School Performance of the Children
of Immigrants in Canada, 1994-98

by

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November 14, 2001

This paper represents the views of the author and does not necessarily reflect the opinions of Statistics Canada.

Aussi disponible en français

Table of Contents

Abstract

The school performance of the children of immigrants in the Canadian school system is analyzed using data from the first three waves of the National Longitudinal Survey of Children and Youth (NLSCY). School performance is measured in terms of ability at reading, writing, mathematics and overall aptitude. The parents' and teachers' assessments of the children's performances are used, as are the results of formal testing. On average, children of immigrants generally do at least as well as the children of the Canadian-born along each dimension of school performance. The children of immigrant parents whose first language is either English or French have especially high outcomes. The children of other immigrant parents have lower performance in reading, writing and composition but their performance in mathematics is comparable to that of the children of Canadian-born parents. It is also found that with more years in the Canadian education system, the performance of these children in reading, writing and mathematics improves and is equal to or greater than the performance of the children of Canadian-born parents by age thirteen in virtually all areas of performance.

1.   Introduction

Immigration remains at the forefront of Canada's policy debates. A necessary component of informed immigration policy development is a thorough understanding of the performance of not only immigrants who arrived as adults but also their children (those born abroad as well as those born in Canada). In addition, Canadian educational policy must work in tandem with immigration policy to provide a nurturing environment where all children may learn. The primary aim of this study is to analyze the performance of the children of immigrants in the Canadian school system using the children of Canadian-born parents as a comparison group. An understanding of the ability of the children of immigrants to succeed in the domestic education system is invaluable both in terms of identifying children at risk and in terms of evaluating the past performance of Canadian immigration policy in selecting immigrants whose families will succeed in Canada.

Data from the National Longitudinal Survey of Children and Youth (NLSCY) from Statistics Canada are employed in the analysis. Data are taken from the 1994/95, 1996/97 and 1998/99 cycles of the survey. This relatively new data source is ideal for this purpose since it contains detailed information on children, their parents, and their school performance. Also, the fact that children's observations can be linked across cycles of the survey means that we can analyze the performance of children as they move through the school system.

On average, children of immigrants generally do at least as well as the children of the Canadian-born along each dimension of school performance. The children of immigrant parents whose first language is either English or French have especially high outcomes. The children of other immigrant parents have lower performance in reading, writing and composition but their performance in mathematics is comparable to that of the children of Canadian-born parents. It is also found that with more years in the Canadian education system, the performance of these children in reading, writing and mathematics improves and is equal to or greater than the performance of the children of Canadian-born parents by age thirteen in virtually all areas of performance.

2.   The Relevant Literature

2.1   Labour Market Performance of Immigrants

The economics literature on the labour market adjustment of immigrants has focused primarily on the earnings of immigrants relative to comparable native-born persons. These studies estimate human capital earnings equations that are augmented with information on the immigrant's years-since-migration, period of arrival and country of origin. Recent empirical work for Canada and the United States has used multiple cross-sectional data (typically from Census surveys) to estimate the magnitude of the immigrant/native-born earnings differential shortly after arrival, and the rate at which this differential is narrowed as immigrants adjust to the new labour market.[1] Studies for both countries have found only modest evidence of earnings assimilation for recent immigrant cohorts, but significant evidence of 'permanent' or cohort effects that suggest the relatively lower earnings of

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[1] Chiswick (1978) was the first to carry out an analysis of this kind. Recent work includes Beach and Worswick (1993), and Baker and Benjamin (1994) using Canadian data, Long (1980), Borjas (1985), LaLonde and Topel (1992), and Borjas (1995) using U.S. data.

recent immigrants will persist over time. The changes in the relative performance of recent immigrants are taken by many authors as evidence of declining immigrant productivity and in the Canadian case are attributed to: 1) changes in the distribution of immigrants across source countries over arrival periods[2] and 2) changes in the composition of immigrants by immigration class over arrival periods.

In a recent study, Duleep and Regets (1997) employ longitudinal data from linked files of the U.S. Current Population Survey (CPS) and find evidence that more recent arrival cohorts of immigrants have had lower entry earnings than earlier cohorts but faster earnings growth at the same level of years since migration. This indicates that more recent arrival cohorts of immigrants to the United States may be at a larger initial disadvantage (compared with earlier arrival cohorts at the same number of years-since-migration); however, this greater disadvantage may be temporary and the greater rate of growth in earnings of recent cohorts of immigrant may completely offset the early differences.

Two recent studies using Canadian data have drawn into question the conclusion that more recent immigrant arrival cohorts in Canada have had poorer performance in the Canadian labour market than did earlier arrival cohorts at the same number of years since migration. McDonald and Worswick (1998) use eleven cross-sectional surveys (1981-1992) of the Survey of Consumer Finances of Statistics Canada to analyse differences in earnings between immigrant and Canadian-born men. They find evidence that the earnings assimilation of immigrants in Canada is sensitive to the macroeconomic conditions—specifically that earnings assimilation is higher during expansionary periods compared with recessionary periods. Grant (1999) finds that the decline in entry earnings for more recent cohorts appears to have stopped and that immigrants that arrived between 1981 and 1985 experienced a 17 percent earnings assimilation rate in their first five years in Canada.

The evidence to date indicates that more recent cohorts of immigrants to both Canada and the United States have had lower earnings at arrival in their new country. However, recent research indicates that these differences in the first few years after arrival may be temporary. It may be that the more recent immigrants are able to adjust to their new environment.

A natural question that arises from this is whether their ability to adapt is also a characteristic of their children. If recent cohorts of immigrants are able to overcome their initial difficulties in the labour market, and if their children are able to succeed in the school system, it may be that their early difficulty is a short-term phenomenon only.

2.2 Educational Performance of Children of Immigrants

In an unpublished paper, Sweetman (1998) compared the school performance of immigrant children to other children in terms of performance in mathematics and science using data for Australia, Canada, Great Britain and the United States from the Third International Math and Science Survey (TIMSS)—carried out in 1995. He found that immigrant children's test scores in mathematics and

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[2] Over the past forty years, the share of immigrants to Canada whose country of origin is the U.S. or in Europe has fallen while the share of immigrants whose country of origin is in Asia, Africa and the Caribbean has risen. See Green and Green (1995) for a discussion of Canadian immigration policy.

science are typically lower than those of native-born children in Canada and the United States but are higher than those of the native-born children in Australia, he also finds evidence of a convergence towards the native-born mean performance with more years in the school system for the cases of Canada and the United States.[3]

The current study differs from this cross-country comparison in that it focuses on Canadian results and employs longitudinal data. The TIMSS data are taken from single cross-sectional surveys for each country. The longitudinal data in the NLSCY allows us to track the actual path of the children's performance as they move through the Canadian school system. Another advantage of the NLSCY is that the data relate to mathematics but also to reading and writing as well as general performance. It is likely that children with parents whose mother tongue is neither English nor French are likely to have difficulty in the areas of reading and writing rather than mathematics and science. The TIMSS data do not contain information on performance in reading and writing.

A number of other studies are worth reviewing. Currie and Thomas (1999) analyze the impact of Head Start (a government sponsored pre-school program) on test scores of Hispanic children in the United States. They find large and significant benefits from the program; however, they find that the benefits from the program vary across sub-groups of the Hispanic population.[4]

Richmond and Mendoza (1990) describe difficulties experienced by the children of immigrants from Caribbean countries in both Canada and Britain. They argue that in both countries, there has been a great deal of concern regarding the "under-achievement" of West Indian children in schools. They report results from surveys of immigrant families and teachers of the children of immigrants from the Caribbean. The data support the view that discrimination is a problem for these children. They also report that researchers in the field have identified social and home circumstances of the children as major factors that determine the academic performance of these students.

Finally, an important paper is the study of Carliner (1995) who looks at the language ability of U.S. immigrants and their children. Using the 1980 and 1990 U.S. Census data, Carliner finds that a substantial fraction of the native-born children of ethnic groups who have come to the U.S. in the past 30 years, were not fluent in English when they entered primary school.

3. *Methodology and Specification Issues*

3.1 *Econometric Specification*

The NLSCY database provides longitudinal information on children, their parents, other family members, the children's teachers, schools and neighbourhoods. Based on the longitudinal nature of the data, up to three observations are available on each child. Different questions are asked about each child according to the child's age and school involvement. A sample of school–age children is

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[3] See also the study of Ahmed (2001) that uses the NLSCY data to analyze the relationship between child health and school performance for immigrant children.
[4] Also of interest is the study by Currie (1995) of the use of public health insurance by the children of immigrants in the United States. While the question of interest in that study of health services utilization differs from that of the proposed research, there are similarities in the methodology used.

used and measures of school performance defined in terms of: 1) reading, 2) writing, 3) mathematics and 4) overall ability are analyzed. Regression analysis is used to allow these variables to be related to the child's characteristics, the parents' characteristics and the province of residence. Of particular interest is whether differences in academic performance are present that vary in magnitude according to the immigrant status of the Person-Most-Knowledgeable (PMK), the PMK's mother tongue, the child's gender, and the education level of both the PMK and the PMK's spouse.[5]

The public education system is based on Canada's two official languages, English and French. In the analysis, children are identified in part by their PMK's immigration status but also by the PMK's mother tongue. It is hypothesized that children living in households where the language spoken is the same as the language of instruction in the child's school program are likely to have better preparation for learning in the school than would be the case for other children. Therefore, the analysis is focused on three groups: 1) the children of Canadian-born PMKs who are assumed to have strong ability in the language of instruction before starting school, 2) the children of immigrant PMKs where the PMK's mother tongue is either English or French (denoted in the remainder of the paper as the EF children) and 3) the children of immigrant PMKs where the PMK's mother tongue is neither English nor French (denoted in the remainder of the paper as the NEF children).

