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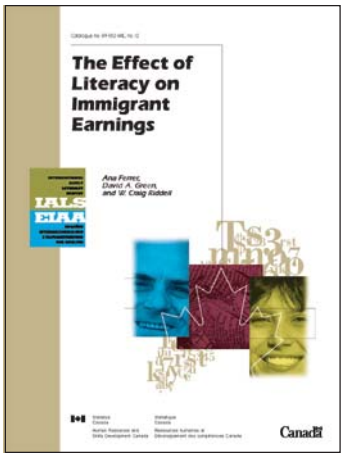
International Adult Literacy Survey

The Effect of Literacy on Immigrant Earnings



Ana Ferrer, David A. Green, and W. Craig Riddell

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The International Adult Literacy Survey (IALS) was a 22-country initiative conducted between 1994 and 1998. The Canadian component of the IALS study was primarily funded by the Applied Research Branch and the National Literacy Secretariat of Human Resources Development Canada.

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Abstract

We use a special Canadian dataset containing both literacy test scores and standard labour market variables to examine the impact of literacy on immigrant earnings. Having a literacy measure allows us to examine issues related to discrimination and the sources of lower returns to foreign acquired education and experience among immigrants. We find that the native-born literacy distribution (assessed in English or French) dominates that for immigrants. However, immigrants and the native born appear to obtain the same return to their literacy skills. We argue that this does not support a discrimination explanation for immigrant-native born earnings differentials. Immigrant shortfalls in literacy can account for about one-half of the earnings gap between university educated immigrants and similarly educated native-born workers. However, low returns to foreign acquired experience have a larger impact on the differential and those low returns are not related to literacy differences. Thus, low literacy among immigrants is an important input to understanding immigrant-native born earnings differentials but is not the dominant explanation.

I Introduction

Immigrant recipient countries devote considerable research effort to understanding earnings differences between immigrant and native-born workers (see Chiswick (1978), Borjas (1985, 1995a) for the U.S., and Baker and Benjamin (1994), Bloom, Grenier and Gunderson (1995), and Grant (1999) for Canada). These studies clearly 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 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 measured 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 a rich dataset of immigrants from Ontario (the Ontario Immigrant Literacy Survey or OILS) which includes both standard demographic and labour market information and results from literacy and numeracy tests. Interpreting the literacy and numeracy 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 Census 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 were earning 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 definite advantages over the data used in these papers because it includes direct measures of foreign acquired education and experience. Part of the contribution of this paper is to re-examine issues about returns to foreign experience and education raised in earlier papers with better data.

This paper also builds on work by Green and Riddell (2003) which uses the International Adult Literacy Survey (IALS) to examine more generally the role of cognitive skills in Canadian earnings patterns. Like the OILS, the IALS contains both standard survey questions and literacy and numeracy tests. Green and Riddell (2003) argue that the types of literacy questions asked in the IALS are particularly conducive to using the literacy test 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 these basic skills influence earnings from an analysis of interactions of the literacy measures and other standard human capital variables. In that analysis they use an hedonic model in which observed earnings are directly determined by the basic skills an individual possesses and the implicit prices of those skills. We adopt a similar interpretative framework in this paper 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 datasets, 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 behavioural 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.[2]

The 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 distributions 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 and 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. We argue that this is evidence against a discrimination explanation for differences in earnings between immigrant and native-born workers.

Our earnings regression results support findings in earlier papers that returns to both foreign acquired education and experience for immigrants are lower than returns to education and experience obtained in Canada by either immigrants or native born workers. Indeed, very low returns to foreign experience almost entirely explain immigrant earnings deficiencies relative to observationally similar 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 variable (equivalent to about 11/2 standard deviations in the score distribution) generating an earnings increase about equal to moving from being a high school drop-out to being a university graduate. The combination of this return to literacy and the lower literacy levels of immigrants explains part of the immigrant earnings differential. We estimate that raising immigrant average literacy levels to the native born level would cut in half the overall earnings disadvantage of university educated immigrants relative to similarly educated native born workers. However, this amounts to only about one quarter of the effect one would obtain by increasing immigrant returns to foreign experience to equal the returns to foreign experience among the native born. Thus, among the most educated literacy differentials 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 return 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. In the next section we present 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 examines whether immigrants have different literacy levels from the native born. The fifth section contains the analysis of immigrant earnings. The final section concludes.

II A framework for discussing earnings generation

This section sets out a simple framework for considering earnings generation and its relationship to literacy skills. This will prove useful in understanding the role of these skills in immigrant and native-born earnings. The framework is based on the one used by Green and Riddell (2003) in a discussion of literacy and earnings among non-immigrants. They distinguish among attributes (personal characteristics that can be acquired by the worker and enhance individual earnings), skills (personal characteristics that aid in productivity in specific tasks and which can be acquired by the worker) and abilities (innate, productive characteristics). In this taxonomy, skills are a subset of attributes, where the former focus on facility with specific tasks while the latter also includes characteristics such as persistence and willingness to follow orders. Abilities are similar to attributes but are innate while attributes are acquirable. In this paper, we group together attributes and skills and refer to them interchangeably. Thus, the key distinction is that between attributes/skills and abilities.

Assume, for the moment, there are three attributes a worker can possess, and workers can possess them in varying amounts. We begin with three attributes only because it allows us to emphasize key points. The framework can easily be extended to address the more likely scenario that there are more than three. Individual earnings are determined according to some function of the skills an individual possesses and puts into use, as follows:

$$E_i = f(G_{1i}, G_{2i}, G_{3i}) + e_i \qquad (1)$$

where E_i are earnings for individual i, G_{ki} is the amount of attribute k that person i sells in the market, and e_i is a disturbance term that is independent of the attributes. The disturbance term captures either measurement error in earnings or individual idiosyncratic events that are independent of the attribute levels. The earnings generation function f(.) can be viewed as derived ultimately from marginal product conditions related to an overall production function that is separable in other (non-skill) inputs. Alternatively, it can be seen as representing worker capacities to capture rent shares from firms (e.g., Bowles, Gintis and Osborne, 2001). We remain agnostic on which interpretation is correct. In either case, by characterizing the f(.) function, we can learn about the importance of the various attributes and how they interact in earnings generation. To help focus ideas, we will think of G_1 as cognitive skills of the type measured in literacy tests, G_2 as other (perhaps manual) attributes that are not captured in such tests and that might be acquired through work experience, and G_3 as non-cognitive characteristics such as persistence.

The earnings function in equation (1) is quite general. However, it will prove easier to work with a more specific functional form. In our empirical investigations, we find that the data is well characterized by first or second order polynomials in observable variables. Thus, for empirical purposes we work with:[3]

$$E_i = \gamma_0 + \gamma_{11}G_{1i} + \gamma_{21}G_{2i} + \gamma_{31}G_{3i} + \gamma_{12}G^2_{1i} + \gamma_{22}G^2_{2i} + \gamma_{32}G^2_{3i} + \delta_{12}G_{1i}\,G_{2i} + \delta_{13}G_{1i}\,G_{3i} + \delta_{23}G_{2i}\,G_{3i} + e_i \qquad (1')$$

We are interested in characterizing the f(.) function and obtaining estimates of the γ and δ parameters. Doing so will provide information about the relative importance of the various attributes in earnings generation and whether the attributes are complements or substitutes in generating earnings.

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 attributes. To see how they enter our framework, consider a set of attribute production functions:

$$G_i = h_k(edn_i, exp_i, \theta_{ki}) \qquad (2)$$

where k indexes the attribute type, *edn* corresponds to a set of dummy variables representing different 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. Of course, an h function could be constructed such that an attribute corresponds one for one with an ability (e.g., persistence may be an innate characteristic rather than something that can be produced).

As with the f(.) function, our discussion of the features of the h_k(.) functions is simplified by considering a quadratic version:

$$G_{ki} = \alpha_{ks1}\,edn_i + \alpha_{ke1}exp_i + \alpha_{ke2}exp^2_i + \alpha_{k\theta 1}\,\theta_{ki} + \alpha_{k\theta 2}\,\theta^2_i + \alpha_{ks2}\,edn^*_i\,exp_i + \alpha_{ks\theta}\,edn^*_i\theta_{ki} + \alpha_{ke\theta}\,exp^*_i\theta_{ki} \qquad (2')$$

where the *e, s* and θ subscripts on the α's correspond to experience, schooling and ability variables, respectively. Note that *edn* corresponds to a vector of education dummy variables and thus the α's correspond to either scalar parameters or vectors of parameters as appropriate.

If we do not observe the G_{ki}'s directly, we can obtain an estimating equation by substituting expressions for G_1, G_2 and G_3 from equation (2') into equation (1'). This yields a reduced form specification for earnings as a function of schooling and experience:

$$E_i = \eta_0 + \eta_1\,edn_i + \eta_2\,exp_i + \eta_3\,exp^2_i + \eta_4\,edn^*_i\,exp_i + v_i \qquad (3)$$

This is the reduced form earnings equation that is commonly estimated. The ability variables are unobserved and thus end up in the error term. An inspection of equations (1') and (2') makes it clear that the coefficient on an observable variable such as educational attainment in equation (3) will consist of a combination of the γ, δ and α parameters. The reduced form coefficients thus reflect the combination of how each explanatory variable contributes to the production of each of the attributes and how those attributes contribute to earnings generation.

