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International Adult Literacy Survey

Literacy and the Labour Market:

Cognitive Skills and Immigrant Earnings

by Aneta Bonikowska, David A. Green and W. Craig Riddell

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Acronyms

ALL	Adult Literacy and Life Skills Survey
CDF	Cumulative distribution function
IALS	International Adult Literacy Survey
IALSS	International Adult Literacy and Skills Survey
OILS	Ontario Immigrant Literacy Survey
YSM	Years since migration

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1. Introduction

Considerable research effort has been devoted to understanding earnings differences between immigrant and native-born (i.e. Canadian-born) workers (see, for example, Chiswick (1978), Borjas (1985, 1995) for the United States, and Baker and Benjamin (1994), Bloom, Grenier and Gunderson (1995), Grant (1999) and Aydemir and Skuterud (2005) for Canada). These studies establish that immigrants typically earn less than Canadian-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 employers in the host country discriminate against immigrants, that is, pay immigrant workers less than equally productive Canadian-born workers. Investigating these issues would be straightforward if we had access to direct measures of skill. In that case, we could compare Canadian 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 the rich data provided by the Canadian component of the International Adult Literacy and Skills Survey (IALSS)[1] which includes both standard demographic and labour market information for the Canadian born and immigrants and results from tests of literacy, numeracy and problem-solving skills. Interpreting the 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-Canadian born earnings differentials.

The primary goal of the paper is to provide answers to four questions related to immigrants' skills. First, do the cognitive skills of immigrants differ from those of Canadian born and, if so, in what way? Second, do immigrant – Canadian born skill differences depend on where immigrant human capital was acquired? Third, do immigrants receive different returns to these skills than observationally similar Canadian-born workers? Fourth, can differences in levels and returns to these skills explain differences in earnings between immigrant and Canadian-born workers?

Recent contributions 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 Israeli-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 Canadian 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. Using data on immigrants to Ontario, Ferrer, Green and Riddell (2006) also find that low returns to foreign experience play a major role in the immigrant – Canadian-born earnings gap, especially among the university-educated. Schaafsma and Sweetman (2001) and Ferrer and Riddell (forthcoming) examine the issue of lower returns to foreign acquired education in a somewhat indirect way by using age at immigration.[2] Both papers find that returns to foreign education, while lower than those to Canadian education, are still substantial. In this paper we provide additional evidence on the importance of where education and experience was acquired. This additional evidence is particularly valuable because the data used in this paper has definite advantages over the data used in previous studies. Part of the contribution of this paper is to re-examine issues about returns to foreign experience and education raised in earlier papers, using better data.

This paper also builds on work by Green and Riddell (2003) and Ferrer, Green and Riddell (2006) that uses, respectively, the International Adult Literacy Survey (IALS) and the Ontario Immigrant Literacy Survey (OILS) to examine the role of cognitive skills in earnings patterns of Canadian-born and immigrant workers. Like the IALSS, the IALS and OILS data contain 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 a 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.

The results imply that the answer to our first main question – Do immigrant literacy skills differ from those of the Canadian born? – is yes. The Canadian-born test score distributions dominate those of immigrants, and immigrants have lower average test scores than observationally equivalent Canadian-born workers. An important part of the gap stems from a set of immigrants unable to complete the tests, and who were therefore assigned low scores. We also find strong evidence that skill differences depend on where human capital was acquired. Immigrants who completed their education prior to arrival in Canada have significantly lower skills than otherwise similar immigrants who obtained some or all of their education in Canada. Regardless of these differences in skill levels and acquisition, however, we clearly reject the hypothesis that immigrants receive lower returns to cognitive skills than the Canadian born. Indeed, an important group of immigrants benefit more than do native-born Canadians from higher skill levels. We argue that this is evidence against a discrimination explanation for differences in earnings between immigrant and Canadian-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 Canadian-born workers. This pattern in returns to experience does not change once we control for cognitive skills, indicating that the root of the problem does not lie in foreign experience generating lower cognitive skills. Cognitive skills themselves exert a significant effect on earnings, with a 100-point increase in the average skill score generating an earnings increase of almost 30 percent[3]. The combination of this return to skills and the lower skill levels of immigrants explain part of the immigrant earnings differential. We estimate that raising immigrant average skill levels to the Canadian-born level would almost eliminate the earnings disadvantage of high school educated male immigrants relative to similarly educated Canadian-born men, and would produce a substantial earnings advantage among high school educated female immigrants. Among the university

educated, for whom the earnings differential is larger, raising immigrant skill levels to the Canadian-born level would reduce the male earnings gap by more than 50 percent and would more than eliminate the female earnings gap, turning the immigrant disadvantage into an advantage.

The paper is organized as follows. In the next section we present a framework for considering what we might learn from introducing cognitive 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 skill levels from the Canadian born. The fifth section contains the analysis of immigrant earnings, and the final section concludes.

2. A framework for discussing earnings generation

This section sets out a simple framework for considering earnings generation and its relationship to cognitive skills. This will prove useful in understanding the role of these skills in immigrant and Canadian-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 simply as skills. Thus, the key distinction is that between skills and abilities.

Assume, for the moment, there are three skills a worker can possess, and workers can possess them in varying amounts. We begin with three skills 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 skill k that person i sells in the market, and e_i is a disturbance term that is independent of the skills. The disturbance term captures either measurement error in earnings or individual idiosyncratic events that are independent of the skill 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 rents 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 skills 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, numeracy and problem-solving tests, G_2 as other (perhaps manual) skills 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:[4]

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

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 skills in earnings generation and whether the skills 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 skills. To see how they enter our framework, consider a set of skill production functions:

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

where *k* indexes the skill 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 skill. Of course, an h function could be constructed such that a skill 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 equation (2) into (1). This yields a reduced form specification for earnings as a function of schooling and experience. The ability variables are unobserved and thus end up in the error term. An inspection of equations (1') and (2') makes it clear that the coefficient on an observable variable such as educational attainment in the reduced form earnings equation will consist of a combination of the α, γ and δ parameters. More specifically, such a coefficient reflects the combination of how that covariate contributes to production of each of the skills and how those skills 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 some but not all of the skills. Labelling the set of observed skills G_1, and using it to refer to a vector of cognitive skills, we obtain a quasi-reduced form earnings regression that includes G_1 (the observed cognitive skills), experience and schooling variables. Thus, our general estimating regression is of the form:

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

where G_{1i} corresponds to our measures of cognitive skills, *edn* is again a vector of education dummy variables, the β's are either scalars or vectors of parameters as appropriate and *u* is an error. Notice 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 skills 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 Canadian born individual. We assume that immigrants use the same sets of skills to generate earnings in the Canadian labour market. Immigrants could differ from the Canadian born in both of the main building blocks of the model: in the returns they obtain from a given set of skills (i.e., immigrants could have a different f(.) function); and in the production functions for creating individual skills (i.e., immigrants could have different h(.) functions).

Differences in the f(.) function between immigrants and the Canadian born correspond to discrimination in this model since they represent differences in earnings between immigrants and Canadian born workers who are in fact equally productive. Thus, if we could directly observe all relevant skills, we could determine whether shortfalls in earnings for immigrants relative to the Canadian born arise from discrimination. It is tempting to think that differences between immigrants and the Canadian 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 Canadian born workers with the same observed cognitive 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 skill (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 Canadian born because *exp* is differentially productive in creating other skills 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 skill production functions differ between immigrants and the Canadian born. Thus, for immigrants, we rewrite these production functions as:

$$G_{ki} = h^I_k(edn_i, exp_i, \theta_{ki}, fedn_i, fexp_i) \qquad (4)$$

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 (4) collapses to equation (2) and differences in earnings between immigrants and the Canadian 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 skill inputs. However, the IALSS 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 this information the immigrant earnings specification, with G_{1i} included, becomes:

$$\begin{aligned} E_i = {} & \beta^I_0 + \beta^I_1 edn_i + \beta^I_2 exp_i + \beta^I_3 exp^2_i + \beta^I_4 edn_i^* exp_i + \beta^I_5 G_{1i} + \beta^I_6 G^2_{1i} \\ & + \beta^I_7 G_{1i}^* edn_i + \beta^I_8 G_{1i}^* exp_i + \beta^I_9 fedn_i + \beta^I_{10} fexp_i \\ & + \beta^I_{11} G_{1i}^* fedn_i + \beta^I_{12} G_{1i}^* fexp_i + \beta^I_{13} fexp_i^* fexp_i + \beta^I_{14} exp_i^* fexp_i + u_i \end{aligned} \qquad (5)$$

Equation (5) 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 inputs in the production of skills. For example, the interaction of *fexp* and *exp* represents the 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 Canada is that more recent cohorts of immigrants have poorer earnings when compared to both earlier immigrants and Canadian-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 distinguish between these features of immigrant adaptation, we are still able to learn much about the immigrant experience and how it relates to measured skills.

Cognitive skills play an important role in this analysis. As stated earlier, we assume that the IALSS test scores provide direct measures of these skills and thus we can examine G_{1i} and its interactions with inputs such as experience and education to learn about the role of various skills in earnings generation. In equation (5), the interactions of cognitive skills with *fexp* and *fedn* are of special importance. Nonzero coefficients on these interactions may reflect impacts of cognitive skills 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 cognitive skills 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} skill 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 a skill in its own right (i.e., we would add G_{4i} to equation (1)) and/or as an input to the generation of other skills. In the latter case, employers care only about the usable amounts of each skill that 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 skills, with greater language ability leading to higher usable skills 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 United Kingdom immigrant data, find that reading fluency is a more important determinant of employment, but speaking fluency is a more important determinant of earnings. Following these and other authors, we control for language proficiency in our analysis.

Finally, the framework is useful for considering endogeneity issues. In either equation (4) or (5), 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, θ_{1i} does not enter the error term – it is fully captured by 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.

3. Data and basic patterns

The main dataset we use in this investigation is the International Adult Literacy and Skills Survey (IALSS), the Canadian component of the Adult Literacy and Life Skills Survey (ALL). Statistics Canada carried out this survey in 2003 to study the skills of Canadians. The IALSS data contain the results of literacy, numeracy and problem-solving tests as well as information on labour market variables such as income, education and labour force status. The survey covers individuals age 16 and over, and this is also the age range we focus on in our analysis. We drop individuals who list their main activity as "student" in order to focus on the effect of completed schooling and what happens subsequently to individual skills. We also drop the over-sampled aboriginal population, reserving a careful analysis of these individuals for a separate paper. Finally, we drop observations when we do not have information on age at arrival or education, and in the earnings analysis we also drop observations with missing earnings information. Although much of the immigration literature focuses on males, we analyse both male and female immigrants. We use the sample weights in our analysis, so all summary statistics and regression estimates are nationally representative. In the regression analysis, when computing standard errors for the coefficient estimates we also use the Jackknife replicate weights provided in the data set to account for the complex survey design.

Our combined immigrant and Canadian-born sample has 18,373 observations, of which 3,709 are immigrants. However, when we turn our attention to the impact of cognitive skills on individual earnings, we restrict the sample to earners, thereby excluding the unemployed and individuals who are out of the labour force. We also exclude the self-employed and workers with weekly earnings that are less than or equal to $50 and over $20,000. The latter restriction cuts out a small number of workers with earnings that are significant outliers relative to the rest of the sample. We exclude the self-employed because we wish to assess the way skills are rewarded in the labour market, and earnings from self-employment reflect both returns to skills and returns to capital.

For the earnings analysis our dependent variable is weekly earnings. In the IALSS, respondents are first asked about their standard pay period and then about typical earnings in that pay period. Using these responses we construct a weekly earnings measure for each paid worker. Thus, for example, in the case of individuals who report that they are paid monthly we divide their usual monthly earnings by 4.333.

The main objective, and major advantage, of the IALSS survey is to provide measures of four skills: Prose literacy, Document literacy, Numeracy and Problem Solving. The test questions do not attempt to measure abilities such as those in mathematics and reading but rather try to assess capabilities in applying skills to circumstances that arise 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 Numeracy 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 implementation and use of skills in the real world and are intended not just to elicit current capacities but also adaptability to answering questions in other contexts (Murray, Clermont and Binkley, 2005).[6] 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.

The survey was administered by first asking respondents to complete a limited set of "core tasks." The majority of respondents then completed the survey and a set of "main tasks" that were randomly drawn from a large pool of potential tasks. Those unable to complete the "core tasks" because of language difficulties or other limitations remain in the sample but have their skill test scores imputed. In our empirical analysis we control for this group, usually by including a dummy variable for "those unable to complete main skill tasks."

A salient feature of the data is the strong correlation among the various cognitive skill measures. The correlation between the Prose literacy and Document literacy scores is 0.96, that between Prose literacy and Numeracy is 0.90, and the correlation between Prose literacy and Problem Solving is 0.93. Further, a principal components analysis indicated only two principal components with the first being vastly more important and placing equal weight on all four scores. Thus a simple average of the four scores captures much of the information available in the skill measures. This is the skill measure that we use in much of the analysis.

The other main variables in our analysis are standard human capital measures plus variables related to language ability in English or French. The survey asked respondents their number of years of completed schooling, so we are able to construct 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 experience of immigrants into foreign experience and Canadian experience.[7] We examine educational impacts using the respondent's highest level of educational attainment, grouped in four categories: less than completed high school, high school graduates, non-university post-secondary graduates, and those with a Bachelor's or higher university degree.[8] As mentioned earlier, a major advantage of the IALSS data is its detailed questions on where immigrants obtained their education. In particular, respondents are asked about their total years of completed schooling as well as their years of schooling completed outside of Canada. The survey also asks whether the respondent completed his/her highest level of education in Canada. We make use of this information 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.

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 respondents about their first language spoken. We create a dummy variable that equals one if the first language spoken is other than English or French. Finally, we include dummy variables corresponding to the country of origin. One variable corresponds to immigrants from the United States or United Kingdom, a second to immigrants from continental Europe, and a third to immigrants from Asia, with the rest of the world forming the omitted category in the estimation.[9] Much of the earlier literature on immigrants indicates that there are strong source country effects and that immigrants from the United States and United Kingdom adapt particularly well to the Canadian economy.

Tables 3.1 and 3.2 display summary statistics for the main variables of interest. Both male and female immigrants are, on average, four years older and, correspondingly, have four more years of labour market experience than their Canadian-born counterparts. Immigrant men report one more year of schooling than do Canadian-born men, but immigrant women report one year less education than Canadian-born women. This gender difference in the immigrant – Canadian-born educational attainment gap is also evident when we look at the

highest level of education attained. Among males, the distribution of formal education among immigrants is very different than, and generally superior to, that for the Canadian born. The fraction of Canadian-born men with no postsecondary education is 57%, versus 46% among immigrants. Additionally, a much larger fraction of male immigrants has a university degree (31%) compared to Canadian-born men (18%). In contrast, the fraction of Canadian-born women with no post-secondary education is the same as that for immigrant women (57%) and the fraction of immigrant women that did not complete high school (26%) is higher than that of Canadian-born women (23%). At the top of the educational distribution, a larger proportion of immigrant women has a university degree (21%) than is the case for Canadian-born women (17%), but the gap between immigrants and native-born Canadians is much smaller than that for males.

Table 3.1
Summary statistics for immigrants and the native (Canadian) born – males

	Immigrant						Canadian born	
	1. Canadian education		2. No Canadian education		3. All		4. All	
	years	percent	years	percent	years	percent	years	percent
Age	45	…	52	…	49	…	44	…
Experience	25	…	33	…	29	…	25	…
Canadian	21	…	20	…	20	…	…	…
Foreign	5	…	13	…	10	…	…	…
Years of schooling	14	…	13	…	14	…	13	…
Less than high school	…	17	…	25	…	21	…	27
High school	…	28	…	22	…	25	…	30
Foreign	…	…	…	22	…	12	…	…
Canadian	…	28	…	…	…	12	…	…
Non-university post-secondary	…	24	…	23	…	23	…	25
Foreign	…	…	…	23	…	13	…	…
Canadian	…	24	…	…	…	11	…	…
University	…	31	…	31	…	31	…	18
Foreign	…	…	…	31	…	17	…	…
Canadian	…	31	…	…	…	14	…	…
Years since migration	29	…	20	…	24	…	…	…
Age at immigration	16	…	32	…	25	…	…	…
First language not English or French	…	66	…	77	…	72	…	5
United States or United Kingdom origin	…	16	…	13	…	14	…	…
European origin	…	26	…	23	…	24	…	…
Asian origin	…	24	…	35	…	30	…	…
Did not complete main skill tasks	…	16	…	30	…	24	…	13
Average score								
Prose literacy score	…	264	…	231	…	245	…	278
Document literacy score	…	271	…	238	…	252	…	281
Numeracy score	…	269	…	240	…	252	…	277
Problem solving score	…	258	…	228	…	241	…	274
Number of observations	750	750	981	981	1,731	1,731	6,711	6,711

… not applicable
Note: Sample includes males, age 16 and older, excluding students and observations with missing information on age at immigration or highest level of schooling.

Table 3.2
Summary statistics for immigrants and the native (Canadian) born – females

	Immigrant							
	Canadian education		No Canadian education		All		Canadian born	
	years	percent	years	percent	years	percent	years	percent
Age	45	…	53	…	50	…	46	…
Experience	26	…	35	…	31	…	27	…
Canadian	21	…	21	…	21	…	…	…
Foreign	5	…	14	…	10	…	…	…
Years of schooling	13	…	12	…	12	…	13	…
Less than high school	…	19	…	31	…	26	…	23
High school	…	32	…	29	…	31	…	34
Foreign	…	…	…	29	…	17	…	…
Canadian	…	32	…	…	…	13	…	…
Non-university post-secondary	…	26	…	20	…	22	…	26
Foreign	…	…	…	20	…	12	…	…
Canadian	…	26	…	…	…	11	…	…
University	…	22	…	20	…	21	…	17
Foreign	…	…	…	20	…	12	…	…
Canadian	…	22	…	…	…	9	…	…
Years since migration	29	…	22	…	25	…	…	…
Age at immigration	16	…	31	…	25	…	…	…
First language not English or French	…	64	…	75	…	71	…	5
United States or United Kingdom origin	…	19	…	15	…	16	…	…
European origin	…	22	…	23	…	22	…	…
Asian origin	…	24	…	36	…	31	…	…
Did not complete main skill tasks	…	17	…	36		28	…	13
Average score								
Prose literacy score	…	261	…	224	…	239	…	283
Document literacy score	…	259	…	223	…	238	…	276
Numeracy score	…	247	…	215	…	228	…	261
Problem solving score	…	252	…	218	…	232	…	273
Number of observations	826	…	1,152	…	1,978	…	7,953	…

… not applicable

Note: Sample includes females, age 16 and older, excluding students and observations with missing information on age at immigration or highest level of schooling.

Another evident difference between immigrants and native-born Canadians is their levels of cognitive skills, as assessed in English or French. The average skill levels of immigrant men range from 241 to 252, whereas these range from 274 to 281 for native-born Canadian men. The largest gaps between immigrants and the Canadian-born are in prose literacy and problem solving and the smallest are in numeracy. Across the four domains, male immigrant skill levels are 9% to 12% lower than those of Canadian-born males. The immigrant – Canadian-born skill gaps are generally even larger for females, ranging from a gap of 31 points for problem-solving to 44 points for prose literacy. The largest gaps are in prose literacy and document literacy and the smallest is in problem solving. Across the four domains, female immigrant skill levels are 11% to 16% below those of native-born Canadians.

An interesting fact arising from Tables 3.1 and 3.2 is the substantial fraction of immigrants who acquire some education in Canada. Columns 1 and 2 separate immigrants between those who report obtaining some or all of their schooling in Canada and those who did not acquire any education in Canada. It is immediately apparent that these two groups have very different characteristics. Both male and female immigrants with Canadian education are much younger, have less work experience, but at least as much experience in the Canadian labour market. They arrived in Canada at a substantially younger age, and have been in the country much longer, despite being substantially younger than immigrants educated abroad. In terms of educational attainment, immigrants with Canadian education have more years of completed schooling, are much less likely to be high school dropouts, but equally likely to be university graduates as immigrants without Canadian education. Perhaps the most striking differences are those relating to measured skills. Immigrants with Canadian education have skill levels somewhat below those of the Canadian born, but much higher than those of immigrants without Canadian education. The skills gap between foreign-educated immigrants and native-born Canadians is especially large for women. Relative to Canadian-born men, the gap in average skills for those educated outside of Canada ranges from 13% for numeracy to 17% for prose literacy and problem solving, whereas for male immigrants with some Canadian education the average skills gap ranges from 3% for numeracy to 6% for problem solving. Among female immigrants educated in Canada the skills gap is somewhat larger than for men – ranging from 5% for numeracy to 8% for prose literacy and problem solving. Among female immigrants educated prior to arrival the skills gap is huge – approximately 20% across all four skill domains. These differences suggest that controlling for the origin of education may indeed be important for understanding immigrant labour market outcomes. They also suggest that there may be gender differences in immigrant outcomes relative to those of native-born Canadians.

We explore these differences further in Tables 3.3 and 3.4, which report summary statistics for our sample of earners – individuals currently employed as paid workers. The substantial differences in the characteristics of the two groups of immigrants are also evident in the sample of earners. Compared to the Canadian born, immigrants without Canadian education are older, have more work experience, and less experience in the Canadian labour market. These generalizations hold for both men and women, although the differences between immigrants without Canadian education and native-born Canadians are more modest among women. As before, one dimension on which there are gender differences is that relating to educational attainment gaps between immigrants and Canadian-born. Immigrant men educated abroad report higher attainment than men born in Canada at both the bottom and the top of the educational distribution. For example, 38% are university graduates versus 18% among Canadian-born men. In contrast, immigrant women without Canadian education have a more dispersed educational distribution than that of native-born Canadians, being both more likely to be high school dropouts and more likely to be university graduates.

