
The Effect of Literacy on Immigrant Earnings

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ABSTRACT

We examine the impact of literacy on immigrant earnings and the sources of lower returns to education and experience among immigrants. We find that the native-born literacy distribution dominates that for immigrants. However, the two groups obtain similar returns to literacy skills, contrary to discrimination-based explanations for immigrant—native-born earnings differentials. Among the university-educated, literacy differences account for about two-thirds of the earnings gap. However, low returns to foreign experience have a larger impact on this differential. Among the less educated, literacy differences and differences in the returns to experience have similar effects on the earnings differential.

I. Introduction

Immigrant recipient countries devote considerable research effort to understanding earnings differences between immigrant and native-born workers (see Chiswick 1978; Borjas 1985, 1995 for the United States, and Baker and Benjamin 1994; Bloom, Grenier, and Gunderson 1995 for Canada). These studies establish that, in general, immigrants earn less than native-born workers with the same amount of education and work experience. The low earnings of immigrants are often attributed to the specificity of human capital to the country where it originates. Skills generated

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through education or work experience in the source country cannot be directly transferred to the host country, resulting in apparently well-qualified immigrants holding low-paying jobs. Of course, this is not the only potential explanation for lower immigrant earnings. Another possibility is that host-country employers discriminate against immigrants, that is, pay immigrant workers less than equally productive native-born workers. Investigating these issues would be straightforward if we had access to direct measures of skill. In that case, we could compare native-born and immigrant workers with the same levels of education and experience to see whether the immigrants in fact have lower skill levels, supporting the first hypothesis. Alternatively, we could observe whether immigrants get a lower return to their observed skills, supporting the second hypothesis. In this paper, we take advantage of rich data on immigrants from Ontario (the Ontario Immigrant Literacy Survey or OILS) that includes both standard demographic and labor market information and results from literacy and numeracy tests. Interpreting the literacy test scores as direct measurements of cognitive skills, we are able to provide a closer examination of explanations for low immigrant earnings than has previously been possible. In addition, the data include more precise information on where education was obtained and age of migration than is available in most previous studies, further refining our ability to scrutinize immigrant—native-born earnings differentials.

The primary goal of the paper is to provide answers to three questions related to immigrants' skills. First, are immigrant literacy skills different from those of the native-born and, if so, in what way? Second, do immigrants receive different returns to these skills than observationally similar native-born workers? Third, can differences in levels and returns to these skills explain differences in earnings between immigrant and native-born workers?

Our approach builds on recent contributions that stress the need to account carefully for where education and experience was acquired in examining immigrant earnings. Using Israeli data, Friedberg (2000) finds that lower immigrant earnings compared to native-born workers with similar education and experience can be explained almost entirely by lower returns to experience acquired outside of Israel. This is true in particular for non-European immigrants. Similarly, Green and Worswick (2002) find zero returns to foreign experience for recent immigrant cohorts but show that, in Canada's case, this is a change from the early 1980s when immigrants earned returns to foreign experience that were similar to what the native-born received for domestically acquired experience. Much of this change over time is related to changes in the source country composition of the inflow. Schaafsma and Sweetman (2001) and Ferrer and Riddell (2003) examine the issue of lower returns to foreign-acquired education in a somewhat indirect way by using age at immigration.¹ Both papers find that returns to foreign education, while lower than those to Canadian education, are still substantial. As we stated earlier, the OILS has advantages over the data used in these studies because it includes direct measures of foreign-acquired education and age of arrival information that enables measurement of foreign experience. Part of the contribution of this paper is to reexamine, using

1. The Canadian Census—the data used in most immigration studies—has no information about the origin of human capital. In addition, the age of arrival variable is coded in intervals, which complicates the imputation of measures of pre and postmigration experience.

better data, issues raised in earlier studies about returns to foreign experience and education.

This paper also builds on Green and Riddell (2003) who use the International Adult Literacy Survey (IALS) to examine the role of cognitive skills in Canadian earnings patterns. Like the OILS, the IALS contains both standard survey questions and literacy tests. Green and Riddell (2003) argue that the IALS literacy questions are particularly conducive to using the literacy scores as measures of cognitive skills possessed by the respondent at the time of the survey. Based on this assumption, they argue that much can be learned about how skills influence earnings from an analysis of interactions of the literacy measures and standard human capital variables. They use an hedonic model in which earnings are determined by the basic skills an individual possesses and the implicit prices of those skills. We adopt a similar interpretative framework here and, in fact, use a sample of native-born workers from the IALS data to provide a comparison group for the immigrants observed in OILS.

While the OILS data has several substantial advantages over earlier data sets, it also has two deficiencies. First, it is a single cross-section, making it impossible to use standard panel data techniques for separating time-in-the-host-country effects from cohort effects. Thus, our time-since-arrival estimates potentially represent a combination of these two effects. Since, as we will see, introducing literacy variables has very little impact on the coefficients relating to experience and time-since-arrival variables, we do not believe this raises substantial issues for our analysis. Nonetheless, it does mean our results are weaker in one dimension than other papers. Second, OILS does not contain variables that can reasonably be used as instruments for either the education or literacy variables. This means that any behavioral interpretations from our estimates require assumptions about the error term that imply that the education and literacy variables can be treated as exogenous. We argue below that the required assumptions are somewhat weaker than what is required to be able to treat education alone as exogenous in an earnings regression context. These assumptions are also consistent with the standard approach to immigrant earnings determination where education is almost universally treated as exogenous.

One other Canadian data set with a direct measure of prearrival education is the 1989 Literacy Skills Used in Daily Activities (LSUDA) survey used by Alboim, Finnie and Meng (2003). Our paper differs from theirs in several respects. First, while Alboim, Finnie, and Meng (2003) focus on returns to foreign education and experience using literacy as essentially an extra control, we focus mainly on the impact of literacy on earnings. Thus, our analysis complements rather than substitutes for theirs. Second, LSUDA is a nationwide survey that does not over-sample immigrants, which results in a sample of only 251 immigrants. This precludes detailed examinations of the more complex impacts of foreign experience and education on Canadian earnings.² In contrast, the OILS surveyed only immigrants, providing us with a sample of about 1350 immigrants. Third, LSUDA contains information on total annual income rather than earnings. OILS and IALS contain information on earnings, which is more closely related to the human capital explanations we seek to investigate.

Our results imply that the answer to our first main question—Do immigrant literacy skills differ from those of the native-born?—is Yes. The native-born test score dis-

2. The same small sample problem arises with the IALS data set, which has around 200 immigrants.

tributions dominate those for immigrants and immigrants have lower average test scores than observationally equivalent native-born workers. However, much of the gap stems from a set of immigrants with test scores so low that they suggest language difficulties. Further, while cognitive skill levels and experience are not significantly correlated for the native-born, immigrant test scores rise with Canadian experience. This is consistent with literacy tests capturing “usable” cognitive skills that incorporate the ability to communicate in English or French. Regardless of these differences in cognitive skill levels and acquisition, however, we easily reject the hypothesis that immigrants and the native-born receive different returns to these literacy skills. This evidence appears to contradict a discrimination explanation for differences in earnings between immigrant and native-born workers, at least in the dimension related to cognitive skills.

Our earnings results support earlier findings that returns to foreign-acquired education and experience for immigrants are lower than returns to education and experience obtained in Canada by either immigrants or the native-born. Indeed, low returns to foreign experience appear to play a major role in explaining immigrant earnings deficiencies relative to native-born workers. This pattern in returns to experience does not change once we control for literacy, indicating that the root of the problem does not lie in foreign experience generating lower cognitive skills. Literacy itself affects earnings significantly with a 100 point increase in the literacy score (equivalent to about 1.5 standard deviations in the literacy score distribution) generating an earnings increase equivalent to moving from being a high school dropout to being a university graduate. Differences in literacy between immigrants and the native-born explain part of the immigrant earnings differential. Among the less educated, literacy differences account for as much of the earnings gap as the lower returns to foreign experience received by immigrants. For university graduates we estimate that raising immigrant literacy skills to the native-born level would reduce the immigrant earnings gap by about two-thirds. However, increasing immigrant returns to foreign experience to equal the returns to experience among the native-born would have a much larger effect, turning the immigrant disadvantage into an advantage. Thus, among the most educated, literacy differences between immigrants and the native-born have important impacts on earnings differentials but they are not as important as differences in returns to foreign experience. Interestingly, though, our results indicate that differences in returns to foreign versus Canadian-acquired university education are entirely explained by foreign universities generating lower levels of (Canadian-usable) literacy.