We are interested in how much we can learn about the structure of the functions in equations (1) and (2) when we observe one of the attributes. Labelling the observed attribute G_1, and using it to refer to cognitive skills, we can substitute expressions for G_2 and G_3 from equation (2') into equation (1'). This yields a quasi-reduced form earnings equation that includes G_1 (the literacy score variable), experience and schooling variables:

$$E_i = \beta_0 + \beta_1 edn_i + \beta_2 exp_i + \beta_3 exp^2_i + \beta_4 edn_i^* exp_i + \beta_5 G_{1i} + \beta_6 G^2_{1i} + \beta_7 G_{1i}^* edn_i + \beta_8 G_{1i}^* exp_i + u_i \quad (4)$$

where G_{1i} corresponds to our measure of literacy, *edn* is again a vector of education dummy variables, the *b*'s are either scalars or vectors of parameters as appropriate and *u* is an error. As was the case when we substituted expressions for G_1, G_2 and G_3 from equation (2') into equation (1') to obtain the reduced form earnings equation, the coefficients associated with the education and experience variables edn_i and exp_i consist of a combination of the γ, δ and α parameters. However, because G_{1i} is observed and included as an explanatory variable, the quasi-reduced form coefficients no longer reflect the contribution of education and experience to the production of literacy skills and the contribution of literacy skills to earnings. Rather, they reflect the contribution of education and experience to the production of the unobserved skills G_2 and G_3, and the impact of these unobserved skills on earnings.[4]

The quasi-reduced form equation (4) is our starting point for estimation. Note that the error term will include interactions of the ability variables and the observables. This means that some type of random coefficients estimator may be appropriate. As a first step, we will ignore this latter complication and present results based on mean regression (though we do correct the standard errors for general forms of heteroskedasticity). Given the model set out above, these estimates are not fully efficient and can provide only part of the story of how the various attributes interact. Nonetheless, as we shall see, there is still a great deal we can learn from mean regressions, and they have the advantage of being easy to interpret and compare to the existing literature.

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 labour market. Immigrants could differ from the native born in both of the main building blocks of the model: in the returns they obtain from a given set of attributes (i.e., immigrants could have a different f(.) function); and in the production functions for creating individual attributes (i.e., immigrants could have different h(.) functions).

Differences in the f(.) function between immigrants and the native born correspond to discrimination in this model since they represent differences in earnings between immigrants and native born workers who are in fact equally productive. Thus, if we could directly observe all relevant attributes, we could determine whether shortfalls in earnings for immigrants relative to the native born arise from discrimination. It is tempting to think that differences between immigrants and the native born in the coefficients on the non-interacted G_{1i} terms (i.e., β_5 and β_6) can provide direct evidence on whether discrimination exists (i.e., on whether immigrant and native born workers with the same observed literacy skills are paid differently). However, if interactions of G_{1i} with the *exp* and *edn* variables are significant then this interpretation need not hold. A non-zero interaction of, for example, *exp* and G_{1i} would imply both that the f(.) function involves an interaction of G_{1i} and some other attribute (say, G_{2i}) and that *exp* helps to produce G_{2i}. In that case, the return to G_{1i} is a complicated function that varies with different levels of *exp* and β_5 and β_6 represent the effect of G_{1i} on earnings at the base level for experience. Consequently, 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 rather than because of discrimination. Thus, the coefficients β_5 and β_6 provide information about discrimination only if the coefficients on the interactions of G_{1i} and other variables (i.e., β_7 and β_8) are zero.

Given results in earlier research both in Canada and in other countries, it seems very likely that the attribute production functions differ between immigrants and the native born. Thus, for immigrants, we rewrite these production functions as:

$$G_{ki} = h^I_k(edn_i, exp_i, \theta_{ki}, fedn_i, fexp_i) \qquad (5)$$

where *edn* and *exp* correspond to education and experience obtained in Canada, while *fedn* and *fexp* represent foreign acquired education and experience. A standard claim in the immigrant earnings literature is that credentials recognition 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 education and experience. If this is not true, then equation (5) collapses to equation (2) and differences in earnings between immigrants and the native born arise either because they have different levels of schooling, experience and ability or because there is discrimination. Often, studies do not have particularly good measures of *fedn* and *fexp* so it is difficult to check directly for differences in returns on these attribute inputs. 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*. With these in hand, the immigrant earnings specification, with G_{1i} included, becomes:

$$\begin{aligned} E_i = {} & \beta^I_0 + \beta^I_1 edn_i + \beta^I_2 exp_i + \beta^I_3 exp^2_i + \beta^I_4 edn_i^* exp_i + \beta^I_5 G_{1i} + \beta^I_6 G^2_{1i} \\ & + \beta^I_7 G_{1i}^* edn_i + \beta^I_8 G_{1i}^* exp_i + \beta^I_9 fedn_i + \beta^I_{10} fexp_i \\ & + \beta^I_{11} G_{1i}^* fedn_i + \beta^I_{12} G_{1i}^* fexp_i + \beta^I_{13} fexp_i^* fexp_i + \beta^I_{14} exp_i^* fexp_i + u_i \qquad (6) \end{aligned}$$

Equation (6) includes a wide variety of interactions of *fexp* and *fedn* with each other and other variables.[5] Thus, the 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 U.S. is that more recent cohorts of immigrants have poorer earnings when compared to both earlier immigrants and native born workers with the same measured levels of education and experience. In our framework, that would arise either because of an increase in discrimination against more recent cohorts (for example, because they have a larger visible minority component) or because more recent cohorts have lower skills. With a single cross-section, we cannot separate effects of changes across immigrant cohorts from the effects of gradual adaptation to the Canadian labour 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.

Literacy plays an important role in this analysis. As stated earlier, we assume that the literacy scores provide direct measures of this skill and thus we can examine G_{1i} and its interactions with inputs such as experience and education to learn about the role of various attributes in earnings generation. In equation (6), the interactions of literacy with *fexp* and *fedn* are of special importance. Nonzero coefficients on these interactions may reflect impacts of literacy in helping immigrants translate their foreign obtained human capital into the Canadian labour market. Note that in our framework, such an effect would amount to improved literacy leading to more production of G_{2i} and G_{3i} with given levels of *fexp* and *fedn* and would be captured by including G_{1i} in the G_{2i} and G_{3i} attribute production functions.

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), and Berman, Lang, and Siniver (2003) 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 (i.e., we would add G_{4i} to equation (1)) 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 ability in French or English 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. Both Chiswick (1991) and Dustmann and Fabbri (2003) include self-reported reading skills along with host country fluency in earnings regressions, interpreting the reading and speaking fluencies as separate skills. Chiswick (1991), using a sample of illegal immigrants to the US, finds that reading fluency has a much stronger effect on earnings than speaking fluency when both are included. Dustmann and Fabbri (2003), using UK immigrant data, find that reading fluency is a more important determinant of employment but speaking fluency is a more important determinant of earnings.

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 labour market) cognitive skills. This means we still interpret differences in the coefficient on literacy variables between immigrants and the native born as evidence of discrimination under the conditions discussed earlier since they imply differential pay for the same effective skills. However, the fact that the scores will partly reflect language acquisition means we expect different patterns in scores and in how the scores vary with age and experience for immigrants.

Finally, the framework is useful for considering endogeneity issues. In either equation (4) or (6), 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 (i.e., 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, $è_{1i}$ 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 (e.g., schooling may help create social skills but that is not why people choose to go to school) 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) datasets do not contain useful instruments. Thus, we are forced to rely on the OLS estimates. It is worth re-iterating that this is no different from the rest of the immigrant earnings literature that rarely if ever addresses the potential endogeneity of education.

III Data and basic patterns

The main dataset we use in this investigation is the Ontario Immigrant Literacy Survey (OILS). Statistics Canada carried out this survey in 1998 to study the language and literacy skills of Ontario immigrants. The target population of OILS consisted of all immigrants aged 16 to 69 and residing in Ontario's six main census metropolitan areas (CMAs): Toronto (including Peel region), Hamilton, Ottawa, Kitchener, London and St. Catherines-Niagara. Together these six CMAs account for more than 80% of the province's immigrants.[6]

We also use the 1994 Canadian version of the 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 information on labour market variables such as income, education and labour force status. The OILS, as discussed, contains only immigrants living in 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.

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 (i.e., IALS based) and immigrant (i.e., OILS based) sample has 2015 observations of which 1350 are immigrants. Both surveys are based on the Labour Force Survey (LFS) sample frame and we use the sample weights in our analysis.

Our dependent variable is annual earnings.[7] Both the IALS and OILS contain data on weeks worked and usual hours per week, raising the possibility of constructing hourly wage measures. However, the weeks, hours and annual earnings questions do not refer to the same time period, so we do not have confidence in weekly or hourly wage measures constructed from the information on weeks and hours of work. Because the OILS and IALS data were collected four years apart, we adjust the earnings data from the IALS using the CPI to put it in comparable dollars to that recorded in the OILS. Of course, it is still the case that native born and immigrant earnings could differ in our data simply because 1993 and 1997 represent different conditions in the Canadian labour market. However, comparisons with estimates obtained from 1996 Census data, presented below, suggest that this problem is not substantial.

