096)	-0.025 (0.095)	0.378 (0.273)
Literacy Score		-0.248*** (0.044)	-0.214*** (0.053)	-0.129* (0.061)
Female			1.263*** (0.090)	1.189*** (0.095)
Age			-0.224*** (0.030)	-0.220*** (0.031)
Age ²			0.003*** (0.000)	0.003*** (0.000)
Years since migration				-0.020 (0.023)
Years since migration ²				0.000 (0.000)
- Below HS				0.204 (0.147)
- PSE below university				0.075 (0.108)

	Dependent variable: Subjective employment status Regression model: Multinomial Logistic			
	Constant model	Numeracy is included		
	Model 1	Model 2	Model 3	Model 4
- PSE at least a bachelor's degree				-0.209 (0.129)
Individuals with STEM degree at PSE				-0.499*** (0.120)
Individuals graduated with a foreign degree				-0.041 (0.196)
Family characteristics				
- Neither parent completed HS			0.024 (0.099)	-0.005 (0.099)
- (Any) PSE education is the highest between the two parents			-0.007 (0.087)	0.032 (0.087)
- Individuals missing parental education			0.139 (0.301)	0.087 (0.299)
101–200 books			0.022 (0.086)	0.028 (0.086)
> 200 books			0.277** (0.097)	0.294** (0.098)
Constant	-1.707*** (0.036)	-1.679*** (0.037)	1.912*** (0.571)	1.891** (0.584)
Unemployed				
Immigrant	0.292* (0.120)	0.055 (0.125)	0.068 (0.126)	1.476*** (0.287)
Literacy Score		-0.532*** (0.064)	-0.510*** (0.069)	-0.368*** (0.083)
Female			0.073 (0.104)	0.074 (0.111)
Age			-0.170*** (0.039)	-0.145*** (0.041)
Age^2			0.002*** (0.000)	0.001** (0.001)
Years since migration				-0.114*** (0.029)
Years since migration ^2				0.002** (0.001)
- Below HS				0.512** (0.173)
- PSE below university				-0.151 (0.173)
- PSE at least a bachelor's degree				-0.415 (0.212)
Individuals with STEM degree at PSE				-0.343* (0.154)
Individuals graduated with a foreign degree				-0.345 (0.241)
Family characteristics				
- Neither parent completed HS			0.291 (0.153)	0.197 (0.150)

	Dependent variable: Subjective employment status Regression model: Multinomial Logistic			
	Constant model	Numeracy is included		
	Model 1	Model 2	Model 3	Model 4
- (Any) PSE education is the highest between the two parents			0.071 (0.147)	0.126 (0.152)
- Individuals missing parental education			0.477 (0.350)	0.327 (0.348)
101–200 books			0.014 (0.138)	0.038 (0.139)
> 200 books			-0.297 (0.156)	-0.261 (0.156)
Constant	-2.508*** (0.056)	-2.513*** (0.057)	1.310 (0.700)	0.849 (0.741)
Not in Labour Force	Model 1	Model 2	Model 3	Model 4
Immigrant	0.130 (0.077)	-0.029 (0.076)	0.067 (0.076)	1.379*** (0.200)
Literacy score		-0.379*** (0.035)	-0.353*** (0.040)	-0.194*** (0.048)
Female			0.884*** (0.072)	0.919*** (0.074)
Age			-0.403*** (0.023)	-0.384*** (0.024)
Age^2			0.005*** (0.000)	0.005*** (0.000)
Years since migration				-0.098*** (0.015)
Years since migration ^2				0.001*** (0.000)
- Below HS				0.492*** (0.124)
- PSE below university				-0.279* (0.110)
- PSE at least a bachelor's degree				-0.573*** (0.120)
Individuals with STEM degree at PSE				-0.198 (0.103)
Individuals graduated with a foreign degree				-0.208 (0.138)
Family characteristics				
- Neither parent completed HS			0.135 (0.086)	0.031 (0.090)
- (Any) PSE education is the highest between the two parents			-0.031 (0.089)	0.031 (0.090)
- Individuals missing parental education			0.496** (0.179)	0.369 (0.189)
101–200 books			-0.028 (0.083)	-0.000 (0.087)
> 200 books			0.191* (0.085)	0.242** (0.091)
Constant	-1.285*** (0.034)	-1.263*** (0.034)	6.152*** (0.482)	5.818*** (0.492)



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