The paper is organized as follows. The next section presents a framework for considering what we might learn from introducing literacy skills measures into a standard earnings equation. In the third section, we discuss our data and present basic data patterns. The fourth section contains the analysis of immigrant earnings. The final section concludes.

II. A Framework for Discussing Earnings Generation

The earnings generation framework borrows from Green and Riddell (2003). They distinguish among attributes/skills—personal characteristics that can be acquired by the worker and enhance individual earnings—and abilities—innate,

productive characteristics. In that framework, we can represent the earnings of an individual by:

$$(1) \quad E_i = f(G_{1i}, \dots, G_{ki}) + e_i$$

where E_i are earnings for individual i , G_{ki} is the amount of skill k that person i sells in the market, and e_i is a disturbance term that is independent of the skills. The skills could include cognitive skills of the type measured in literacy tests, other (perhaps manual) attributes that are not captured in such tests, and noncognitive characteristics such as persistence.

Characterizing the earnings function would be relatively straightforward if we observed the skills, G_{ki} . Typically, of course, we do not observe them. What we do observe are some of the inputs used in generating the skills, which are related to those skills through production functions:

$$(2) \quad G_{ki} = h_k(edn_i, exp_i, \theta_{ki})$$

where edn is a set of dummy variables representing levels of formal schooling, exp is years of work experience and θ_k is an ability specific to the production of the k th attribute. We then obtain an estimating equation by substituting Equation 2 into Equation 1. This yields a reduced form specification for earnings as a function of schooling and experience. The ability variables are unobserved and thus end up in the error term. Assuming that we have a measure for the cognitive skills through the literacy variable and characterizing f and h using first or second order polynomials in observable variables, we arrive at an earnings regression:

$$(3) \quad E_i = \beta_0 + \beta_1 edn_i + \beta_2 exp_i + \beta_3 exp_i^2 + \beta_4 edn_i * exp_i + \beta_5 G_{1i} + \beta_6 G_{1i}^2 + \beta_7 G_{1i} * edn_i + \beta_8 G_{1i} * exp_i + u_i$$

where G_{1i} corresponds to our measure of literacy, the β s are either scalars or vectors of parameters as appropriate and u is an error. Notice that the β s reflect the combination of how a covariate contributes to production of each of the skills and how the skills contribute to earnings generation.

The framework set out to this point could be considered the relevant earnings generation model for a native-born individual. We assume that immigrants use the same sets of attributes to generate earnings in the Canadian labor market. However, immigrants could differ from the native-born in the returns they obtain from a given set of attributes (different $f(\cdot)$ functions) and in the production functions for creating individual attributes (different $h(\cdot)$ functions). Differences in the $f(\cdot)$ function between immigrants and the native-born correspond to discrimination in this model since they represent differences in earnings among workers who are in fact equally productive.³ A standard claim in the immigrant earnings literature is that credentials problems and mismatches in technological requirements imply that education and experience obtained in most other countries will not be as productive in Canada as Canadian edu-

3. It is tempting to think that differences between immigrants and the native-born in the coefficients on the noninteracted G_{1i} terms (that is, β_5 and β_6) provide direct evidence of discrimination. However, this interpretation need not hold if interactions of G_{1i} with exp and edn are significant. Thus, one could observe different coefficients related to G_{1i} between immigrants and the native-born because exp is differentially productive in creating other attributes for the two groups.

cation and experience. This raises the possibility that we should consider both separate measures of education and experience obtained abroad and separate $h(\cdot)$ functions for immigrants. When we do so, our specification becomes:

$$(4) \quad E_i = \beta_0^I + \beta_1^I \text{edn}_i + \beta_2^I \text{exp}_i + \beta_3^I \text{exp}_i^2 + \beta_4^I \text{edn}_i * \text{exp}_i + \beta_5^I G_{1i} + \beta_6^I G_{1i}^2 \\ + \beta_7^I G_{1i} * \text{edn}_i + \beta_8^I G_{1i} * \text{exp}_i + \beta_9^I \text{fedn}_i + \beta_{10}^I \text{fexp}_i + \beta_{11}^I G_{1i} * \text{fedn}_i \\ + \beta_{12}^I G_{1i} * \text{fexp}_i + \beta_{13}^I \text{fexp}_i * \text{fexp}_i + \beta_{14}^I \text{exp}_i * \text{fexp}_i + u_i$$

where, *fedn* and *fexp* correspond to education and experience obtained outside Canada. This specification allows for complex interactions among foreign obtained attribute inputs in the production of attributes. For example, the interaction of *fexp* and *exp* represents that possibility that immigrants are better able to translate their source country experience into earnings after they have more experience in Canada.

A key conclusion of the previous literature on immigrant earnings in both Canada and the United States is that more recent cohorts of immigrants have poorer earnings when compared with both earlier immigrants and native-born workers with the same measured levels of education and experience. With a single cross-section, we cannot separate effects of changes across immigrant cohorts from the effects of gradual adaptation to the Canadian labor market by new immigrants. The Canadian experience coefficients we estimate for immigrants will effectively combine true assimilation effects and the impact on earnings of differences across cohorts. Although this means we cannot decompose this feature of immigrant adaptation, we are still able to learn much about the immigrant experience and how it relates to measured literacy.

To this point we have not mentioned a key component of the immigrant assimilation experience: language skills. Using a variety of approaches to address potential endogeneity and measurement error issues, papers by Chiswick (1991), Chiswick and Miller (1995), Dustmann and Fabbri (2003), Berman, Lang, and Siniver (2003), Bleakley and Chin (2004) and Gonzalez (2005) find substantial effects of host-country language acquisition on immigrant earnings. In our framework, fluency in the host-country language can enter either as an attribute in its own right and/or as an input to the generation of other attributes. In the latter case, employers care only about the usable amounts of each attribute a worker possesses. Thus, an engineer who is well trained but cannot communicate with his or her employer or fellow employees would be counted as having zero usable engineering skills. Language proficiency then enters as an input into the production of usable attributes, with greater language ability leading to higher usable attributes for any given level of other inputs.

One possible approach with our data would be to treat the literacy variables as measures of reading fluency in English or French. However, the fact that the tests are mainly focussed on eliciting cognitive skill levels means that this simple interpretation of the literacy measures will not work. On the other hand, inability to answer the test would indicate a lack of reading fluency. In general, the literacy test scores for immigrants will reflect a combination of cognitive skill levels and language (reading) skills. We see no way to untangle these two factors. In what follows, we interpret literacy test scores for immigrants as capturing “usable” (in the Canadian labor market) cognitive skills.

Finally, the framework is useful for considering endogeneity issues. In either Equation 3 or 4, the error term will contain ability factors and, potentially, the interaction of those factors with skill inputs such as education and experience. As in

standard analyses of the endogeneity of schooling, if those ability factors are also inputs into choices about levels of schooling and skills then G_{1i} and edn_i are endogenous. It is interesting to consider the assumptions under which such an endogeneity problem does not exist. Assume that cognitive ability is only an input into generating cognitive skills (that is, it enters the G_{1i} production function but not those for G_{2i} and G_{3i}) and other types of ability do not help produce cognitive skills. Thus, for example, social ability does not help produce cognitive skills and cognitive ability does not help produce social skills. In that case, θ_{1i} does not enter the error term—it is fully captured in the included G_{1i} variable. Then, assuming the various types of ability are uncorrelated is sufficient to imply that G_{1i} is exogenous. Further, if schooling choices are related only to generation of cognitive skills (schooling may help create social skills but that is not why people choose to go to school, for instance) then education is also exogenous. These assumptions are strong but no stronger than what is assumed when researchers include measures of ability in earnings regressions to address the schooling endogeneity problem, and we do not view them as completely unreasonable. We would like to be able to test these assumptions by comparing our OLS estimates with instrumental variable estimates. However, as discussed in Green and Riddell (2003), the IALS (and OILS) data sets do not contain useful instruments. Thus, we are forced to rely on the OLS estimates. It is worth reiterating that this is no different from the rest of the immigrant earnings literature which rarely if ever addresses education endogeneity.