Table 3.3
Summary statistics for immigrant and native (Canadian) born workers – males

		Immigrant			
		Canadian education	No Canadian education	All	**Canadian born**
Annual earnings[1]					
Mean	dollars	49,408	39,146	44,060	44,484
Median	dollars	40,000	31,200	35,100	41,000
Weekly earnings					
Mean	dollars	972	780	872	895
Median	dollars	788	626	702	808
Hours worked[1]	hours	41	42	42	42
Weeks worked[1]	weeks	49	50	50	49
Age	years	38	44	41	38
Experience	years	17	24	21	18
Canadian	years	14	13	13	…
Foreign	years	4	12	8	…
Years of schooling	years	15	14	14	13
Percentage with less than high school		11	14	12	18
Percentage with high school		32	25	29	35
Foreign	percent	…	25	13	…
Canadian	percent	32	…	15	…
Percentage with non-university post-secondary		27	23	24	29
Foreign	percent	…	23	12	…
Canadian	percent	27	…	13	…
Percentage with university		31	38	35	18
Foreign	percent	…	38	20	…
Canadian	percent	31	…	15	…
Years since migration	years	23	13	18	…
Age at immigration	years	15	31	23	…
Percentage with first language not English or French		64	79	72	5
Percentage with United States or United Kingdom origin		15	9	12	…
Percentage with European origin		22	18	20	…
Percentage with Asian origin		27	40	34	…
Percentage did not complete main skill tasks		11	25	18	11
Prose literacy score	score	273	241	256	289
Document literacy score	score	282	249	265	293
Numeracy score	score	280	250	264	289
Problem solving score	score	267	236	251	285
Number of observations		417	500	917	3,634

… not applicable

1. Annual earnings and weeks worked (annual) are based on slightly smaller samples due to missing information. Hours worked (weekly) are based on a smaller sample in case of the Canadian born only.

Note: Sample: Males, age 16 and older, excluding students and observations with missing information on age at immigration or highest level of schooling and with weekly earnings greater than $50 and less than or equal to $20,000.

Table 3.4
Summary statistics for immigrant and native (Canadian) born workers – females

		Immigrant			
		Canadian education	No Canadian education	All	**Canadian born**
Annual earnings[1]					
Mean	dollars	33,091	27,545	30,401	31,182
Median	dollars	29,900	25,000	27,040	27,196
Weekly earnings (dollars)					
Mean	dollars	747	546	649	641
Median	dollars	577	485	525	540
Hours worked[1]	hours	37	36	37	35
Weeks worked[1]	weeks	49	49	49	49
Age	years	40	43	41	38
Experience	years	20	24	22	19
Canadian	years	16	14	15	…
Foreign	years	4	9	6	…
Years of schooling	years	14	14	14	14
Percentage with less than high school		12	16	14	12
Percentage with high school		33	26	30	37
Foreign	percent	…	26	13	…
Canadian	percent	33	…	17	…
Percentage with non-university post-secondary		29	24	27	29
Foreign	percent	…	24	12	…
Canadian	percent	29	…	15	…
Percentage with university		27	34	30	22
Foreign	percent	…	34	16	…
Canadian	percent	27	…	14	…
Years since migration	years	25	15	20	…
Age at immigration	years	14	28	21	…
Percentage with first language not English or French		63	77	70	6
Percentage with United States or United Kingdom origin		16	12	14	…
Percentage with European origin		18	21	20	…
Percentage with Asian origin		27	41	34	…
Percentage did not complete main skill tasks		11	23	17	9
Prose literacy score	score	274	246	260	300
Document literacy score	score	273	247	260	294
Numeracy score	score	260	239	250	278
Problem solving score	score	262	237	250	289
Number of observations		437	433	870	4,133

… not applicable

1. Annual earnings and weeks worked (annual) are based on slightly smaller samples due to missing information. Hours worked (weekly) are based on a smaller sample in case of the Canadian born only.

Note: Sample is females, age 16 and older, excluding students and observations with missing information on age at immigration or highest level of schooling and with weekly earnings greater than $50 and less than or equal to $20,000.

The apparent advantage in education and experience among immigrant men does not translate into higher income. Average annual and weekly earnings of Canadian-born men are substantially higher than those of immigrants without Canadian education, and the gap in median earnings is even greater. In contrast, mean earnings of immigrants with some Canadian education exceed earnings of the Canadian born, although median earnings are modestly lower than those of native-born Canadians. Among women both mean and median earnings of foreign-educated immigrants are below those of the Canadian-born, whereas mean and median earnings of Canadian-educated immigrants exceed those of native-born Canadians.

One possible explanation for the puzzle of lower earnings of immigrants without Canadian education, despite their generally reporting more experience and education, is that the Canadian labour market may place a different value on the experience and education obtained outside of Canada than on that obtained after arrival in Canada. Another possible explanation for lower earnings is that the skills of immigrants educated abroad are much lower than those of native-born Canadians, despite their higher levels of educational attainment and greater amount of total labour market experience. We explore both of these explanations further in what follows.

4. Do immigrant and Canadian-born cognitive skills differ?

Charts 4.1.A and 4.2.A plot the kernel density functions of the individual averages of the four cognitive skill scores for males and females, respectively.[10] For both men and women the cumulative distribution function (CDF) for Canadian-born scores lies to the right of the immigrant CDF throughout the sample range and stochastically dominates the immigrant CDF at conventional significance levels.[11] The differences between immigrants and native-born Canadians are especially large at the low end of the skill distribution. For example, among women the immigrant-Canadian born gap is over 50 points at the 10th percentile, 38 points at the median, and 25 points at the 90th percentile. The skill gaps for men are smaller but follow the same pattern – a differential of 42 points at the 10th percentile, 30 points at the 50th percentile, and 14 points at the 90th percentile. Charts 4.1.B and 4.2.B plot the cognitive skill distributions with the respondents who did not complete the main tests removed. The immigrant literacy distributions now appear more similar, though still inferior, to the Canadian born distributions.

Charts 4.1.C and D, and 4.2.C and D, show the skills distributions for immigrants with and without Canadian education relative to that of the Canadian born. The skill distributions of both immigrant groups are inferior to those of the Canadian born, and the difference between the respective distributions is largest for immigrants educated outside of Canada.[12] There is also less dispersion in the cognitive skills of immigrants who completed their education in Canada than is the case for those educated outside of Canada. In addition, for immigrant men educated in Canada the upper tail of the distribution is similar to that for Canadian born men, whereas this is not the case for male immigrants who were educated prior to arrival in Canada, nor is it the case for either group of female immigrants. For both men and women a noteworthy difference between immigrants who obtained some or all of their education in Canada and those who did not is the relative absence of individuals with high skill levels in the latter group.

The final two charts, 4.1.E and F, and 4.2.E and F, compare the skills distributions of the two immigrant groups to those of the Canadian born after removing individuals who did not complete the main cognitive skill tasks. Doing so makes little difference to the distributions for immigrants with Canadian education, but makes a substantial difference to the distributions for immigrants without Canadian education. A significant number of those with low skill levels are evidently in this group.

Chart 4.1
Distribution of average skill score – males

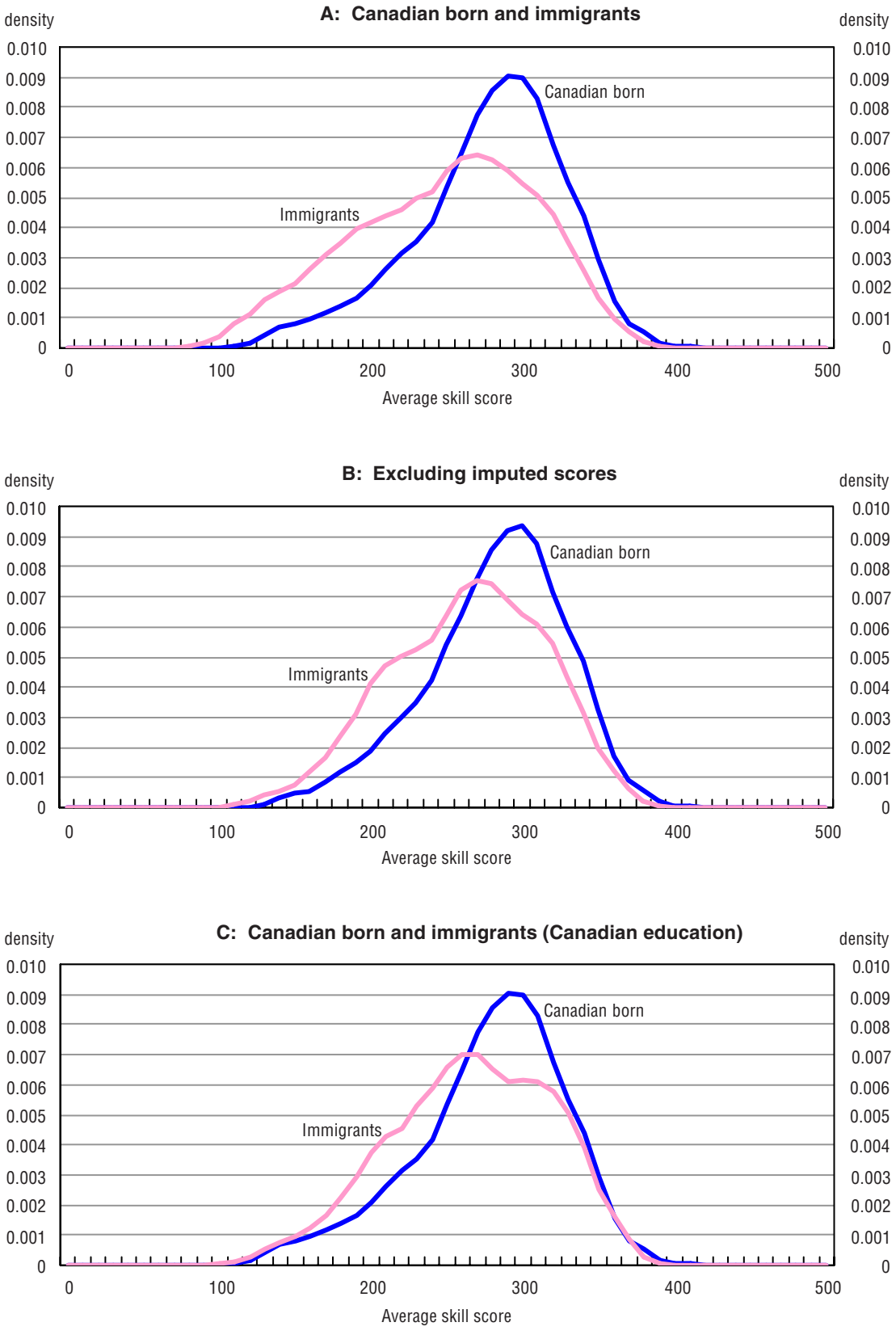
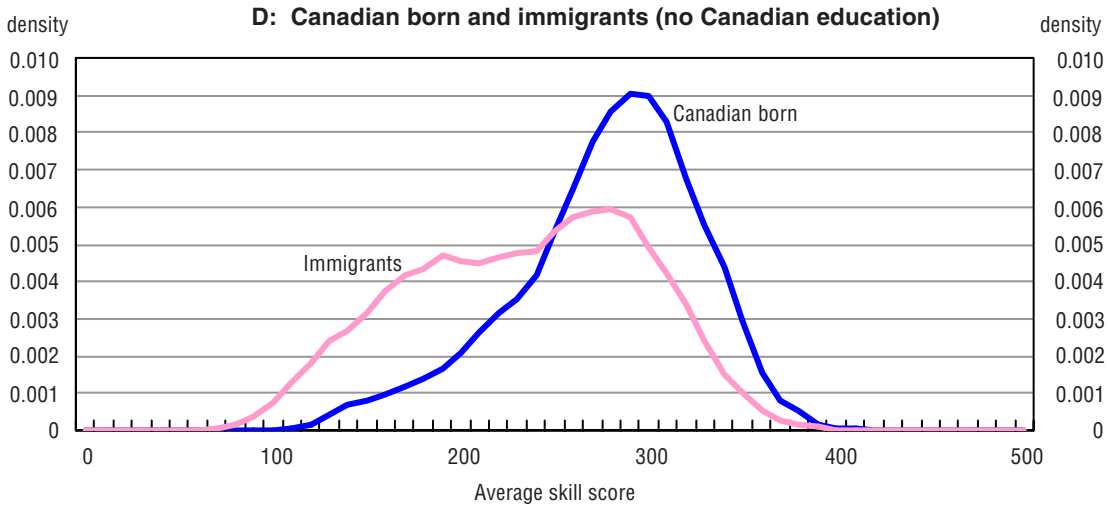
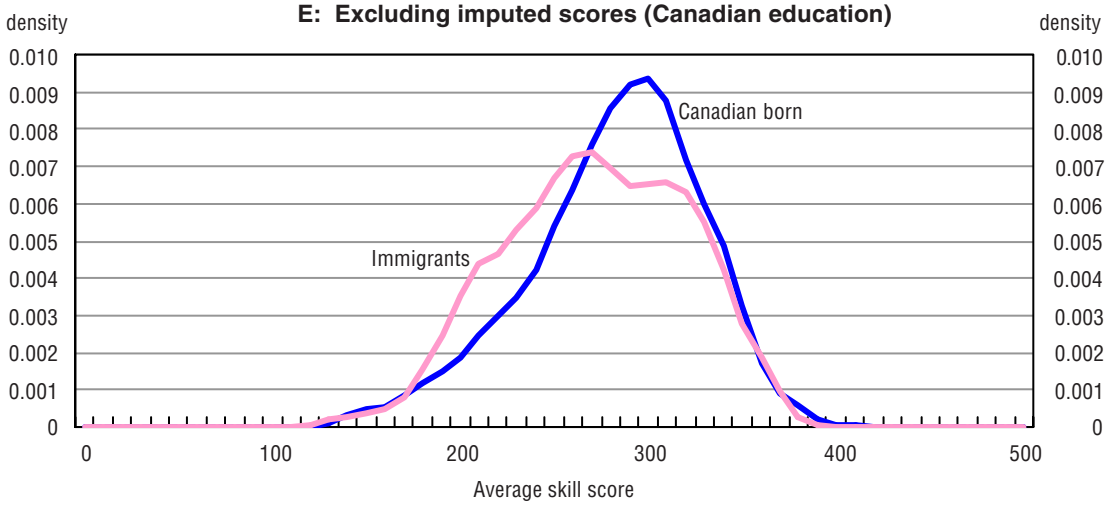


Chart 4.1
Distribution of average skill score – males (concluded)





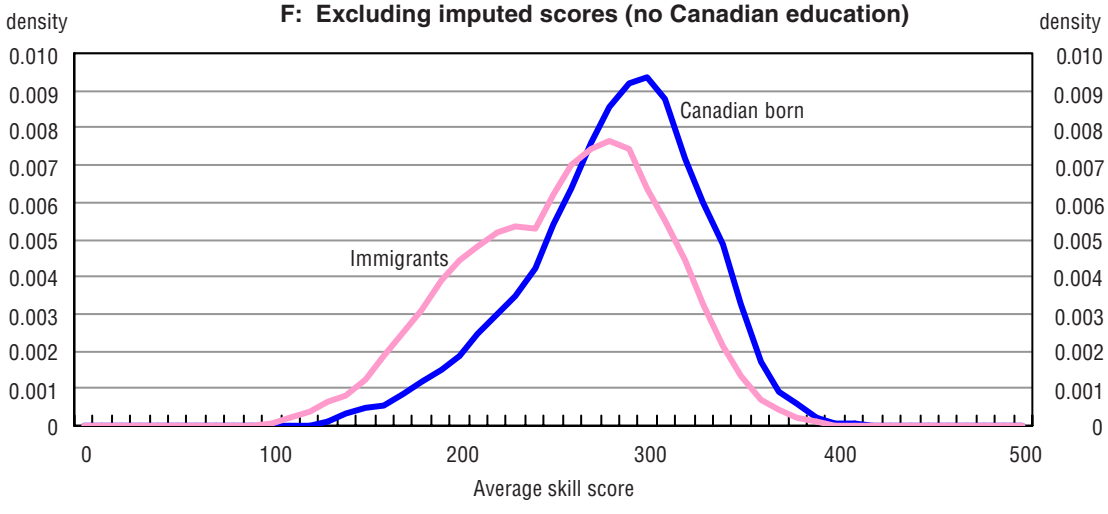


Chart 4.2
Distribution of average skill score – females

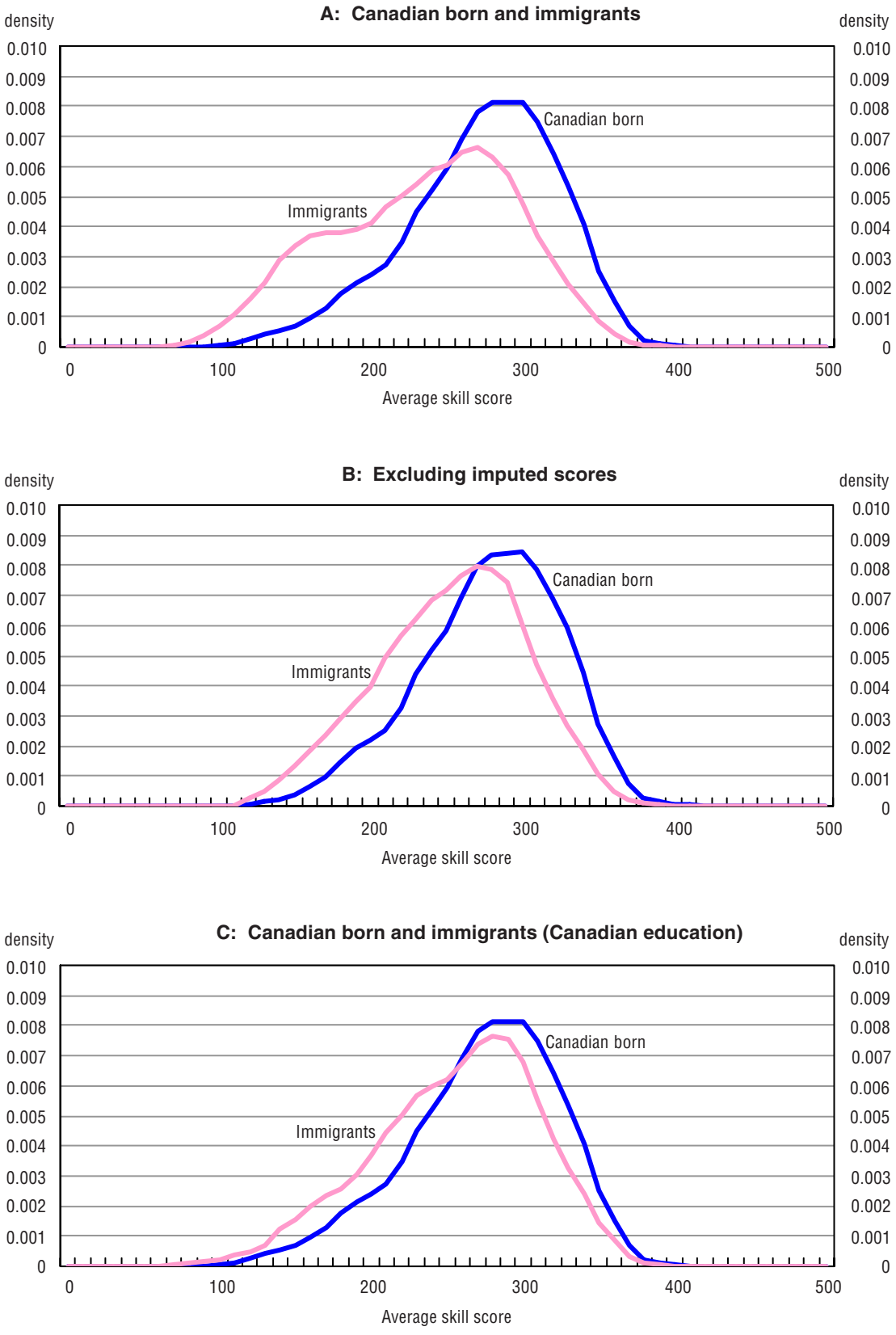
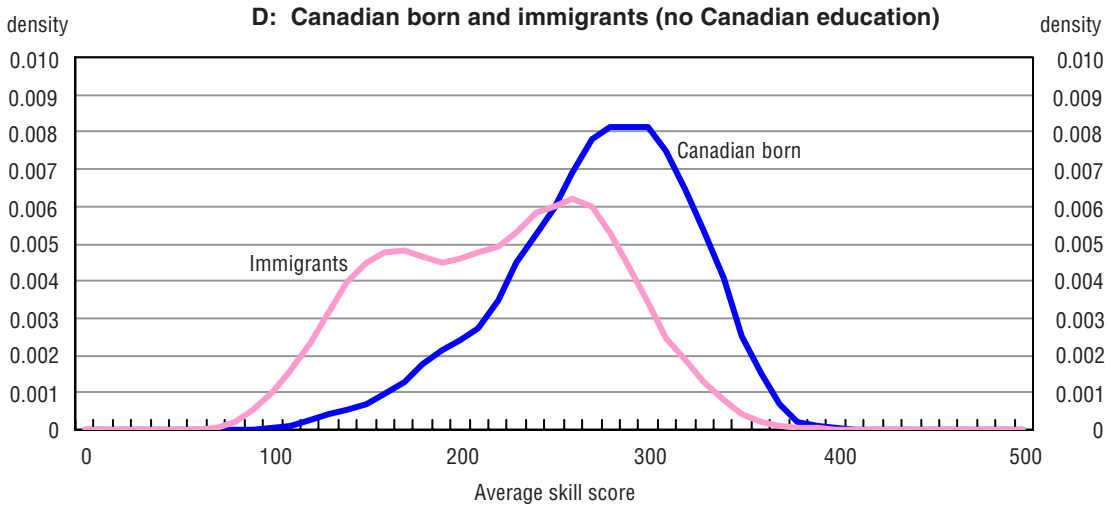
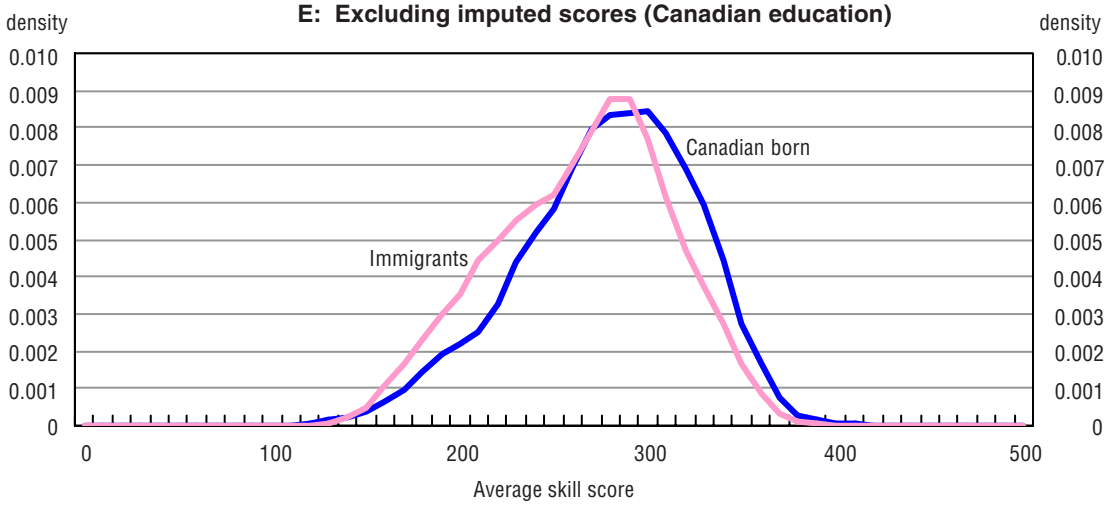
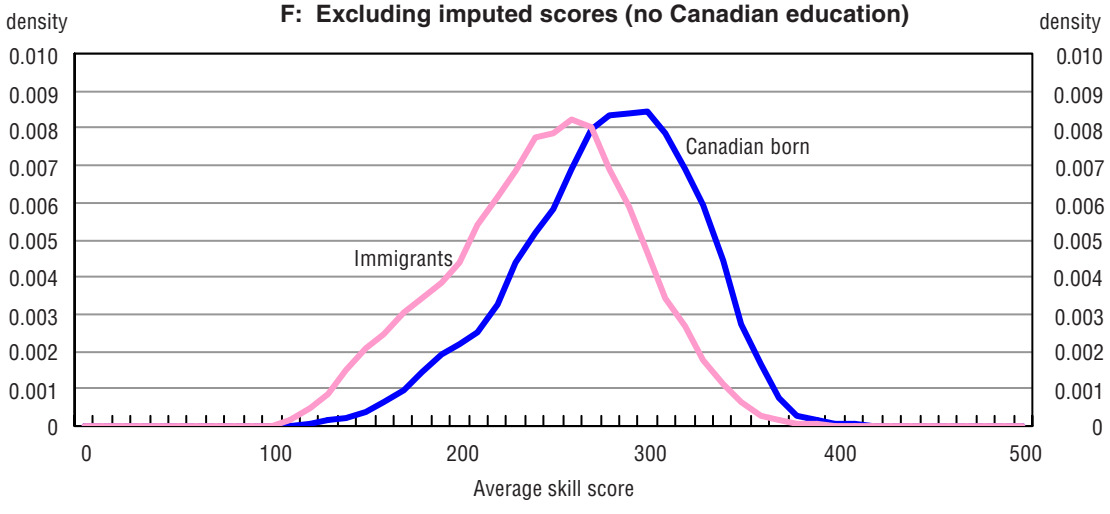