Consider the following reduced-form model of a child's academic performance at time t:

$$(1) \qquad Y_{it} = X_{it}\beta + \beta_{ief}EF_i + \beta_{iefA}EF_iYRS_{it} + \beta_{io}NEF_i + \beta_{ioA}NEF_iYRS_{it} + \varepsilon_{it}$$

Where Y_{it} is a measure of academic performance[6], X_{it} is a vector of personal and family characteristics[7], EF_i is a dummy variable that equals one if the PMK is an immigrant whose first language is either English or French, NEF_i is a dummy variable that equals one if the PMK is an immigrant whose first language was neither English nor French; YRS_{it} is the difference between the child's age and the minimum age for which children are eligible to take the test under the survey; ε_{it} is a mean zero error term that may contain individual-specific heterogeneity that is assumed to be fixed, and β, β_{ief}, β_{iefA}, β_{io} and β_{ioA} are parameter vectors.

This specification allows for differences in school performance between the three groups of children (those whose PMK was born in Canada, the EF children and the NEF children). Also, these differences are allowed to vary (in principle) according to the number of years in the school system.[8] This allows for the possibility, for example, that a child whose PMK's first language is neither English nor French may have lower performance in reading tests at an early age but with more years in the school system, the child's performance on reading tests may converge to that of other children.

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[5] In the vast majority of cases, the PMK is the child's mother. For example, in cycle 2 of the survey, for 90.2 percent of the children, the PMK was the child's biological mother.

[6] In the analysis, it will either be the natural logarithm of a test score or an indicator variable (1,0) of the child's performance based on the perception of the PMK and the teacher.

[7] In particular, the age and gender of the child are included. Also included are dummy variables for the survey years.

[8] A more general specification was also explored where the square of the YRS_{it} variable was also included as interactions with the EF_i and the NEF_i variables. The coefficients on these interaction terms were generally not statistically significant. Therefore, the more parsimonious specification, (1), has been employed.

The test scores models are estimated using standard regression analysis. The analysis of the discrete assessments of performance of the child by the PMK and the teacher are analyzed using linear probability models. The linear probability model can be criticized on the grounds that it does not restrict the predictions from the model to lie in the zero to one range. A probit model, for example, does not suffer from this shortcoming. The linear probability model has been employed due to the fact that the estimates are easy to interpret, and the model can be applied easily to the use of fixed effects estimation.[9]

3.2 Accounting for Unobserved Heterogeneity

Since at least some aspects of a child's family background and ability are impossible to observe in standard data sets, it is reasonable to assume that it will at least in part appear in the error term of equation (1). It is assumed that these factors do not vary across time. Therefore, they are treated as a component of the fixed component of the error term. Ignoring this fact will lead to inefficient estimates of the remaining parameters of the model and also lead to inconsistent parameter estimates if these 'fixed effects' are also correlated with the right-hand-side variables of (1).

A fixed effects estimation strategy was employed rather than a random effects estimation strategy because there is strong reason to believe that the unobserved heterogeneity is correlated with the explanatory variables. This leads standard random effects strategies to be invalid.

Another advantage to the fixed effects estimation strategy is that it allows for estimation of the true effect of the years variable in each model. The composition of the children in a particular grade may vary across the waves of the panel. This could be due to new immigrant families arriving between 1994 and 1998 and their children entering the survey frame. The fixed effects estimation allows us to control for the unobserved characteristics and this permits estimation of the true effect of more time in the Canadian school system rather than the effects of a change in the composition of children within school entry cohorts.

The fixed effects estimation approach yields coefficient estimates for the variables that potentially vary for a given child across the time frame of the survey. For example, coefficient estimates are generated for the interaction variables of the YRS_{it} variable with the EF_i and NEF_i indicator variables. However, it will not be possible to generate coefficient estimates for the other variables, such as the EF_i and NEF_i indicator variables. This means that it will be possible to generate the change across years in the school system in the difference in performance between the child of an immigrant PMK and the child of a Canadian-born PMK but it will not be possible to generate the level difference in performance at a point in time using the estimates from the fixed effects estimation.

To solve this problem, a second stage of estimation is carried out using as the dependent variable the residuals from the first stage/fixed effects estimation. The residuals contain the effects of the variables that do not vary over time. The second stage estimation regresses these residuals on the remaining variables on the right hand side of (1). In particular, this second stage estimation yields coefficient estimates for the EF_i and NEF_i variables. These second stage estimates can be used with

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[9] Moffitt (1999) argues in favour of the use of the linear probability model since for observations close to the mean, the problem of predicted probabilities outside of the (0,1) range is unlikely to be a concern and because methods can be employed to address the problem of heteroskedasticity that exists for this model.

the first stage estimates to generate predicted differences in performance between the children of immigrant PMKs and the children of the Canadian-born PMKs for different numbers of years in the school system.

4. Estimation Sample, Key Variables and Summary Statistics

4.1 The NLSCY Data and Sample Selection

Data from the master files of the NLSCY from Statistics Canada are employed in the analysis. Data are taken from the 1994/95, 1996/97 and 1998/99 cycles of the survey.

The population surveyed in the 1994/95 Cycle was comprised of children aged 0 to 11 living in a province in 1994/95. There are 22,831 children in the Cycle 1 sample. The population covered in the Cycle 2 survey was comprised of children aged 0 to 13 living in a province in 1996/97. The sample size for the Cycle 2 data is 20,025. To reduce costs, fewer children were interviewed in Cycle 2 than in Cycle 1. This was achieved in part by not following more than two children from any given household longitudinally. The result was that 16,903 children who had appeared in the Cycle 1 data also appear in the Cycle 2 data.

The Cycle 3 sample contains 31,963 children age 0 to 15 living in a province in 1998/99. The sample size for Cycle 3 is much larger due to a significant increase in the number of new children being added to the survey. The total number of children who appear in all three cycles of the survey is 15,400.

The sample was restricted to include only children currently attending school and this results in a sample size for the combined sample from all three cycles of 29,287. The number of children whose PMK is an immigrant is 2,698. The number of EF children is 1,275 and the number of NEF children is 1,423.

The NLSCY data sets contain weights to allow for generalizations of the results to the underlying population of Canadian children. These weights are employed in the analysis of this paper.

4.2 Comparability of the NLSCY with the 1996 Canadian Census

In order to investigate whether the NLSCY sample is representative of the three populations of interest (the children of the Canadian-born PMKs, the EF children and the NEF children), comparisons were made with the 1996 Canadian Census micro data file. Given the different characteristics of the NLSCY and the Census, a perfect comparison is not possible. However, it is possible to calculate the percentage of children in the second cycle of the NLSCY according to the immigrant status and mother tongue of the PMK. These percentages can then be compared with the percentage of women in the 1996 Census file with at least one unmarried child residing in the same dwelling according to the woman's immigrant status and mother tongue.

The percentage of children in school in the NLSCY data who have a PMK who is an immigrant is 18.3 percent.[10] The percentage of women in the 1996 Canadian Census data file who are immigrants and have at least one unmarried child living at home is 17.6 percent. This supports the idea that children of immigrant PMKs are well represented in the NLSCY.

A second comparison of interest involves comparing the percentage of children with an immigrant PMK who are in the NEF group in the NLSCY data with the percentage of immigrant women in the 1996 Census who have at least one unmarried child residing at home and whose mother tongue is neither English nor French. The former percentage is found to be 59.2 percent and the latter is 65.6 percent. This indicates that the NEF children may be under-represented in the NLSCY data. However, it should be noted that the magnitude of this difference is only 6.4 percentage points and may not represent a substantive difference in response rates. It may be caused by the imperfect nature of the comparison across the two data sources.

However, one possible explanation for this difference may be a higher rate of refusal to answer the survey questions by parents of the NEF children. The survey questions are detailed and the time required to answer them is significant. It may be that parents with limited ability in English or French may be more likely to refuse to answer the survey.[11]

4.3 Key Variables

The NLSCY data allow for an analysis of school performance of children along a number of dimensions and based on different reporting sources. Key dimensions of interest are: 1) reading, 2) writing, 3) mathematics, and 4) overall performance in school. This information can be gained from different variables in the NLSCY data. The three sources used in this paper are: 1) questions posed to the PMK about the child; 2) questions posed to the child's teacher; and 3) the scores on tests administered to the child.