III. Data and Basic Patterns

Our main data source is the Ontario Immigrant Literacy Survey (OILS) carried out by Statistics Canada in 1998 to study the language and literacy skills of Ontario immigrants. We also use the Canadian version of the 1994 International Adult Literacy Survey (IALS) to provide a comparison between immigrants and the native-born. Both data sets are comparable and contain the results of literacy tests as well as labor market variables such as income, education and labor force status. The OILS, as its name suggests, contains only immigrants from Ontario and, in fact, only from urban areas in Ontario. We could try to match this data using an IALS sub-sample containing only native-born workers from urban areas in Ontario. However, this yields too small a native-born sample and, instead, we use a sample of native-born workers from urban areas throughout Canada. We include provincial dummy variables in our estimation to control for cross-province differences in earnings among the native-born.

Often, studies do not have particularly good measures of foreign education and experience so it is difficult to determine the impacts of these inputs.⁴ However, the OILS data contains direct questions on education obtained abroad and permits calculation of age at arrival as a continuous variable. This means we can construct reliable versions of both $fedn$ and $fexp$, where the former is based on directly reported information and the latter is constructed using the Mincer experience measure and information on foreign-acquired education and age at arrival.

4. Exceptions are Betts and Lofstrom (2000) and Bratsberg and Terrell (2002).

We keep only individuals who have positive earnings and whose age is between 16 and 65, and drop observations when we do not have information on earnings, age at arrival or education. Following much of the immigration literature we focus on males and leave for a separate study the analysis of female immigrants. Our combined native-born (that is, IALS based) and immigrant (that is, OILS based) sample has 2,015 observations of which 1,350 are immigrants. Both surveys are based on the Labour Force Survey (LFS) sample frame and we use the sample weights in our analysis.

Both the IALS and OILS contain data on annual earnings from paid and self-employment, weeks worked and usual hours per week. We use this data to construct weekly wages. However, it is worth noting that the earnings variable corresponds to the previous 12 months while weeks worked corresponds to the previous calendar year and, thus, there is imperfect overlap between the variables. We nonetheless use weekly wages because they come closer than annual earnings to the type of skill prices that we wish to examine. Doing so introduces measurement error in the dependent variable that should not introduce any biases in the estimated coefficients.⁵ Because the OILS and IALS data were collected four years apart, we adjust the earnings data from the IALS using the CPI to put them in comparable dollars to those recorded in the OILS.⁶ Of course, native-born and immigrant earnings could differ simply because 1993 and 1997 represent different conditions in the Canadian labor market. However, comparisons with estimates obtained from 1996 Census data, presented below, suggest that this problem is not substantial. Finally, both data sets provide measures of Document and Quantitative literacy. The Document questions, which are intended to assess capabilities in locating and using information in various forms, range from identifying percentages in categories in a pictorial graph to assessing an average price by combining several pieces of information. The Quantitative component ranges from simple addition of pieces of information on an order form to calculating the percentage of calories coming from fat in a Big Mac based on a nutritional table. Thus, the questions are related to problem-solving and implementation of skills in the real world rather than attempting to measure abilities in math and reading, and are intended to elicit both current capacities and adaptability to answering questions in other contexts (Statistics Canada, 1996). This is an important point for the interpretation of our results since we regard the test results as revealing job relevant skills at the time of the interview rather than inherent abilities. It is worth emphasizing that these skills are essentially cognitive in nature.

Green and Riddell (2003) find that the document and quantitative literacy scores are highly correlated in their IALS sample and, because of multicollinearity problems, work with a simple average of the individual literacy scores. In our data, both the native-born and immigrants who obtained their highest level of education before arriving in Canada exhibit correlations on the order of 0.87 between their document and quantitative scores. However, the correlation for male immigrants who obtained their highest level of education in Canada is only 0.67. This raises the possibility of separating different types of literacy effects, at least for the latter group. We present

5. Results using annual earnings and hourly wages are similar, and are available at <https://webdisk.ucalgary.ca/~aferrer/public.html>

6. The OILS was carried out in May 1998, and the annual earnings information refers to 1997. IALS annual earnings refers to 1993.

results using both an average literacy score and using separate document and quantitative scores.

The other main variables in our analysis are standard human capital measures plus variables related to language ability in English or French. Experience is the standard Mincer measure of potential experience (that is, age – years of schooling – six). Since we know the age at which immigrants entered Canada, we are able to divide immigrant experience into two components: foreign experience (age at arrival – years of schooling – six) and Canadian experience (age – age at arrival). We examine educational impacts using a series of dummy variables corresponding to high school graduates, nonuniversity postsecondary graduates, and those with a Bachelor's or higher university degree. The omitted category contains individuals with less than completed high school education.⁷ As mentioned earlier, a major advantage of the OILS data is that respondents are asked about the highest level of education they attained before migrating as well as their highest ultimate level of education. Based on this, we can ascertain whether, for example, an immigrant completed high school abroad and then obtained a postsecondary degree in Canada. We make use of this feature by dividing our analysis between immigrants who completed their education in Canada and those who completed it abroad. This distinction—which cannot be made very precisely in many data sets—turns out to be important.⁸

The survey also includes questions on language ability in English or French, all of which are self-reported. We use one that asks the respondent how well he can express himself in English or French. We create a dummy variable corresponding to either of the two lowest categories: not at all or poorly. Finally, we include dummy variables corresponding to the country of origin. One variable corresponds to immigrants from the United States or the United Kingdom, while the other corresponds to immigrants from continental Europe, with the rest of the world forming the omitted category. The earlier literature on immigrants indicates that there are strong source country effects and that immigrants from the United States and the United Kingdom adapt particularly well to the Canadian economy. We also tried further dividing the rest of the world but found no significant differences among immigrants from other regions.

Table 1 displays summary statistics of the main variables of interest. Immigrants have, on average, four more years of experience and report the same number of years of schooling as the native-born. However, the distribution of formal education among immigrants is superior to that for the native-born. The fraction of native-born workers with no postsecondary education is 66 percent, versus 49 percent among immigrants. Additionally, a larger fraction of immigrants has a university degree (29 percent) compared to native-born Canadians (14 percent).⁹ This apparent advantage in observable skills does not translate into higher income. Annual earnings are very similar for native-born and immigrant men. A plausible explanation for this puzzle, long recognized in the literature, is that the labor market may place a different value

7. Note that individuals who attended postsecondary institutions but have not graduated are classified as high school graduates if they have in fact graduated from high school.

8. Some individuals report obtaining a postsecondary degree both in Canada and abroad. We treat these cases as completing education in Canada.

9. The difference between the years of schooling and highest level of attainment arises because immigrants tend to have fewer years of schooling than native-born workers who are in the same educational category.

Table 1
Summary Statistics for Immigrant and Native-born Workers

	OILS 1998 and IALS 1994				Census 1996, Urban Ontario	
	Native-born (Ontario)	All	Immigrant		Native-born	Immigrant
			Canadian Education	Foreign Education		
Annual earnings	39,882	40,149	47,077	35,712	40,865	38,512
Hours worked	43	44	44	44	38	38
Weeks worked	48	49	49	49	46	46
Years of experience	19	23	18	26	17	22
Canadian	—	16	17	16	—	—
Foreign	—	7	1	10	—	—
Years of education	13	13	15	12	14	14
Education (percent)						
Less than high school	27	23	10	31	21	25
High school	39	26	21	29	27	19
Foreign	—	18	—	29	—	—
Canadian	—	8	21	—	—	—
Nonuniversity	20	22	31	16	30	32
Postsecondary						
Foreign	—	10	—	16	—	—
Canadian	—	12	31	—	—	—
University	14	29	38	24	22	24
Foreign	—	14	—	24	—	—
Canadian	—	15	38	—	—	—

Table 1 (continued)

	OILS 1998 and IALS 1994		Census 1996, Urban Ontario		
	Native-born (Ontario)	Immigrant			
		All	Canadian Education	Foreign Education	Native-born
Years since migration	—	26	16	—	19
Age at immigration	—	14	28	—	25
Document literacy	288	272	216	—	—
Quantitative literacy	285	289	244	—	—
Observations	275	527	823	7,437	16,125

Data sources: for Column 1 the 1994 International Adult Literacy Survey; for Columns 2 to 4 the Ontario Immigrant Literacy Survey, and for Columns 5 and 6 the 1996 Census public use file. Earnings are converted to 1997 dollars using the CPI.

on the experience and education of immigrant workers. Note that if we distinguish between the foreign and Canadian components of the experience and education variables, the “immigrant advantage” vanishes to some extent. For instance, the Canadian experience of immigrants (16 years) is less than the experience of native-born workers (19 years) and around one-half of the postsecondary educational degrees held by immigrants were obtained outside of Canada. Further, native-born workers have higher average document and quantitative literacy scores than immigrants. The immigrant—native-born gap is especially large for document literacy.