Chart 4.2
Distribution of average skill score – females (concluded)







Charts 4.3 to 4.10 provide further evidence of differences in the distribution of skills among native-born Canadians and the two immigrant groups. These charts recreate charts 4.1 and 4.2 for each of the four individual skills. For both men and women the immigrant distributions are clearly inferior to those of the Canadian born. The immigrant – Canadian-born skill gaps are most evident for prose literacy and least evident for numeracy. This latter pattern may reflect the tendency for numeracy to be less language dependent. As was the case with the average scores, separating immigrants into two sub-samples delineated by where they obtained their education reveals substantial differences between the two groups. For each of the four cognitive skills and both genders the distributions for immigrants educated in Canada have lower dispersion than those for foreign-educated immigrants and proportions of individuals with high skill levels that are closer to those observed among the Canadian born. This similarity at the top of the skill distribution is especially evident for males. Both immigrant groups have larger proportions of their respective distributions with low skill levels (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 prior to arriving in Canada.

Chart 4.3
Distribution of prose literacy score – males

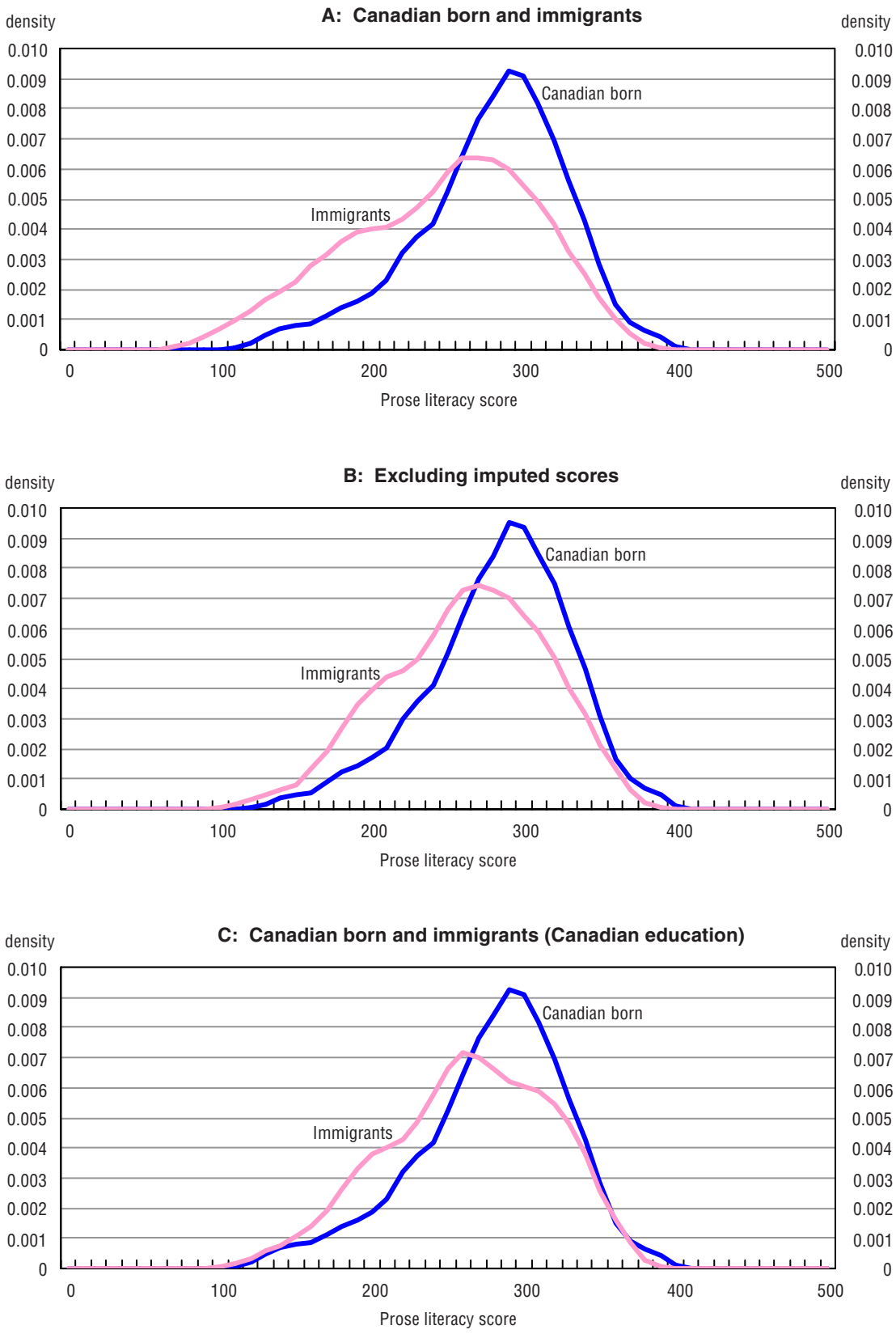


Chart 4.3
Distribution of prose literacy score – males (concluded)

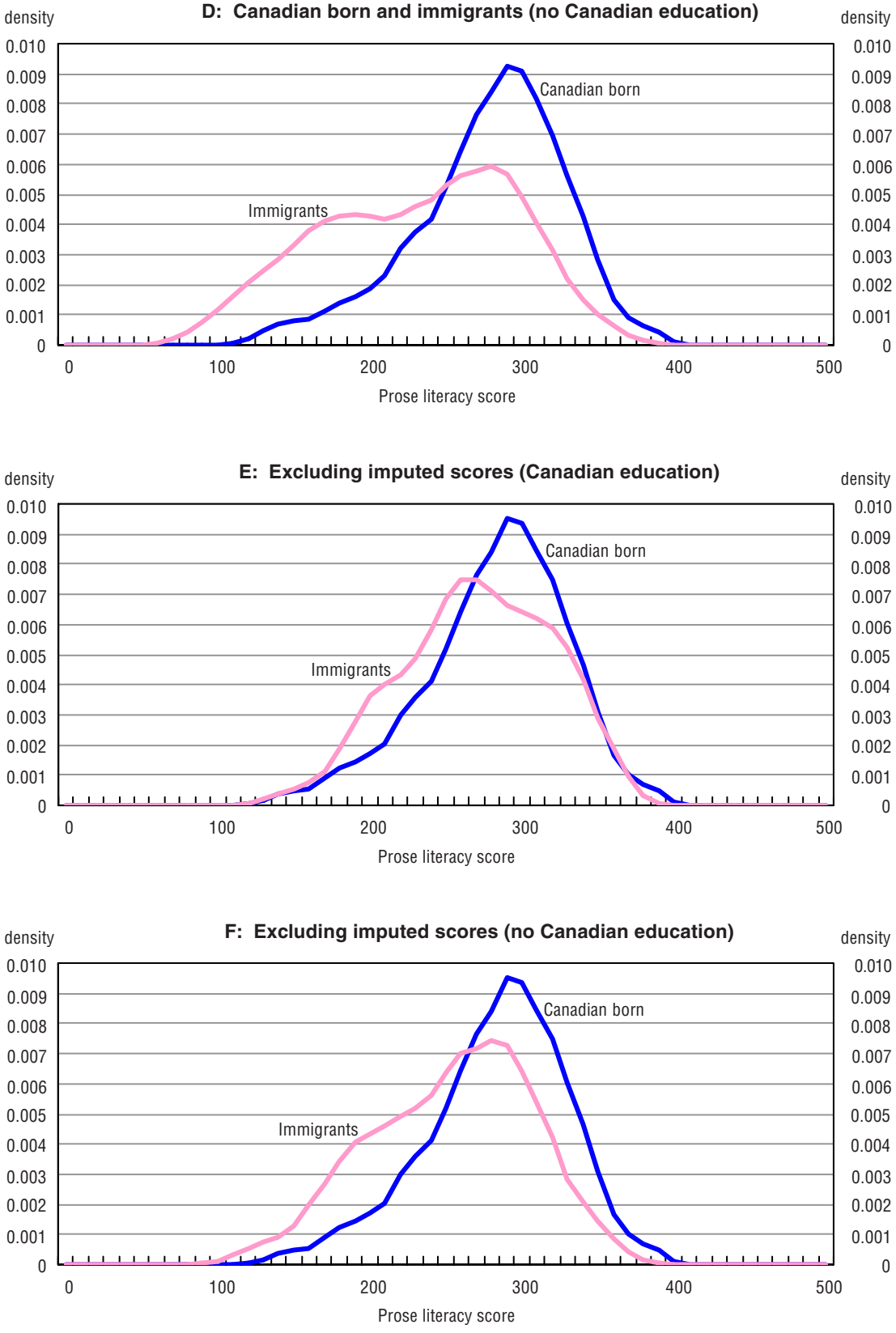


Chart 4.4
Distribution of prose literacy score – females

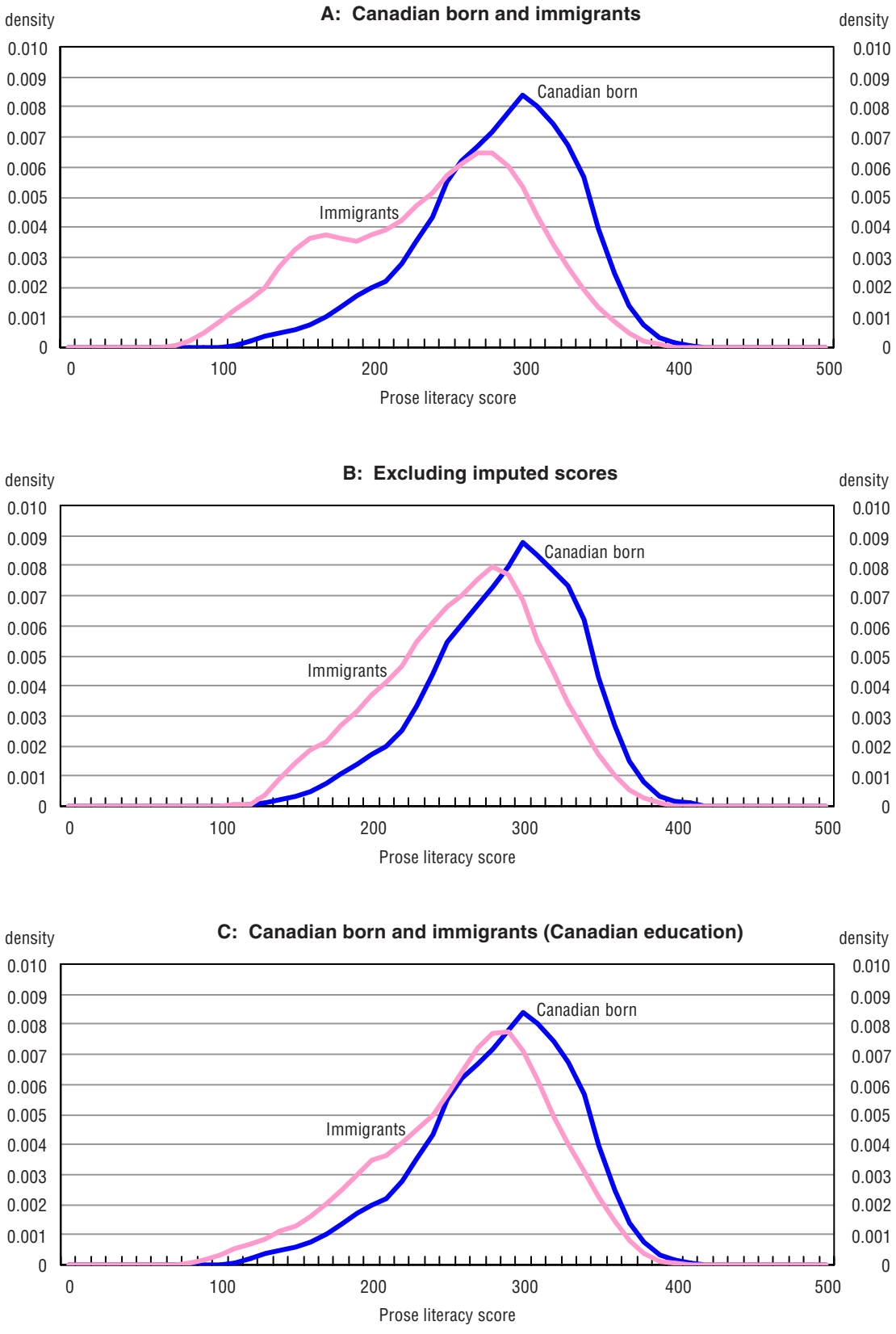
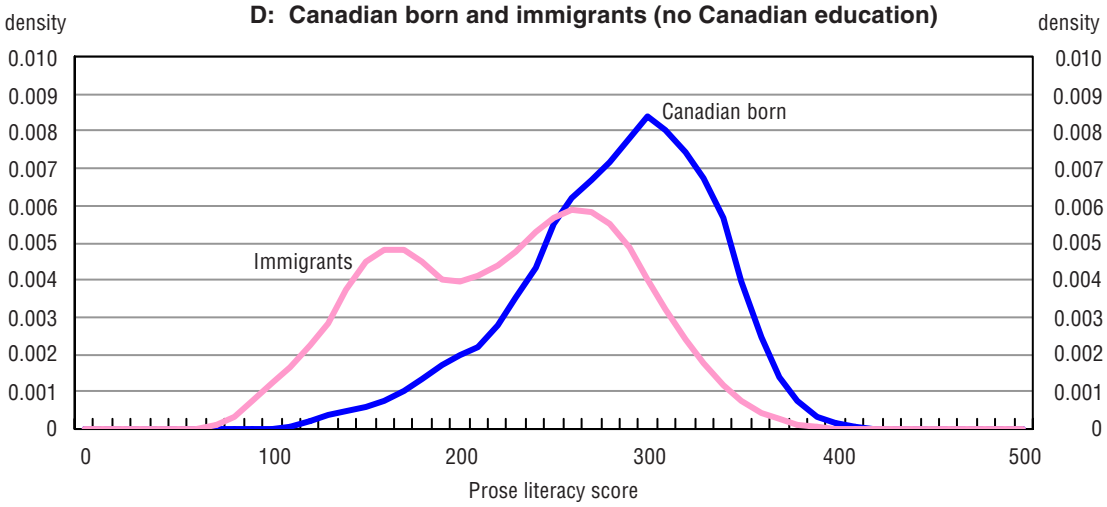
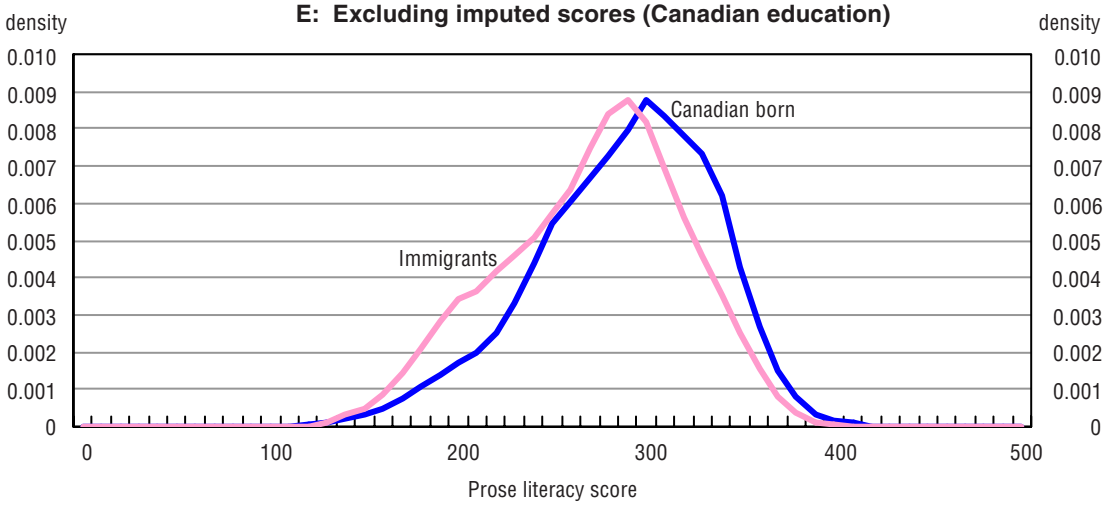


Chart 4.4
Distribution of prose literacy score – females (concluded)





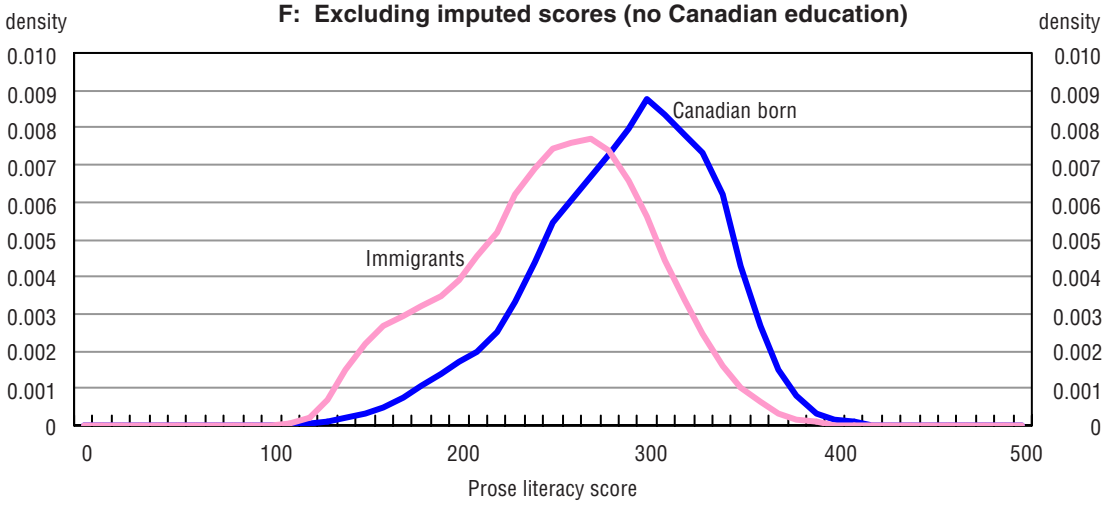


Chart 4.5
Distribution of document literacy score – males

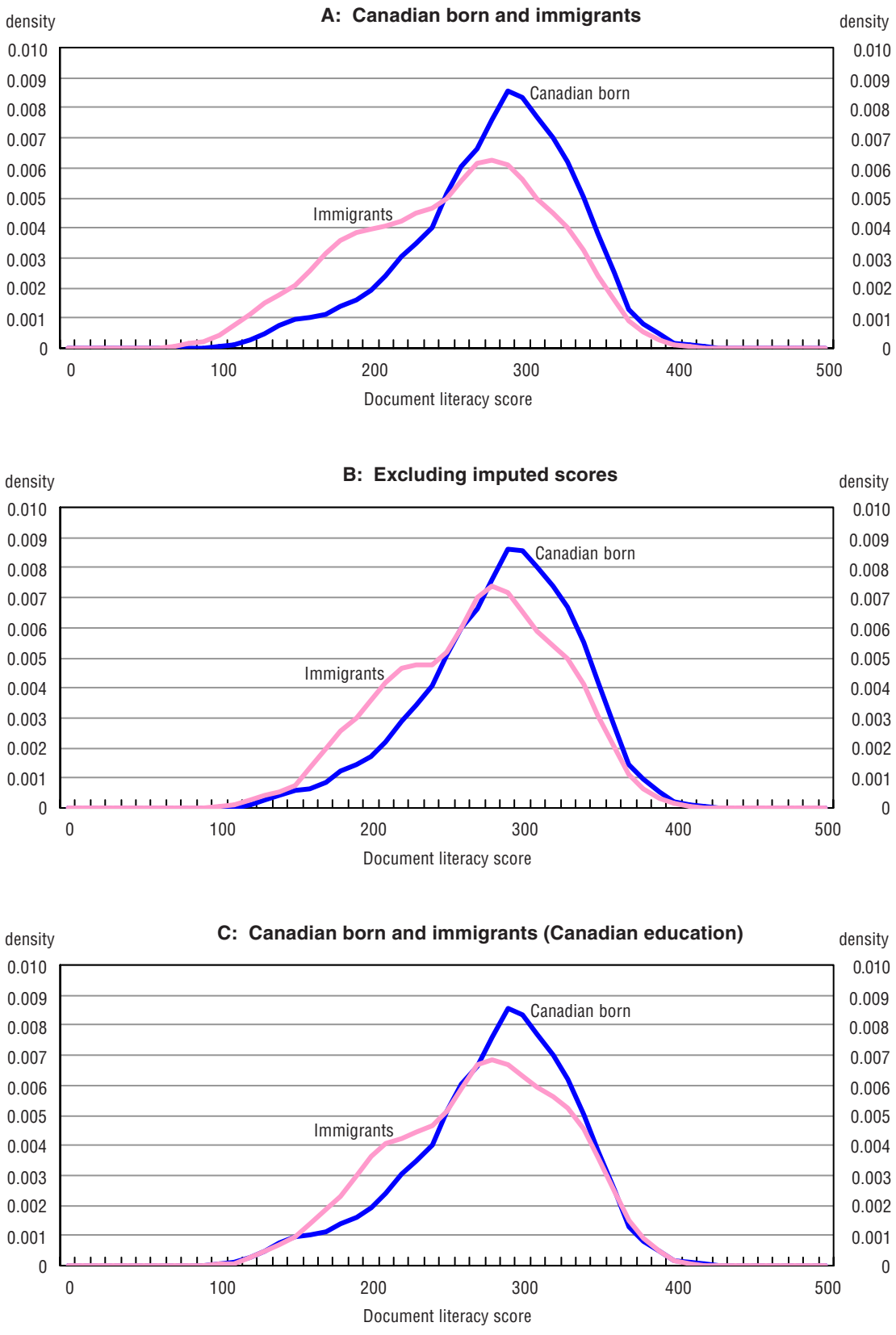


Chart 4.5
Distribution of document literacy score – males (concluded)