The child's teacher was only interviewed if the parents gave their permission. Also, tests were administered to the child only after the permission of the child's parents was obtained. Therefore, information on the test scores and the teacher's assessment of the child's performance are only available for a subset of the children for which the PMK's assessment is available. This sample selection is unlikely to be random. However, there do not appear to be variables in the data set that could be used as instruments to enable a sample selection correction procedure. Therefore, the approach taken in this paper is to carry out separate analyses of the PMK's assessment, the teacher's assessment and the test scores to see if the results appear to be robust to the choice of measure of performance and to the sample employed.

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[10] This percentage is generated using the sample weights. This explains why it is larger than what would be generated using the sample counts. The NLSCY sampling framework over-samples children outside of the large urban areas where immigrants often settle. This leads to an under-sampling of the population of children of immigrants.

[11] It may be that the NEF children in the NLSCY are a selected group whose parents ability in English and or French is superior to that of the equivalent immigrant parents who may have refused to answer the survey questions. This would lead to an upward bias in the performance of the NEF children overall. However, given the fairly small difference in the proportion of NEF children in the NLSCY sample compared with proportion of immigrant women with at least one child at home in the Census data, it seems unlikely that this sample selection would have a large impact on the results of this paper.

The survey does not provide the same scale of possible responses to the PMK and to the teacher in terms of evaluating the ability of the child in each area. In each case, a set of qualitative responses were provided from which the PMK or teacher would choose. For the questions posed to the PMK, the respondent was asked to rate the child's performance in different areas of development using the following categories: 1) very well, 2) well, 3) average, 4) poorly, and 5) very poorly. For the questions posed to the teacher, the following categories were presented from which the teacher could choose: 1) near the top of the class, 2) above the middle of the class, but not at the top, 3) in the middle of the class, 4) below the middle of the class, but above the bottom, 5) near the bottom of the class. The natural ordering of these responses was used in each case to generate an indicator variable. For the case of the question posed to the PMK, a dummy variable is created that equals 1 if the PMK indicated that the child performs the activity 'very well' and equals zero if one of the other four possible responses was chosen. For the case of the question posed to the teacher, a dummy variable is created that equals one if the teacher indicated that the child's performance at the activity is either 'near the top of the class' or 'above the middle of the class, but not at the top' and zero if one of the other three responses were selected. While there are similarities between these two dummy variables, they are not directly comparable. However, as the sample sizes of Table 1 indicate, the indicator variables have similar sample means. This may indicate that the variables capture similar standards of performance.

During the household interview, the child's parents were asked to agree to a series of tests being performed at the school. In all three cycles, the Peabody Picture Vocabulary Test—Revised (PPVT) was administered to children ages 4 and 5 and those age 6 who had not yet entered grade 2. The test is designed to evaluate the child's level of oral vocabulary. In Cycle 1, a math test was performed for children in grade 2 and above. In Cycle 2 and Cycle 3, both a math test and a reading test were performed on children in grade 2 and above. In Cycle 2 and Cycle 3, there were separate versions of the math and reading tests for each academic grade level (a total of seven).[12]

For all three of these tests, raw scores and scaled scores are provided. The raw scores represent the actual outcomes of the test measured in terms of correct responses. The scaled scores take the raw scores and adjust them so as to allow for comparisons of a child's scores across different academic levels and ages. Results presented in the paper employ the standardized scores; however, the analysis was repeated using the raw scores, and the results were qualitatively the same.

4.4   Summary Statistics

Sample means of key measures of school performance are presented in Table 1. Both the top panel and the bottom panel contain indicator variables for the child's performance in: 1) reading, 2) writing, 3) mathematics, and 4) overall. The first panel contains variables derived from questions posed to the PMK. The second panel contains similar variables derived from questions posed to the child's teacher.

Comparing the first two columns, we see that the mean performance of the children of immigrant PMKs is generally at least as good as the mean performance of the children of Canadian-born PMKs

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[12] The mathematics test was a short version of the CAT/2 mathematical operations test. It tested ability at addition, subtraction, multiplication and division. The reading comprehension test was also developed in part from the CAT/2.

along each dimension based upon either the PMK's or the teacher's assessment of the child's performance. The only cases where the mean performance of the children of immigrant PMKs differs from that of the children of Canadian-born PMKs are for the PMK's assessment of reading and the teacher's assessment of mathematics and overall aptitude. In each case, the children of immigrant PMKs have higher mean performance.

The third and fourth columns contain sample means of these variables for children of immigrant PMKs separately by the mother tongue status of the PMK. According to each dimension and according to both the PMK's and the teacher's assessment, the EF children have better performance than the NEF children. It is also worth stressing that children in the former group have better mean performance along all dimensions than do the children of the Canadian-born PMKs and these differences are each individually significant at the ten percent level. The NEF children have significantly lower performance than the children of Canadian-born PMKs for the case of the PMK's assessment of writing and the teacher's assessment of reading.

Table 2 contains the sample means of the test scores (the PPVT for children in kindergarten or grade one, and the reading and mathematics for the children in grade two or higher). The children of immigrant PMKs have lower scores than the children of Canadian-born PMKs on the PPVT. When the means are generated separately by the mother tongue of the immigrant PMK, the means for the EF children and the NEF children are found to be significantly lower than that of the children with Canadian-born PMKs with the difference being much larger for the NEF children. The performance of the EF children is significantly higher than that of the children of the Canadian-born PMKs in the reading and mathematics tests. This may indicate an assimilation across time towards the performance of the children of Canadian-born PMKs (since the reading and mathematics tests are performed by older children (grade 2 and above)). The NEF children have significantly lower performance on the reading tests than the children of the Canadian-born PMKs but the equivalent difference in performance for the math test is not statistically significant.

5.   Multivariate Analysis of the School Performance of Children

5.1   Linear Probability Model Results using PMK's Assessment

Table 3a contains least squares estimates from the linear probability models of the PMK's assessment of the child's school performance. Since many of the patterns in the results are present for all four models, the relationships between the PMK's immigrant status and mother tongue will be discussed for all four models first, followed by a discussion of the effects of the other variables in the models.

The coefficients on the controls for the EF children are generally not significant. The one exception is for the mathematics results where the coefficient on the dummy variable for the EF group is not significant but the coefficient on the interaction of the EF variable with the YRS variable is significant at the ten percent level. The results are consistent with the idea that these EF children have similar performance in all areas to that of the children of Canadian-born PMKs at least in terms of the PMK's assessment. The coefficient estimates on the controls for the NEF children indicate that they generally have lower school performance than the children of Canadian-born PMKs at least in

the first years at school. This effect is not statistically significant for reading but is significant for writing, mathematics and overall.

In Figure 1a, these relationships are plotted over the age range for which the children are eligible to take the test. The first panel contains the predicted profiles for the case of the EF children and the second panel contains the equivalent relationships for the NEF children. Given that the coefficients on the EF variables in Table 3 are not statistically significant, the EF children have generally similar performance to the children of Canadian-born PMKs. The NEF children have lower performance in the first few years in school than the performance of the children of Canadian-born PMKs. However, by age 11, there is either no difference in mean performance across the two groups or an advantage on the part of the NEF children.

The results from Table 3a also give insights into a number of other determinants of children's school performance. Girls are found to have significantly better performance compared with boys in reading, writing and overall performance. The girls also have equivalent performance to boys in the area of mathematics. Also, both the PMK's education and the PMK's spouse's education are important determinants of the child's performance in each of the areas. The positive relationship between parental education and child's performance appears to be larger in magnitude for the case of the PMK's education than for the spouse's education.

Table 3b contains estimated coefficients from fixed effects regression estimation of the linear probability model of the PMK's assessment of the child's performance. The estimation procedure removes individual specific fixed effects (or intercept shifts). These will include the effects of any variables that do not vary across the time frame of the longitudinal survey. Therefore, only variables that vary across time for an individual child can be included. Controls for the child's age as well as dummy variables for the survey year are included. Also, the interaction variables of the EF and NEF variables with the YRS variable are included as is the dummy variable for the spouse being present.[13] Table 3b also includes the results from the second stage estimation using the first stage residuals as the dependent variable and regressing the residuals on the variables on the right hand side of equation (1) that do not vary over time.

There are a number of differences in the coefficient estimates in Table 3b compared with the equivalent coefficient estimates from Table 3a. However, it is difficult to see a pattern in the differences in estimates across the two estimation procedures. This can be best be seen by comparing the predicted profiles for differences in school performance, compared with children of Canadian-born PMKs, for the EF and NEF children in Figure 1a with the equivalent profiles in Figure 1b, generated using the estimates from Table 3b. For the EF children, a more pronounced initial disadvantage in performance emerges; however, these differences are only significant for the cases of writing and overall aptitude. Also, a more pronounced upward trend is apparent leading to a cross-over point at approximately age 9. After that age, the model predicts higher performance for the EF children than the children of the Canadian-born PMKs. For the NEF children, the relationships are similar across the two figures; however, the fixed effects procedure leads to somewhat flatter profiles

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[13] The controls for the PMK's education and the spouse's education were not included since they are unlikely to change for many children over the course of the longitudinal survey's timeframe.

with smaller initial disadvantages in performance relative to the children of the Canadian-born PMKs.[14]

5.2 Linear Probability Model Results using Teacher's Assessment

Table 4a contains estimates from the linear probability model for the Teacher's assessment of the child's school performance. As stated above, the teacher was only interviewed if the parents gave their permission. Therefore, this part of the estimation involves a subset of the samples used in the estimation of Tables 3a and 3b. However, the teacher's assessment is particularly of interest in that there may be a bias on the part of the PMK toward reporting good performance at the different activities due to their close relationship with the child. The teacher's assessment, on the other hand, is likely to be more objective.