An interesting fact arising from Table 1 is the substantial fraction of immigrants who acquire their education in Canada. Columns 3 and 4 separate immigrants between those who obtained their highest degree in Canada and those who did not acquire any Canadian education. It is evident that these two groups have very different labor market experiences. Immigrants with Canadian education earn 32 percent more than immigrants with no Canadian education and 18 percent more than native-born workers. Further, they have experience that is comparable to that of the native-born and higher levels of formal education than both native-born and other immigrant workers. The average literacy scores of this group are also close to those of Canadians. For example, the immigrant—native-born literacy differential is 72 points for immigrants educated outside Canada but only 16 points for those completing their education in Canada. Immigrants educated in Canada actually score a bit higher than the native-born on quantitative literacy, whereas those with foreign education score over 40 points less. The difference in earnings reflects these differences in human capital. These findings suggest that controlling for the origin of education may be important for understanding immigrant earnings.

In order to assess the extent to which our sample is representative of the Ontario population, the last two columns of Table 1 show average values for a sample drawn for urban Ontario from the 1996 Census. Most of the mean values (earnings, experience, years of education and years since migration) are similar in the two samples.¹⁰

Figure 1a plots the kernel density function of the average of the document and quantitative literacy scores.¹¹ The immigrant distribution is bimodal with a main mode near the mode in the native-born distribution and a smaller—though still substantial—mode near the bottom of the distribution.¹² The smoothing inherent in the kernel estimator makes it appear that there is mass across a range of scores near the second mode. In reality, the second mode captures the fact that there are 145 immigrant respondents with the lowest score in the sample (83). This value was the score assigned to individuals who lacked the language skills to answer the test. Figure 1b plots the average literacy distributions removing the respondents who are assigned the

10. The differences in the distribution of degrees and in the reported hours and weeks worked are likely due to differences in the two questionnaires regarding these variables. Despite these differences, estimated earnings equations using the two data sets are very similar. (Regressions available at https://webdisk.ualgary.ca/~aferrer/public_html/)

11. We estimate the kernel density functions with the *kdensity* function in Stata, using the Epanechnikov kernel and Stata’s default bandwidth formula.

12. In virtually all the native-born–immigrant comparisons that follow, the CDF for native-born scores lies to the right of the immigrant CDF throughout our sample range. We cannot reject the null hypothesis that the native-born CDF first order stochastically dominates the immigrant CDF at any conventional significance level, using the first order stochastic dominance test described in Barrett and Donald (2003).

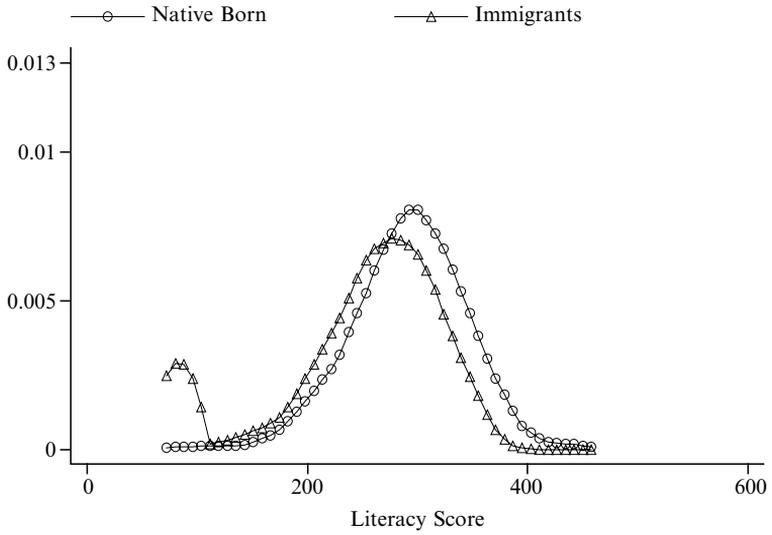


Figure 1a
Distribution of Literacy

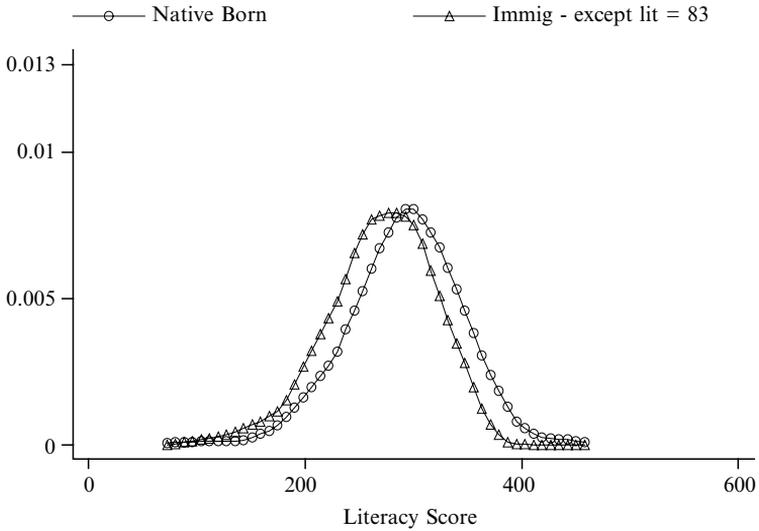


Figure 1b
Distribution of Literacy (except lit = 83)

lowest score. The immigrant literacy distribution now appears more similar, though still inferior, to the native-born distribution.

The group of immigrants who could not complete the literacy test is interesting in its own right. One might assume that it consists primarily of recent immigrants. In fact, in terms of years since arrival in Canada it is a mixed group, with a predominance of immigrants from Southern Europe (Italian and Portuguese) who have been in Canada for over 20 years combined with a significant minority from Asia who have been in Canada for much shorter periods. Not surprisingly, the education and host-country language skills of this group are not strong. Nonetheless, their average earnings (\$26,061) are perhaps higher than one might expect. Being able to last so long without learning English or French while still obtaining reasonable earnings levels is suggestive of the existence of immigrant enclaves, where they found jobs that do not require language or literacy skills.¹³ Only 30 percent of these immigrants report using English at work, and 60 percent report that they do not use literacy skills at work. Table 1A in the appendix shows the average characteristics of this particular group of immigrants.

Figures 1c and 1d show the distribution of literacy scores (after removing those assigned the minimum score) for immigrants with and without Canadian education relative to that of the native-born. The literacy skills distributions of both immigrant groups are inferior to that of the Canadian-born, and the difference between the respective distributions is largest for immigrants educated outside of Canada. There is also much less dispersion in the literacy scores of immigrants who completed their education in Canada than is the case for the native-born. In particular, the upper tail of the distribution is much larger for Canadian-born men than for immigrants educated in Canada. Most of the difference between the mean scores of immigrants who completed their education in Canada and the native-born, as reported in Table 1, arises from the relative absence of immigrants with high levels of literacy.¹⁴

Understanding the relationship between literacy and human capital variables like education and experience is central to our analysis. Table 2 reports the results from a regression of the literacy score on these variables plus language proficiency, source country, and province of residence (not reported). We also include a dummy variable to control for the individuals who were incapable of answering the literacy test. We do not view this regression as representing a causal story of how literacy skills are generated. Instead, we interpret the coefficients as revealing partial correlations that are useful for summarizing literacy patterns in the population.