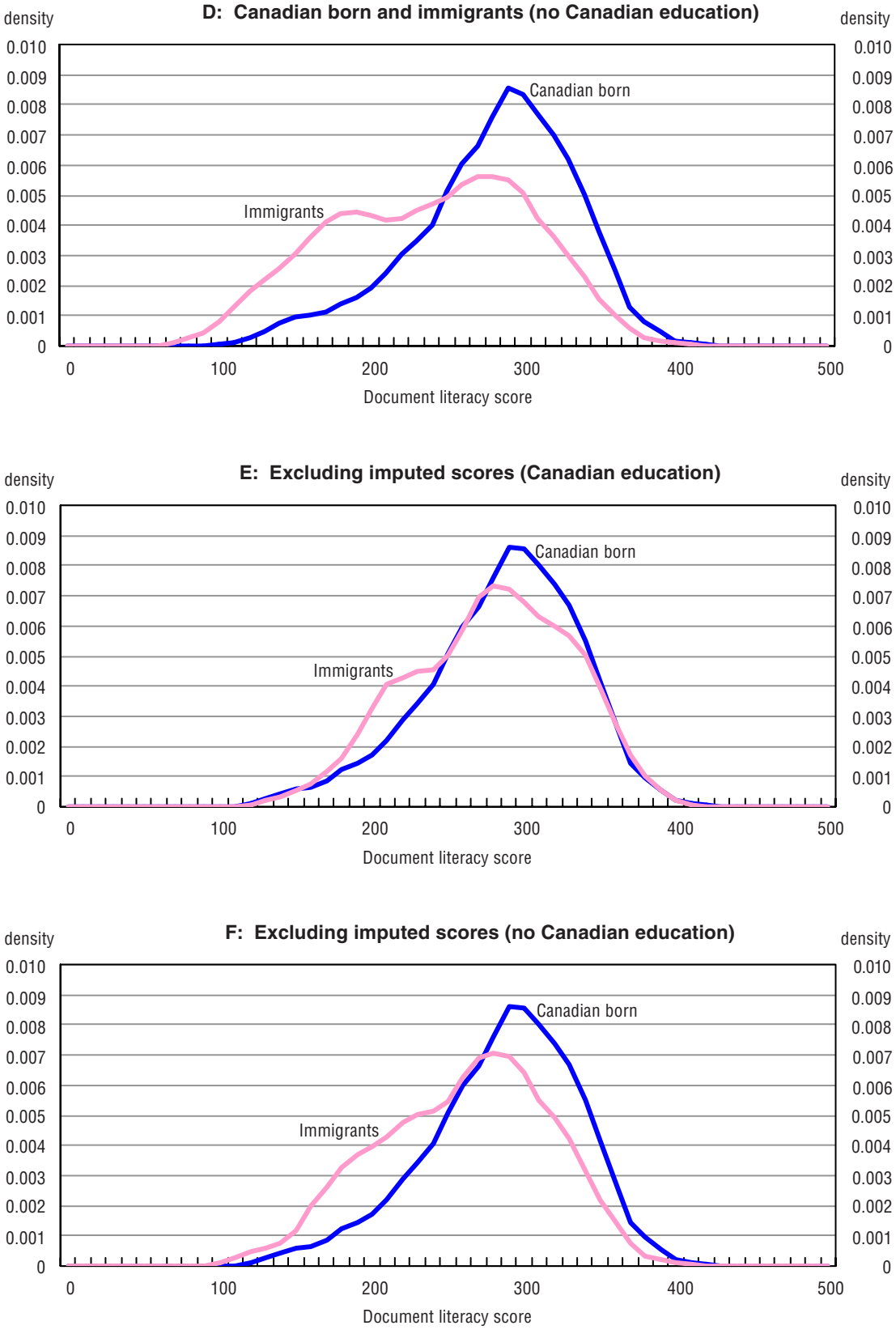


Chart 4.6
Distribution of document literacy score – females

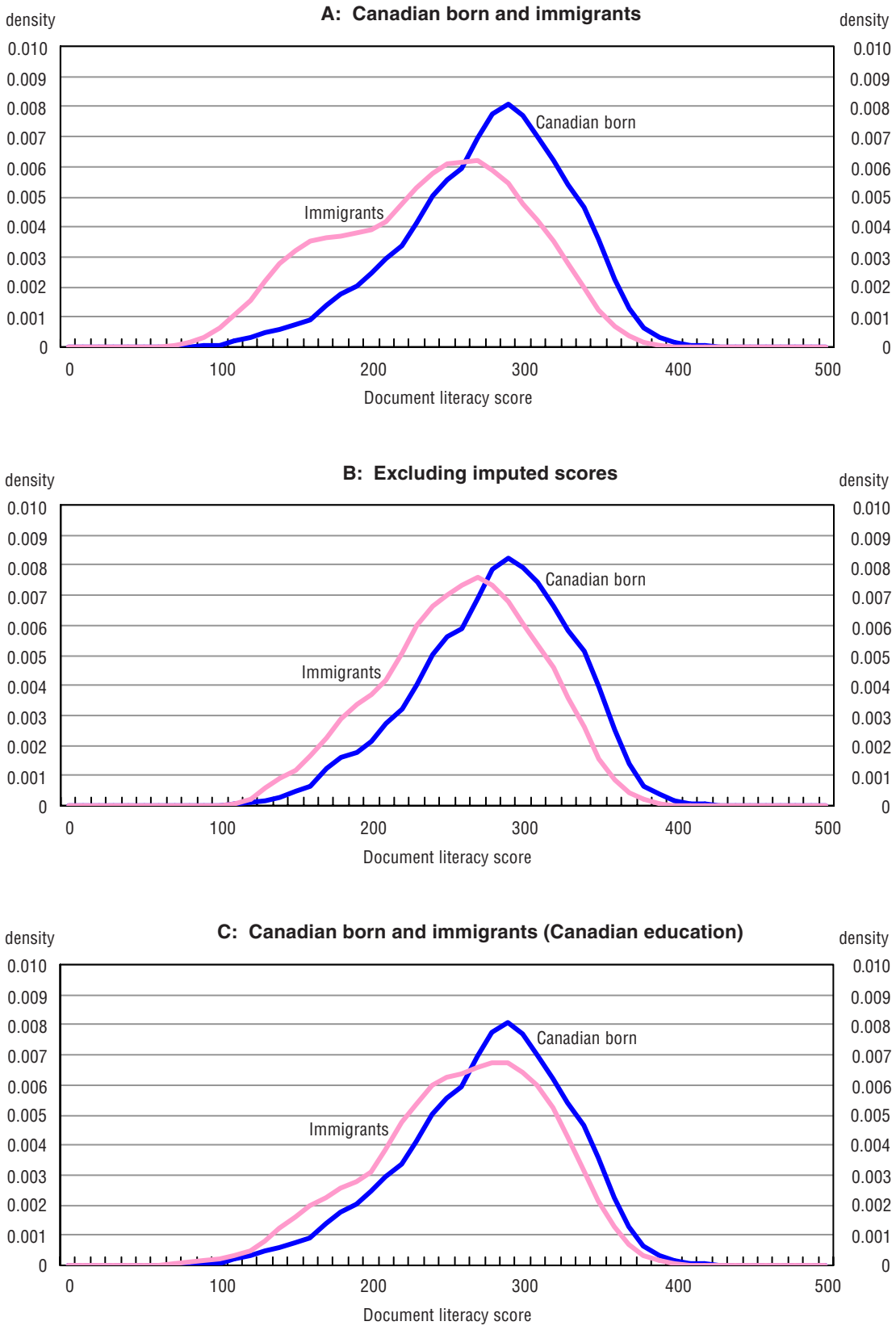


Chart 4.6
Distribution of document literacy score – females (concluded)

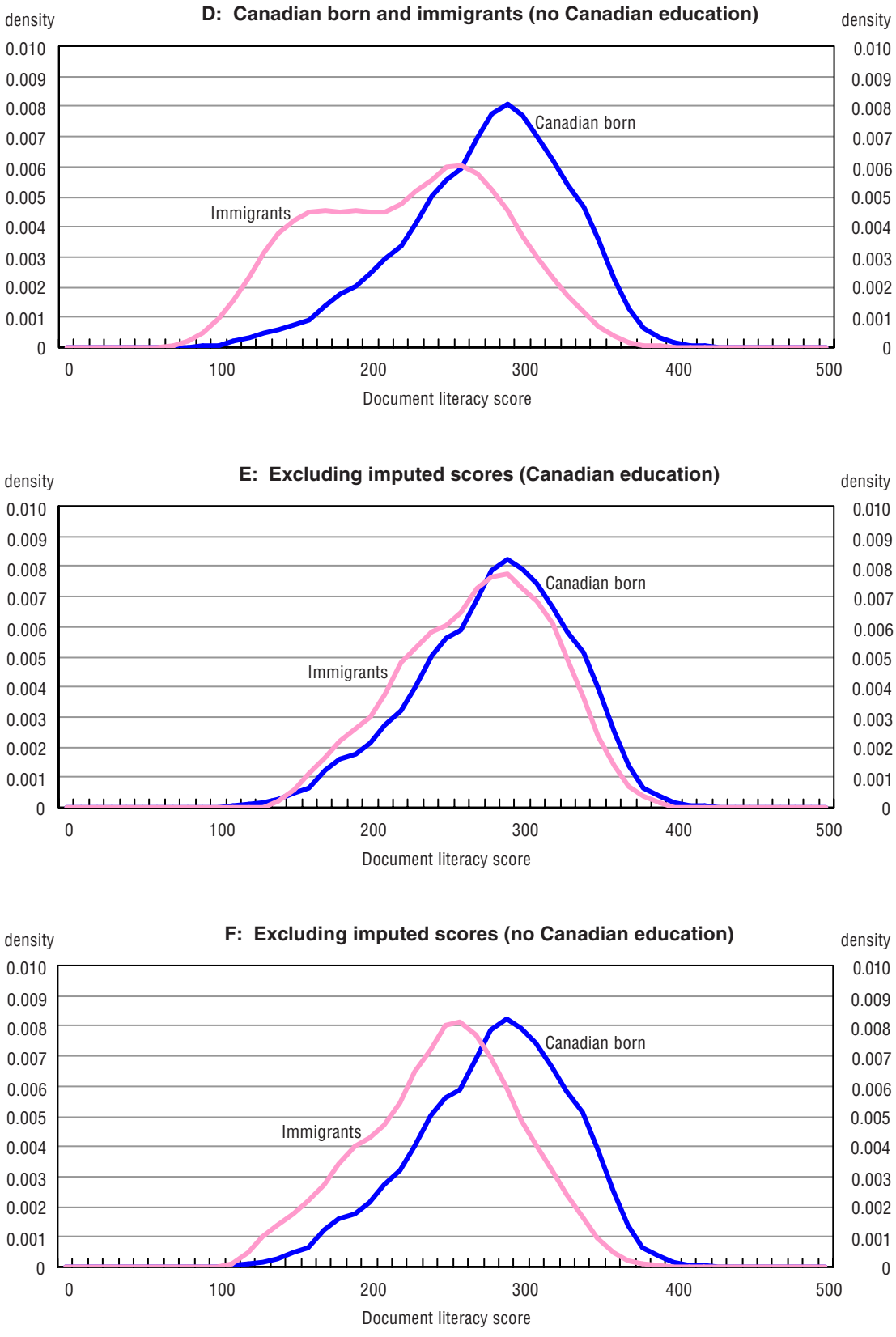


Chart 4.7
Distribution of numeracy score – males

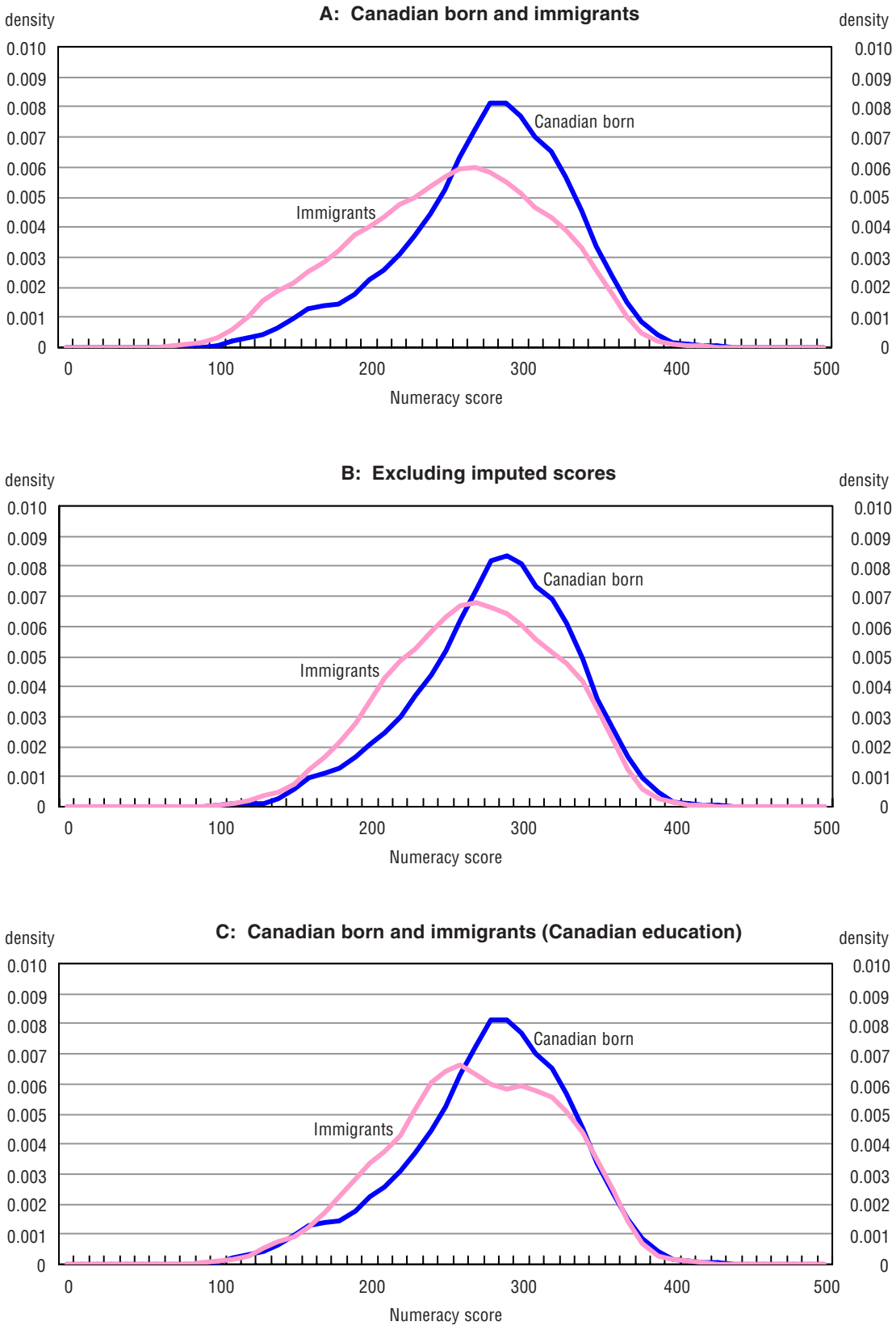
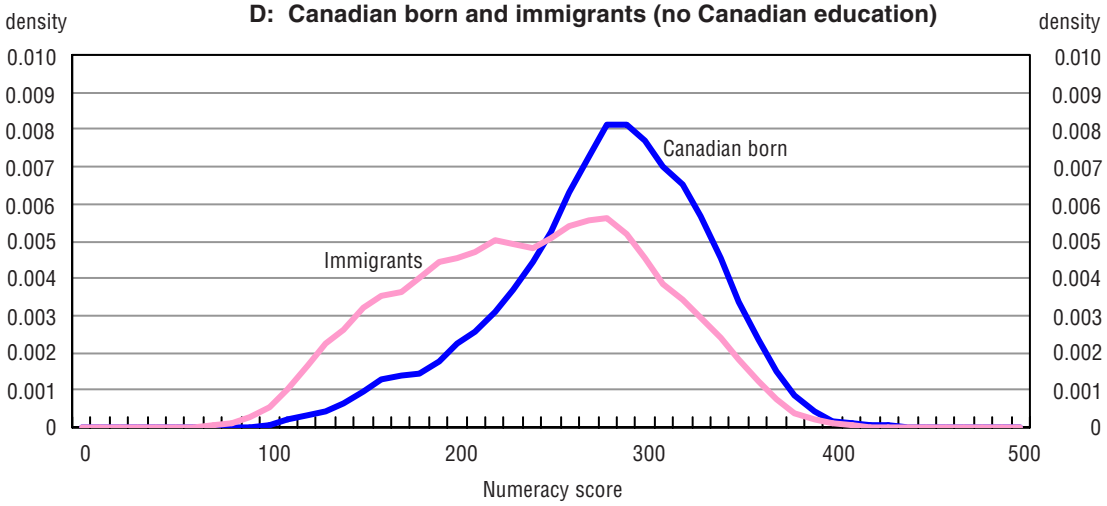
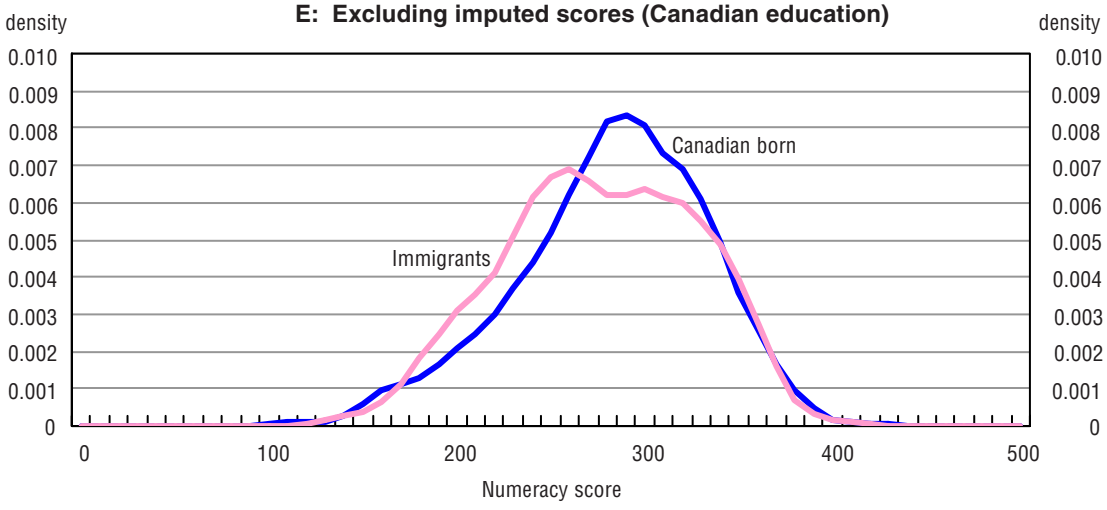


Chart 4.7
Distribution of numeracy score – males (concluded)