Finally, both datasets provide measures of Document and Quantitative literacy.[8] The test questions do not attempt to measure abilities in mathematics and reading but try to assess capabilities in applying skills to problem solving in everyday life. Thus, 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 and are intended not just to elicit current capacities but also adaptability to answering questions in other contexts (Statistics Canada, 1996). This is an important point for the interpretation of our results since we want to interpret 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 individual document and quantitative literacy scores are highly correlated in their IALS sample and, because of multi-collinearity problems arising from this, work solely with a simple average of the literacy scores for each individual. 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 obtain 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 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 (i.e., age – years of schooling – 6). 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 – 6) and Canadian experience (age – age at arrival). We examine educational impacts using a series of dummy variables corresponding to high school graduates, non-university post-secondary graduates, and those with a Bachelor's or higher university degree. The omitted category contains individuals with less than completed high school education.[9] As mentioned earlier, a major advantage of the OILS data is its detailed questions on where the immigrant obtained his education. In particular, 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 post-secondary degree in Canada. We make use of this feature in what follows by dividing our analysis between immigrants who completed their education in Canada versus those who completed it abroad. This turns out to be an important distinction and is one that cannot be made very precisely in data sets such as the Census.[10]

The survey also includes a series of 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 U.S. or U.K. while the other corresponds to immigrants from continental Europe, with the rest of the world forming the omitted category in the estimation. Much of the earlier literature on immigrants indicates that there are strong source country effects and that immigrants from the U.S. and U.K. 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 mean values of the main variables in the data for male immigrants and native-born Canadians. Immigrants are, on average, 5 years older than the native born, which translates into experience differentials of 4 years. Immigrant and Canadian born men report the same number of years of schooling. However, when we look at the highest level of education attained, the distribution of formal education among immigrants is superior to that for the native born. The fraction of native-born workers with no post secondary education is 66%, versus 49% among immigrants. Additionally, a larger fraction of immigrants has a university degree (29%) compared to native born Canadians (14%).[11]

This apparent advantage in observable skills does not translate into higher income. Annual earnings are very similar for both native born and immigrant men. A plausible explanation for this puzzle, long recognized in the literature, is that the Canadian labour market may place a different value 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 post secondary educational degrees held by immigrants were obtained outside of Canada. Further, native born workers have higher average document and quantitative literacy scores than immigrants.

In order to assess the extent to which our sample is representative of the Ontario population, Table 1 also shows similar tabulations 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. The distribution of degrees, however, differs across the samples. The Census data consistently show a higher fraction of individuals reporting their highest level of education as non-university post-secondary, and a lower fraction reporting high school, than do the OILS/IALS data. This is probably due to the differences in the education questions in the two surveys. There are also discrepancies in the reported number of hours of work per week, and the reported number of weeks of work per year, which are higher in the OILS/IALS sample. Once again, the reason seems to be differences in the two questionnaires regarding these variables.[12] As we will see below, these differences do not imply important differences in earnings regression estimates using the two datasets.

An interesting fact arising from Table 1 is the substantial fraction of immigrants who acquire their education in Canada. Table 2 separates immigrants between those who report obtaining their highest degree in Canada and those who did not acquire any education in Canada. It is immediately apparent that these two groups have very different experiences in the Canadian labour market. Immigrants with Canadian education earn 32% more than immigrants with no Canadian education and 18% more than native-born workers. Further, they have experience that is comparable to that of native born Canadians 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. On the other hand, the average immigrant with no Canadian education has earnings that are 90% of those of the average native born worker, less Canadian experience (although more total experience), and much lower literacy scores. These findings suggest that controlling for the origin of education may indeed be important for understanding immigrant earnings.

IV Are Immigrants and Native Born Literacy Levels Different?

Figure 1(a) plots the kernel density function of the individual averages of the document and quantitative literacy scores.[13] The immigrant distribution is bi-modal 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.[14] 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 who all share the lowest score in the sample: 83. This score corresponds to the assigned score for individuals who lacked the language skills to answer the test.[15] Figure 1b plots the average literacy distributions with the respondents who are assigned the lowest score removed. 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 of recent immigrants who have not yet acquired English or French language skills. In fact, it is a mixed group in terms of years since arrival in Canada, 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. They have, on average, six fewer years of education than the other immigrants and about one-half of them report not being able to carry on a conversation in English. 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.[16] Only 30% of these immigrants report using English at work, and 60% report that they do not use literacy skills at work. Their jobs are mainly in the service sector, construction and manufacturing. Table 1A in the appendix shows the average characteristics of this particular group of immigrants.

Figures 1(c) and 1(d) show the distribution of literacy scores (after removing the group 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 who were 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 2, arises from the relative absence of immigrants with high levels of literacy.

A further investigation of differences in literacy is provided in Figures 2 and 3. Figure 2a

recreates Figure 1a for document literacy scores only. Again, there is clear bimodality in the immigrant sample driven by the set of respondents who are unable to answer the literacy questions. The distributions are redrawn in Figure 2b after removal of these observations with assigned literacy scores. The immigrant distribution is clearly inferior to that of the native born. Figures 2c and 2d recreate this comparison for the immigrant sub-samples delineated by where they completed their education. As with overall literacy, we see that both immigrant groups have inferior distributions and the distribution for immigrants educated in Canada has lower dispersion and much smaller concentration to the right of the mode. Both immigrant groups have larger proportions of their respective distributions with low literacy scores (below 200) than is the case for the Canadian born. This concentration in the lower tail of the distribution is especially pronounced for immigrants who completed their education in Canada.

Figures 3(a) to 3(d) reproduce this set of distributions but for quantitative literacy. The distribution for immigrants educated in Canada again displays much lower variance than that of the native born, but the mode is somewhat higher for immigrants than native Canadians. Among immigrants educated abroad, the distribution is bimodal with one mode below, and the other mode above, that of the native born. Overall, in contrast to the results for document literacy, the quantitative literacy distributions for both sets of immigrants are more similar to the native born distribution. This may make sense since one would expect quantitative literacy to be less language dependent.

Understanding the relationship between literacy and human capital variables like education and experience is central to our analysis. Table 3 reports the results from a regression of the literacy score on these variables plus language ability, 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 estimated coefficients reported in the table indicate that years of experience are essentially uncorrelated with the worker's literacy level. Green and Riddell (2003) find that this is a robust result across various specifications in the IALS data that is predominantly made up of native born workers. On the other hand, there is a strong relationship between education and literacy for the native born. Canadian born university graduates have average literacy scores that are 75 points higher than workers who have not completed high school. Given that the average score is just under 300, this is a sizeable difference. University graduates also have dramatically higher literacy than graduates from other post-secondary institutions.

The results for immigrants are somewhat mixed. For ease of interpretation, the experience and education variables used in the Table 3 estimation are defined in such a way that the immigrant coefficients stand on their own; that is, they are not defined relative to the native born coefficients. Immigrants who have not completed high school have average literacy scores on the order of 50 points below their Canadian counterparts with the same education regardless of where they finished their schooling. For immigrants who obtained their education abroad, there is no difference in average literacy between high school graduates and dropouts, which is in strong contrast to the outcome for the native born. On the other hand, relative to high school dropouts both the non-university post-secondary and university literacy differentials are smaller, though not dramatically so, than those observed for the native born. As a result, foreign-educated immigrants with a university degree have an average literacy score that is approximately 60 points lower than that for a university-educated native born worker.

Foreign experience does not have a statistically significant relationship with literacy, mirroring the results for Canadian experience among the native born. On the other hand, immigrants who finish their education in Canada exhibit a relatively strong relationship between

Canadian experience and literacy. An immigrant who has 20 years of Canadian experience has an average literacy score that is 34 points higher than an immigrant just entering the Canadian labour force. Immigrants educated abroad also have a positive relationship between Canadian experience and literacy, though the effect is not statistically significant and the size of its impact is only about one-third of that for Canadian educated immigrants when evaluated at 20 years of experience. Thus, for university educated immigrants who completed their education before migrating, literacy improvements over their first 20 years in Canada reduce their 60 point literacy shortfall relative to their native born counterparts by 10 points.

These improvements in literacy scores associated with time in Canada may reflect increased language skills that then improve the "usability" of immigrant cognitive skills. One piece of information that fits with this hypothesis comes from estimations (not reported here) that included interactions of Canadian experience with the source region. For immigrants from the US and UK we could not reject at conventional significance levels the null hypothesis that literacy did not change with experience in a one-sided test against the alternative that it grew with experience. Thus, there is no evidence that immigrants from English speaking countries exhibit increases in literacy with time in Canada. However, caution is required because we cannot tell whether Canadian experience is capturing a time in Canada effect or cohort effects. There is no such confusion with foreign experience, however, and the results there are the same as with Canadian experience for the native born.

These results indicate that, for foreign educated immigrants, there is an overall literacy deficiency relative to the native born and that deficiency rises somewhat with education. However, the estimates in Table 3 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 in obtaining these results we control for region of origin and that immigrants from the U.S. or U.K. do not face as large a literacy disadvantage. Combining this with the earlier result that immigrants and the native born differ in document literacy rather than quantitative literacy, a reasonable set of conclusions might be the following: (i) that the document literacy score partially reflects language fluency for immigrants; (ii) that immigrants not from the U.S. or U.K. have some difficulties in English or French; and (iii) that any language difficulties accentuate differences relative to the native born to a greater extent at higher than lower education levels.

V The effect of education and literacy on immigrant earnings

Results without literacy variables

In this section, we examine results from earnings regressions with and without controlling for literacy. The dependent variable is the log of annual earnings, which, as discussed earlier, is the only reliable earnings concept in the OILS data. As a first step, we estimate standard cross-section regressions using both Census data and our combination of OILS and IALS data. This comparison will enable us to see if the OILS data is similar enough to the data most commonly used in immigration research to permit conclusions to be generalized. We estimate a specification that includes a quadratic in experience, the education dummy variables specified earlier, a dummy for immigrant status, a quadratic in years since entering Canada for immigrants, and dummy variables corresponding to English or French language proficiency. The Census and the OILS surveys do not contain the same language proficiency questions. In the Census based estimates, we include a set of language controls indicating whether English or French was the first language spoken and whether the individual speaks English or French at home.[18] With the OILS we use a question asking how well the individual can express him or herself in English or French.