The estimated coefficients on the EF variables indicate a relationship of lower performance than the children of Canadian-born children at the time of entering school but a catch-up with time in school. This relationship is strongly significant for the case of reading. For the other areas, the coefficients are generally not significant. This pattern is much stronger for the NEF children. Their initial disadvantage is 20 to 27 percent and strongly significant. These differences shrink with years in school at a rate of 2.7 to 4.6 percent.

Figure 2a presents these relationships for both the EF and the NEF children. For the EF children, the profiles indicate average performance equal to or greater than the performance of the children of the Canadian-born PMKs by age 9. The cross-over point for the NEF children appears later; however, by age twelve, the NEF children's performance is as high as that of the children of the Canadian-born PMKs.

The results in Table 4a indicate that the relationships between parental education and the child's performance are very similar in each case. As was the case in the results based on the PMK's assessment, higher education on the part of either the PMK or the PMK's spouse leads to significantly higher performance in reading, writing, mathematics and overall. The magnitude of this effect is larger for the PMK than for the PMK's spouse. Also, the children's performance is greatly affected by the PMK having only elementary education versus more secondary education. This may reflect the importance of the PMK in providing instruction before the child starts school and after the child enters school. The PMK's spouse may not play as important a role in this learning process.

The final results from Table 4a relate to differences in children's performance based on the child's gender and whether the PMK's spouse is present or not. Girls have significantly higher performance (as assessed by the teacher) in reading, writing and overall; however, there is not a statistically significant difference between the performances of boys and girls in mathematics. The coefficients on the dummy variable identifying whether a spouse is present are all positive and significant. This indicates that children with two parents present have higher performance in school, ceteris paribus.

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[14] The coefficient on the spouse present variable generally is insignificant in the fixed effects estimation of all of the models of this paper. This is likely due to the fact that a spouse being present is correlated with unobserved heterogeneity in household characteristics that are correlated with the child's school performance. The other factors that impact upon school performance (such as gender, PMK's education and the spouse's education) have very similar effects in the fixed effects estimation procedure as in Table 3a.

Table 4b contains regression results from fixed effects estimation of the models. The procedure is equivalent to that used to generate the results of Table 3b. As was the case for the PMK's assessment, there are a number of differences between the results of the estimation without fixed effects and the estimation results when fixed effects are included. These differences are most striking for the case of the NEF children. The large negative differences in performance relative to the children of the Canadian-born PMKs found in Table 4a are not present in Table 4b.

This can best be seen by comparing the panels of Figure 2b with the panels of Figure 2a. The profiles of Figure 2b are generated using the results of Table 4b. The profiles for the NEF children indicate a much smaller initial disadvantage relative to the comparison group, and a much flatter profile through years in school. It is only in the area of mathematics that a cross-over age is apparent, with the NEF children having equivalent performance to those of the children of Canadian-born PMKs by age ten. However, the differences in performance are small in the other areas. For the EF children, the differences in profiles between Figure 2a and Figure 2b are smaller and lead to the same qualitative conclusions. The performance of the EF children in both cases is generally equivalent to that of the children of Canadian-born PMKs. The one exception being the area of reading where under both sets of results, the EF children are at a disadvantage at time of entry to school, but in each case, the EF children catch-up to the children of the Canadian-born PMKs by age nine.

5.3   Test Score Regression Results

In Table 5a, results from the test score regressions are presented. The first column contains results from the PPVT test score model. The PPVT was administered to children ages four and five and those age six who had not yet entered grade two. It is a test of oral vocabulary and is, therefore, more comparable with the reading test than with the mathematics test. The other test scores (reading and mathematics) were administered to children in grade two or higher. Therefore, one can think of the PPVT capturing performance of kindergarten children and the other two tests capturing their performance at a later stage of their education.

Figure 3a contains predicted differences in test scores by age for the EF and NEF children, with the children of the Canadian-born PMKs as the comparison group. The EF children are at a disadvantage of 4.9 percent on the PPVT score at age four. This difference is significant at the five percent level. An even larger disadvantage is found for the NEF children. This group of children's tests scores are 16.8 percent lower at age four than those of the children of Canadian-born PMKs; however, this difference is smaller, the longer the child is in school, so that the difference shrinks by three percentage points each year. The results of the second column indicate much smaller differences in performance for the children of immigrant PMKs compared with the children of Canadian-born PMKs. The EF children do not have significantly different performance on the reading test either at age seven or later than the children of Canadian-born PMKs. The NEF children have approximately seven percent lower reading scores than do the children of Canadian-born PMKs. Recall that the equivalent difference for PPVT results (see column 1) is much larger. This may indicate a convergence in performance where the performance of these immigrant children approach those of the Canadian-born as they move through the Canadian school system. In the third column's results from the mathematics test, the controls for the children's PMK's immigrant status are not statistically

significant. This is consistent with the sample means comparison of Table 1 where the mathematics scores on average were either very similar between the three groups or were slightly higher, which was the case for NEF children.

Overall, EF children appear to be matching the performance of the children of the Canadian-born PMKs both in kindergarten in terms of general skills and later in terms of reading and mathematics skills. The NEF children are at a sizeable disadvantage in kindergarten; however, this differential appears to be smaller in the case of the older children.

The education levels of both the PMK and the PMK's spouse play an important role in determining children's performance on each of the three tests. The higher is the adult's education level, the better is the child's performance. Tertiary education is important for each spouse; however, the child's performance is also sensitive to whether the PMK has only elementary education. This is consistent with the idea that the PMK plays a crucial role in preparing the child for elementary school and that the spouse of the PMK is not as involved in this preparation.

Table 5b contains the results from the fixed effects estimation of the test score models. The results are very similar to what was found in Table 5a. This can be seen by comparing the predicted profiles of Figure 3b (generated using the results of Table 5b) with the profiles of Figure 3a. In both cases, the pattern is consistent with the idea that both EF children and NEF children are at a disadvantage in terms of performance in kindergarten and grade one but with more years in school have performance that is comparable with that of the children of Canadian-born PMKs.

6. Conclusions

The school performance of the children of immigrants in the Canadian school system has been analyzed using data from the first three waves of the National Longitudinal Survey of Children and Youth (NLSCY) from Statistics Canada. School performance is measured in terms of ability at reading, writing, mathematics and overall aptitude. The parents' and teachers' assessments of the children's performances as well as the results of formal testing were employed.

Overall, children of immigrants generally do on average at least as well as the children of the Canadian-born along each dimension of school performance. The children of immigrant parents whose first language is either English or French have especially high outcomes. The children of other immigrant parents have lower performance in reading than do other children; however, their performance in other areas is comparable to that of the children of Canadian-born parents. Evidence is also found that, with more years in the Canadian education system, the performance of these children in reading converges to that of the children of Canadian-born parents. In general, the results indicate that the children of immigrants have predicted performance in virtually all areas that is at least as good as the performance of the children of the Canadian-born by age 13. In a number of cases, this standard is met at much earlier ages.

The results indicate that the children of immigrants in Canada are performing very well on average in school. The success of children from neither English nor French backgrounds is particularly impressive given the challenges that they likely face in adapting to a school system that operates in

an unfamiliar language. A natural issue for future research is a comparison of the resource costs to the education system to educating children from the EF and NEF groups.

The results of this study also indicate that the Canadian immigration system has been able to select immigrants whose children will adapt well to the Canadian school system. This is an important result given the current concern that more recent arrival cohorts of immigrants may not be experiencing as much success in the labour market as their predecessors did at the same number of years-since-migration. Future research should attempt to track the performance of these children of immigrants as they move through the school system and into the labour market to see if they continue to succeed at a level comparable to the children of the Canadian-born.