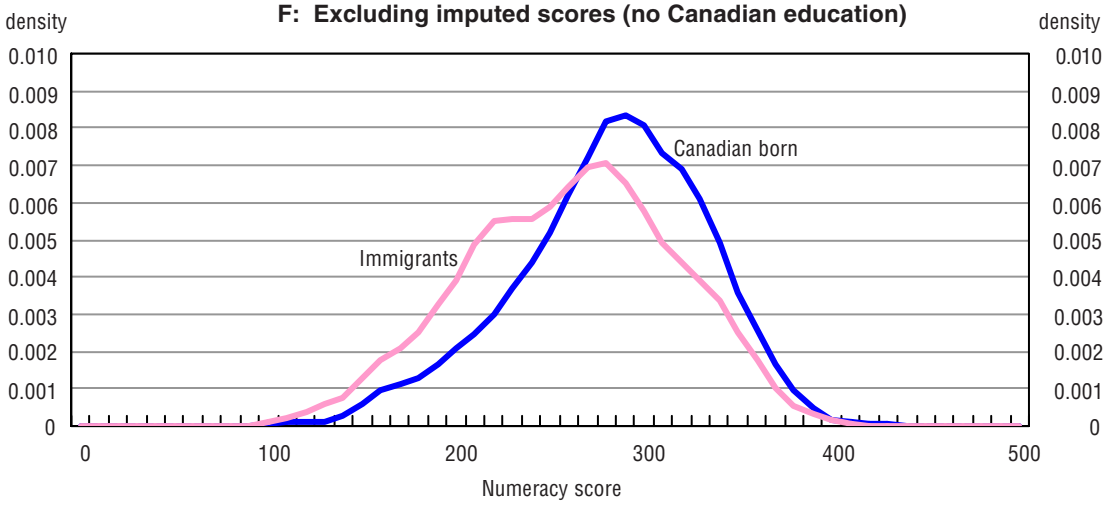


Chart 4.8
Distribution of numeracy score – females

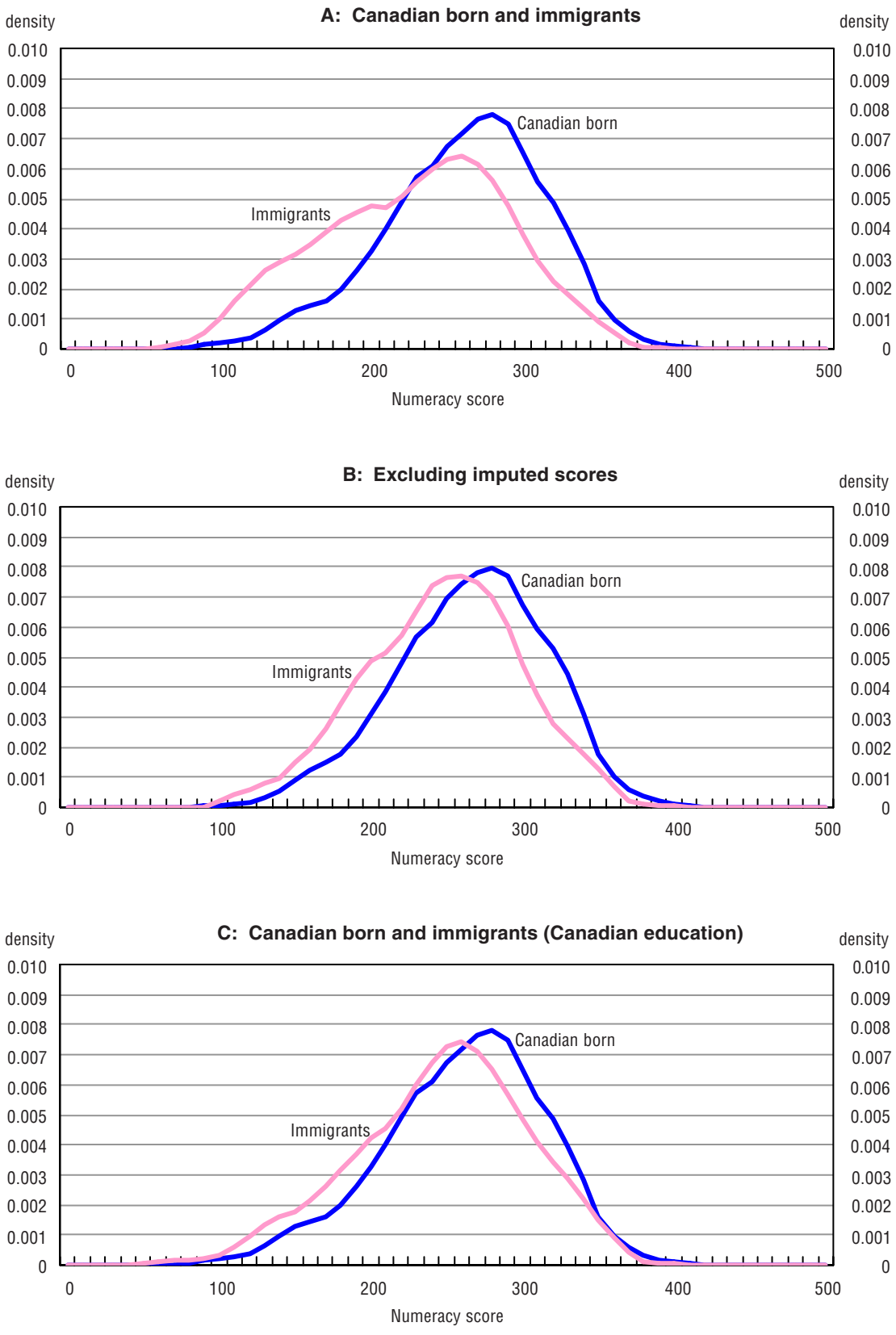


Chart 4.8
Distribution of numeracy score – females (concluded)

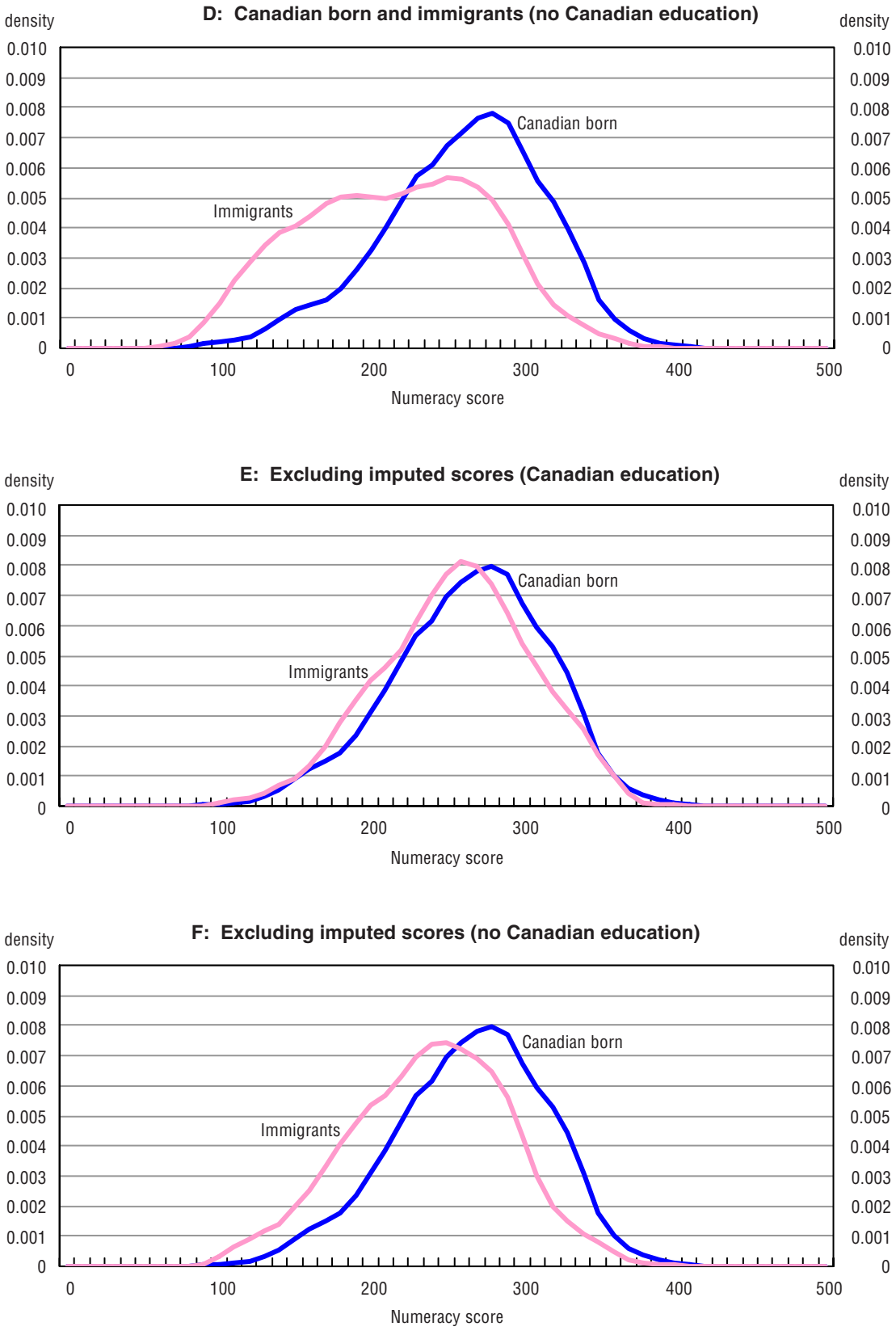


Chart 4.9
Distribution of problem solving score – males

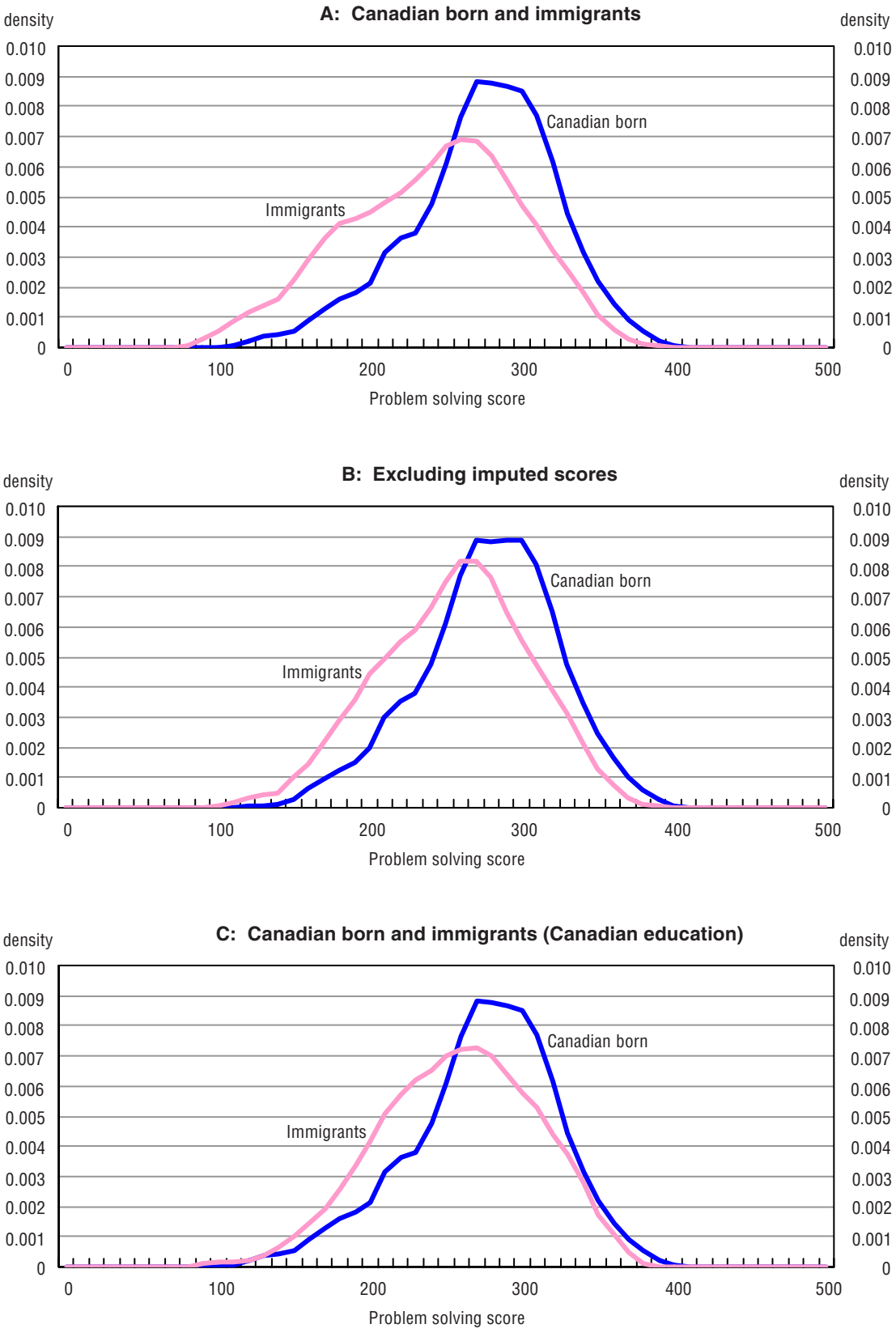
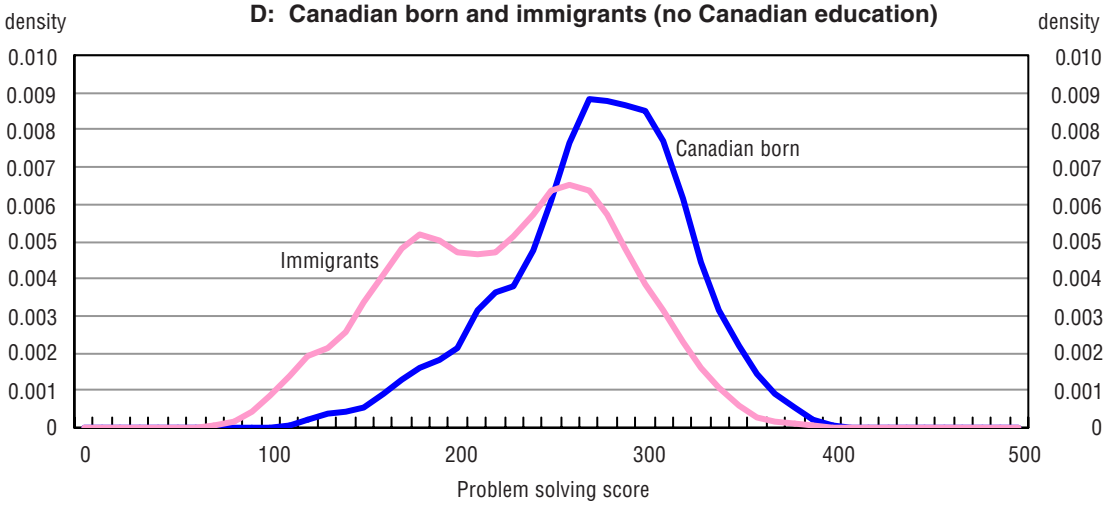
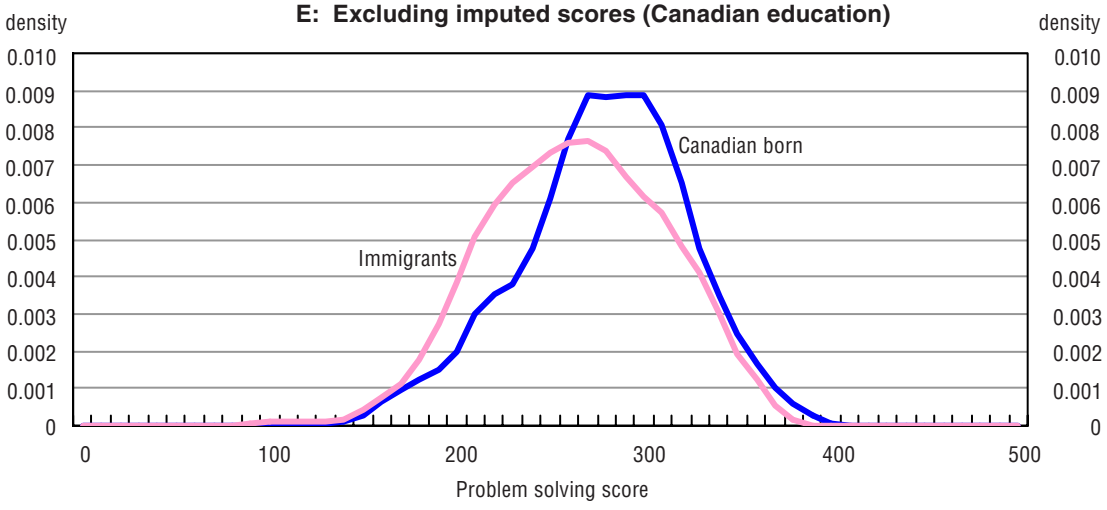


Chart 4.9
Distribution of problem solving score – males (concluded)





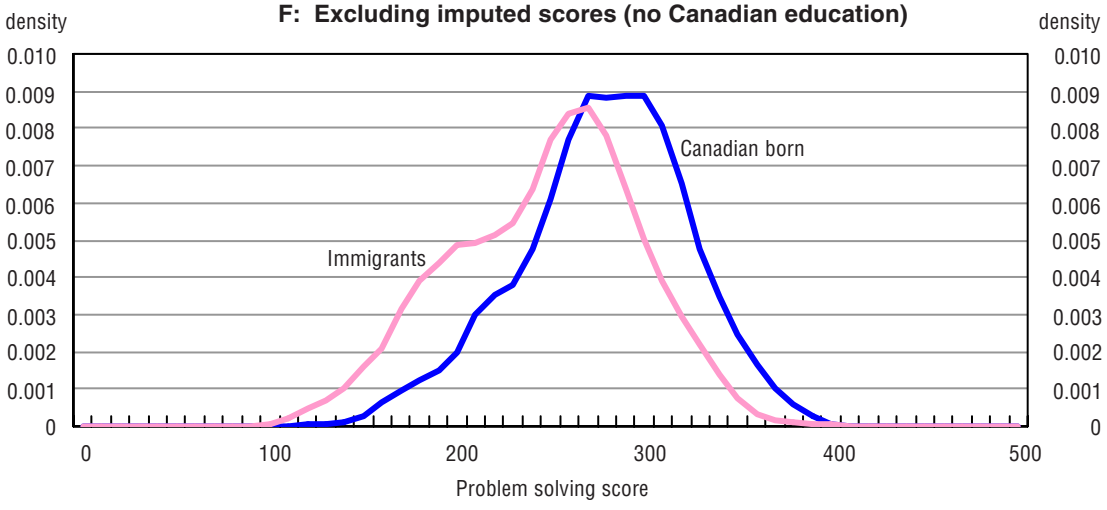


Chart 4.10
Distribution of problem solving score – females

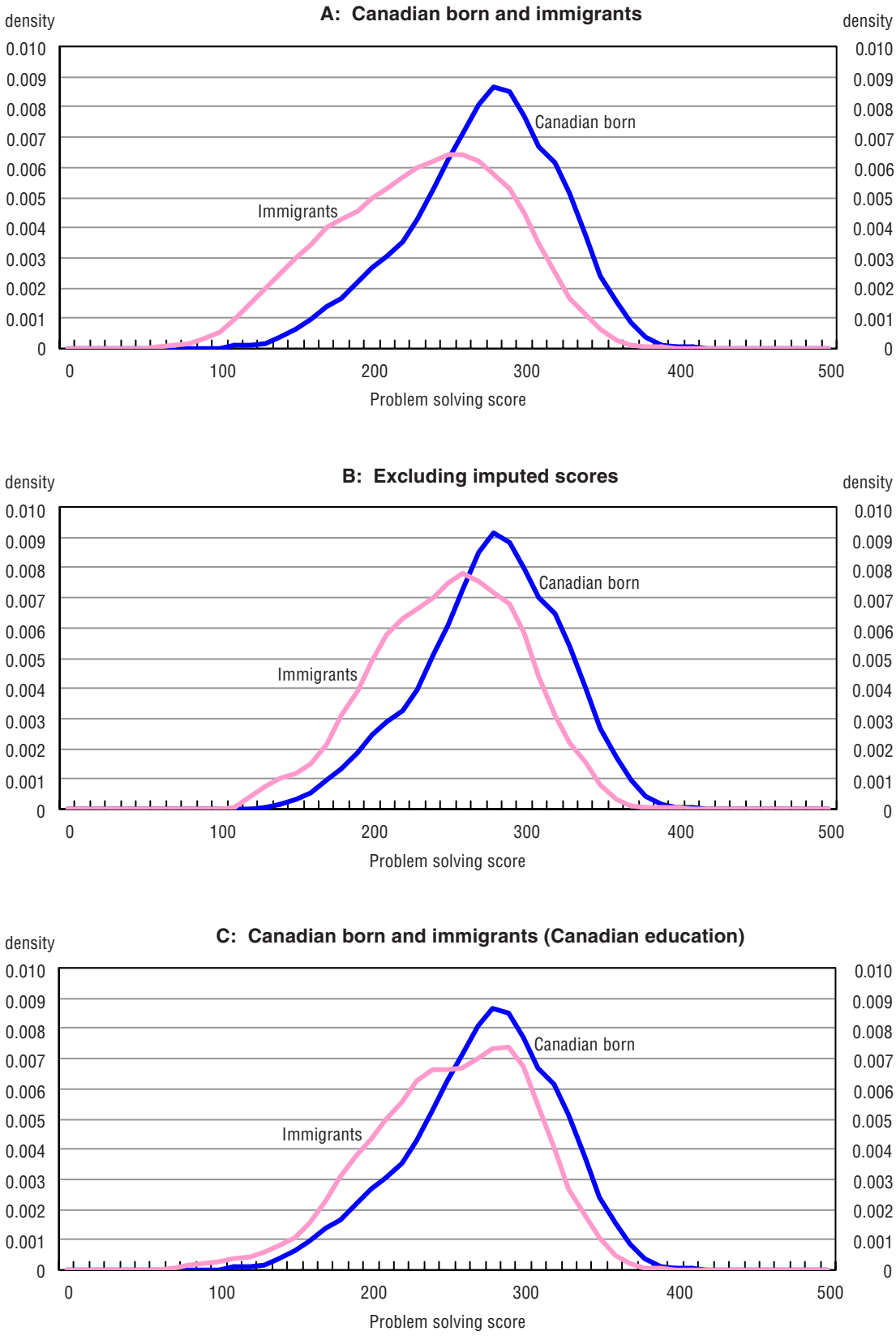
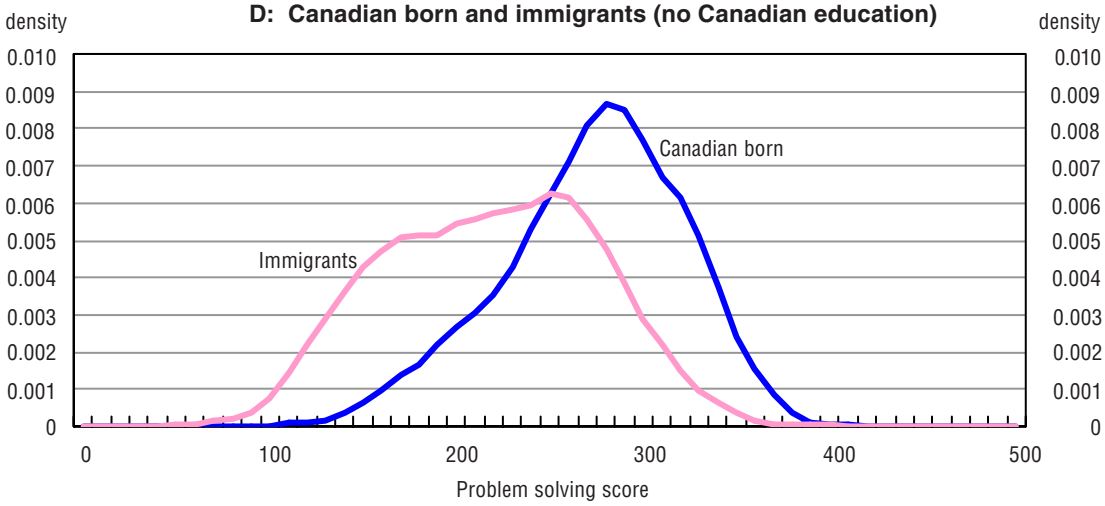
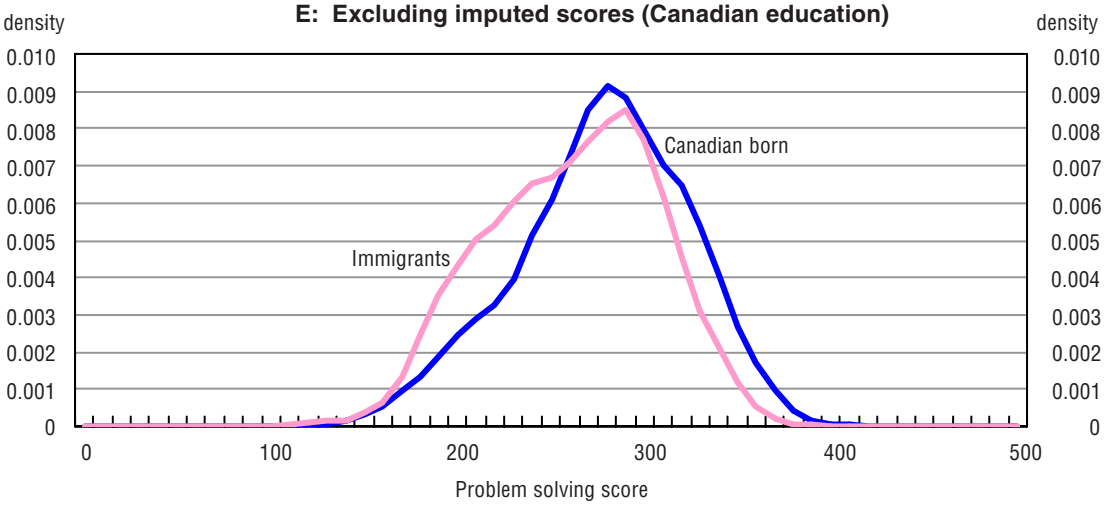
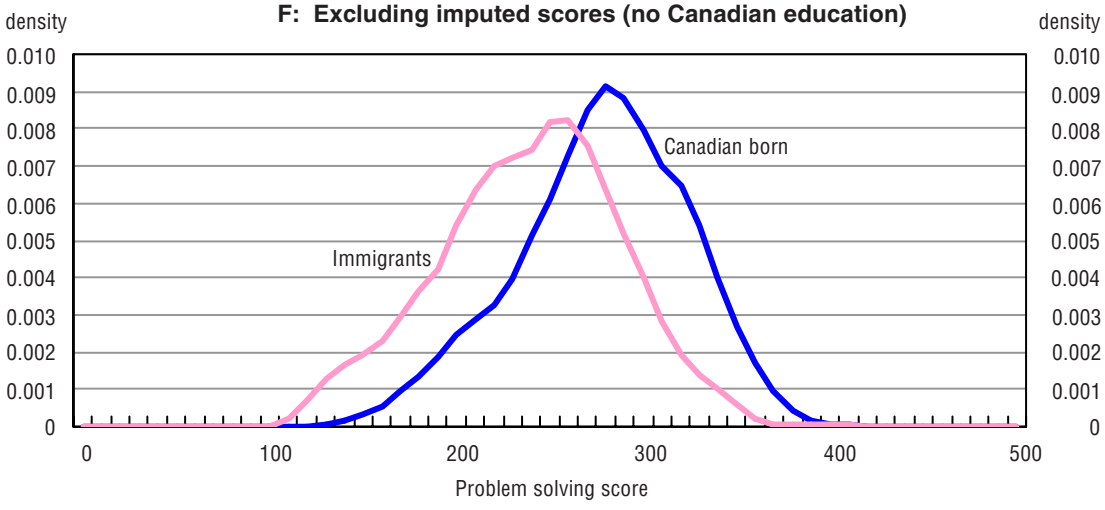