The first column in Table 4 presents the results based on a sample of immigrant and native-born male workers resident in Ontario from the 1996 Census. The results reflect commonly observed patterns. In particular, the returns to experience are near 9% just after leaving school but decline to zero by 30 years later. There are also substantial returns to education that are on the order of those found in earlier studies. Immigrants receive annual earnings that are over 60% less than earnings of native born workers with the same level of total experience and education. Immigrant earnings then rise at a rate of approximately 3% more per year compared to similar native born workers in the years just after the immigrant enters Canada. As indicated by the negative coefficient on the years-since-migration (YSM) squared variable, this rate of catch-up to the native born diminishes over time. If immigrant earnings actually follow this "years since migration" profile then their earnings would equal those of a comparable native born worker at approximately 28 years after in Canada. This, however, is a big "if". As Borjas (1985) points out, if immigrants arriving in different years (i.e., in different cohorts) face different entry earnings and/or years since migration earnings profiles then a cross-sectional years since migration profile will represent a combination of actual profiles and the effects of shifts across cohorts. Thus, the cross-sectional profile is not necessarily the relevant earnings assimilation profile for any set of immigrants. With only a single cross-section of OILS data, there is no way to address this problem. The immigrant dummy variable and years since migration profile summarize a combination of cohort effects and assimilation profiles rather than a profile that bears behavioural interpretation. Since our focus is on literacy effects rather than cohort patterns, this is not a central concern. It is only important that we control for the combination of cohort and assimilation effects, not that we can separately identify them.

The second column of Table 4 repeats the estimation of the basic regression using the OILS/IALS data. Because of sample size considerations with the IALS, we include native born workers from all of Canada in our comparison sample and then include provincial dummy variables (not reported in the table) in our regression.[19] The key point for our purposes is the very strong similarity with the Census based estimates. This is particularly true for the immigrant and YSM effects but also holds for the returns to experience profile. The return to completing high school is substantially lower in the OILS/IALS data than what we find in the Census but the returns to each of the higher education levels (relative to graduating high school) are very similar. We conclude that estimates based on our data are representative of the Ontario population and thus conclusions with respect to the unique variables in our data (literacy and others) are potentially generalizable.

The specification in column 2 imposes equal returns to education and experience for immigrants and the native born but allows immigrants to have separate entry earnings and an earnings progression with years since arrival. However, the latter YSM effects can be difficult to interpret even in the absence of the cohort effect complication just described. For individuals arriving in Canada after they have completed their education, YSM corresponds to experience in the Canadian labour market. For individuals completing their education in Canada, YSM will equal years of experience in the Canadian labour market plus the number of years between arrival and entering the labour market. Since the latter years may include time when the migrant is quite young, their impact on earnings is likely quite different from that of labour market experience. For that reason, we implement an adjusted specification (reported in column 3) that allows the immigrant effects and Canadian experience effects to differ between immigrants who arrive after completing their education and immigrants who complete their education in Canada. Differences between these two groups of immigrants in the coefficients on Canadian experience variables could represent some combination of differential returns to experience and differential cohort effects.

As discussed earlier, most previous studies are forced to make approximations concerning the amount of education immigrants acquire before arrival. Inclusion of specific questions on pre-arrival education is one of the advantages of the OILS. The one other Canadian dataset with a direct measure of pre-arrival education is the 1989 Literacy Skills Used in Daily Activities (LSUDA) survey which is used in a study of immigrant earnings by Alboim, Finnie and Meng (2003). Our paper differs from theirs in a number of key respects. First, while Alboim et. al. (2003) focus mainly on returns to foreign education and experience, using literacy as essentially an extra control, we focus mainly on issues relating to the impact of literacy on earnings. Thus, we view our analysis as a complement rather than a substitute for their paper. Second, the LSUDA is a nationwide survey that does not over-sample immigrants. As a result, Alboim et. al. (2003) have a sample of only 251 immigrants to work with. This precludes detailed examinations of some of the more complex impacts of foreign experience and education on Canadian earnings. In contrast, the OILS focuses only on immigrants, allowing us to work with a sample of about 1350 immigrants. Third, the LSUDA contains information on total annual income rather than earnings. OILS and IALS contain information on annual earnings, which we view as being more closely related to the types of human capital explanations we seek to investigate.

The adjusted basic specification in column 3 includes both the new immigrant experience variables described above and two dummy variables corresponding to immigrants whose source country was either: 1) the US or UK; or 2) any continental European country. We include these variables because previous studies have placed a great deal of emphasis on country of origin effects in explaining immigrant earnings patterns (e.g., Baker and Benjamin, 1994). In interpreting the estimates reported in column 3 note that the various experience coefficients are reported so that they can be read directly rather than as comparisons to, say, the Canadian experience variables.

The three sets of experience effects reported in the third column are all quite comparable in size, and tests of the hypothesis that they are equal to each other cannot be rejected at conventional significance levels. The estimated coefficients relating to the Canadian experience of immigrants who complete their education in Canada and the overall experience coefficient (which corresponds mainly to the experience effects for the native born) are extremely similar. The intercept coefficients for the two groups of immigrants are both negative but not precisely estimated. Nonetheless, the implication from the coefficients is that immigrants who complete their education abroad have earnings that are over 30% lower than comparable native born workers. This estimate applies to the base category, those with reasonable language skills in French or English and who are not from the US, the UK, or Europe. For those with poor language skills, average annual earnings are another 45% lower. Finally, the country of origin effects suggest that immigrants from the US, UK or continental Europe have earnings that are over 20% higher than those of other immigrants, though these effects are not precisely estimated.

The adjusted basic specification is still, potentially, too restrictive. In particular, it restricts the returns to foreign experience (in terms of earnings in Canada) to be the same as returns to Canadian experience for the native born. The specification in the fourth column of Table 4 permits a separate return to foreign experience. This is important because Friedberg (2000) finds, using Israeli data, 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 labour market. These results are replicated for Canada by Alboim et al (2003). Green and Worswick (2002) study this further and show that this is a recent phenomenon for Canada since immigrant cohorts in the early 1980s earned returns on foreign experience that were similar to the returns the native born earned for Canadian experience. Similar to results in those papers, when we introduce foreign experience variables in column 4, the immigrant intercept for immigrants educated before arrival actually turns positive, though it is still not well defined. At the same time, the returns to Canadian experience for this group are now estimated to be 2% below those for the native born and Canadian educated immigrants in the period after entry into the Canadian labour market.[20] Finally, note that introducing the foreign experience effect does not change the returns to education, language impacts, and country of origin effects.

The return to foreign experience itself is about one-third of the return to Canadian experience achieved by the native born and less than one-half of the return to Canadian experience obtained by immigrants who complete their education abroad. It is this low rate of return on foreign experience that is the source of the negative immigrant effects in the first three columns of the table. Comparing immigrant earnings to those of native born workers with the same total number of years of experience shows that immigrant earnings are significantly lower. This occurs because the immigrants are obtaining quite low returns to some of those years of experience. Once we control for foreign experience, we are effectively comparing immigrants to native born workers with the same number of years of Canadian experience and it turns out that immigrant and native born workers have earnings that are much more similar when compared on that basis. This does not negate the fact that immigrants have lower earnings. However, it does help us understand that a main source of those lower earnings is an inability to transfer human capital acquired in a foreign labour market to Canada. It is worth noting, as well, that foreign experience does not suffer from the same difficulties as Canadian experience for immigrants. That is, there is no cohort dimension to the number of years an immigrant worked before arriving. Immigrants arriving in recent cohorts and cohorts from decades ago could all have the same distribution of foreign experience before arriving. The same is not true of Canadian experience: those arriving in earlier cohorts necessarily have more. This means that we can give the coefficient on foreign experience a standard human capital acquisition interpretation much as we have given to Canadian experience. [21]

The final column of Table 4 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 sets of 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 indicates 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 the results in the last column of Table 4, we present fitted average earnings for a set of specific cases characterized by differing levels of education and experience in the left panel of Table 6. To generate the entries in this table, we formed fitted average log earnings values for a base case person who is a native born worker who has not graduated from high school and has no Canadian experience. We also formed 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 US, the UK 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.

An examination of the table entries corresponding to immigrants who have not graduated from high school with either 0 or 10 years of foreign experience (the 2nd and 3rd rows in the first column, respectively) indicates that low educated immigrants earn considerably more than similarly educated native born workers when they first enter the Canadian labour market. Moving from the foreign experience = 0 to the foreign experience = 10 entry in the first column shows the returns to foreign experience, which is substantial but much less than what the native born gain from their first 10 years of experience. Also, 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 stronger return to Canadian experience than foreign experience. We can also compare the native born and immigrants at 20 years of experience. For the native born, the difference relative to the base case for someone with low education and 20 years of experience is given in the third column in the first row. Immigrants who arrived in Canada right out of school, and hence have no foreign experience, have an earnings differential at 20 years of experience relative to the base case given in the third column of the second row. Immigrants with10 years of foreign experience and 10 further years of Canadian experience have an earnings differential given in the second column of the third row. All three numbers are similar in size, with the latter number being somewhat larger. Thus, the immigrant advantage right out of school is whittled away by the fact that the native born get a higher return to Canadian experience than do immigrants.[22]

For high school graduates, immigrants with no foreign experience and no Canadian experience again earn more than do similar native born workers. However, a comparison of an immigrant with 10 years of foreign experience and no Canadian experience with a native born worker with 10 years of Canadian experience indicates that the immigrant earns about 16% less. 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. As before, at 20 years of experience, average earnings are about the same regardless of the combination of foreign and Canadian experience that underlies that 20 years.

For the university educated, foreign experience actually has a negative return, as witnessed by the fact that the average earnings differential is lower for a university educated immigrant with 10 years of foreign experience than one with 0 years. As with high school graduates, an immigrant with 10 years of foreign experience and no Canadian experience earns much less than a native born worker with 10 years of Canadian experience. Immigrants with 20 years of Canadian experience and no foreign experience and native born workers with 20 years of experience earn about the same amount but immigrants with 10 years of foreign experience and 10 years of Canadian experience earn about 40% less than 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.