For native-born workers, the estimates indicate that experience is essentially uncorrelated with literacy, but that there is a strong relationship between education and literacy.¹⁵ Immigrants who have not completed high school (the base category) have average literacy scores about 50 points below their Canadian counterparts. Relative to high school dropouts both the nonuniversity postsecondary and university literacy differentials are smaller, though not dramatically so, than those observed for the native-born. As a result, literacy scores of foreign-educated immigrants with a university

13. See Edin, Fredriksson, and Aslund (2003) for evidence relating to ethnic neighborhoods and immigrant enclaves.

14. See Kahn (2004) for a detailed study of immigrant-native-born literacy differences using IALS.

15. This is consistent with evidence on the native-born reported in Green and Riddell (2003).

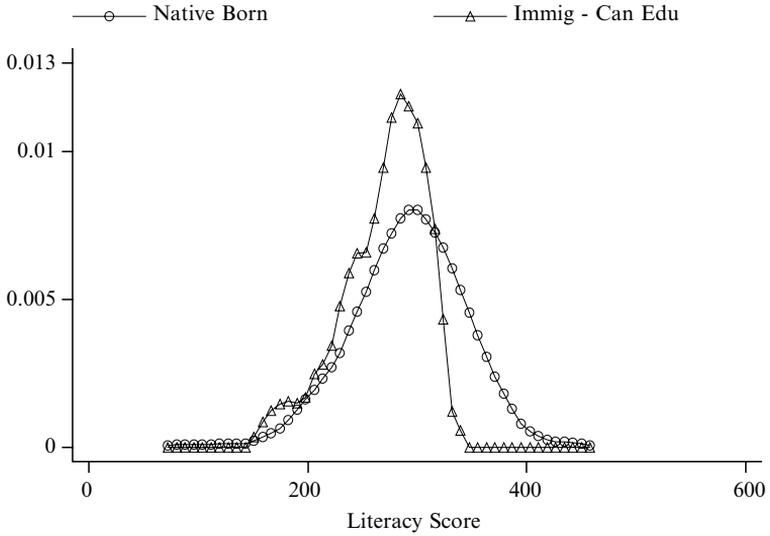


Figure 1c
Distribution of Literacy (Canadian Education)

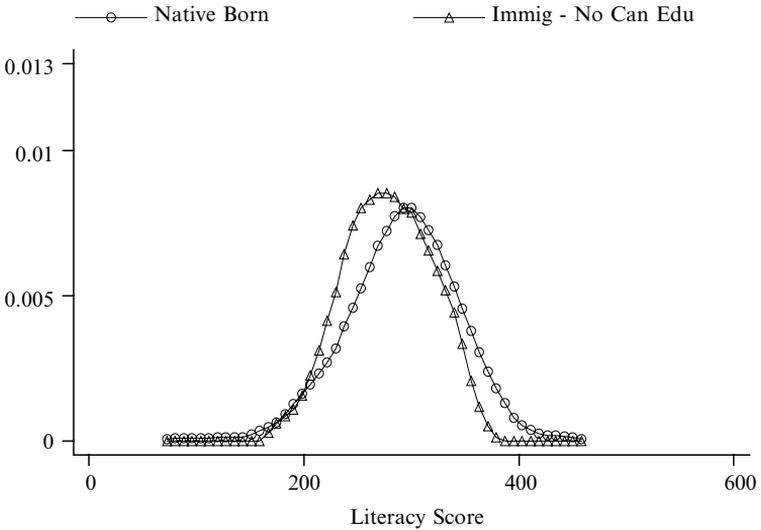


Figure 1d
Distribution of Literacy (No Canadian Education)

Table 2
Regressions with Literacy Score as the Dependent Variable^{ab}

Canadian experience (native-born)	0.48 (.31)
Canadian experience 2 (native-born)	-0.027 (.0069)+++
Immigrants with Canadian education	-56.89 (25.04)++
Canadian experience (immigrants with Canadian education)	3.08 (1.36)++
Canadian Experience2 (immigrants with Canadian education)	-0.070 (.042)
Immigrants without Canadian education	-52.43 (16.11)+++
Canadian experience (immigrants without Canadian education)	1.72 (1.24)
Canadian experience2 (immigrants without Canadian education)	-0.057 (.032)+
Foreign experience	-0.47 (1.07)
Foreign experience2	0.0047 (.036)
High school (native-born)	27.81 (2.79)+++
Nonuniversity postsecondary (native-born)	34.73 (3.53)+++
University (native-born)	75.42 (3.18)++
Foreign high school (immigrants)	-0.97 (10.57)
Foreign nonuniversity postsecondary (immigrants)	26.32 (12.68)++
Foreign university (immigrants)	67.67 (10.76)+++
Canadian high school (immigrants)	23.82 (25.97)
Canadian nonuniversity postsecondary (immigrants)	7.04 (25.20)
Canadian university (immigrants)	40.59 (24.42)
Language proficiency	-14.95 (6.44)++
U.S. or U.K. origin	36.49 (9.07)+++
European origin	15.88 (8.23)+
Unable to answer literacy	-149 (12.28)+++
Observations	2,015
R ²	0.47

Notes: (+++) indicates the coefficient is significant at 1 percent significance level, (++) indicates the coefficient is significant at 5 percent significance level, (+) the coefficient is significant at the 10 percent significance level.

a. Regression also includes controls for province of residence.

b. For ease of interpretation the experience and education variables are defined in such a way that the immigrant coefficients stand on their own rather than being defined relative to the native-born coefficients.

degree are approximately 60 points lower than those for university-educated native-born workers. Foreign experience does not have a statistically significant relationship with literacy, but there is a strong positive relationship between the Canadian experience of immigrants educated in Canada and literacy. For immigrants educated abroad this relationship remains positive, though smaller and not statistically significant. These improvements in literacy associated with time in Canada may reflect increased language skills that improve the “usability” of immigrant cognitive skills.¹⁶

16. Estimations (not reported) that included interactions of Canadian experience with the source region indicate that immigrants from English-speaking countries do not exhibit increases in literacy with time in

Overall, for foreign educated immigrants, there is a literacy deficiency relative to the native-born and that deficiency rises somewhat with education. However, the estimates in Table 2 also indicate that average literacy score levels are as low or lower for immigrants who complete their education in Canada and that disadvantage is larger at higher education levels. Thus, the lower literacy levels among immigrants overall and their tendency to fall further behind at higher levels of education appears to be more a function of immigrants themselves than of foreign institutions.¹⁷ Notice that these results control for region of origin; furthermore, immigrants from the United States or the United Kingdom do not face as large a literacy disadvantage. Combining this with the earlier result that immigrants and the native-born differ more in document literacy than in quantitative literacy, a reasonable set of conclusions might be the following: (1) that the document literacy score partially reflects language fluency for immigrants; (2) that immigrants not from the United States or the United Kingdom have some difficulties in English or French; and (3) that any language difficulties accentuate differences relative to the native-born to a greater extent at higher than lower education levels.

IV. The Effect of Education and Literacy on Immigrant Earnings

A. Results Without Literacy Variables

We now turn to log weekly wage regressions, first presenting results without controlling for literacy. This allows us to compare our results to common specifications in the immigrant literature and to closely examine the effect of foreign education and experience. Our initial specification (Table 3, Column 1) includes the education variables used earlier, a quadratic in experience, language proficiency, and dummies for country of birth. As mentioned above, we take advantage of the OILS questions on education by including separate dummy variables for immigrants according to whether they completed their education in Canada or before entering Canada. Furthermore, we separate the Canadian experience of these two groups of immigrants. The three experience effects reported in the first column are comparable in size, and tests of the hypothesis that they equal each other cannot be rejected at conventional significance levels. The estimates relating to the Canadian experience of immigrants who complete their education in Canada and to the native-born are extremely similar. The intercept coefficients imply that immigrants who complete their education abroad have entry earnings that are over 35 percent lower than comparable native-born workers, while earnings of those who finish their education in Canada do not differ from those of the native-born. These estimates apply to the base category, those with reasonable language skills and who are not from the United

Canada. We cannot tell whether Canadian experience is capturing a time in Canada effect or cohort effects. However, there is no such confusion with foreign experience and the results there are the same as with Canadian experience for the native-born.

17. This outcome could arise if language skills are best acquired at a young age. In these circumstances, completing one's education in Canada may not fully compensate for a deficiency in English or French.