Chart 4.10
Distribution of problem solving score – females (concluded)







Removing individuals who had their skill scores imputed has a substantial impact on the skill distribution, particularly in the case of immigrants. Thus, it is informative to look at the characteristics of those who did and did not complete the main skill tasks – a comparison that is provided in Table 4.1. Given that most of the analysis in this paper focuses on the earners sample, we report the results of this comparison for our sample of immigrant workers. Immigrant workers who did not complete the main tasks were, on average, older at the time of migration than those who completed these tasks, have lower educational attainment and are roughly half as likely to have English or French as a first language. Nonetheless, around 75% of immigrants who did not complete the main skill tasks report that they speak English on a regular basis at work. About the same proportion reports believing they have sufficient reading skills in English to do their job well, although about 10% fewer report being satisfied with their English writing skills. Literacy use at work is also much lower among immigrants who did not complete the main skill tasks. For example, about half report rarely using writing skills in English at work, compared to only about 20% among immigrants who did complete the main skill tasks. Finally, immigrant workers who did not complete the main skill tasks receive around 70%-80% of the average annual earnings received by immigrants who did complete these tasks, although those earnings are still fairly high ($31,435 for men and $25,134 for women).

The principal objective of this paper is to examine the relationship between cognitive skills and the labour market outcomes experienced by immigrants and native-born Canadians. However, because of its relevance to our analytical framework we also examine the determinants of individual skills, with particular focus on the relationship between cognitive skills and human capital variables like education and age or experience. Table 4.2 reports the results from regressions of the average skill score on age and education plus parents' education, language proficiency, source country, and province of residence (not reported). The dependent variable is the log of the average skill score, so the coefficients can be interpreted as showing the percentage effect of a unit change in the variable of interest on the average score. We also include a dummy variable to control for the individuals who did not complete the main tasks, and whose test scores were therefore imputed. We do not view this regression as representing a causal story of how cognitive skills are generated. Instead, we interpret the coefficients as revealing partial correlations that are useful for summarizing skill patterns in the population.

Table 4.1
Summary statistics by imputed and non-imputed skill scores among immigrant workers

		Males		Females	
		Completed main skill tasks	Did not complete main skill tasks	Completed main skill tasks	Did not complete main skill tasks
Annual earnings (dollars)[1]					
Mean	dollars	46,377	33,662	31,435	25,134
Median	dollars	37,128	31,200	29,120	21,008
Weekly earnings (dollars)					
Mean	dollars	916	673	679	502
Median	dollars	740	650	575	408
Age	years	40	44	41	43
Experience	years	20	26	21	25
Canadian	years	13	14	16	15
Foreign	years	7	13	6	10
Years of schooling	years	15	12	14	12
Percentage with high school		27	34	29	31
Foreign	percent	12	20	11	19
Canadian	percent	16	13	18	12
Percentage with non-university post-secondary		25	23	27	26
Foreign	percent	11	15	12	12
Canadian	percent	14	8	15	14
Percentage with university		39	15	33	14
Foreign	percent	21	13	18	10
Canadian	percent	17	2	15	4
Years since migration	years	18	16	21	18
Age at immigration	years	22	28	20	25
Percentage first language English/French		32	14	33	19
Percentage United States or United Kingdom origin		13	6	15	10
Percentage European origin		18	28	19	20
Percentage Asian origin		35	31	32	42
Percentage speak English regularly at work		91	74	88	75
Percentage satisfied with own skills:[2]					
Read English	percent	98	70	96	75
Write English	percent	96	62	94	65
Math skills	percent	96	79	94	84
Percentage with low skill use at work:[3]					
Reading	percent	10	31	6	35
Writing	percent	22	50	20	53
Numeracy	percent	6	14	9	17
Number of observations		768	149	727	143

1. Statistics in some cases based on a slightly smaller sample than the number of observations reported, due to missing information.
2. Respondents were asked whether they strongly agree, agree, disagree or strongly disagree that they have the reading and writing skills in English as well as the math skills they need to do their main job well. The table reports the percentage of immigrant workers who reported that they strongly agree or agree in each of the three cases.
3. Percentage of workers who report rarely or never performing any of the literacy tasks asked about. Respondents were asked about 6 different reading tasks, 5 writing tasks and 6 mathematical tasks.

Table 4.2

Estimated coefficients from regressions with log of average cognitive skill score as the dependent variable

	Males				Females			
	Column 1: Regression results with differing age profiles and education effects	standard error	Column 2: Regression results including year since migration variable	standard error	Column 3: Regression results with differing age profiles and education effects	standard error	Column 4: Regression results including year since migration variable	standard error
Age (Canadian born)	0.005***	(0.001)	0.005***	(0.001)	0.006***	(0.001)	0.006***	(0.001)
Age squared / 100 (Canadian born)	-0.008***	(0.001)	-0.008***	(0.001)	-0.009***	(0.001)	-0.009***	(0.001)
Immigrant (Canadian education)	-0.079	(0.055)	-0.091	(0.061)	-0.1	(0.071)	-0.105	(0.074)
Age (immigrant, Canadian education)	0.005*	(0.002)	0.003	(0.003)	0.007*	(0.003)	0.004	(0.003)
Age squared / 100 (immigrant, Canadian education)	-0.007***	(0.002)	-0.009**	(0.004)	-0.011***	(0.004)	-0.011***	(0.004)
Years since migration (immigrant, Canadian education)	…	…	0.004*	(0.002)	…	…	0.005*	(0.003)
Years since migration squared / 100 (immigrant, Canadian education)	…	…	0.0002	(0.003)	…	…	-0.002	(0.004)
Immigrant (no Canadian education)	-0.310**	(0.120)	-0.374**	(0.138)	-0.208**	(0.094)	-0.152	(0.110)
Age (immigrant, no Canadian education)	0.005	(0.005)	0.008		0.003	(0.004)	-0.0005	(0.005)
Age squared / 100 (immigrant, no Canadian education)	-0.006	(0.004)	-0.008	(0.005)	-0.005	(0.004)	-0.003	(0.005)
Years since migration (immigrant, no Canadian education)	…	…	-0.003*	(0.002)	…	…	0.004	(0.003)
Years since migration squared / 100 (immigrant, no Canadian education)	…	…	0.004	(0.004)	…	…	-0.003	(0.005)
High school (Canadian born)	0.131***	(0.009)	0.131***	(0.009)	0.127***	(0.007)	0.127***	(0.007)
Non-university post-secondary (Canadian born)	0.153***	(0.008)	0.154***	(0.009)	0.156***	(0.009)	0.155***	(0.009)
University (Canadian born)	0.237***	(0.010)	0.238***	(0.010)	0.223***	(0.009)	0.223***	(0.009)
High school (immigrant, Canadian education)	0.107***	(0.032)	0.113***	(0.031)	0.097***	(0.026)	0.106***	(0.025)
Non-university post-secondary (immigrant, Canadian education)	0.143***	(0.030)	0.161***	(0.030)	0.172***	(0.027)	0.179***	(0.025)
University (immigrant, Canadian education)	0.256***	(0.027)	0.273***	(0.026)	0.237***	(0.032)	0.246***	(0.029)
High school (immigrant, no Canadian education)	0.175***	(0.037)	0.178***	(0.037)	0.183***	(0.028)	0.182***	(0.029)
Non-university post-secondary (immigrant, no Canadian education)	0.243***	(0.030)	0.245***	(0.029)	0.282***	(0.026)	0.289***	(0.026)
University (immigrant, no Canadian education)	0.349***	(0.032)	0.346***	(0.031)	0.325***	(0.026)	0.338***	(0.026)
Father's education								
High school	0.027**	(0.011)	0.027**	(0.011)	0.02***	(0.006)	0.021***	(0.006)
Non-university post secondary	0.030***	(0.009)	0.028***	(0.009)	0.028***	(0.007)	0.028***	(0.007)
University	0.031***	(0.010)	0.031***	(0.010)	0.045***	(0.011)	0.046***	(0.011)
None reported	-0.008	(0.015)	-0.008	(0.015)	-0.013	(0.010)	-0.014	(0.010)
Mother's education								
High school	0.035***	(0.008)	0.034***	(0.008)	0.029***	(0.006)	0.030***	(0.006)
Non-university post secondary	0.036***	(0.011)	0.036***	(0.012)	0.044***	(0.007)	0.044***	(0.007)
University	0.053***	(0.016)	0.052***	(0.016)	0.051***	(0.011)	0.051***	(0.011)
None reported	-0.029	(0.021)	-0.028	(0.021)	-0.055***	(0.015)	-0.055***	(0.015)
First language not English or French	-0.024	(0.014)	-0.023	(0.014)	-0.025**	(0.012)	-0.023*	(0.012)
United States or United Kingdom origin	0.093***	(0.022)	0.083***	(0.024)	0.107***	(0.018)	0.089***	(0.019)
European origin	0.021	(0.028)	0.016	(0.027)	0.022	(0.019)	0.011	(0.019)
Asian origin	-0.014	(0.021)	-0.014	(0.021)	-0.057***	(0.014)	-0.042	(0.013)
Did not complete main skill tasks	-0.115***	(0.008)	-0.114***	(0.008)	-0.11***	(0.009)	-0.107	(0.008)
Number of observations	8,442	…	8,442	…	9,931	…	9,931	…
R-squared	0.540	…	0.550	…	0.610	…	0.620	…

… not applicable
* coefficient significant at 10% significance level
** coefficient significant at 5% significance level
*** coefficient significant at 1% significance level
Note: Regressions include indicators for province of residence.

Regression results are reported separately for males and females as some of the determinants of skills vary by gender. We also allow the effects of age and education to differ across the three groups – Canadian-born, immigrants with Canadian education, and immigrants who completed their education prior to arrival. Columns 1 and 3 allow the age profiles (as well as education effects) to differ across the three groups, while columns 2 and 4 also include a "years since migration" variable that allows the immigrant age profile after arrival to differ from that prior to arrival. For ease of interpretation, the age and education variables used in the Table 4.2 estimation are defined in such a way that the immigrant coefficients stand on their own; that is, they are not defined relative to the Canadian-born coefficients.

In the Table 4.2 regressions the omitted category consists of native-born Canadians with less than high school education, whose mothers and fathers also had not completed secondary school, whose first language is English or French and who completed the main skill tasks. Relative to these Canadians, the skills of immigrants with Canadian education are 8% to 11% lower, although the estimate associated with this immigrant dummy is imprecise and not significantly different from zero. Foreign-educated immigrants have much lower skills than the reference group – in the order of 20% lower for females and more than 30% lower for males. These estimates are statistically significant. A further reduction of 11-12% is associated with inability to complete the main skill tasks.

The age profiles reported in columns 1 and 3 are similar for men and women. For all three groups there is a positive partial correlation between age and skills, but one that is small in magnitude and diminishes with increased age. The estimated impact is about the same for Canadian-born and Canadian-educated immigrants – about half of 1% per year at early ages, diminishing to zero by age 25 to 30. For foreign-educated immigrants the magnitudes of the estimated coefficients are similar to those for the other two groups but the estimates are imprecise and not significantly different from zero. These results suggest that among adults (i.e. after about age 20) there is essentially no relationship between age (or experience) and the individual's skills. This conclusion is consistent with Green and Riddell (2003) who find that years of experience are essentially uncorrelated with the individual's skill level across various specifications in the IALS data that is predominantly made up of adult workers. Adding controls for years since arrival provides some evidence suggesting that years in Canada matter more than years abroad, especially for immigrants with Canadian education. Nonetheless the main message is the small effect of age on an individual's skills.

On the other hand, there is a strong relationship between education and cognitive skills for all three groups. Canadian-born high school graduates have skills that are approximately 13% higher than those of high school dropouts, while university graduates have average skill scores that are 22-24% higher than individuals who have not completed high school. University graduates also have dramatically higher skills than graduates from other post-secondary institutions.

Among Canadian-educated immigrants the impact of educational attainment on skills is similar to that of native-born Canadians – gains of 10-11% associated with secondary school, somewhat larger gains associated with non-university post-secondary, and skill gains in the order of 26% associated with university education. In contrast, the educational gradients are much larger for immigrants who obtained their education abroad – estimated skill gains of 18% for high school and approximately 35% for university education.

In summary, for all three groups there are substantial gains in skills associated with higher educational attainment.[13] The skill gains associated with higher education are greatest for immigrants without Canadian education, and similar in size for the Canadian born and immigrants with Canadian education. Combining the negative immigrant dummies with the positive effects of higher education, foreign-educated male immigrants with a university degree have an average cognitive skill score that is 20-25% lower than that for a university-educated Canadian-born male. In contrast, among male high school dropouts the skills gap between these two groups is approximately 30-40%. The comparable estimates for females are approximately 5-10% and 15-20%, respectively. For both genders a university education narrows the skills gap relative to high school dropouts by approximately 10 percentage points.

Parents' education is also positively associated with the child's cognitive skills, but the estimated impacts are relatively modest. Among men the key factor is having a father or mother with at least a high school education; beyond this level there is little additional impact of the father's education. Among women there is a clear gradient, with the estimated effect of either parent being a university graduate being approximately double that of either parent being a high school graduate. The estimates imply that if both parents are university graduates the average skills of men are 8% higher than if both parents are high school dropouts, while those of women are 10% higher.

Language also appears to exert only a modest effect on cognitive skills. Having one's first language being other than English or French is associated with average skills that are 2-3% lower compared to individuals whose first language is one of the two official languages. Although the estimated impacts of language are very similar for males and females, the language coefficients for males are less precisely estimated and not statistically significantly different from zero.

These results indicate that, for foreign-educated immigrants, there is a substantial skills deficiency relative to the Canadian born, and that deficiency declines somewhat with education. In contrast, for immigrants who obtained some of their education in Canada the skills disadvantage relative to native-born Canadians is much smaller, but that disadvantage is not reduced at higher education levels. Notice that in obtaining these results we control for region of origin, and that immigrants from the United States or United Kingdom do not face as large a skills disadvantage. These differences in measured skills could arise because of differences in the quality of education across source countries or because immigrants not from the United States or United Kingdom have some difficulties in English or French.[14]

5. The effect of education and cognitive skills on earnings

Results without cognitive skill variables

In this section, we use our sample of paid workers to estimate earnings regressions with and without controlling for individual skills. The dependent variable is the log of weekly earnings. As a first step, 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 a dummy for first language other than English or French. This specification is similar to immigrant – Canadian born earnings equations estimated with cross-sectional data that have been reported in previous studies.

The first column in Tables 5.1 (males) and 5.2 (females) presents these results. They reflect commonly observed patterns. In particular, male returns to experience are approximately 7% per year just after leaving school but decline to zero by 29 years later. As is typically found to be the case, female returns to experience are lower, 5.4% per year early in the career and also declining to zero by 25-30 years later. There are also substantial returns to education that are on the order of those found in earlier studies, with women experiencing much higher returns to schooling than men. Male immigrants receive weekly earnings that are over 50% less than earnings of Canadian-born workers with the same level of total experience and education. For female immigrants the magnitude of this negative entry effect is somewhat lower, but the gap is still a substantial one – approximately 44 percent. Immigrant earnings then rise at rates of approximately 2.5% (males) and 2.8% (females) more per year compared to similar Canadian born workers in the years just after the immigrant enters Canada. As indicated by the negative coefficients on the years-since-migration (YSM) squared variables, this rate of catch-up to the Canadian-born diminishes over time. If male and female immigrant earnings actually follow these "years since migration" profiles, then their earnings would equal those of a comparable Canadian-born worker after approximately 28 years 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 IALSS 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 effects of cognitive skills 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.[15]

The specification in column 1 imposes equal returns to education and experience for immigrants and the Canadian 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 entry into the labour market. Since the latter years may include time when the immigrant 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 2) that allows the immigrant entry effects and Canadian experience effects to differ between immigrants who arrive after completing their education and immigrants who obtain some or all of 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.

The adjusted specification in column 2 includes both the separate immigrant experience variables described above and three dummy variables corresponding to immigrants whose source country was either: 1) the United States or United Kingdom; 2) any continental European country; or 3) Asia. We include these variables because previous studies have placed a great deal of emphasis on region of origin effects in explaining immigrant earnings patterns (e.g., Baker and Benjamin, 1994). In interpreting the estimates reported in column 2 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.

Although the results for males and females share many common features, there are also some noteworthy gender differences. We therefore discuss the male results (Table 5.1) and female results (Table 5.2) separately. The estimated coefficients relating to the Canadian experience of male immigrants who obtained some of their education in Canada and the overall male experience coefficient (which corresponds mainly to the experience effects for the Canadian born) are very similar in size, and tests of the hypothesis that they are equal to each other cannot be rejected at conventional significance levels. In contrast, male immigrants without Canadian education receive significantly greater returns to Canadian work experience. The intercept coefficients for the two groups of immigrants are both negative and significantly different from zero. Nonetheless, the implication from the coefficients is that immigrants who complete their education abroad have earnings that are almost 65% lower than comparable Canadian-born workers, whereas those with some Canadian education receive earnings that are about 16% lower than otherwise comparable native-born Canadians. These estimates apply to the base category, those whose first language spoken was French or English and who are not from the United States, the United Kingdom, Europe, or Asia. For those whose first language was other than English or French, average weekly earnings are another 3% to 5% lower, although this effect is not precisely estimated and is not significantly different from zero. Finally, the source region coefficients suggest that immigrants from continental Europe have earnings that are over 20% higher than those of other immigrants. Immigrants from the United States/ United Kingdom also receive higher earnings than the base group, although these estimated effects are smaller than for Europe (about 12%) and are not precisely estimated. Immigrants from Asia have earnings that are slightly lower than the base group, although this effect is also not statistically significant.