Results with literacy variables

In Table 5, we use the preferred specification from Table 4 but include the average literacy score. A comparison of column I, where we simply add the literacy variable without any interactions, and the last column in Table 4 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 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 education decline by about one-third for the native born, indicating that a substantial amount of conventional estimates of the return to schooling arises from the impact of education on literacy and the value placed on literacy in the labour market. With the inclusion of controls for literacy skills, estimated returns to foreign education decline even more than was the case for the native born. Thus, literacy skills constitute much of what foreign education seems to deliver — at least in terms of what skills are valued by the Canadian employers.

As discussed earlier, a main point of interest in these regressions is whether returns to literacy are lower for immigrants. Recall that in our framework differences in the coefficient on the literacy variable between immigrants and the native born can be interpreted as a clear measure of discrimination in cases where there are no interactions between literacy and other variables such as experience. For immigrants, if we add interactions between literacy variables and either experience or education variables to any of the specifications set out in Table 5, we cannot reject the hypothesis that the coefficients on these interaction terms equal zero. Thus, we can examine literacy coefficients directly for evidence of discrimination against immigrants. The specification in column II of Table 5 permits 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. It is worth emphasizing that this result refers to what we call "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 immigrants

are getting returns to literacy as measured in English or French that are no worse than those obtained by native born workers.

Once we introduce these complexities in the returns to literacy, returns to university are about the same as for the native born. Returns to the other levels of education do not change much with the introduction of the separate literacy coefficients and remain much smaller than for the native born. Within our analytical framework, the implication is that high school and non-university post-secondary education acquired abroad does not produce literacy (since these coefficients virtually do not change with the introduction of the literacy variable). However, foreign universities appear to produce literacy but at a lower rate than Canadian universities. Thus, the different returns from foreign and Canadian university education seen in standard specifications are eliminated once we control for literacy in a flexible way. Thus, differences in those returns turn out to be completely explained by differences in the extent to which foreign and Canadian university programs generate literacy (as measured in English or French).

In column III 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. 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 multi-collinearity. That is, it may not be possible to separately identify the effects of document and quantitative literacy given the high correlation between the two scores. We thus advise strong caution in pinning too much on these differences between immigrants and the native born.

The last specification in column IV 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 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 non-zero 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. One might have expected literacy interactions to help explain this (i.e., that immigrants get less of a return to experience because they don't have the literacy skills to complement the skills generated by experience) but the lack of significant interactions with literacy skills implies 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 who receive the assigned low literacy score that indicates an inability to do the test has a positive coefficient indicating that these workers earn approximately 40% more than one would anticipate given their literacy score and other characteristics. While this coefficient is not well defined, it may fit with results in other papers indicating the importance of immigrant enclaves in allowing immigrants to do better than expected when they do not acquire the host country language (Edin et. al. (2003)).

To aid in the interpretation of the results in the last column of Table 5, 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 right hand panel in Table 6. Comparing this to the left panel, one sees similar patterns to those 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 much more 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 control for the literacy level. For example, the differential between immigrant and native born high school educated workers, both with zero Canadian and foreign experience, is .36 log points when we do not control for literacy and .6 log points when we do. 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 right hand panel where the literacy score is constant.

One interesting question arising out of 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 5. 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 .10 log points over the native born among high school educated workers and an immigrant disadvantage of .36 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 results is an increase in the immigrant advantage for the high school educated to .26 log points and a shift from the immigrant disadvantage of .36 log points to an immigrant advantage of .41 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 gave 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 from the .10 log points mentioned above to .30 log points. For the university educated, it reduces the immigrant disadvantage from .36 log points to .15 log points. Thus, poorer literacy among immigrants has a slightly larger effect on immigrant-native born differentials than 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.

VI Conclusion

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. We argue that this fits with literacy scores partially reflecting host country language ability. 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 otherwise equivalent native born workers. If we rely on Becker's notion of discrimination (i.e., 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 drop-out to a university graduate. Introducing a literacy score variable into a standard earnings regression reduces estimated education differentials by about one-third. This impact differs between immigrants and the native born, and 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 a lower level of (Canadian economy-usable) literacy skills.

The result that literacy skills have a significant impact on earnings implies that lower immigrant literacy skill levels may help in understanding immigrant-native born earnings differentials. This is indeed the case. If immigrants had the same average literacy scores as the native born, the earnings differential between immigrants and the native born would narrow by about 20%. This change would eliminate just over half 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 native born 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, the impact is decidedly smaller than the effect of low returns to foreign experience among the highly educated. It is worth noting, as well, 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.

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Endnotes

1. The Canadian Census of Population — the data used in most previous immigration studies — has no information about the origin of human capital. In addition, the age of arrival variable is coded in bracketed intervals. This enormously complicates the imputation of measures of pre- and post-migration experience.
2. We are not aware of a paper in the large literature on immigrant earnings that treats education as endogenous.
3. We omit higher order interaction terms because they do not enter our specifications.
4. The differences between the coefficients in the reduced form equation (3) and those in the quasi-reduced form equation (4) can be seen by substituting the expressions for *G1, G2* and G3 into equation (1') to obtain equation (3) and then substituting the expressions for *G2* and *G3* into equation (1') to obtain equation (4).
5. We have, however, left out further interactions of Canadian obtained education with source country variables since they turn out not to be important in our empirical analysis.
6. Immigrants are defined as individuals who landed officially in Canada. Thus, non-permanent residents are excluded.
7. The OILS was carried out in May 1998, and the annual earnings information refers to 1997. Similarly, IALS annual earnings refers to 1993.
8. The IALS also includes measurements of a third literacy domain (Prose) but since the OILS does not include these questions we focus only on Document and Quantitative scores.
9. Note that individuals who attended post-secondary institutions but have not graduated are classified as high school graduates if they have in fact graduated from high school.
10. There are some ties in the data (e.g., individuals who record obtaining a post-secondary degree both in Canada and abroad). We treat ties as corresponding to completing education in Canada.
11. The difference between the years of schooling and categorical results arises because immigrants tend to have fewer years of schooling than native born workers who are in the same educational category.
12. The census asks about the number of hours worked in the previous week and the number of weeks worked during the previous calendar year, whereas the OILS/IALS asks about usual hours worked during the previous year and the number of weeks worked during the last 12 months.
13. We estimate the kernel density functions with the kdensity function in Stata, using the Epanechnikov kernel and Stata's default bandwidth formula.
14. In virtually all of 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, and in all the comparisons we cannot reject the null hypothesis that the native born CDF first order stochastically dominates the immigrant CDF at any conventional significance level. (We use the test for first order stochastic dominance described in Barrett and Donald (2002)).
15. The assigned score for the quantitative test is 108, and for the document score it is 57.
16. See Borjas (1995b) and Edin et.al. (2003) for evidence relating to ethnic neighbourhoods and immigrant enclaves.
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.
18. Rather than including the coefficients from all of these variables in the table, we report "yes" in the language expression row to indicate that we did control for self-reported language skills in the Census runs.
19. Recall, though, that to match the OILS data, we keep only IALS sample members who are not resident in rural areas
20. Note that in this specification we have imposed the restriction that returns to Canadian experience for immigrants who complete 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 not statistically significantly different cannot be rejected at any conventional significance level.
21. However, Green and Worswick (2002) point out that native born earnings can also be organized in a cohort format and that doing so provides insights into the cross-cohort patterns in immigrant cohorts. In particular, they find that approximately 60% of the cross-cohort decline in immigrant earnings in the 1980s can be attributed to general declines across cohorts of new entrants of all kinds into the Canadian labour market.
22. Note that all of these statements are based on interpreting coefficients on Canadian experience as reflecting true returns to experience rather than cohort effects. 1 OILS and IALS annual earnings refer to the years 1997 and 1993 respectively. Census earnings refer to 1995.

Figure 1A

Distribution of literacy

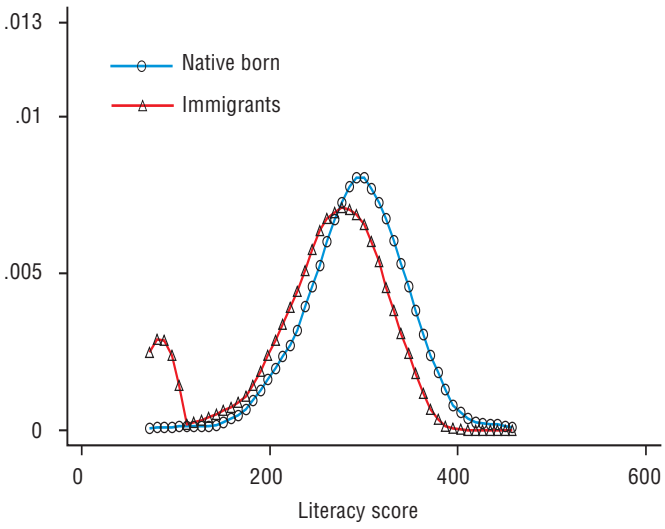

Figure 1B

Distribution of literacy (except lit=83)

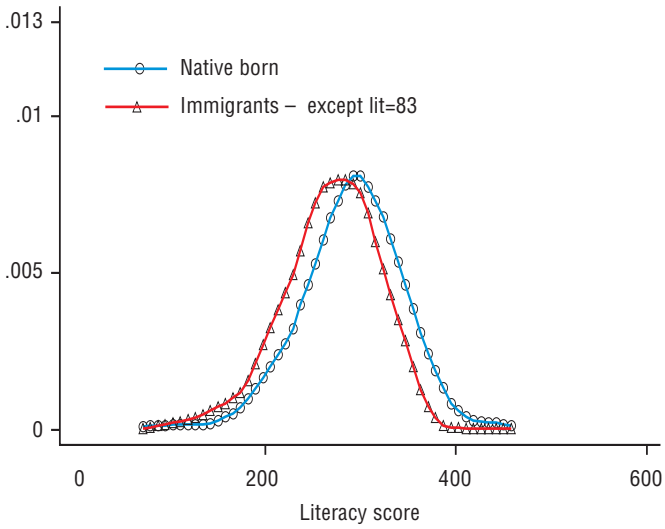

Figure 1C

Distribution of literacy (Canadian education)