Table 1

Means of Indicator Variables of PMK's and Teacher's Assessment of Child's School Performance by PMK's Immigrant Status and Mother Tongue:

Assessment of:	Children of Canadian-born PMK	Children of Immigrant PMK	Children of Immigrant PMK: Eng./Fre. (EF)	Children of Immigrant PMK: Other (NEF)
PMK	(1)	(2)	(3)	(4)
Reading	.492	.512*	.549***	.485
	(.500)	(.500)	(.498)	(.500)
	[20,765]	[2,173]	[1,027]	[1,146]
Writing	.373	.372	.404*	.348*
	(.484)	(.483)	(.491)	(.477)
	[20,008]	[2,096]	[990]	[1,106]
Mathematics	.473	.498	.522***	.478
	(.499)	(.500)	(.500)	(.500)
	[26,364]	[2,673]	[1,260]	[1,413]
Overall	.453	.461	.493***	.435
	(.498)	(.499)	(.500)	(.496)
	[26,589]	[2,698]	[1,275]	[1,423]
Teacher				
Reading	.477	.479	.548***	.423**
	(.499)	(.500)	(.498)	(.494)
	[9,844]	[1,024]	[493]	[531]
Writing	.426	.437	.483***	.398
	(.494)	(.496)	(.500)	(.490)
	[11,013]	[1,130]	[546]	[584]
Mathematics	.499	.526*	.555**	.501
	(.500)	(.500)	(.497)	(.500)
	[10, 840]	[1,108]	[541]	[567]
Overall	.444	.478**	.532***	.432
	(.497)	(.500)	(.499)	(.496)
	[11,188]	[1,142]	[554]	[588]

Note:
1. Data from all three cycles are used for the PMK's assessment. Data from the first two cycles are used for the teacher's assessment.
2. Tests were performed of the significance of the difference between the sample mean for the children of immigrant PMKs versus the relevant mean for the children of the Canadian-born PMKs. The symbol, *, denotes significance at the ten percent level, ** at the five percent level and *** at the one percent level.
3. The survey weights are used in calculating these means.
4. Standard deviations are presented in round brackets; (unweighted) sample sizes are presented in square brackets.
5. The child's teacher was interviewed only after the parents permission was given.

Table 2

Means of Children's Test Scores by PMK's Immigrant Status and Mother Tongue

Variable	Children of Canadian-born PMK	Children of Immigrant PMK	Children of Immigrant PMK: Eng./Fre. (EF)	Children of Immigrant PMK: Other (NEF)
Test Scores	(1)	(2)	(3)	(4)
PPVT	100	92.9***	98.9**	88.9***
	(14.9)	(17.6)	(16.6)	(17.0)
	[9,874]	[1,301]	[564]	[737]
Reading	253	253	263***	244***
	(46.13)	(49.8)	(47.3)	(50.2)
	[9,615]	[875]	[438]	[437]
Mathematics	457	462	470***	456
	(109.6)	(111.7)	(110.0)	(112.8)
	[13,419]	[1,303]	[641]	[662]

Note:
1. In each case, the test score variable is the standardized test score in the NLSCY data. The PPVT scores vary from a minimum of 40 to a maximum of 160 in the data. The reading scores vary from a minimum value of 61 to a maximum value of 361 in the data. The math scores vary from a minimum of 204 to a maximum of 871 in the data.
2. Data from all three cycles are used.
3. Tests were performed of the significance of the difference between the sample mean for the children of immigrant PMKs versus the relevant mean for the children of Canadian-born PMKs. The symbol, *, denotes significance at the ten percent level, ** at the five percent level and *** at the one percent level.
4. The survey weights are used in calculating these means.
5. Standard deviations are presented in round brackets; sample sizes are presented in square brackets.
6. All tests were given to the children only after the permission of the parents was given. The reading and mathematics tests were given to children in grade 2 or higher. The PPVT test was administered to children age four and five and also to children age 6 who were not yet in grade 2.
7. The mathematics and the PPVT tests were given in all three cycles (1994, 1996, 1998). The reading test was only given in the latter two cycles (1996 and 1998).

Table 3a

Linear Probability Models of PMK's Assessment

	Reading	Writing	Mathematics	Overall
EF	.104	.008	-.070	-.062
	(.073)	(.070)	(.056)	(.055)
NEF	-.073	-.107*	-.106**	-.138***
	(.062)	(.062)	(.048)	(.047)
EF×YRS	-.013	.004	.016*	.014
	(.015)	(.014)	(.009)	(.009)
NEF×YRS	.015	.021	.021**	.022***
	(.013)	(.013)	(.007)	(.008)
Female	.124***	.149***	-.003	.126***
	(.011)	(.010)	(.009)	(.009)
PMK's Education				
Elementary	-.111***	-.069**	-.109***	-.069***
	(.031)	(.029)	(.027)	(.027)
Secondary without graduation	-.043**	-.056***	-.058***	-.053***
	(.020)	(.019)	(.017)	(.017)
Post-secondary	.027**	.026**	.031***	.032***
	(.014)	(.013)	(.012)	(.012)
University	.129***	.130***	.151***	.146***
	(.020)	(.020)	(.018)	(.018)
Spouse Present	.030	.020	.044*	.040*
	(.027)	(.027)	(.023)	(.023)
Spouse's Education				
Elementary	-.071**	-.066**	-.038	-.052**
	(.030)	(.029)	(.027)	(.026)
Secondary without graduation	-.019	-.0001	.010	.008
	(.018)	(.018)	(.016)	(.016)
Post-secondary	.034**	.039**	.041***	.050***
	(.013)	(.013)	(.012)	(.012)
University	.079***	.076***	.115***	.106***
	(.020)	(.019)	(.017)	(.017)
R^2	.043	.052	.040	.052
Overall F-test	19.99	25.32	24.25	32.95
Sample Size	22,938	22,104	29,037	29,287

Note:
1. Controls for region of residence in Canada as well as linear and quadratic terms in the child's age are also included in the regression specification.
2. The symbol, *, denotes significance at the ten percent level, ** at the five percent level and *** at the one percent level.

Table 3b

Fixed Effects Estimates of Linear Probability Models of PMK's Assessment

	Reading	Writing	Mathematics	Overall
First Stage, Fixed Effects Estimates				
EF×YRS	.015 (.010)	.027** (.011)	.008 (.007)	.013** (.006)
NEF×YRS	.015 (.011)	.022* (.012)	.006 (.007)	.007 (.007)
Spouse Present	.009 (.018)	-.004 (.019)	-.005 (.015)	.010 (.014)
Second Stage Analysis of First Stage Residuals				
EF	-.043 (.027)	-.116*** (.026)	-.030 (.023)	-.060*** (.023)
NEF	-.077*** (.023)	-.120*** (.022)	-.027 (.020)	-.056*** (.020)

Note:
1. Controls for the child's age and dummy variables for the survey year were also included in the first stage estimation.
2. Controls for the gender of the child, the province of residence, the education of the PMK and the education of the PMK's spouse were also included in the second stage estimation.
3. The symbol, *, denotes significance at the ten percent level, ** at the five percent level and *** at the one percent level.

Table 4a

Linear Probability Models of Teacher's Assessment

	Reading	Writing	Mathematics	Overall
EF	-.184**	-.089	-.071	-.112
	(.088)	(.083)	(.088)	(.080)
NEF	-.205***	-.271***	-.222**	-.228***
	(.077)	(.066)	(.076)	(.047)
EF×YRS	.044**	.023	.018	.031**
	(.015)	(.015)	(.016)	(.014)
NEF×YRS	.027*	.046***	.042**	.039***
	(.015)	(.012)	(.014)	(.013)
Female	.112***	.170***	.021	.122***
	(.015)	(.014)	(.014)	(.013)
PMK's Education				
Elementary	-.100**	-.122**	-.140***	-.170***
	(.045)	(.043)	(.038)	(.033)
Secondary without graduation	-.057*	-.079***	-.044	-.062**
	(.029)	(.026)	(.028)	(.026)
Post-secondary	.033*	.029*	.038**	.036**
	(.019)	(.017)	(.018)	(.017)
University	.193***	.168***	.214***	.216***
	(.027)	(.027)	(.026)	(.026)
Spouse Present	.115***	.103***	.120***	.136***
	(.030)	(.026)	(.027)	(.026)
Spouse's Education				
Elementary	-.001	-.058	.017	.065
	(.045)	(.047)	(.046)	(.046)
Secondary without graduation	-.055**	-.019	-.007	-.046*
	(.027)	(.025)	(.027)	(.025)
Post-secondary	.021	.036*	.021	.017
	(.019)	(.018)	(.019)	(.019)
University	.107***	.109***	.109***	.112***
	(.027)	(.026)	(.026)	(.025)
R^2	.070	.081	.060	.086
Overall F-test	14.58	20.29	16.00	24.56
Sample Size	10,868	12,143	11,948	12,330

Note:
1. Controls for region of residence in Canada as well as linear and quadratic terms in the child's age are also included in the regression specification.
2. The symbol, *, denotes significance at the ten percent level, ** at the five percent level and *** at the one percent level.

Table 4b

Fixed Effects Analysis of Linear Probability Models of Teacher's Assessment

	Reading	Writing	Mathematics	Overall
First Stage, Fixed Effects Estimates				
EF×YRS	.032* (.018)	.010 (.016)	.012 (.017)	.010 (.016)
NEF×YRS	-.005 (.019)	.003 (.017)	.009 (.017)	.003 (.017)
Spouse Present	.038 (.028)	.040 (.025)	.050* (.026)	.040 (.025)
Second Stage Analysis of First Stage Residuals				
EF	-.118*** (.034)	-.030 (.032)	-.030 (.033)	-.030 (.032)
NEF	-.039 (.032)	-.052* (.027)	-.056 (.032)	-.052* (.027)

Note:
1. Controls for the child's age and dummy variables for the survey year were also included in the first stage estimation.
2. Controls for the gender of the child, the province of residence, the education of the PMK and the education of the PMK's spouse were also included in the second stage estimation.
3. The symbol, *, denotes significance at the ten percent level, ** at the five percent level and *** at the one percent level.