Table 3
Earnings Regressions with and without Literacy Effects^{a,b,c}

	Without Literacy Measure			With Literacy Measure		
	Basic	Expanded	Preferred	Basic	Expanded	Preferred
Immigrant educated after arrival	-0.036 (0.153)	-0.018 (0.087)	0.312 ⁺⁺ (0.099)	-0.425 (0.408)	-0.367 (0.408)	-0.706 ⁺ (0.435)
Immigrant educated before arrival	-0.352 ⁺⁺ (0.169)	0.366 ⁺ (0.194)	0.633 ⁺⁺ (0.285)	0.735 ⁺ (0.416)	0.858 ⁺⁺ (0.431)	0.479 (0.462)
Language	-0.297 ⁺⁺ (0.100)	-0.279 ⁺⁺ (0.101)	-0.277 ⁺⁺ (0.104)	-0.207 ⁺⁺ (0.104)	-0.190 ⁺ (0.104)	-0.207 ⁺⁺ (0.101)
Canadian experience						
Immigrant educated after arrival	0.070 ⁺⁺ (0.021)	—	—	—	—	—
Canadian experience2						
Immigrant educated after arrival/100	-0.113 ⁺ (0.065)	—	—	—	—	—
Canadian experience						
Immigrant educated before arrival	0.052 ⁺⁺ (0.020)	0.049 ⁺⁺ (0.020)	0.045 ⁺⁺ (0.020)	0.044 ⁺⁺ (0.020)	0.042 ⁺⁺ (0.020)	0.041 ⁺⁺ (0.019)
Canadian experience2						
Immigrant educated before arrival/100	-0.104 ⁺⁺ (0.051)	-0.101 ⁺⁺ (0.051)	-0.095 ⁺ (0.052)	-0.087 ⁺ (0.052)	-0.083 (0.052)	-0.083 ⁺ (0.050)
Canadian experience ^d	0.077 ⁺⁺ (0.005)	0.077 ⁺⁺ (0.0047)	0.089 ⁺⁺ (.0060)	0.089 ⁺⁺ (0.006)	0.086 ⁺⁺ (0.006)	0.081 ⁺⁺ (0.007)
Canadian experience2/100	-0.137 ⁺⁺ (0.011)	-0.137 ⁺⁺ (0.011)	-0.147 ⁺⁺ (0.011)	-0.137 ⁺⁺ (0.011)	-0.138 ⁺⁺ (0.011)	-0.158 ⁺⁺ (0.011)

Table 3 (continued)

	Without Literacy Measure			With Literacy Measure		
	Basic	Expanded	Preferred	Basic	Expanded	Preferred
Foreign experience	—	0.016 (0.017)	0.030 (0.020)	0.032+ (0.020)	0.035+ (0.020)	0.036++ (0.019)
Foreign experience2/100	—	-0.090 (0.057)	-0.106 (0.060)	-0.108* (0.059)	-0.114++ (0.059)	-0.115++ (0.057)
High school	0.015 (0.043)	0.006 (0.043)	—	—	—	—
Nonuniversity postsecondary	0.040 (0.054)	0.028 (0.054)	—	—	—	—
University	0.396++ (0.048)	0.387++ (0.049)	—	—	—	—
High school, Native-born	—	—	0.264++ (0.092)	0.158+ (0.091)	0.171+ (0.092)	0.226 (0.286)
Nonuniversity postsecondary native-born	—	—	0.491+++ (0.109)	0.380+++ (0.108)	0.399+++ (0.108)	-2.276++ (0.392)
University native-born	—	—	0.563++ (0.100)	0.340+++ (0.103)	0.323++ (0.104)	0.352 (0.359)
Foreign high school	—	—	-0.044 (0.264)	-0.087 (0.264)	-0.082 (0.265)	-0.074 (0.256)
Foreign nonuniversity postsecondary	—	—	0.200 (0.287)	0.121 (0.288)	0.157 (0.288)	0.171 (0.278)
Foreign university	—	—	0.503++ (0.241)	0.354 (0.255)	0.360 (0.255)	0.369 (0.247)

High school*Canadian experience. Native-born	—	—	-0.011 ⁺⁺ (0.004)	-0.009 ⁺⁺ (0.004)	-0.010 ⁺⁺ (0.004)	-0.019 ⁺⁺ (0.004)
Nonuniversity postsecondary *Canadian experience. Native-born	—	—	-0.027 ⁺⁺⁺ (0.005)	-0.027 ⁺⁺⁺ (0.005)	-0.028 ⁺⁺⁺ (0.006)	-0.028 ⁺⁺⁺ (0.006)
University*Canadian experience. Native-born	—	—	-0.005 (0.005)	-0.005 (0.004)	-0.005 (0.004)	-0.015 ⁺⁺ (0.005)
<hr/>						
Foreign high school*foreign experience. Immigrant	—	—	-0.007 (0.020)	-0.004 (0.020)	-0.004 (0.020)	-0.004 (0.019)
Foreign Nonuniversity postsecondary*foreign experience. Immigrant	—	—	-0.012 (0.027)	-0.015 (0.027)	-0.017 (0.027)	-0.018 (0.026)
Foreign university*foreign experience. Immigrant	—	—	-0.039 ⁺ (0.016)	-0.043 ⁺⁺⁺ (0.015)	-0.044 ⁺⁺⁺ (0.015)	-0.044 ⁺⁺⁺ (0.015)
<hr/>						
Literacy score. Native-born	—	—	—	0.003 ⁺⁺⁺ (0.0004)	—	—
Literacy. Immigrants educated after arrival	—	—	—	0.005 ⁺⁺⁺ (0.001)	—	—
Literacy. Immigrants educated before arrival	—	—	—	0.003 ⁺⁺ (0.0013)	—	—
Unable to answer literacy questions	—	—	—	0.250 (0.265)	0.244 (0.265)	0.250 (0.256)
Quantitative literacy native-born	—	—	—	—	0.0025 ⁺⁺⁺ (0.0006)	-0.007 ⁺⁺⁺ (0.003)
Quantitative literacy immigrants. Educated after arrival	—	—	—	—	0.0004 (0.0013)	0.001 (0.001)
Quantitative literacy. immigrant. educated before arrival	—	—	—	—	-0.0004 (0.002)	-0.0003 (0.0016)
Document literacy native-born	—	—	—	—	0.0003 (0.0005)	0.007 ⁺⁺⁺ (0.0024)
Document literacy immigrants. Educated after arrival.	—	—	—	—	0.005 ⁺⁺⁺ (0.001)	0.005 ⁺⁺⁺ (0.0012)

Table 3 (continued)

	Without Literacy Measure			With Literacy Measure		
	Basic	Expanded	Preferred	Basic	Expanded	Preferred
Document literacy immigrants. Educated before arrival.	—	—	—	—	0.003+ (0.001)	0.0027++ (0.0014)
Quantitative literacy*experience	—	—	—	—	—	0.00043++ (0.00007)
Document literacy*experience. Native-born	—	—	—	—	—	-0.00036++ (0.00007)
Quantitative literacy*high school quantitative literacy*nonuniversity postsecondary. Native-born	—	—	—	—	—	0.0077+++ (0.0021)
Quantitative literacy*university. Native-born	—	—	—	—	—	0.0009 (0.0022)
Document literacy*high school. Native-born	—	—	—	—	—	0.0013 (0.0020)
	—	—	—	—	—	-0.007+++ (0.0020)

Document literacy*nonuniversity postsecondary. Native-born	—	—	—	—	—	0.008 ⁺⁺⁺ (0.0023)
Document literacy*university. Native-born	—	—	—	—	—	-0.0004 (0.0019)
Observations	2,014	2,014	2,014	2,014	2,014	2,014
Adjusted R-squared	0.195	0.203	0.210	0.234	0.237	0.286

Notes: (++) Indicates significance at 1 percent. (+++) Indicates significance at 5 percent. (*) Indicates significance at 10 percent.

a. Standard errors in parenthesis

b. Regressions also include controls for province of residence (native-born) and country of origin (immigrants).

c. For ease of interpretation the experience and education variables are defined in such a way that the immigrant coefficients stand on their own rather than being defined relative to the native-born coefficients.

d. In Column 1 this refers to the Canadian experience of the native-born. In the remaining columns it refers to the Canadian experience of the native-born and immigrants educated in Canada.

States, the United Kingdom, or Europe. For those with poor language skills, average weekly earnings are another 30 percent lower.

The basic specification restricts immigrants' returns to foreign experience to be the same as returns to Canadian experience for the native-born. The specification in the second column of Table 3 permits a separate return to foreign experience. This is important because Friedberg (2000) finds that negative immigrant entry earnings effects can be completely explained by a lower return to foreign experience than native experience. For immigrants from some countries, she found that foreign experience was worth zero in the Israeli labor market. Similar results are found for Canada in Green and Worswick (2002), and Aydemir and Skuterud (2005). Echoing these results, when we introduce foreign experience controls in Column 2, the intercept for immigrants educated before arrival is no longer negative. At the same time, the returns to Canadian experience for this group are now estimated to be around 3 percent below those for the native-born and Canadian educated immigrants in the period after entry into the Canadian labor market.¹⁸ Finally, note that introducing the foreign experience effect does not change the impacts of education, language, and country of origin.