Table 5.1
Estimated coefficients from earnings regressions without skill effects – males

	Column 1: Basic regression results		Column 2: First adjusted regression results[1]		Column 3: Second adjusted regression results[2]		Column 4: Preferred adjusted regression results[3]	
	regression coefficient	standard error	regression coefficient	standard error	regression coefficient	standard error	regression coefficient	standard error
Immigrant	-0.528***	(0.066)	…	…	…	…	…	…
Immigrant (Canadian education)	…	…	-0.157	(0.092)	0.032	(0.115)	-0.003	(0.094)
Immigrant (no Canadian education)	…	…	-0.643***	(0.117)	0.020	(0.107)	0.628***	(0.134)
Years since migration	0.025***	(0.004)	…	…	…	…	…	…
Years since migration squared / 100	-0.019**	(0.008)	…	…	…	…	…	…
Experience	0.070***	(0.003)	0.072***	(0.003)	…	…	…	…
Experience squared / 100	-0.122***	(0.007)	-0.125***	(0.007)	…	…	…	…
Canadian experience (Canadian born)	…	…	…	…	0.075***	(0.004)	0.092***	(0.005)
Canadian experience squared / 100 (Canadian born)	…	…	…	…	-0.132***	(0.008)	-0.144***	(0.008)
Canadian experience (immigrant, Canadian education)		…	0.072***	(0.009)	0.062***	(0.011)	0.076***	(0.013)
Canadian experience squared / 100 (immigrant, Canadian education)	…	…	-0.109***	(0.021)	-0.098***	(0.027)	-0.092***	(0.030)
Foreign experience (immigrant, Canadian education)	…	…	…	…	…	…	-0.003	(0.017)
Foreign experience squared / 100 (immigrant, Canadian education)	…	…	…	…	…	…	0.046	(0.060)
Canadian experience (immigrant, no Canadian education)	…	…	0.099***	(0.013)	0.058***	(0.011)	0.047***	(0.011)
Canadian experience squared / 100 (immigrant, no Canadian education)	…	…	-0.152***	(0.039)	-0.104***	(0.030)	-0.088**	(0.033)
Foreign experience (immigant, no Canadian education)	…	…	…	…	…	…	-0.008	(0.009)
Foreign experience squared / 100 (immigant, no Canadian education)	…	…	…	…	…	…	0.005	(0.023)
Foreign experience	…	…	…	…	0.002	(0.009)	…	…
Foreign experience squared / 100	…	…	…	…	-0.005	(0.028)	…	…
High school	0.200***	(0.047)	0.200***	(0.048)	0.207***	(0.047)	…	…
Non-university post-secondary	0.402***	(0.040)	0.402***	(0.040)	0.412***	(0.038)	…	…
University	0.719***	(0.043)	0.731***	(0.042)	0.739***	(0.040)	…	…
High school (Canadian born and immigrant, Canadian education)	…	…	…	…	…	…	0.422***	(0.080)
Non-university post-secondary (Canadian born and immigrant, Canadian education)	…	…	…	…	…	…	0.816***	(0.072)
University (Canadian born and immigrant, Canadian education)	…	…	…	…	…	…	1.223***	(0.082)
High school (immigant, no Canadian education)	…	…	…	…	…	…	0.117	(0.097)
Non-university post-secondary (immigrant, no Canadian education)	…	…	…	…	…	…	0.364***	(0.102)
University (immigant, no Canadian education)	…	…	…	…	…	…	0.477***	(0.090)
High school * Canadian experience (Canadian born and immigrant, Canadian education)	…	…	…	…	…	…	-0.01***	(0.003)
Non-university post-secondary * Canadian experience (Canadian born and immigrant, Canadian education)	…	…	…	…	…	…	-0.021***	(0.003)
University * Canadian experience (Canadian born and immigrant, Canadian education)	…	…	…	…	…	…	-0.026***	(0.004)

Table 5.1
Estimated coefficients from earnings regressions without skill effects – males (concluded)

	Column 1: Basic regression results		Column 2: First adjusted regression results[1]		Column 3: Second adjusted regression results[2]		Column 4: Preferred adjusted regression results[3]	
	regression coefficient	standard error	regression coefficient	standard error	regression coefficient	standard error	regression coefficient	standard error
First language not English or French	-0.049	(0.043)	-0.028	(0.052)	-0.023	(0.055)	-0.049	(0.052)
United States or United Kingdom origin	…	…	0.119	(0.092)	0.121	(0.103)	0.123	(0.102)
European origin	…	…	0.234***	(0.082)	0.231***	(0.081)	0.229***	(0.078)
Asian origin	…	…	-0.042	(0.063)	-0.021	(0.058)	-0.005	(0.049)
Number of observations	4,551	…	4,551	…	4,551	…	4,551	…
R-squared	0.390	…	0.400	…	0.400	…	0.430	…

… not applicable
* coefficient significant at 10% significance level
** coefficient significant at 5% significance level
*** coefficient significant at 1% significance level
1. With adjusted immigrant entry and Canadian experience effects.
2. With adjusted separate return to Canadian experience.
3. With complete interactions among all immigrant, experience and education variables.

Note: Regressions include indicators for province of residence.

Table 5.2
Estimated coefficients from earnings regressions without skill effects – females

	Column 1: Basic regression results		Column 2: First adjusted regression results[1]		Column 3: Second adjusted regression results[2]		Column 4: Preferred adjusted regression results[3]	
	regression coefficient	standard error	regression coefficient	standard error	regression coefficient	standard error	regression coefficient	standard error
Immigrant	-0.436***	(0.096)	…	…	…	…	…	…
Immigrant (Canadian education)	…	…	-0.046	(0.093)	0.090	(0.079)	0.153**	(0.069)
Immigrant (no Canadian education)	…	…	-0.387***	(0.118)	-0.072	(0.149)	0.639**	(0.247)
Years since migration	0.028***	(0.007)	…	…	…	…	…	…
Years since migration squared / 100	-0.035***	(0.012)	…	…	…	…	…	…
Experience	0.054***	(0.005)	0.054***	(0.006)	…	…	…	…
Experience squared / 100	-0.102***	(0.012)	-0.102***	(0.013)	…	…	…	…
Canadian experience (Canadian born)	…	…	…	…	0.057***	(0.006)	0.072***	(0.005)
Canadian experience squared / 100 (Canadian born)	…	…	…	…	-0.108***	(0.014)	-0.114***	(0.013)
Canadian experience (immigrant, Canadian educated)	…	…	0.066***	(0.007)	0.058***	(0.007)	0.072***	(0.006)
Canadian experience squared / 100 (immigrant, Canadian education)	…	…	-0.120***	(0.019)	-0.109***	(0.018)	-0.113***	(0.016)
Foreign experience (immigrant, Canadian education)	…	…	…	…	…	…	-0.022	(0.013)
Foreign experience squared / 100 (immigrant, Canadian education)	…	…	…	…	…	…	0.105**	(0.051)
Canadian experience (immigrant, no Canadian education)	…	…	0.076***	(0.015)	0.054***	(0.016)	0.040**	(0.015)
Canadian experience squared / 100 (immigrant, no Canadian education)	…	…	-0.126***	(0.036)	-0.099**	(0.038)	-0.078**	(0.034)
Foreign experience (immigrant, no Canadian education)	…	…	…	…	…	…	0.026	(0.017)
Foreign experience squared / 100 (immigrant, no Canadian education)	…	…	…	…	…	…	-0.079	(0.047)
Foreign experience	…	…	…	…	0.003	(0.008)	…	…
Foreign experience squared / 100	…	…	…	…	0.015	(0.027)	…	…

Table 5.2

Estimated coefficients from earnings regressions without skill effects – females (concluded)

	Column 1: Basic regression results		Column 2: First adjusted regression results[1]		Column 3: Second adjusted regression results[2]		Column 4: Preferred adjusted regression results[3]	
	regression coefficient	standard error	regression coefficient	standard error	regression coefficient	standard error	regression coefficient	standard error
High school	0.342***	(0.060)	0.341***	(0.059)	0.354***	(0.059)	-	-
Non-university post-secondary	0.569***	(0.066)	0.570***	(0.067)	0.580***	(0.066)	-	-
University	0.967***	(0.079)	0.971***	(0.080)	0.983***	(0.080)	-	-
High school (Canadian born and immigrant, Canadian education)	…	…	…	…	…	…	0.604***	(0.085)
Post-secondary non-university (Canadian born and immigrant, Canadian education)	…	…	…	…	…	…	1.028***	(0.119)
University (Canadian born and immigrant, Canadian education)	…	…	…	…	…	…	1.430***	(0.083)
High school (immigrant, no Canadian education)	…	…	…	…	…	…	0.143	(0.127)
Non-university post-secondary (immigrant, no Canadian education)	…	…	…	…	…	…	0.290**	(0.130)
University (immigrant, no Canadian education)	…	…	…	…	…	…	0.411***	(0.141)
High school * Canadian experience (Canadian born and immigrant, Canadian education)	…	…	…	…	…	…	-0.010***	(0.003)
Non-university post-secondary * Canadian experience (Canadian born and immigrant, Canadian education)	…	…	…	…	…	…	-0.020***	(0.004)
University * Canadian experience (Canadian born and immigrant, Canadian education)	…	…	…	…	…	…	-0.020***	(0.003)
First language not English or French	-0.049	(0.044)	-0.046	(0.052)	-0.044	(0.051)	-0.064	(0.052)
United States or United Kingdom origin	…	…	-0.067	(0.103)	-0.085	(0.117)	-0.072	(0.132)
European origin	…	…	-0.052	(0.077)	-0.038	(0.076)	-0.081	(0.075)
Asian origin	…	…	-0.078	(0.072)	-0.072	(0.070)	-0.083	(0.072)
Number of observations	5,003	…	5,003	…	5,003	…	5,003	…
R-squared	0.330	…	0.330	…	0.340	…	0.360	…

… not applicable
* coefficient significant at 10% significance level
** coefficient significant at 5% significance level
*** coefficient significant at 1% significance level
1. With adjusted immigrant entry and Canadian experience effects.
2. With adjusted separate return to Canadian experience.
3. With complete interactions among all immigrant, experience and education variables.

Note: Regressions include indicators for province of residence.

Table 5.1 reports the results for females. As was the case for men, the negative entry effect experienced by foreign-educated immigrants is much larger than that for immigrants with Canadian education. However, both entry effects are smaller (in absolute value) than the corresponding estimates for male immigrants, and the coefficient associated with Canadian-educated female immigrants is not significantly different from zero. Another feature common to both male and female immigrants is the result that foreign-educated immigrants experience substantially higher returns to Canadian experience than do native-born Canadians. However, in contrast to the results for men, female immigrants with Canadian education also obtain higher returns to Canadian experience than the Canadian born, albeit lower than those obtained by their foreign-educated counterparts. Finally, although the estimated consequences of having a first language other than English or French are similar to those for men, the earnings differences associated with alternative source countries are very different. In particular, after controlling for other factors, female immigrants from the United States/United Kingdom and Europe do not experience higher earnings than those from other source regions, in contrast to the situation for male immigrants.

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 column 3 of Table 5.2 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) and Ferrer, Green and Riddell (2006). 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 Canadian born earned for Canadian experience. Similar to results in those papers, when we introduce foreign experience variables in column 3, the immigrant entry effect coefficients are no longer significantly different from zero; indeed, three of the four estimated coefficients are positive. At the same time, for both men and women the returns to Canadian experience for the two immigrant groups are not significantly different from those for the Canadian born. Finally, note that introducing the foreign experience effect does not change the returns to education, language impacts, and country of origin effects.

Among both male and female immigrants the return to foreign experience itself is essentially zero. It is this low rate of return on foreign experience that is the source of the negative immigrant entry effects in columns 1 and 2 of the table. Comparing immigrant earnings to those of Canadian-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 zero returns to some of those years of experience. Once we control for foreign experience, we are effectively comparing immigrants to Canadian-born workers with the same number of years of Canadian experience, and it turns out that immigrant and Canadian-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 major 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 interpretation 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.[16]

Column 4 of Table 5.2 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 some education in Canada. For both males and females we could not reject the restriction that the differences between these returns and those for the Canadian born were zero at any conventional significance level. However, we do find that returns to education are significantly lower for male and female immigrants without Canadian education. We also allowed for the possibility that each type of experience (whether foreign or Canadian-acquired) might interact with each type of education. We do find evidence of significant interactions of Canadian experience with education for the Canadian born and immigrants who obtained some education after arrival. These interaction coefficients are negative for both men and women, and increase (in absolute value) with educational attainment. Thus among the Canadian born and immigrants with Canadian education the positive impact of experience on earnings diminishes as educational attainment rises. However, there is no evidence of similar interactions between experience and education for immigrants educated before arrival.

To aid in interpretation of the results in column 4 of Table 5.2, we present in Table 5.3 fitted average earnings for a set of specific cases characterized by differing levels of education and experience. To generate the entries in this table, we formed fitted average log earnings values for a base case person – a Canadian-born worker who has not graduated from high school and has no Canadian experience. We also formed average log earnings for Canadian-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 completed schooling outside Canada, who is not from the United States, the United Kingdom, Europe or Asia, and whose first language is English or French. The various fitted earnings are differenced relative to those of the base case Canadian-born individual.

Table 5.3
Fitted returns to immigrants and Canadian born by experience and education, no skill effects

	Males						Females					
	Canadian experience (years) = 0	standard error	Canadian experience (years) = 10	standard error	Canadian experience (years) = 20	standard error	Canadian experience (years) = 0	standard error	Canadian experience (years) = 10	standard error	Canadian experience (years) = 20	standard error
Canadian born (less than high school)	0.00	…	0.77	(0.04)	1.26	(0.07)	0.00	…	0.60	(0.04)	0.98	(0.06)
Immigrant (less than high school)												
Foreign experience = 0	0.63	(0.13)	1.01	(0.11)	1.22	(0.10)	0.64	(0.25)	0.96	(0.18)	1.13	(0.15)
Foreign experience = 10	0.55	(0.14)	0.93	(0.13)	1.14	(0.12)	0.82	(0.21)	1.14	(0.13)	1.31	(0.11)
Canadian born (high school)	0.42	(0.08)	1.10	(0.08)	1.48	(0.08)	0.60	(0.09)	1.11	(0.08)	1.38	(0.08)
Immigrant (foreign high school)												
Foreign experience = 0	0.74	(0.13)	1.13	(0.1)	1.33	(0.09)	0.78	(0.17)	1.10	(0.11)	1.27	(0.12)
Foreign experience = 10	0.67	(0.12)	1.05	(0.1)	1.26	(0.09)	0.96	(0.14)	1.28	(0.09)	1.45	(0.11)
Canadian born (university)	1.22	(0.08)	1.73	(0.08)	1.96	(0.08)	1.43	(0.08)	1.83	(0.08)	2.00	(0.09)
Immigrant (foreign university)												
Foreign experience = 0	1.10	(0.12)	1.49	(0.10)	1.69	(0.09)	1.05	(0.20)	1.37	(0.16)	1.54	(0.17)
Foreign experience = 10	1.03	(0.12)	1.41	(0.11)	1.62	(0.11)	1.23	(0.14)	1.55	(0.11)	1.72	(0.14)

… not applicable

Note: Estimates are fitted log weekly earnings based on the parameter estimates in the final column of Tables 5.1 and 5.2, respectively, and differenced relative to the base case. The base group consists of English or French speaking native born workers with less than high school education, and experience normalized to zero.

An examination of the table entries corresponding to Canadian-born and foreign-educated immigrants who have not graduated from high school (the 1st and 2nd rows in the first and fourth columns, respectively) indicates that low educated immigrants earn considerably more than similarly educated Canadian-born workers when they first enter the Canadian labour market. By moving along the first and second rows, we can see the effects of increasing Canadian experience for low educated workers. The larger increase as we move along the first row rather than the second arises because foreign-educated immigrants receive a lower return to Canadian experience than do native-born Canadians.

Thus, the immigrant advantage right out of school is whittled away by the fact that the Canadian born get a higher return to Canadian experience than do immigrants.[17]

Moving across rows 1, 4 and 7 shows the effects of greater Canadian experience for Canadian-born workers with different levels of education. Earnings increase with experience for all three education categories, but the magnitude of the increase is smaller among well educated workers than among the poorly educated.

It is also instructive to move down each column to see the impacts of increased educational attainment for a given level of Canadian experience. Comparing rows 1, 4 and 7 to rows 2, 5 and 8 within each column illustrates the higher estimated returns to education for Canadian-born compared to foreign-educated immigrant workers.

Finally, a noteworthy feature of the immigrant – Canadian-born differences is that the patterns are very similar for men and women.

Results with cognitive skill variables

In Tables 5.4 and 5.5, we use the preferred specification from Tables 5.1 and 5.2 but include the average skill score. A comparison of the first column in Tables 5.4 (males) and 5.5 (females), where we simply add the skill variable without any interactions, and the fourth column in Tables 5.1 and 5.2 respectively reveals the direct impact of cognitive skills and their indirect impacts on other returns. The returns to skills are substantial, with a 100-point increase in cognitive skills raising earnings by almost 30 percent.[18] The impact of skills on earnings is remarkably similar for men and women. As in Green and Riddell (2003), there is little, if any, change in the experience effects or experience interactions when we control for skills. However, estimated returns to education for Canadian-born and Canadian-educated immigrants decline to a significant extent, indicating that an important component of conventional estimates of the return to schooling arises from the impact of education on skills and the value placed on skills in the labour market.[19] With the inclusion of controls for cognitive skills, estimated returns to foreign-educated immigrants decline even more than was the case for the Canadian born. Indeed, for men returns to education fall by about 50%; for women the decline is even greater, and, after controlling for skills, the remaining returns to education are no longer significantly different from zero. Thus, cognitive skills constitute a significant amount of what foreign education seems to deliver – at least in terms of the skills that are valued by Canadian employers.

Table 5.4
Estimated coefficients from earnings regressions with skill effects – males

	Column 1: Regression results with added skill variable		Column 2: First adjusted regression results[1]		Column 3: Second adjusted regression results[2]		Column 4: Third adjusted regression results[3]	
	regression coefficient	standard error	regression coefficient	standard error	regression coefficient	standard error	regression coefficient	standard error
Average skill score / 100	0.281***	(0.033)	…	…	…	…	…	…
Average skill score / 100 (Canadian born)	…	…	0.244***	(0.051)	0.241***	(0.050)	0.108	(0.093)
Average skill score / 100 (immigrants)	…	…	0.368***	(0.045)	…	…	…	…
Average skill score / 100 (immigrant, Canadian education)	…	…	…	…	0.317***	(0.076)	0.267***	(0.085)
Average skill score / 100 (immigrant no Canadian education)	…	…	…	…	0.408***	(0.056)	0.279***	(0.098)
Average skill score /100* experience (Canadian born)	…	…	…	…	…	…	0.007**	(0.003)
Average skill score /100* foreign experience (immigrant)	…	…	…	…	…	…	0.011*	(0.006)
Did not complete main skill tasks	0.098***	(0.026)	0.104***	(0.026)	0.106***	(0.026)	0.11***	(0.026)
Immigrant (Canadian education)	0.068	(0.085)	-0.288	(0.246)	-0.152	(0.308)	-0.416	(0.427)
Immigrant (no Canadian education)	0.814***	(0.157)	0.541*	(0.276)	0.458*	(0.268)	0.439	(0.409)
Canadian experience (Canadian born)	0.092***	(0.005)	0.092***	(0.005)	0.092***	(0.005)	0.071***	(0.012)
Canadian experience squared / 100 (Canadian born)	-0.140***	(0.008)	-0.141***	(0.008)	-0.14***	(0.008)	-0.134***	(0.009)
Canadian experience (immigrant, Canadian education)	0.076***	(0.013)	0.075***	(0.012)	0.076***	(0.012)	0.079***	(0.013)
Canadian experience squared / 100 (immigrant, Canadian education)	-0.087***	(0.029)	-0.085***	(0.028)	-0.086***	(0.028)	-0.089***	(0.030)
Foreign experience (immigrant, Canadian education)	0.004	(0.016)	0.006	(0.015)	0.004	(0.015)	-0.027	(0.025)
Foreign experience squared / 100 (immigrant, Canadian education)	0.036	(0.053)	0.031	(0.052)	0.034	(0.052)	0.053	(0.055)
Canadian experience (immigrant, no Canadian education)	0.049***	(0.011)	0.05***	(0.011)	0.05***	(0.012)	0.054***	(0.012)
Canadian experience squared / 100 (immigrant, no Canadian education)	-0.091***	(0.032)	-0.092***	(0.032)	-0.092***	(0.032)	-0.101***	(0.033)
Foreign experience (immigrant, no Canadian education)	-0.01	(0.009)	-0.01	(0.008)	-0.01	(0.009)	-0.041*	(0.021)
Foreign experience squared / 100 (immigrant, no Canadian education)	0.014	(0.020)	0.016	(0.020)	0.016	(0.019)	0.036	(0.025)
High school (Canadian born and immigrant, Canadian education)	0.356***	(0.087)	0.363***	(0.085)	0.365***	(0.085)	0.393***	(0.078)
Post-secondary non-university (Canadian born and immigrant, Canadian education)	0.719***	(0.076)	0.730***	(0.077)	0.732***	(0.077)	0.774***	(0.073)
University (Canadian born and immigrant, Canadian education)	1.042***	(0.084)	1.050***	(0.083)	1.058***	(0.086)	1.124***	(0.081)
High school (immigrant, no Canadian education)	0.020	(0.088)	-0.016	(0.09)	-0.034	(0.087)	-0.074	(0.082)
Non-university post-secondary (immigrant, no Canadian education)	0.207**	(0.098)	0.152	(0.101)	0.125	(0.100)	0.082	(0.093)
University (immigrant, no Canadian education)	0.267***	(0.084)	0.194**	(0.090)	0.158	(0.093)	0.147	(0.099)
High school* Canadian experience (Canadian born and immigrant, Canadian education)	-0.011***	(0.003)	-0.011***	(0.003)	-0.011***	(0.003)	-0.012***	(0.003)
Post-secondary non-university* Canadian experience (Canadian born and immigrant, Canadian education)	-0.021***	(0.003)	-0.021***	(0.003)	-0.021***	(0.003)	-0.023***	(0.003)
University* Canadian experience (Canadian born and immigrant Canadian education)	-0.026***	(0.004)	-0.026***	(0.004)	-0.026***	(0.004)	-0.029***	(0.004)

Table 5.4
Estimated coefficients from earnings regressions with skill effects – males (concluded)

	Column 1: Regression results with added skill variable		Column 2: First adjusted regression results[1]		Column 3: Second adjusted regression results[2]		Column 4: Third adjusted regression results[3]	
	regression coefficient	standard error	regression coefficient	standard error	regression coefficient	standard error	regression coefficient	standard error
First language not English or French	-0.027	(0.045)	-0.021	(0.046)	-0.018	(0.045)	-0.020	(0.044)
United States or United Kingdom origin	0.031	(0.099)	-0.003	(0.094)	-0.004	(0.094)	0.004	(0.094)
European origin	0.173**	(0.080)	0.159*	(0.082)	0.161*	(0.083)	0.155*	(0.084)
Asian origin	-0.015	(0.050)	-0.024	(0.052)	-0.022	(0.052)	-0.030	(0.057)
Number of observations	4,551	…	4,551	…	4,551	…	4,551	…
R-squared	0.450	…	0.450	…	0.450	…	0.450	…

… not applicable
* coefficient significant at 10% significance level
** coefficient significant at 5% significance level
*** coefficient significant at 1% significance level
1. Allowing differing returns to skills between immigrants and Canadian-born.
2. Allowing differing returns to skill across Canadian-born, foreign- and Canadian-educated immigrants.
3. With interactions of average skill scores with education and experience.