Table 5a

Test Score Regressions

	PPVT	Reading	Mathematics
EF	-.049**	.031	.017
	(.021)	(.020)	(.016)
NEF	-.168***	-.068**	.001
	(.023)	(.034)	(.016)
EF×YRS	.012	-.003	-.003
	(.015)	(.004)	(.004)
NEF×YRS	.032*	.011	.006
	(.017)	(.007)	(.004)
Female	.006	.019***	-.001
	(.006)	(.005)	(.004)
PMK's Education			
Elementary	-.081***	-.051***	-.049***
	(.020)	(.015)	(.011)
Secondary without graduation	-.035**	-.037***	-.020***
	(.014)	(.014)	(.007)
Post-secondary	.026***	.007	.013***
	(.008)	(.006)	(.005)
University	.055***	.043***	.039***
	(.011)	(.008)	(.007)
Spouse Present	.024*	.016	.017*
	(.014)	(.013)	(.009)
Spouse's Education			
Elementary	-.015	-.023	-.011
	(.021)	(.014)	(.010)
Secondary without graduation	-.014	-.028**	-.002
	(.010)	(.013)	(.007)
Post-secondary	.021***	.017***	.014***
	(.007)	(.006)	(.005)
University	.065***	.051***	.047***
	(.011)	(.008)	(.007)
R^2	.136	.461	0.678
Overall F-test	19.83	149.93	518.04
Sample Size	11,175	10,490	14,722

Note:
1. Controls for region of residence in Canada as well as linear and quadratic terms in the child's age are also included in the regression specification.
2. The symbol, *, denotes significance at the ten percent level, ** at the five percent level and *** at the one percent level.
3. The reading test was not performed in the first wave of the panel.

Table 5b

Fixed Effects Estimates of Test Score Models

	PPVT	Reading	Mathematics
First Stage, Fixed Effects Estimates			
EF×YRS	-.006 (.012)	.007 (.006)	-.001 (.004)
NEF×YRS	.010 (.013)	.005 (.007)	.006 (.004)
Spouse Present	-.007 (.016)	-.002 (.008)	-.005 (.007)
Second Stage Analysis of First Stage Residuals			
EF	-.030** (.013)	.008 (.013)	.014 (.009)
NEF	-.144*** (.014)	-.057*** (.016)	-.001 (.008)

Note:
1. Controls for the child's age and dummy variables for the survey year were also included in the first stage estimation.
2. Controls for the gender of the child, the province of residence, the education of the PMK and the education of the PMK's spouse were also included in the second stage estimation.
3. The symbol, *, denotes significance at the ten percent level, ** at the five percent level and *** at the one percent level.

Figure 1a

Differences in Performance by Age Between the Children of Immigrant PMKs and Canadian-born PMKs' Children: PMK's Assessment
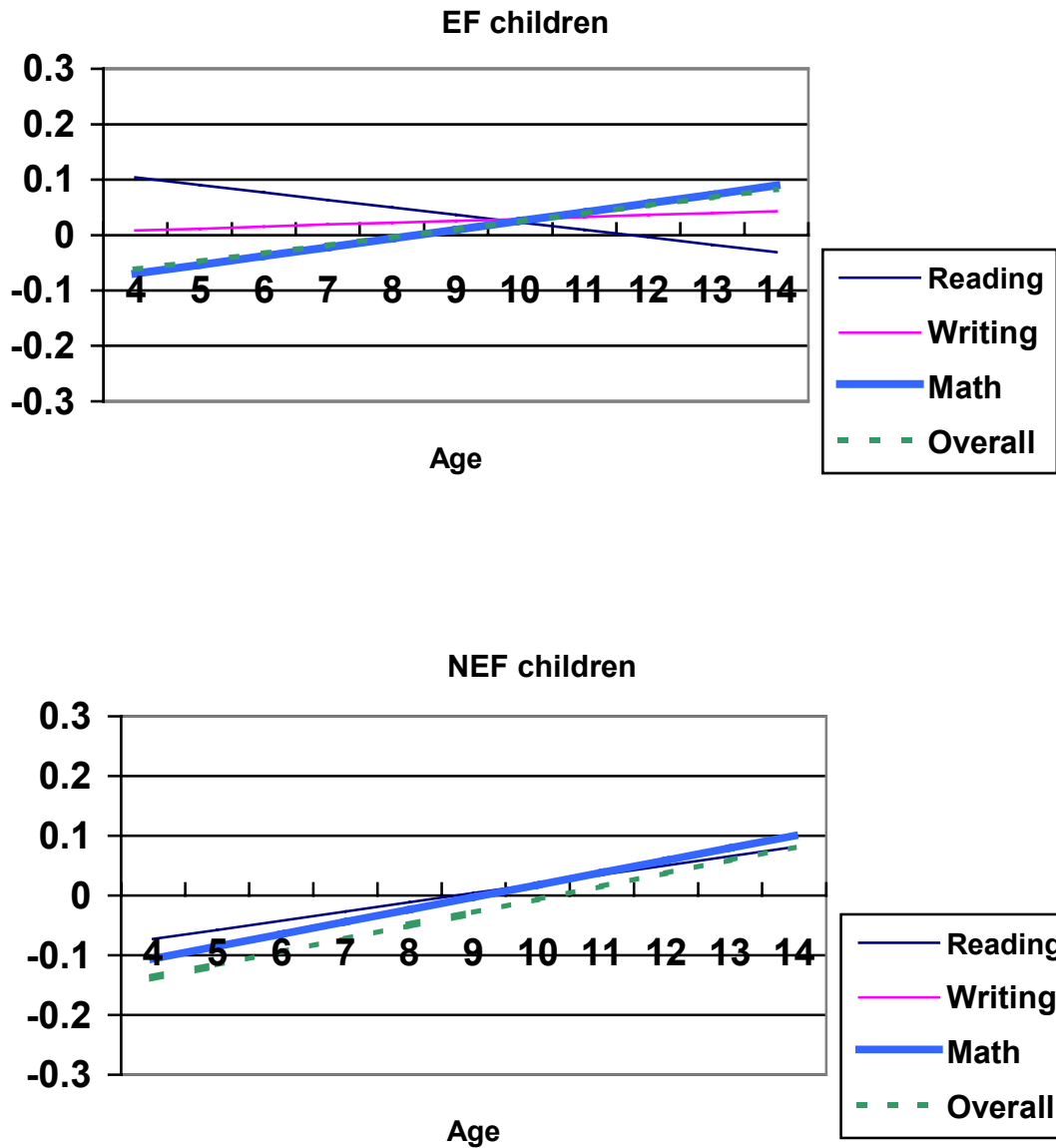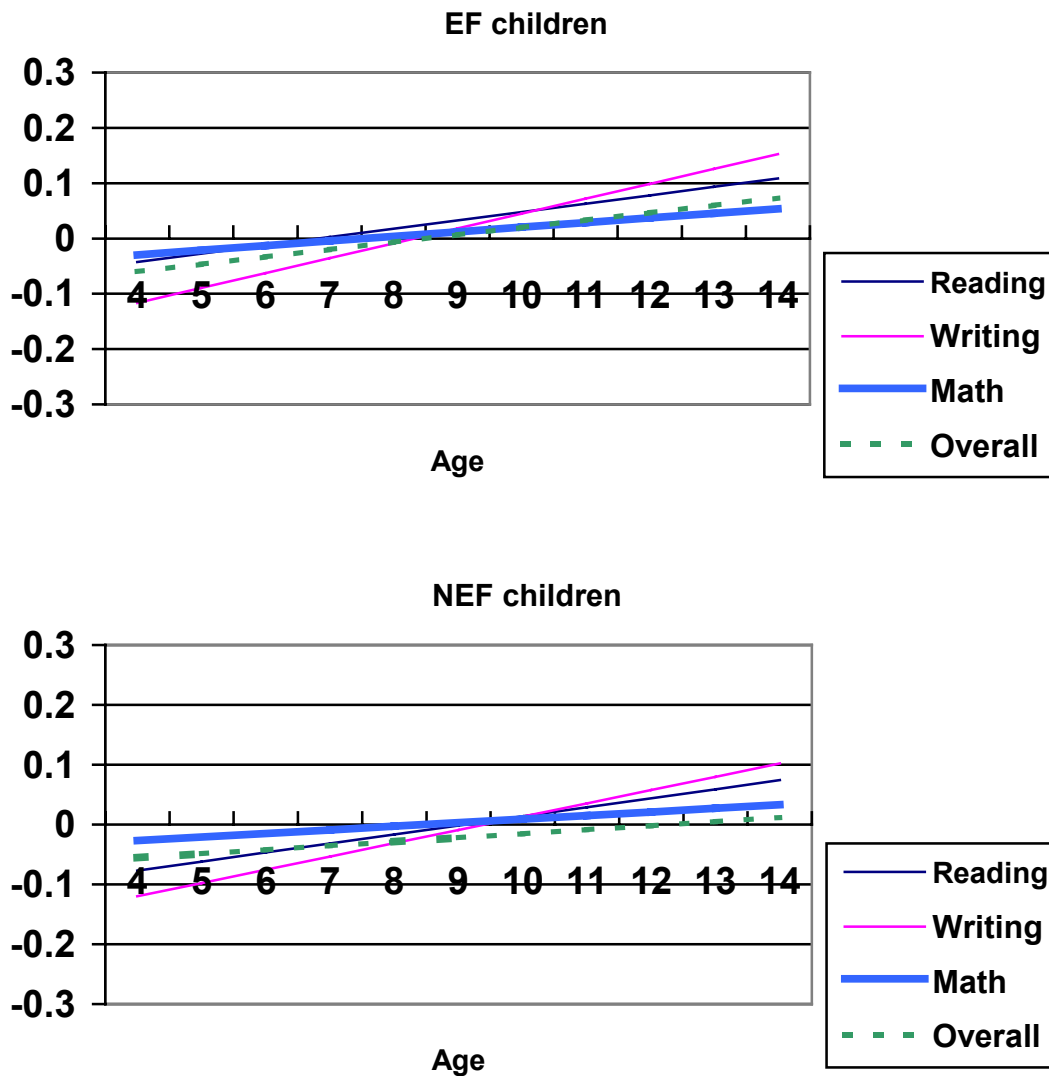