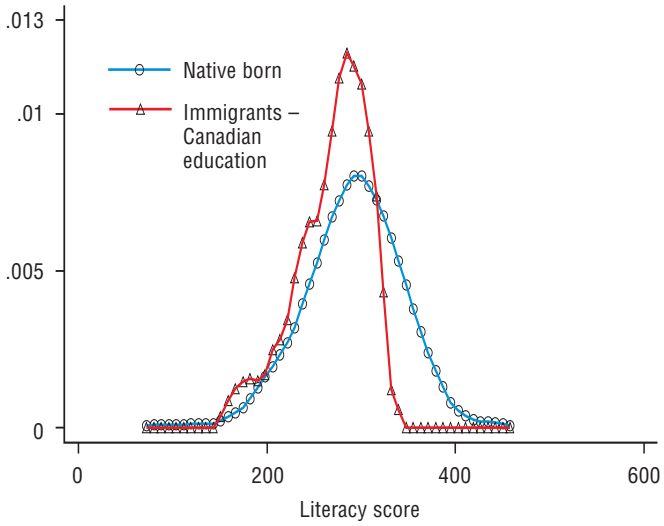

Figure 1D

Distribution of literacy (no Canadian education)

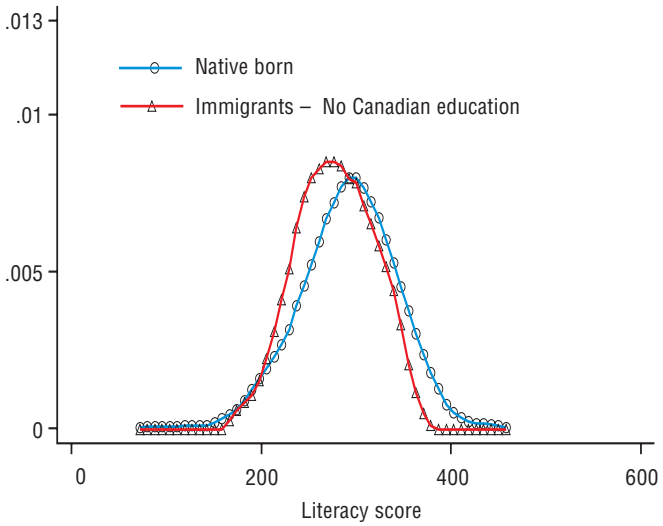

Figure 2A

Distribution of document score

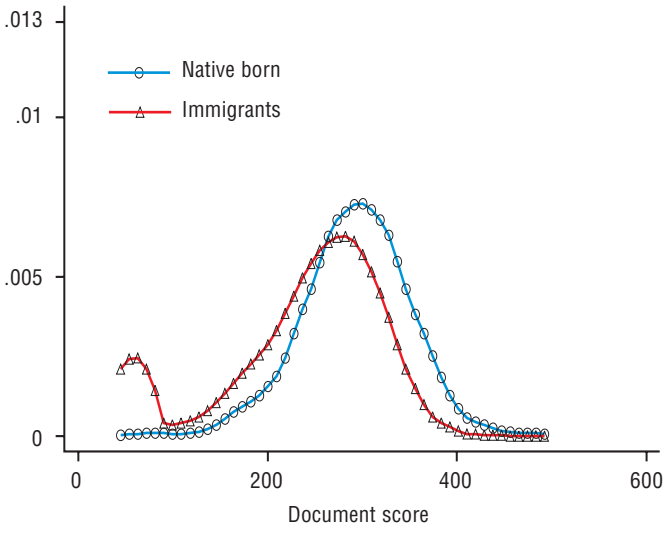

Figure 2B

Distribution of document score (except doc=57)

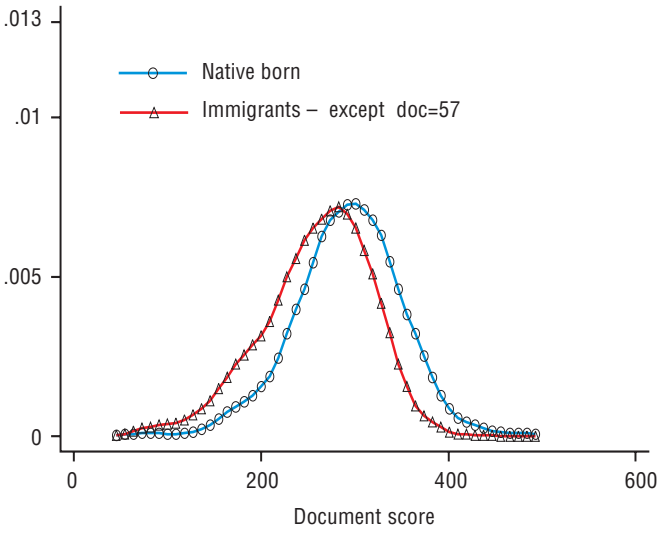

Figure 2C

Distribution of document score (Canadian education)

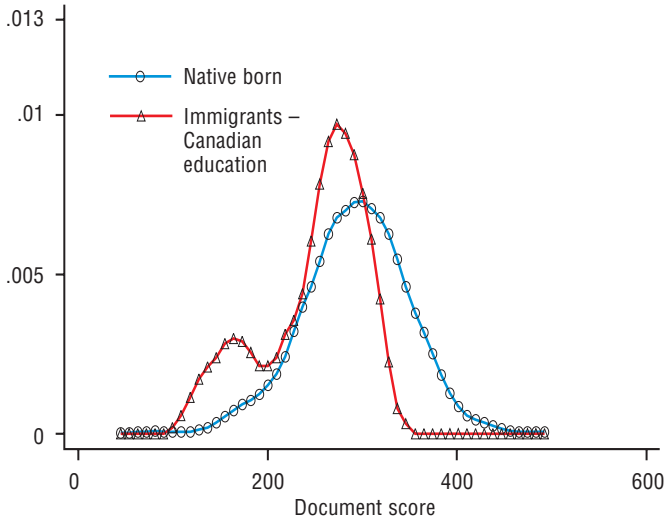

Figure 2D

Distribution of document score (no Canadian education)

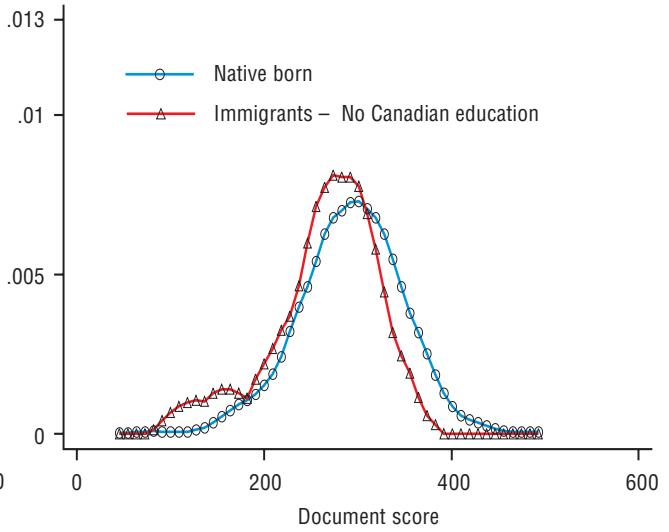

Figure 3A

Distribution of quantitative score

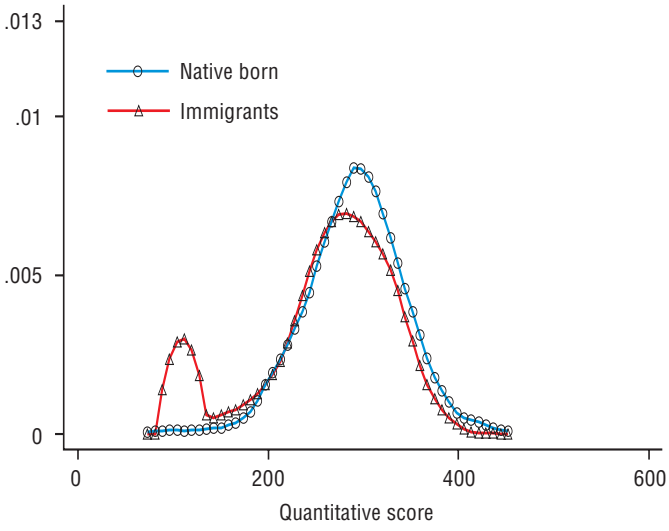

Figure 3B

Distribution of quantitative score (except q=108)

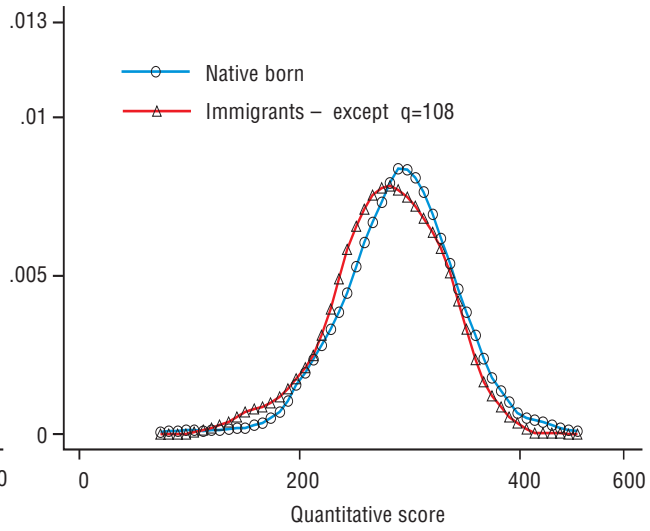

Figure 3C

Distribution of quantitative score (Canadian education)