The third column of Table 3 contains our preferred specification which we reach by first allowing a complete set of interactions among all immigrant, experience and education variables and then eliminating interactions where testing indicates it is appropriate. Thus, for example, we allowed for different returns to education for immigrants who obtained their highest degree in Canada. We could not reject the restriction that the differences between these returns and those for the native-born were zero at any conventional significance level. We also allowed for the possibility that each type of experience (whether foreign- or Canadian-acquired) might interact with each type of education. In each case, interaction coefficients involving immigrants who obtained their education after arrival in Canada were neither statistically significantly different nor economically substantially different from what was observed for the native-born. Thus, in every dimension, immigrants educated after arrival appear to have equivalent returns to human capital when compared with the native-born (after holding language ability constant). We do find evidence of significant interactions of Canadian experience with education for the native-born (and immigrants educated after arrival) and of foreign experience with foreign education for immigrants educated before arrival. The coefficient that stands out most among these latter interactions is the interaction of foreign experience with a foreign university degree. This coefficient, when combined with the foreign experience coefficient for the base group (high school dropouts) implies that individuals with a foreign university degree obtain essentially zero returns to foreign experience. Individuals with lower levels of education appear to get positive, though still small, returns to foreign experience. This suggests that it may be harder to translate human capital to a new country the less manual are the skills involved.

To aid in interpretation of our preferred results we present in the left panel of Table 4 fitted average earnings for a set of specific cases characterized by differing

18. This specification imposes that returns to Canadian experience for immigrants completing their education in Canada are the same as those for the native-born. Allowing the returns to differ for these two groups produces coefficients that are extremely similar, and the hypothesis that they are equal cannot be rejected at any conventional significance level.

Table 4
Fitted Returns to Immigrants and Native-born by Experience and Education^a

	Interaction Education–Experience			Interaction Literacy–Human Capital		
	Canadian Experience =	Canadian Experience =	Canadian Experience =	Canadian Experience =	Canadian Experience =	Canadian Experience =
	0	10	20	0	10	20
Native-born (less than high school)	0.00	0.74 (0.05)	1.19 (0.08)	0.18 (0.26)	1.04 (0.25)	1.58 (0.25)
Immigrant (less than high school)	0.63 (0.29)	0.99 (0.24)	1.15 (0.23)	1.17 (0.36)	1.50 (0.33)	1.66 (0.32)
Foreign experience = 0	0.83 (0.25)	1.18 (0.19)	1.34 (0.19)	1.41 (0.34)	1.74 (0.30)	1.90 (0.30)
Native-born (high school)	0.26 (0.09)	0.90 (0.10)	1.24 (0.10)	0.58 (0.24)	1.25 (0.24)	1.60 (0.24)
Immigrant (foreign high school)	0.59 (0.29)	0.94 (0.24)	1.10 (0.23)	1.09 (0.36)	1.42 (0.32)	1.59 (0.32)
Foreign experience = 10	0.72 (0.22)	1.07 (0.24)	1.23 (0.24)	1.30 (0.32)	1.63 (0.36)	1.79 (0.35)
Native-born (university)	0.56 (0.10)	1.25 (0.10)	1.65 (0.10)	0.79 (0.25)	1.50 (0.24)	1.90 (0.25)
Immigrant (university)	1.14 (0.24)	1.49 (0.19)	1.65 (0.20)	1.54 (0.31)	1.87 (0.29)	2.03 (0.29)
Foreign experience = 0, foreign university	0.94 (0.21)	1.30 (0.16)	1.46 (0.18)	1.34 (0.30)	1.67 (0.27)	1.83 (0.28)

a. Estimates are fitted log earnings based on the parameter estimates in the final column of Table 3 and differenced relative to the base case. The base group consists of English-speaking native-born workers with average literacy score (when required), less than high school education, and experience normalized to zero.

levels of education and experience. To generate the entries in this table, we formed fitted average log earnings values for a base case person who is native-born, did not complete high school and has no Canadian experience. We also estimated average log earnings for native-born and immigrant workers with differing levels of Canadian and foreign experience and education. For the immigrants, we formed the fitted averages such that they are relevant for an individual who finished his education outside Canada, who is not from the United States, the United Kingdom, or Europe and who does not have poor language skills in English or French. The various fitted earnings are differenced relative to those of the base case native-born individual.

Examination of the entries corresponding to immigrants who have not completed high school with either zero or ten years of foreign experience (the second and third rows in the first column) indicates that low educated immigrants earn considerably more than similarly educated native-born workers when they first enter the Canadian labor market. By moving along the second row, we can see the effects of increasing Canadian experience for a low educated worker who entered with no foreign experience. The larger increase as we move along this row rather than down the first column indicates that these immigrants receive a greater return to Canadian experience than foreign experience. It is interesting to compare the differential returns of a native-born with 20 years of experience (1.194) with those of an immigrant with 20 years of Canadian experience but no foreign experience (1.148) and those of immigrants with the same amount of total experience split between ten years of foreign experience and ten years of Canadian experience (1.178). All three estimates are similar in size. The initial immigrant advantage is whittled away by the fact that the native-born get a higher return to Canadian experience than do immigrants.¹⁹ For high school graduates, immigrants with no experience again earn more than do similar native-born workers. However, an immigrant with ten years of foreign experience and no Canadian experience earns about 20 percent less than a native-born worker with ten years of experience. This is an example of an immigrant earning less than a native-born worker with the same total experience because of lower returns to foreign experience. For the university-educated, foreign experience actually has a negative return, as witnessed by the fact that the earnings differential is lower for a university-educated immigrant with ten years of foreign experience than one with zero years. Immigrants with 20 years of Canadian experience and no foreign experience and native-born workers with 20 years of experience earn the same amount but immigrants with ten years of foreign experience and ten years of Canadian experience have earnings that are about 75 percent of those of the other two groups. Thus, patterns are similar for the high school and the university-educated except that the latter have even lower returns to foreign experience.

B. Results with Literacy Variables

In the second panel of Table 3, we examine the effects of literacy. A comparison of our basic estimates (Column 4), where we simply add the literacy variables without any interactions, and our preferred specification (Column 6), which adds all significant

19. All of these statements are based on interpreting coefficients on Canadian experience as reflecting true returns to experience rather than cohort effects.

interactions, reveals the direct impact of literacy and its indirect impacts on other returns. The returns to literacy are substantial, with a 100 point increase in literacy (equivalent to approximately one and a half standard deviations in the literacy score distribution) raising earnings by about the same amount as moving from being a high school dropout to a university graduate. As in Green and Riddell (2003), none of the experience effects or experience interactions change when we control for literacy. However, estimated returns to Canadian education decline by about one-third, and even more in the case of foreign degrees. This suggests that a substantial amount of conventional estimates of the return to schooling, especially foreign schooling, arises from the impact of education on literacy and the value placed on literacy in the labor market. Note, in particular, how the different returns from foreign and Canadian university education seen in more standard specifications are eliminated once we control for literacy in a flexible way. Thus, differences in returns to university turn out to be completely explained by differences in the extent to which foreign and Canadian university programs generate literacy. Recall that immigrants with a foreign-acquired university degree had an average literacy score that was 60 points lower than the score for the native-born with a Canadian degree. Differences in returns to education between immigrants and the native-born are often attributed to insufficient recognition of credentials obtained abroad. This result speaks against that conclusion; foreign educated university graduates have lower effective literacy levels than their Canadian educated counterparts.

An important question is whether returns to literacy are lower for immigrants. Our basic specification allows for different returns to literacy for the native-born, immigrants who completed their education before arrival, and immigrants who completed their education in Canada. The estimates indicate almost identical returns to literacy for the native-born and immigrants educated before their arrival in Canada. Immigrants who finished their education in Canada have a higher return to literacy, though it is not immediately obvious why this would occur. Nonetheless, these estimates provide no evidence of discrimination in the sense of employers paying immigrants less for the same literacy skills as native-born workers.²⁰ It is worth emphasizing that this result refers to “usable” literacy skills. Immigrants may have higher literacy scores if tested in their native language and one could argue that those skills are being undervalued, but they receive returns to literacy as measured in English or French that are no worse than those obtained by native-born workers.