Note:
1. Author's calculations based on estimates from Table 3a.
2. The vertical axis can be scaled up by 100 and then interpreted as percentage differences in performance between the children of immigrant PMKs and the children of Canadian-born PMKs.

Figure 1b

Differences in Performance by Age Between the Children of Immigrant PMKs and Canadian-born PMKs' Children: PMK's Assessment, Fixed Effects Estimation
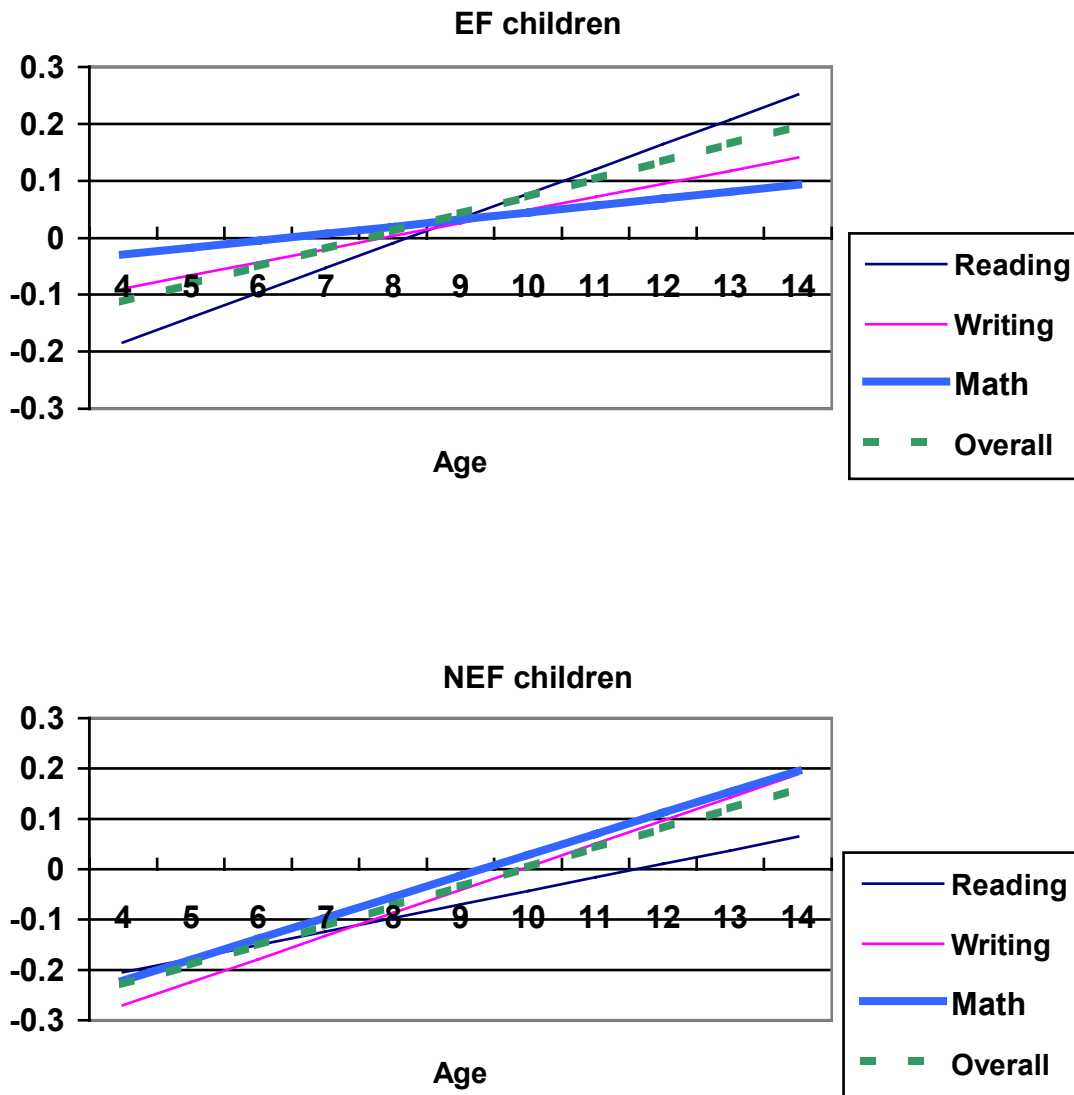
EF children

NEF children

Note:
1. Author's calculations based on estimates from Table 3b.
2. The vertical axis can be scaled up by 100 and then interpreted as percentage differences in performance between the children of immigrant PMKs and the children of Canadian-born PMKs.

Figure 2a

Differences in Performance by Age Between the Children of Immigrant PMKs and Canadian-born PMKs' Children: Teacher's Assessment
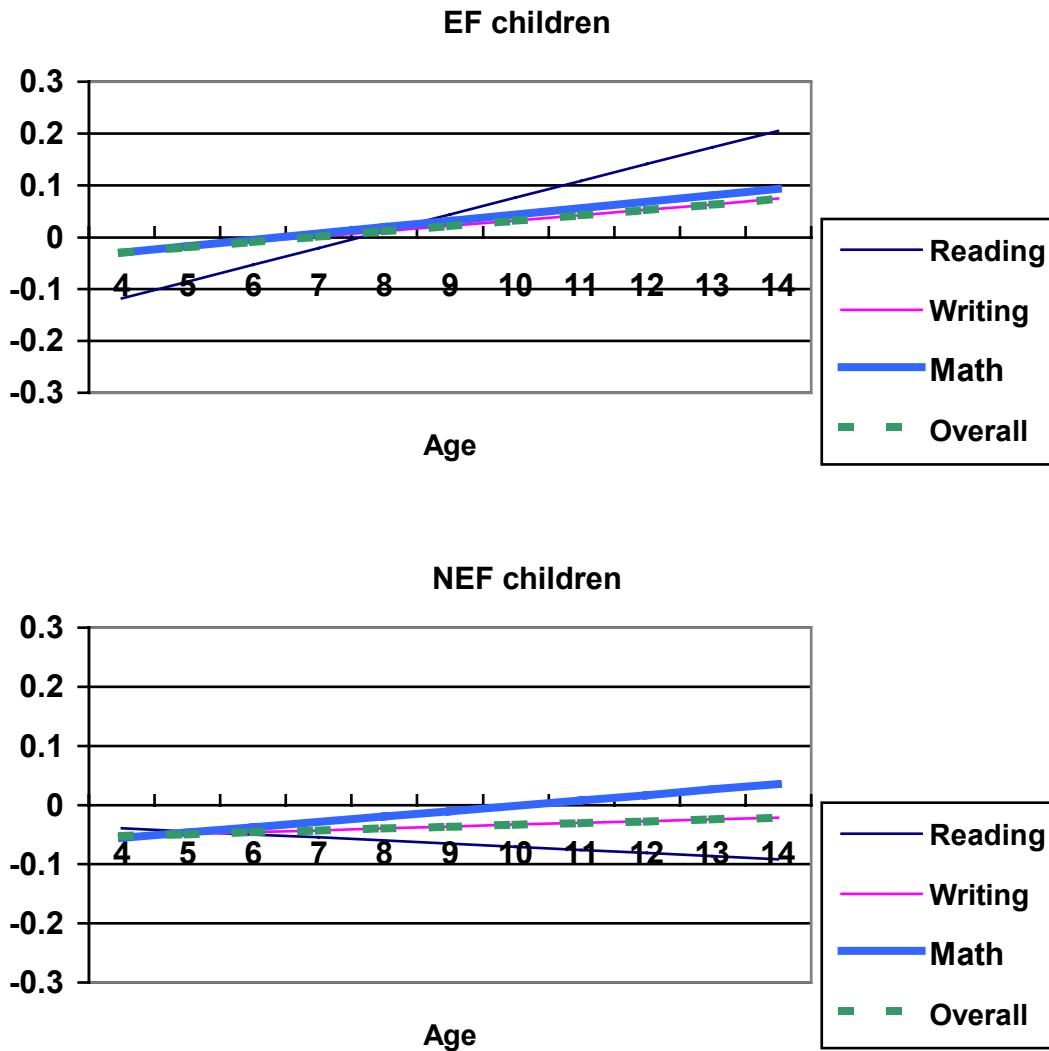

EF children

NEF children

Note:
1. Author's calculations based on estimates from Table 4a.
2. The vertical axis can be scaled up by 100 and then interpreted as percentage differences in performance between the children of immigrant PMKs and the children of Canadian-born PMKs.