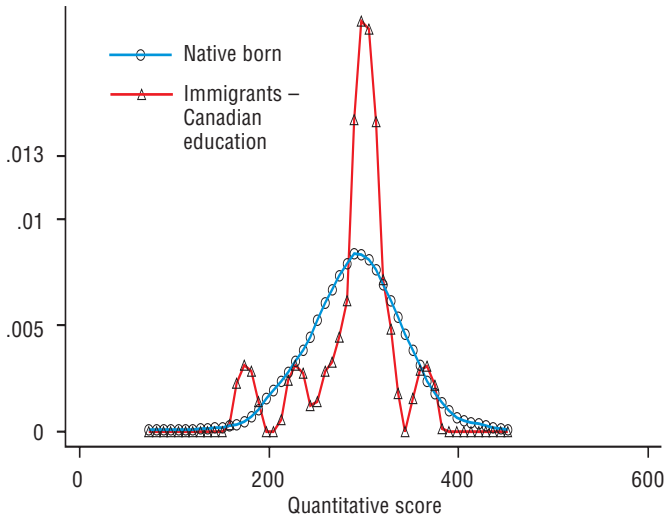

Figure 3D

Distribution of quantitative score (no Canadian education)

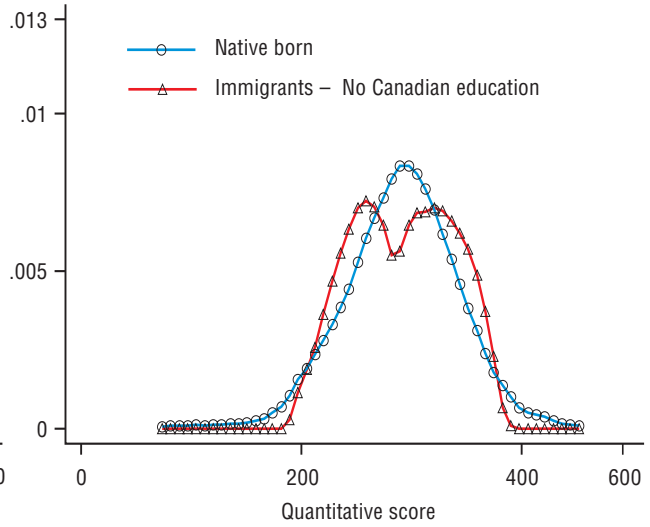

Table 1

Summary statistics for immigrant and native born workers

	OILS 1998 and IALS 1994		Urban Ontario (Census 1996)	
	Immigrant	Native born (Ontario)	Immigrant	Native born
Annual earnings[1]	40,149	39,882	38,512	40,865
Hours worked	44	43	38	38
Weeks worked	49	48	46	46
Age	43	38	42	37
Experience	23	19	22	17
Canadian	16	.	.	
Foreign	7	.	.	
Years of education	13	13	14	14
Percent less than high school	23	27	25	21
Percent high school	26	39	19	27
Foreign	18	.	.	.
Canadian	8	.	.	.
Percent non-university postsecondary	22	20	32	30
Foreign	10	.	.	.
Canadian	12	.	.	.
Percent university	29	14	24	22
Foreign	14	.	.	.
Canadian	15	.	.	.
Years since migration	20	.	19	.
Age at immigration	23	.	25	.
Percent less than 8 years-since-migration	19	.	16	.
Document literacy	238	288	.	.
Quantitative literacy	262	285	.	.
Observations	1,350	275	16,125	7,437

1. OILS and IALS annual earnings refer to the years 1997 and 1993 respectively. Census earnings refer to 1995.

Table 2

Summary statistics by origin of education

	Immigrants			Native born
	Canadian education	No Canadian education	All	
Annual earnings	47,077	35,712	40,149	39,882
Hours worked	44	44	44	43
Weeks worked	49	49	49	48
Age	40	45	43	38
Experience	18	26	23	19
Canadian	17	16	16	.
Foreign	1	10	7	.
Years of education	15	12	13	13
Percent less than high school	10	31	23	27
Percent high school	21	29	26	39
Foreign	.	29	18	.
Canadian	21	.	8	.
Percent non-university postsecondary	31	16	22	20
Foreign	.	16	10	.
Canadian	31	.	12	.
Percent university	38	24	29	14
Foreign	.	24	14	.
Canadian	38	.	15	.
Years since migration	26	16	20	.
Age at immigration	14	28	23	.
Percent less than 8 years-since-migration	8	25	19	.
Document literacy	272	216	238	288
Quantitative literacy	289	244	262	285
Observations	527	823	1,350	275

Table 3

Regressions with literacy score as the dependent variable

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 – Canadian education)	3.08 (1.36) **
Canadian experience^2 (immigrants – Canadian education)	-0.070 (.042)
Immigrants without Canadian education	-52.43 (16.11) ***
Canadian experience (immigrants – no Canadian education)	1.72 (1.24)
Canadian experience^2 (immigrants – no Canadian education)	-0.057 (.032) *
Foreign experience	-0.47 (1.07)
Foreign experience^2	0.0047 (.036)
High school (Canadian)	27.81 (2.79) ***
Non-university postsecondary (Canadian)	34.73 (3.53) ***
University (Canadian)	75.42 (3.18) **
Foreign high school (immigrants)	-0.97 (10.57)
Foreign non-university postsecondary (immigrants)	26.32 (12.68) **
Foreign university (immigrants)	67.67 (10.76) ***
Canadian high school (immigrants)	23.82 (25.97)
Canadian non-university postsecondary (immigrants)	7.04 (25.20)
Canadian university (immigrants)	40.59 (24.42)
Language other	-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

(***) Coefficient is significant at 1% significance level.
(**) Coefficient is significant at 5% significance level.
(*) Coefficient is significant at the 10% significance level.

Table 4

Annual earnings regressions without literacy effects

	Census	Basic 1	Basic 2	Expanded	Preferred
Immigrant	-0.55 ***	-0.52 ***	- -	- -	- -
	(0.017)	(0.18)			
Immigrant (education after arrival)	- -	- -	-0.17	-0.082	0.35 ***
			(0.19)	(0.11)	(0.12)
Immigrant (education before arrival)	- -	- -	-0.33	0.34	0.73 **
			(0.21)	(0.24)	(0.35)
Language expression	Yes	-0.33 ***	-0.45 ***	-0.44 ***	-0.42 ***
		(0.12)	(0.12)	(0.12)	(0.12)
Years since migration	0.030 ***	.034 **	- -	- -	- -
	(0.0016)	(0.015)			
Years since migration^2	-0.037 ***	-0.042	- -	- -	- -
	(0.0038)	(0.032)			
Experience	0.089 ***	0.088 ***	0.087 ***	- -	- -
	(0.0013)	(0.0056)	(0.0059)		
Experience^2 (/100)	-0.15 ***	-0.15 ***	-0.15 ***	- -	- -
	(0.0027)	(0.013)	(0.013)		
Canadian experience – immigrants (education after arrival)	- -	- -	0.092 ***	- -	- -
			(0.025)		
Canadian experience^2 – immigrants (education after arrival)	- -	- -	-0.15 *	- -	- -
			(0.079)		
Canadian experience – immigrants (education before arrival)	- -	- -	0.11 ***	0.071 ***	0.062 ***
			(0.024)	(0.024)	(0.025)
Canadian experience^2 – immigrants (education before arrival)	- -	- -	-0.18 ***	-0.15 **	-0.14 **
			(0.063)	(0.063)	(0.063)
Canadian experience[a]	- -	- -	- -	0.091 ***	0.11 ***
				(0.0058)	(.0072)
Canadian experience^2	- -	- -	- -	-0.16 ***	-0.17 ***
				(0.013)	(0.014)
Foreign experience	- -	- -	- -	0.031	0.051 **
				(0.021)	(0.024)
Foreign experience^2	- -	- -	- -	-0.14 **	-0.16 **
				(0.069)	(0.073)
High school	0.05 ***	0.006	0.0089	0.0059	- -
	(0.014)	(0.53)	(0.053)	(0.053)	
Non-university postsecondary	0.26 ***	0.16 **	0.17 ***	0.17 **	- -
	(0.013)	(0.066)	(0.066)	(0.066)	
University	0.53 ***	0.49 ***	0.49 ***	0.49 ***	- -
	(0.014)	(0.059)	(0.059)	(0.059)	
High school (native born)	- -	- -	- -	- -	0.37 ***
					(0.11)
Non-university postsecondary (native born)	- -	- -	- -	- -	0.67 ***
					(0.13)
University (native born)	- -	- -	- -	- -	0.70 ***
					(0.12)

Table 4 – concluded

Annual earnings regressions without literacy effects

	Census	Basic 1	Basic 2	Expanded	Preferred
Foreign high school	- -	- -	- -	- -	-0.00086 (0.32)
Foreign non-university postsecondary	- -	- -	- -	- -	0.38 (0.34)
Foreign university	- -	- -	- -	- -	0.56 * (0.29)
High school* Canadian experience (native born)	- -	- -	- -	- -	-0.016 *** (0.0045)
Postsecondary* Canadian experience (native born)	- -	- -	- -	- -	-0.028 *** (0.0066)
University* Canadian experience (native born)	- -	- -	- -	- -	-0.0047 (0.0053)
Foreign high school* foreign experience (immigrants)	- -	- -	- -	- -	-0.013 (0.024)
Foreign postsecondary* foreign experience (immigrants)	- -	- -	- -	- -	-0.023 (0.033)
Foreign university* foreign experience (immigrants)	- -	- -	- -	- -	-0.053 *** (0.019)
Country of origin U.S. – U.K.	- -	- -	0.21 (0.17)	0.21 (0.17)	0.28 * (0.17)
Country of origin Europe	- -	- -	0.26 (0.16)	0.22 (0.15)	0.12 (0.16)
Observations	23,552	2,015	2,015	2,015	2,015
Adjusted R^2	0.321	0.197	0.195	0.194	0.204

(***) Indicates the coefficient is significant at 1%.

a. This includes native born Canadians and immigrants educated in Canada.