Note: Regressions include indicators for province of residence.

Table 5.5
Estimated coefficients from earnings regressions with skill effects – females

	Column 1: Regression results with added skill variable		Column 2: First adjusted regression results[1]		Column 3: Second adjusted regression results[2]		Column 4: Third adjusted regression results[3]	
	regression coefficient	standard error	regression coefficient	standard error	regression coefficient	standard error	regression coefficient	standard error
Average skill score / 100	0.281***	(0.038)	…	…	…	…	…	…
Average skill score / 100 (Canadian born)	…	…	0.281***	(0.045)	0.278***	(0.046)	0.125	(0.099)
Average skill score / 100 (immigrants)	…	…	0.283***	(0.041)	…	…	…	…
Average skill score / 100 (immigrant, Canadian education)	…	…	…	…	0.196***	(0.064)	0.192***	(0.064)
Average skill score / 100 (immigrant, no Canadian education)	…	…	…	…	0.373***	(0.064)	-0.077	(0.234)
Average skill score / 100* experience (Canadian born)	…	…	…	…	…	…	0.008*	(0.004)
Average skill score / 100* high school (immigrant, no Canadian education)	…	…	…	…	…	…	0.515**	(0.202)
Average skill score / 100* non-university post-secondary (immigrant, no Canadian education)	…	…	…	…	…	…	0.345	(0.266)
Average skill score / 100* university (immigrant, no Canadian education)	…	…	…	…	…	…	0.708**	(0.314)
Did not complete main skill tasks	0.015	(0.041)	0.015	(0.041)	0.018	(0.041)	0.01	(0.042)
Immigrant (Canadian education)	0.197**	(0.078)	0.189	(0.163)	0.428*	(0.21)	-0.036	(0.269)
Immigrant (no Canadian education)	0.842***	(0.245)	0.836***	(0.267)	0.654***	(0.234)	1.033**	(0.501)
Canadian experience (Canadian born)	0.074***	(0.005)	0.074***	(0.005)	0.074***	(0.005)	0.049***	(0.013)
Canadian experience squared / 100 (Canadian born)	-0.114***	(0.013)	-0.114***	(0.013)	-0.114***	(0.013)	-0.106***	(0.013)
Canadian experience (immigrant, Canadian education)	0.074***	(0.007)	0.074***	(0.007)	0.074***	(0.007)	0.078***	(0.007)
Canadian experience squared / 100 (immigrant, Canadian education)	-0.113***	(0.018)	-0.113***	(0.018)	-0.115***	(0.017)	-0.118***	(0.018)
Foreign experience (immigrant, Canadian education)	-0.010	(0.012)	-0.010	(0.011)	-0.015	(0.012)	-0.016	(0.013)
Foreign experience squared / 100 (immigrant, Canadian education)	0.084*	(0.043)	0.084*	(0.041)	0.094**	(0.046)	0.099**	(0.046)

Table 5.5
Estimated coefficients from earnings regressions with skill effects – females (concluded)

	Column 1: Regression results with added skill variable		Column 2: First adjusted regression results[1]		Column 3: Second adjusted regression results[2]		Column 4: Third adjusted regression results[3]	
	regression coefficient	standard error	regression coefficient	standard error	regression coefficient	standard error	regression coefficient	standard error
Canadian experience (immigrant, no Canadian education)	0.040**	(0.015)	0.040**	(0.015)	0.040***	(0.014)	0.041***	(0.014)
Canadian experience squared / 100 (immigrant, no Canadian education)	-0.079**	(0.033)	-0.079**	(0.033)	-0.079**	(0.033)	-0.083**	(0.032)
Foreign experience (immigrant, no Canadian education)	0.031*	(0.016)	0.031*	(0.016)	0.033*	(0.016)	0.035*	(0.017)
Foreign experience squared / 100 (immigrant, no Canadian education)	-0.081*	(0.046)	-0.081*	(0.046)	-0.083*	(0.046)	-0.099*	(0.049)
High school (Canadian born and immigrant, Canadian education)	0.546***	(0.088)	0.546***	(0.088)	0.551***	(0.088)	0.581***	(0.084)
Non-university post-secondary (Canadian born and immigrant, Canadian education)	0.938***	(0.129)	0.938***	(0.129)	0.946***	(0.130)	0.979***	(0.132)
University (Canadian born and immigrant, Canadian education)	1.280***	(0.083)	1.280***	(0.083)	1.289***	(0.084)	1.355***	(0.090)
High school (immigrant, no Canadian education)	-0.0001	(0.132)	-0.001	(0.133)	-0.049	(0.153)	-1.007***	(0.346)
Non-university post-secondary (immigrant, no Canadian education)	0.092	(0.144)	0.090	(0.142)	0.025	(0.166)	-0.514	(0.446)
University (immigrant, no Canadian education)	0.179	(0.139)	0.178	(0.139)	0.101	(0.165)	-1.402*	(0.701)
High school* Canadian experience (Canadian born and immigrant, Canadian education)	-0.011***	(0.003)	-0.011***	(0.003)	-0.011***	(0.003)	-0.013***	(0.003)
Non-university post-secondary* Canadian experience (Canadian born and immigrant, Canadian education)	-0.021***	(0.005)	-0.021***	(0.005)	-0.021***	(0.005)	-0.023***	(0.005)
University* Canadian experience (Canadian born and immigrant, Canadian education)	-0.021***	(0.003)	-0.021***	(0.003)	-0.021***	(0.003)	-0.025***	(0.004)
First language not English or French	-0.048	(0.052)	-0.048	(0.051)	-0.049	(0.051)	-0.048	(0.051)
United States or United Kingdom origin	-0.119	(0.126)	-0.119	(0.126)	-0.129	(0.125)	-0.131	(0.131)
European origin	-0.100	(0.074)	-0.100	(0.074)	-0.101	(0.075)	-0.101	(0.078)
Asian origin	-0.063	(0.067)	-0.063	(0.067)	-0.054	(0.067)	-0.038	(0.071)
Number of observations	5,003	…	5,003	…	5,003	…	5,003	…
R-squared	0.380	…	0.380	…	0.380	…	0.380	…

… not applicable
* coefficient significant at 10% significance level
** coefficient significant at 5% significance level
*** coefficient significant at 1% significance level
1. Allowing differing returns to skills between immigrants and Canadian-born.
2. Allowing differing returns to skill across Canadian-born, foreign- and Canadian-educated immigrants.
3. With interactions of average skill scores with education and experience.

Note: Regressions include indicators for province of residence.

As discussed earlier, a major question of interest is whether returns to skills are lower for immigrants. To investigate this issue we report in column 2 estimates based on a specification that allows the returns to skills to differ between immigrants and native-born Canadians, but does not allow interactions between skills and human capital inputs like education and experience. As discussed previously, in the absence of such interaction effects differences in the coefficient on the average skill measure between immigrants and the Canadian born can be interpreted as a clear measure of discrimination. The estimates in column 2 provide no evidence of discrimination in the sense of immigrants receiving a lower return to cognitive skills. Indeed, male immigrants receive a rate of return that is about 50% greater than that experienced by Canadian-born men (earnings gains for immigrants of 37% associated with a 100 point increase in cognitive skills, versus 24% for native-born Canadians) while female immigrants receive returns equal to those of native-born women – earnings gains of approximately 28%.

In column 3 we report a more general specification that allows returns to skills to differ across the three groups, again estimated without interactions with skills. Among males, foreign-educated immigrants receive the largest returns to skills, followed by immigrants with Canadian education, and native-born Canadians receive the lowest (although still substantial) returns. The differences in returns between Canadian-born and foreign-educated immigrants are statistically significant, but the pair-wise differences between the other two groups (native-born Canadians versus Canadian-educated immigrants, Canadian-educated versus foreign-educated immigrants) are not statistically significant at conventional levels. A test of the hypothesis that all three coefficients equal each other cannot be rejected at the 10% level. Among females, foreign-educated immigrants also experience the greatest returns, followed by native-born Canadians, with Canadian-educated immigrants receiving the lowest returns. The three coefficients are also not significantly different from each other at the 10% level. However, in a pair-wise comparison of Canadian and foreign-educated immigrants, we can reject equality of earnings impacts at the 10% level.

Once we allow the impact of cognitive skills on earnings to differ across the three groups, returns to education decline markedly for foreign-educated immigrants, and remain much smaller than for the Canadian born. Indeed, for both male and female foreign-educated immigrants the coefficients on educational attainment are no longer significantly different from zero. Immigrants who finished their education prior to arrival in Canada receive substantially greater returns to skills than do native-born Canadians but lower returns to formal education after we control for skills. Within our analytical framework, the implication is that education acquired abroad produces cognitive skills such as literacy, numeracy and problem solving skills (since the educational attainment coefficients change substantially with the introduction of the skill variable) but does not produce other skills that are valued in the Canadian labour market (since the educational attainment coefficients are not significantly different from zero once we control for skills).

In summary, when we allow the impacts of skills on earnings to differ across the three groups, we find no evidence that the returns to skills for native-born Canadians exceed those for Canadian-educated or foreign-educated immigrants. Indeed, among foreign-educated immigrant men the earnings gains associated with additional skills are significantly greater than those for native-born Canadians, while those for Canadian-educated immigrants are not significantly different from those for natives. Among women the skills-related earnings gains received by the Canadian born are not significantly different from those received by Canadian-educated or foreign-educated immigrants. Thus these estimates provide no evidence of discrimination in the sense of employers paying immigrants less for the same skills as Canadian-born workers. It is worth emphasizing that this result refers to what we call "usable" skills. Immigrants may have higher cognitive skill scores if tested in their native language and one could argue that those skills are being undervalued. But immigrants are receiving returns to skills as measured in English or French that are no worse than those obtained by Canadian-born workers.

The last specification in column 4 is the result of a specification search involving interactions of average skill scores with education and experience. The results indicate some interaction of skills with experience for Canadian-born men and women and for male (but not female) immigrants. The two immigrant groups are pooled in this case because the (foreign) experience-skills interaction effects of the two groups were not significantly different from each other. These interaction effects are positive, suggesting that immigrant men and Canadian-born men and women with higher skill levels receive greater returns to work experience. The interaction effects are moderate in size; for example, an extra 25 skill points raises the returns to experience by about 2 percentage points. For men the interaction is somewhat larger among immigrants than native-born Canadians, but this is not the case for women as there is no evidence of an interaction between experience (Canadian or foreign) and skills for immigrant women.

Perhaps the most interesting implication from the fourth column is the strong evidence of a positive interaction between education and skills for female immigrants educated outside Canada. The magnitude of this effect is largest at the university level, followed by the high school graduate level. Including these interaction terms results in the coefficient on the average skill score of foreign-educated female immigrants falling to zero. This implies that women with less than a high school education receive zero returns to additional skills, while women with at least a high school education experience earnings gains from a 100-point increase in skills in the order of 35% (in the case of non-university post-secondary graduates) to 71% (for university graduates). However, returns to skills do not vary with educational attainment for Canadian-born women and Canadian-educated immigrant women. The interaction terms between education and skills were also not statistically significant among men. The reasons for these differences between foreign-educated immigrants and the other two groups in the way skills and education interact in influencing earnings – and the differences in the nature of these interactions between men and women – warrant further analysis.

Finally, the dummy variable corresponding to men whose skill scores were imputed indicates that inability (or unwillingness) to complete the main test is positively associated with earnings. These men, many of whom are immigrants, earn approximately 10% more than one would anticipate given their imputed skill scores and other characteristics. This positive coefficient is consistent with results in other studies 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)). However, the result does not hold for females, for whom there is no difference in earnings associated with not completing the main tasks.

To aid in the interpretation of the results in the fourth column of Tables 5.4 and 5.5, we repeat the exercise of forming fitted average log earnings for various types of workers but, in this case, holding the average skill score constant at 283 (the sample weighted average value for men and women). The results are contained in Table 5.6. Comparing these results to those in Table 5.3, one sees patterns similar to those when skills are not held constant.

Table 5.6
Fitted returns to immigrants and native born by experience and education with skill effects

	Males						Females					
	Canadian experience (years) = 0	standard error	Canadian experience (years) = 10	standard error	Canadian experience (years) = 20	standard error	Canadian experience (years) = 0	standard error	Canadian experience (years) = 10	standard error	Canadian experience (years) = 20	standard error
Canadian born (less than high school)	0.31	(0.26)	1.08	(0.28)	1.59	(0.29)	0.35	(0.28)	0.97	(0.29)	1.38	(0.29)
Immigrant (less than high school)												
Foreign experience = 0	1.23	(0.33)	1.66	(0.30)	1.90	(0.30)	0.81	(0.44)	1.14	(0.40)	1.30	(0.39)
Foreign experience = 10	1.16	(0.33)	1.59	(0.31)	1.82	(0.31)	1.06	(0.39)	1.39	(0.36)	1.54	(0.35)
Canadian born (high school)	0.70	(0.28)	1.35	(0.30)	1.74	(0.30)	0.93	(0.30)	1.43	(0.30)	1.71	(0.31)
Immigrant (foreign high school)												
Foreign experience = 0	1.15	(0.32)	1.59	(0.29)	1.82	(0.29)	1.26	(0.33)	1.59	(0.31)	1.75	(0.31)
Foreign experience = 10	1.08	(0.32)	1.52	(0.30)	1.75	(0.30)	1.51	(0.32)	1.84	(0.30)	1.99	(0.30)
Canadian born (university)	1.43	(0.26)	1.92	(0.27)	2.13	(0.28)	1.71	(0.26)	2.08	(0.28)	2.23	(0.30)
Immigrant (foreign university)												
Foreign experience = 0	1.38	(0.31)	1.81	(0.29)	2.04	(0.29)	1.42	(0.35)	1.74	(0.33)	1.90	(0.34)
Foreign experience = 10	1.30	(0.32)	1.74	(0.31)	1.97	(0.31)	1.66	(0.32)	1.99	(0.30)	2.15	(0.31)

Note: Estimates are fitted log weekly earnings based on the parameter estimates in the final column of Tables 5.4 and 5.5, respectively, and differenced relative to the base case. The base group consists of English or French speaking native born workers with average skill score, less than high school education, and experience normalized to zero.

One interesting question arising out of these estimates is the relative importance of lower immigrant skill levels in explaining immigrant/Canadian-born earnings differentials. To investigate this, we constructed a series of fitted average earnings differentials, all based on the fourth column in Tables 5.4 and 5.5. We first construct an estimate of average log earnings for immigrants and the Canadian born separately using the estimated coefficients in conjunction with the appropriate average values for the regressors.[20] Those estimates imply an overall average immigrant earnings disadvantage of 11 log points over the Canadian born among high school educated men and an immigrant advantage of 1 log point among high school educated women. The corresponding estimates among those with university education imply an immigrant disadvantage of 22 log points for men and 19 log points for women. We next repeated this exercise but gave immigrants the same return to foreign experience as the Canadian born receive for their Canadian experience. The result is a shift from the immigrant disadvantage of 11 log points to an advantage of 46 log points for high school educated men – a net change of 57 percentage points in the earnings gap – and a shift from the immigrant advantage of 1 log point to an immigrant advantage of 13 log points for high school educated women – a net change of 12 percentage points. Among the university educated the immigrant disadvantage changes from 22 log points to an immigrant advantage of 28 log points for men – a net change of 50 percentage points in the earnings gap, and from an immigrant disadvantage of 19 log points to a disadvantage of 8 log points for women, a net change of 11 percentage points. These estimates fit with results in earlier papers, described above, indicating that lower returns to foreign experience play an important role in understanding immigrant/Canadian-born earnings differentials, especially for men. The importance of low returns to foreign experience is much more important for men than for women, but for each gender is similar across education groups.

In our next counterfactual, we set the returns to foreign experience back to their original values but gave immigrants the average skill scores observed for Canadian-born workers with the same level of education. For high school educated men, this reduces the immigrant disadvantage from the 11 log points mentioned above to an advantage of 5 log points, a net change of 16 percentage points, and among high school educated women it increases the immigrant advantage from 1 log point to 14 log points, a net change of 13 percentage points. For the university educated, it reduces the immigrant disadvantage from 22 log points to 11 log points for males and from 19 log points to 1 log point for females, net changes of 11 and 18 percentage points respectively. Again, the changes in the earnings differential are similar across the two education groups. Low skills thus appear to be an important factor for understanding male immigrant earnings differentials, though not nearly as important as low returns to foreign experience. However, for females low skills are a somewhat more important factor in explaining immigrant – Canadian-born earnings differences than are low returns to foreign experience.

6. Conclusions

At the outset of the paper, we posed four questions related to immigrant skills and earnings. First, do the cognitive skills of immigrants differ from those of the Canadian born? Second, do immigrant – Canadian-born skill differences depend on where immigrant human capital was acquired? Third, do immigrants receive a different return to those skills than observationally equivalent Canadian-born workers? Fourth, can differences in levels and returns to cognitive skills help explain differences in earnings between immigrant and Canadian-born workers? Based on an examination of data that include both earnings and skill test scores for immigrants and the Canadian born, the answer to the first question is clearly yes. The Canadian-born cognitive skill 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 Canadian-born workers. These differences in measured skills may partially reflect host country language proficiency. As a result, the test scores should be interpreted as reflecting cognitive skills that are "usable" in the Canadian economy.

The answer to the second question is clearly yes. We find substantial differences in behaviour and outcomes between immigrants who obtained their education prior to arrival in Canada and immigrants with Canadian education. Foreign-educated immigrants have much lower skills and earnings than immigrants with Canadian education. Indeed, the latter group is in many respects more similar to the Canadian born than to foreign-educated immigrants.

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

Cognitive 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 of men and women by almost 30 percent. Introducing the average skill score into a standard earnings regression reduces estimated education differentials by about 10-20 percent for the Canadian born, and by substantially more for foreign-educated immigrants.

The result that cognitive skills have a significant impact on earnings implies that lower immigrant skill levels may help in understanding immigrant/Canadian-born earnings differentials. This is indeed the case. If immigrants had the same average skills as the Canadian born, the earnings differential between high school educated immigrants and native-born Canadians would narrow by about 13-16 percentage points. This change would turn the 11% earnings disadvantage of immigrant men with high school education into a 5% advantage, and would raise the advantage of high school educated female immigrants to almost three times that magnitude. Similarly, this change would reduce by half the immigrant earnings disadvantage

among university educated men and would eliminate the 19 percentage point disadvantage among university educated women. It is worth noting, as well, that controlling for cognitive skills 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 workers' cognitive skills.

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Endnotes

1. The IALSS study is known internationally as the Adult Literacy and Life Skills Survey (ALL).
2. 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.
3. To put this in perspective, the mean skill score among high school graduates is approximately 280, whereas that among university graduates is approximately 320, a differential of 40 points.
4. We omit higher order interaction terms because they do not enter our specifications.
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. The IALSS builds on the IALS survey that was carried out in several countries during the period 1994 to 1998. Two of the skill domains – prose literacy and document literacy – are defined and measured in the same manner in IALS and IALSS.
7. Foreign experience = age at arrival – foreign years of schooling – 6 if positive, zero otherwise. Canadian experience = age – age at arrival – (total years of schooling – foreign years of schooling) if positive and age at arrival >=6. Canadian experience = age – total years of schooling – 6 if age at arrival<6.
8. Individuals with some but not completed post-secondary education are classified as high school graduates.
9. We also examined finer breakdowns of the source country but these had little effect on the results.
10. We estimate the kernel density functions with the density function in Stata, using the Epanechnikov kernel and Stata's default bandwidth formula.
11. More precisely, we cannot reject the null hypothesis that the Canadian born CDF first order stochastically dominates the immigrant CDF at conventional significance levels, using the test for first order stochastic dominance described in Barrett and Donald (2003).
12. For example, the median skill score of female immigrants without Canadian education is 54 points below that of natives (Canadian born), while that of female immigrants with Canadian education is 16 points below that of natives. The story for males is similar: a differential in the median skill score of 45 points between foreign-educated immigrants and native Canadians versus a differential of 17 points between Canadian-educated immigrants and natives.
13. As noted previously these estimates should not be given a causal interpretation. The positive association between education and skills may (or may in part) arise because education exerts a causal influence on skill formation. However, the association could also arise because both educational attainment and cognitive skills are correlated with unobserved factors such as innate ability.
14. Note, however, that the regressions control for the respondent's first language being other than English or French, so any additional effect of language on skills would need to arise for reasons that are not captured in our language variable.
15. See Green and Riddell (2007) for an analysis of cohort and aging effects among native-born Canadians using the 1994 IALS data and the 2003 IALSS data, and Willms and Murray (2007) for an analysis of skill loss and gain over time. In future work we plan to examine cohort effects using the 1998 OILS data and the Ontario observations in the 2003 IALSS data.
16. However, Green and Worswick (2002) point out that Canadian-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.
17. Note that all of these statements are based on interpreting coefficients on Canadian experience as reflecting true returns to experience rather than cohort effects.

18. However, these estimated returns to skills are lower than those obtained in our previous research for Canadian-born workers with the IALS data (Green and Riddell, 2003) and for immigrants with the OILS data (Ferrer, Green and Riddell, 2006). These differences warrant further investigation.
19. For example, the earnings gain associated with a university education (relative to less than high school) falls by 18 percentage points for men and 15 percentage points for women.
20. We constructed fitted average earnings separately for the two immigrant groups; the estimates for immigrants as a whole are weighted averages of the fitted earnings for immigrants with and without Canadian education.