Figure 2b

Differences in Performance by Age Between Children of Immigrant PMKs and Canadian-born PMKs' Children: Teacher's Assessment, Fixed Effects Estimation
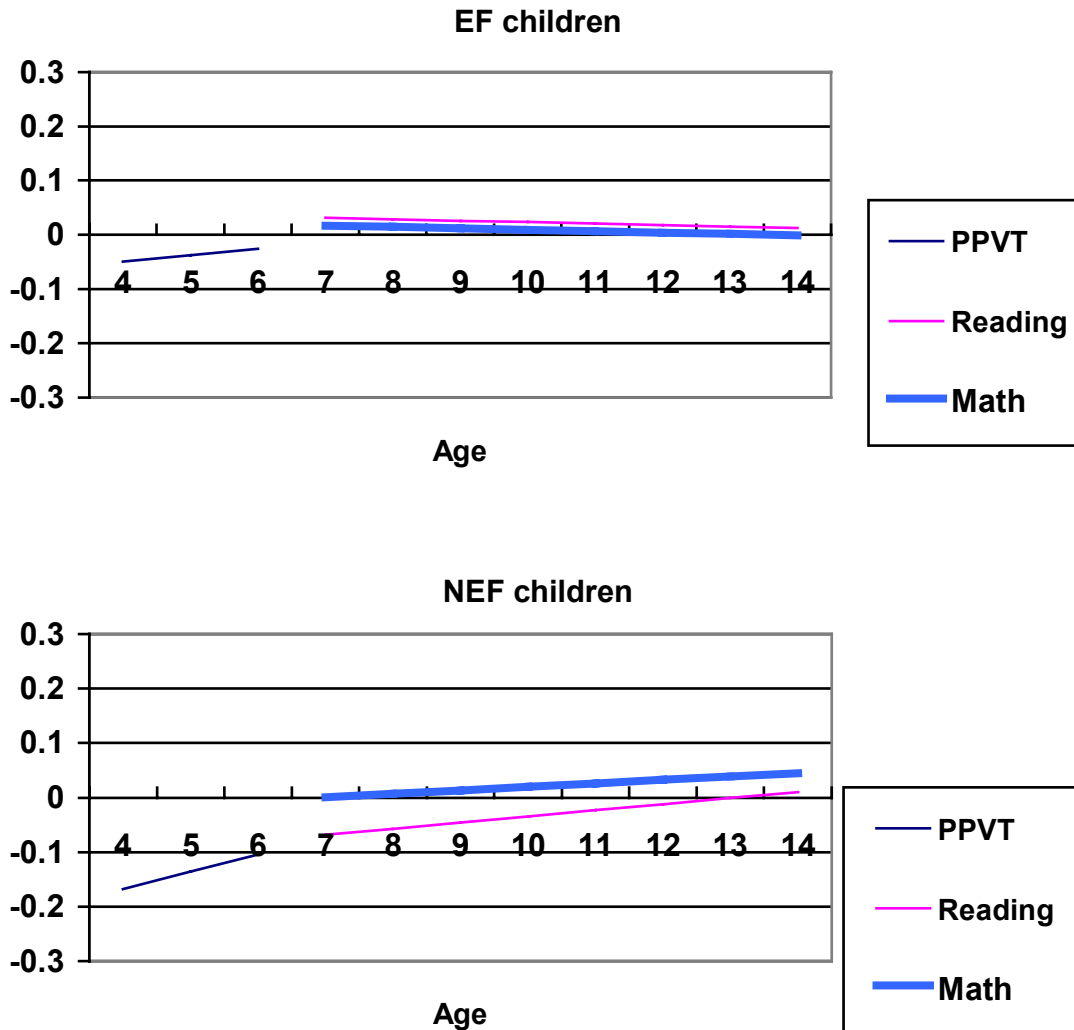

Note:
1. Author's calculations based on estimates from Table 4b.
2. The vertical axis can be scaled up by 100 and then interpreted as percentage differences in performance between the children of immigrant PMKs and the children of Canadian-born PMKs.

Figure 3a

Differences in Performance by Age Between the Children of Immigrant PMKs and Canadian-born PMKs' Children: Formal Tests

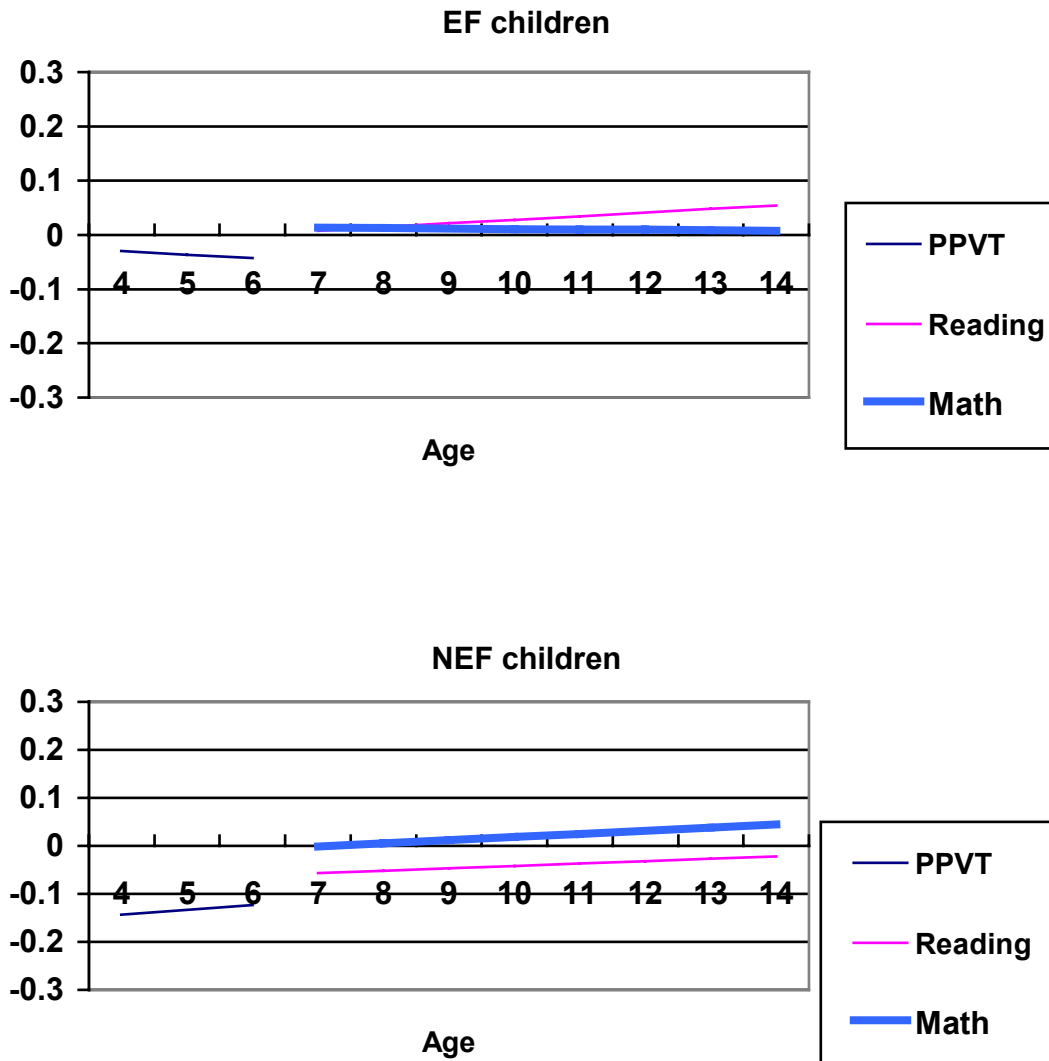### EF children

NEF children

Note:
1. Author's calculations based on estimates from Table 5a.
2. The vertical axis can be scaled up by 100 and then interpreted as percentage differences in performance between the NEF children and the children of Canadian-born PMKs.

Figure 3b

Differences in Performance by Age Between the Children of Immigrant PMKs and Canadian-born PMKs' Children: Formal Tests, Fixed Effects Estimation

EF children

NEF children

Note:
1. Author's calculations based on estimates from Table 5b.
2. The vertical axis can be scaled up by 100 and then interpreted as percentage differences in performance between the NEF children and the children of Canadian-born PMKs.

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