In Column 5 we allow document and quantitative literacy to have separate effects. The patterns are intriguing. The native-born get a substantial return to quantitative literacy but none to document literacy. For immigrants the opposite pattern holds. One way to interpret this result would be that the document score for immigrants is picking up language proficiency. The fact that immigrants obtain no earnings impact from quantitative literacy might suggest that they are being discriminated against since this skill is highly valued among the native-born. However, the result could be due to multicollinearity. That is, it may not be possible to separately identify the effects of document and quantitative literacy given the high correlation between the

20. Recall that differences in the coefficient on the literacy variable between immigrants and the native-born can be interpreted as discrimination in cases where there are no interactions between literacy and other variables such as experience. The interactions between literacy and both immigrant experience and education are not significant at any conventional level of significance.

two scores. We thus advise strong caution in pinning too much on these differences between immigrants and the native-born.²¹

The last specification in Column 6 is the result of a specification search involving interactions of literacy scores of both types with education and experience. The results indicate some interactions of literacy with experience and education for the native-born but no such interactions for the foreign born. A key implication is that literacy does not change returns to experience in a substantial way for either the native-born or immigrants. This fits with the insignificant effects on literacy of both foreign experience for immigrants and Canadian experience for the native-born. It also agrees with the conclusion reached by Green and Riddell (2003) that experience does not generate literacy but it does generate some other skill(s) that employers value. There is some evidence that this unobserved skill interacts with literacy skills for the native-born (because literacy scores and experience variables have nonzero interaction effects) but these interaction effects are not large.

A particularly interesting implication from the last column is that immigrants educated abroad receive very similar returns to foreign and Canadian-acquired experience but both are valued less than experience acquired by the Canadian-born and immigrants educated in Canada. Although one might have expected that immigrants receive lower returns to experience because they don't have the literacy skills to complement the skills generated by experience, the lack of significant interactions with literacy skills suggests that this is not the case. Whatever is behind the different returns to experience for Canadian and foreign educated workers it is not related to literacy. Thus, literacy does not help explain one of the key differences between immigrant and native-born workers. It stands as a separate and interesting part of the immigrant assimilation process.

Finally, the dummy variable corresponding to immigrants unable to complete the literacy test has a positive coefficient indicating that these workers earn approximately 40 percent more than one would anticipate given their literacy score and other characteristics. While this coefficient is not precisely estimated, it may fit with evidence on the importance of immigrant enclaves in allowing immigrants to do better than expected when they do not acquire the host-country language (Edin, Fredriksson, and Aslund 2003).

We repeat the exercise of forming fitted average log earnings for various types of workers but, in this case, holding the literacy score value constant at 292 (the overall sample average). The results are contained in the righthand panel in Table 4. Comparison between the right and the left panel shows similar patterns to those observed when literacy is not held constant. For example, university-educated immigrants with no foreign experience and educated abroad earn much more than their native-born counterparts. However, their lower return to experience implies that the two groups have similar earnings when they reach 20 years of Canadian experience. Foreign experience is actually a handicap for workers with this education level. There are two main differences between the results controlling and not controlling for literacy. The first is that the (positive) differential between immigrant entry earnings and the earnings of native-born workers with zero experience is larger when we

21. We tried to explore this issue further by interacting the document and quantitative measures with the language variable but found no significant interactions.

control for the literacy level. This implies that lower literacy levels weaken immigrant earnings relative to similar native-born workers. The second difference between the two panels is the greater similarity in earnings at high levels of Canadian experience between immigrant and native-born earnings when not controlling for literacy. This is a reflection of the rise in average literacy with Canadian experience for immigrants described earlier. This rise shows up in the earnings numbers in the left-hand panel but cannot reveal itself in the righthand panel where the literacy score is constant.

One interesting question arising from these estimates is the relative importance of lower immigrant literacy levels in explaining immigrant—native-born earnings differentials. To investigate this, we constructed a series of fitted average earnings differentials, all based on the last column in Table 3. We first construct an estimate of average log earnings for immigrants and the native-born separately using the estimated coefficients in conjunction with the appropriate average values for the regressors. Those estimates imply an overall average immigrant earnings advantage of 0.03 log points over the native-born among high school educated workers and an immigrant disadvantage of 0.22 log points among the university-educated. We next repeated this exercise but gave immigrants the same return to foreign experience as the native-born receive for their Canadian experience. The result is an increase in the immigrant advantage for the high school educated to 0.25 log points and an immigrant advantage of 0.44 log points for the university-educated. This fits with results in earlier papers, described above, indicating that lower returns to foreign experience play an important role in understanding immigrant—native-born earnings differentials. Also, as in Friedberg (2000), the importance of returns to foreign experience is greatest for more-educated workers.

In our next counterfactual, we set the returns to foreign experience back to their original value but give immigrants the average literacy scores observed for native-born workers with the same level of education. For the high school educated, this increases the immigrant advantage to 0.23 log points. For the university-educated, it reduces the immigrant disadvantage from 0.22 log points to 0.06 log points. Thus, poorer literacy among immigrants has an effect on immigrant—native-born differentials that is very similar in size to the impact of low returns to foreign experience for the high school educated but about one-quarter the effect of low returns to foreign experience among the university-educated. Low literacy thus appears to be an important factor for understanding immigrant earnings differentials, though not nearly as important as returns to foreign experience for understanding differentials in the group where human capital transfer is likely most important—the highly educated.

V. Conclusions

At the outset of the paper, we posed three questions related to immigrant literacy and earnings. First, do immigrant literacy skills differ from those of the native-born? Second, do immigrants receive a different return to those skills than observationally equivalent native-born workers? Third, can differences in levels and returns to literacy skills help explain differences in earnings between immigrant and native-born

workers? Based on an examination of data that include both earnings and literacy test scores for immigrants and the native-born, the answer to the first question is clearly yes. The native-born literacy distributions first order stochastically dominate the distributions for immigrants. This is not just a reflection of differences in observable characteristics such as education since immigrants have lower average test scores than observationally equivalent native-born workers. Immigrants and the native-born also differ in the relationship between literacy skills and experience. While literacy skills exhibit no relationship with experience for the native-born, there is a mild positive relationship between literacy and Canadian experience for immigrants. This fits with literacy scores partially reflecting host country language proficiency. As a result, the test scores should be interpreted as reflecting cognitive skills that are “usable” in the Canadian economy.

The answer to the second question is a resounding no. There is no evidence that immigrants receive a lower return to the types of cognitive skills measured in literacy tests than do otherwise equivalent native-born workers. If we rely on Becker’s notion of discrimination (that is, equally productive workers being paid unequally) this indicates that immigrant—native-born earnings differentials cannot be explained by discrimination, at least in this dimension.

Literacy skills have a significant impact on earnings. A 100 point increase in the literacy score (equivalent to approximately one and a half standard deviations in the literacy distribution) raises earnings by about the same amount as moving from being a high school dropout to a university graduate. Introducing literacy into a standard earnings regression reduces estimated education coefficients by about one-third. This impact differs between immigrants and the native-born. Indeed, we find that the standard result that immigrants’ return to a university education acquired before migration is lower than native-born returns to a host country-acquired university education is eliminated once we control for literacy. The implication is that immigrants receive a lower return to foreign-acquired university education because foreign universities generate lower levels of “usable” (in Canada) literacy skills.

The result that literacy skills have a significant impact on earnings implies that lower immigrant literacy levels contribute to immigrant—native-born earnings differentials. If immigrants had the same average literacy scores as the native-born, the earnings differential between immigrants and the native-born would narrow by 15 to 20 log points. This change would eliminate about two-thirds of the immigrant earnings disadvantage among university-educated workers. As a point of comparison, our data reflect a well-known pattern in which low returns to foreign experience appear to play a strong role in immigrant—native-born earnings differences. The effect of raising immigrant literacy levels to those of the native-born is slightly larger than the effect of eliminating the immigrant shortfall in returns to experience for the less educated but about one-quarter of this foreign experience effect for the university-educated. Thus, while literacy deficiencies among immigrants have an important impact on earnings differentials, among the highly educated the impact is decidedly smaller than the effect of low returns to foreign experience. It is also worth noting that controlling for literacy does not affect the relative patterns of returns to foreign and Canadian-acquired experience. Thus, this important dimension of immigrant earnings patterns is not related to literacy.

Table 1A
Summary Statistics by Literacy Score (Immigrants)

	Not assigned minimum score		Assigned minimum score	
Annual earnings	41,483		26,061	
Age	42		46	
Experience	22		32	
Canadian	16		17	
Foreign	6		15	
Years of education	14		8	
Education (percent)				
High school	27		19	
Foreign	18		19	
Canadian	9		—	
Nonuniversity postsecondary	24		5	
Foreign	11		3	
Canadian	13		2	
University	32		4	
Foreign	16		4	
Canadian	17		—	
Age at immigration	22		29	
Years since migration	20		18	
Language skills (percent)				
Understand English well /very well	67		17	
Able to converse in English	99		53	
English used at work	91		31	
Never use literacy skills at work	16		60	
First language	English	20	Italian / Portuguese	54
	Spanish	17	Cantonese/ Mandarin	17
Observations	1,205		145	

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