- - Indicates variable not included in model in question.

Table 5

Annual earnings regressions with literacy effects

	(I)	(II)	(III)	(IV) Preferred
Literacy score	0.0036 ***	- -	- -	- -
	(0.00042)			
Literacy score (native born)	- -	0.0036 ***	- -	- -
		(0.00046)		
Literacy – immigrants (education after arrival)	- -	0.0071 ***	- -	
		(0.0017)		
Literacy – immigrants (education before arrival)	- -	0.0033 **	- -	
		(0.0015)		
Unable to answer literacy questions	- -	0.37	0.36	0.36
		(0.32)	(0.32)	(0.32)
Quantitative literacy (native born)	- -	- -	0.0032 ***	-0.0073 **
			(0.0022)	(0.0030)
Quantitative literacy – immigrants (education after arrival)	- -	- -	0.0011	0.0019
			(0.0016)	(0.0016)
Quantitative literacy – immigrants (education before arrival)	- -	- -	-0.0011	-0.0011
			(0.0021)	(0.0020)
Document literacy (native born)	- -	- -	0.00061	0.0085 ***
			(0.00062)	(0.0030)
Document literacy – immigrants (education after arrival)	- -	- -	0.0058 ***	0.0054 ***
			(0.0015)	(0.0015)
Document literacy – immigrants (education before arrival)	- -	- -	0.0039 **	0.0039 **
			(0.0018)	(0.0017)
Immigrant (education after arrival)	0.36 ***	-0.57	-0.51	-0.92
	(0.12)	(0.50)	(0.50)	(0.54)
Immigrant (education before arrival)	0.97 ***	0.93 *	1.12 **	0.66
	(0.34)	(0.51)	(0.53)	(0.57)
Language expression	-0.33 ***	-0.33 ***	-0.31 **	-0.33 **
	(0.13)	(0.13)	(0.12)	(0.12)
Canadian experience – immigrant (education before arrival)	0.062 ***	0.060 ***	0.057 ***	0.057 **
	(0.024)	(0.024)	(0.024)	(0.024)
Canadian experience^2 – immigrant (education before arrival)	-0.13 **	-0.13 **	-0.12 **	-0.12 *
	(0.062)	(0.063)	(0.063)	(0.070)
Canadian experience (native born)	0.10 ***	0.10 ***	0.10 ***	0.094 ***
	0.0072)	(0.0072)	(0.0072)	(0.0091)
Canadian experience^2 (native born)	-0.16 ***	-0.16 ***	-0.16 ***	-0.18 ***
	(0.013)	(0.014)	(0.013)	(0.014)
Foreign experience	0.049 **	0.055 **	0.058 ***	0.059 **
	(0.024)	(0.024)	(0.024)	(0.023)
Foreign experience^2	-0.15 **	-0.17 **	-0.17 **	-0.18 **
	(0.072)	(0.072)	(0.073)	(0.070)
Country of origin U.S. – U.K.	0.12	-0.022	0.0061	0.0030
	(0.17)	(0.18)	(0.18)	(0.18)
Country of origin Europe	0.13	0.059	0.078	0.11
	(0.15)	(0.16)	(0.16)	(0.15)

Table 5 – concluded

Annual earnings regressions with literacy effects

	(I)	(II)	(III)	(IV) Preferred
High school (native born)	0.24 **	0.23 **	0.25 **	0.044
	(0.11)	(0.11)	(0.11)	(0.35)
Non-university postsecondary (native born)	0.53 ***	0.52 ***	0.54 ***	-2.04 **
	(0.13)	(0.13)	(0.13)	(0.48)
University (native born)	0.41 ***	0.40 ***	0.38 ***	0.40
	(0.12)	(0.12)	(0.12)	(0.44)
Foreign high school	-0.15	-0.040	-0.043	-0.033
	(0.32)	(0.32)	(0.32)	(0.32)
Foreign non-university postsecondary	0.18	0.30	0.34	0.36
	(0.35)	(0.35)	(0.35)	(0.34)
Foreign university	0.24	0.39	0.39	0.41
	(0.29)	(0.31)	(0.31)	(0.30)
High school* Canadian experience (native born)	-0.015 ***	-0.014 ***	-0.015 ***	-0.025 ***
	(0.0044)	(0.0043)	(0.0044)	(0.0050)
Non-university postsecondary* Canadian experience (native born)	-0.028 ***	-0.027 ***	-0.028 ***	-0.029 ***
	(0.0065)	(0.0065)	(0.0065)	(0.0072)
University* Canadian experience (native born)	-0.0041	-0.0037	-0.0037	-0.014 **
	(0.0052)	(0.0052)	(0.0052)	(0.0062)
Foreign high school* foreign experience (immigrants)	-0.0062	-0.010	-0.0091	-0.0097
	(0.024)	(0.024)	(0.024)	(0.024)
Foreign university postsecondary* foreign experience (immigrants)	-0.024	-0.027	-0.030	-0.031
	(0.033)	(0.033)	(0.033)	(0.033)
Foreign university* foreign experience (immigrants)	-0.057 ***	-0.059 ***	-0.060 ***	-0.059 ***
	(0.019)	(0.019)	(0.019)	(0.018)
Quantitative literacy* experience (native born)	- -	- -	- -	0.00041 ***
				(0.000086)
Document literacy* experience (native born)	- -	- -	- -	-0.00033 ***
				(0.000082)
Quantitative literacy* high school (native born)	- -	- -	- -	0.011
				(0.0026)
Quantitative literacy* non-university postsecondary (native born)	- -	- -	- -	0.001
				(0.0027)
Quantitative literacy* university (native born)	- -	- -	- -	0.003
				(0.0024)
Document literacy* high school (native born)	- -	- -	- -	-0.010
				(0.0025)
Document literacy* non-university postsecondary (native born)	- -	- -	- -	0.008
				(0.0028)
Document literacy* university (native born)	- -	- -	- -	-0.002
				(0.0023)
Observations	2,015	2,015	2,015	2,015
Adjusted R^2	0.233	0.234	0.237	0.271

Table 6

Fitted returns to immigrants and native born by experience and education

	Interaction education-experience			Interaction literacy-human capital		
	Canadian experience = 0	Canadian experience = 10	Canadian experience = 20	Canadian experience = 0	Canadian experience = 10	Canadian experience = 20
Native born (high school dropout)	**0.000**	**0.891**	**1.437**	**0.000**	**0.993**	**1.631**
	(0.0605)	(0.0982)		(0.308)	(0.309)	
Immigrant (high school dropout)						
Foreign experience = 0	0.731	1.215	1.426	1.115	1.562	1.771
	(0.3488)	(0.2916)	(0.2817)	(0.448)	(0.406)	(0.399)
Foreign experience = 10	1.078	1.562	1.773	1.527	1.974	2.184
	(0.3035)	(0.2345)	(0.2288)	(0.415)	(0.367)	(0.363)
Native born (high school)	**0.372**	**1.103**	**1.488**	**0.497**	**1.242**	**1.634**
	(0.1121)	(0.1167)	(0.1216)	(0.297)	(0.294)	(0.294)
Immigrant (foreign high school)						
Foreign experience = 0	0.730	1.214	1.425	1.082	1.528	1.738
	(0.3548)	(0.2880)	(0.2836)	(0.445)	(0.393)	(0.391)
Foreign experience = 10	0.944	1.428	1.639	1.397	1.843	2.053
	(0.2661)	(0.3234)	(0.3126)	(0.390)	(0.457)	(0.449)
Native born (university)	**0.700**	**1.544**	**2.044**	**0.686**	**1.533**	**2.027**
	(0.1220)	(0.1208)	(0.1274)	(0.305)	(0.300)	(0.304)
Immigrant (university)						
Foreign experience = 0, foreign university	1.296	1.779	1.989	1.522	1.969	2.178
	(0.2874)	(0.2345)	(0.2486)	(.387)	(0.352)	(0.362)
Foreign experience = 10, foreign university	1.114	1.598	1.809	1.336	1.779	1.991
	(0.2530)	(0.1966)	(0.2187)	(0.365)	(0.331)	(0.344)

Base group consists of English speaking native born male workers with average literacy score (when required), less than high school education, and experience normalized to zero.

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
Percent high school	27	19
Foreign	18	19
Canadian	9	-
Percent non-university postsecondary	24	5
Foreign	11	3
Canadian	13	2
Percent university	32	4
Foreign	16	4
Canadian	17	-
Age at immigration	22	29
Years since migration	20	18
Understand English	Well/Very well (67%)	Well/Very well (17%)
First language	English (20%)Spanish (17%)	Italian/Portuguese (54%) Cantonese/Mandarin (17%)
Language used at work	English (91%)	English (31%)
Use literacy skills at work	Never (16%)	Never (60%)
Conversation in English	99%	53%
Observations	1,205	145

International Adult Literacy Survey

Monograph Series

The International Adult Literacy Survey (IALS) was a seven-country initiative conducted in the fall of 1994. Its goal was to create comparable literacy profiles across national, linguistic and cultural boundaries. Successive waves of the survey now encompass close to 30 countries around the world.

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