School Performances of children of Immigrant Families in Atlantic Canada

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Abstract

Using Cycle 3 (1998-99) data from the National Longitudinal Survey of Children and Youth (NLSCY) in Canada this study compares the educational outcomes of children of the Native-born Canadian (NBC) group with those of the immigrant group in Canada as a whole and in Atlantic Canada. An immigrant family is defined as one in which at least one of the parents is foreign-born. Educational outcomes are measured by the PMK's(person most knowledgeable about the child) assessment of the child's overall performance, and by mathematics test scores. Ordered logit models are employed for the PMK's assessment and OLS models for mathematics test scores. The children selected for analysis are 6 to 15 years of age. The NLSCY data suggest that, on average, the educational outcomes of children of the immigrant group are significantly better than those of the NBC group. The educational outcomes of children of immigrant families would be better even for the same level of observable resources. These findings are robust to measures and geographic divisions. On the other hand, within group comparisons indicate that children in the NBC group perform poorer in Atlantic Canada compared to the national average, while those in the immigrant group perform better in Atlantic Canada compared to the national average.

1. Introduction

Immigration has become an important economic policy issue in Atlantic Canada in the last few years. Long-term economic benefits of immigration are determined not only by the characteristics of immigrants themselves, but also by those of their children. Hence, it is necessary to recognize the importance of the immigrant population as well as its children to maximize the benefits of immigration. However, while research on immigration is vast, comparative economic research on the children of immigrant families in Canada, particularly, in Atlantic Canada, is almost absent.

Comparative research on the educational outcomes of children of immigrant and native-born Canadian (NBC) families is important as this factor forms human capital, which affect the labour market outcome of a child when he/she becomes an adult. Jencks et al. (1979) find that academic skills measured in grade school are significant predictors of later educational attainment, occupational status, and earnings. Curie (1999) shows that the test scores measured as early as age 7 have significant effects on future test scores, educational attainments, and labour market outcomes.

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The educational performance of children depends on the resources and opportunities available to them. Available information on the immigrant population suggests that, on average, immigrant families have higher levels of the observable resources that affect child development outcomes.[1] For example, immigrant families have a higher level of average household income, education, and occupational prestige, and lower levels of unemployment, public assistance, and divorce. Research on self-selection of immigrant population suggests that immigrant populations may have a higher level of unobservable characteristics such as drive, ability, motivation, attitude, farsightedness, ambitiousness, and willingness to work hard (See, for example, Chiswick 1978). These studies find that data are consistent with the selectivity hypothesis that the average economic outcomes of immigrants cross over those of the comparable native-born because they have above average unobservable characteristics. If these attributes are inheritable, or learned from parents, this implies that the children of immigrant families would have a higher level of unobservable characteristics (Ahmed 2002). Also, research on economic assimilation[2] shows that the average labour market outcomes of immigrant families are lower initially, and eventually catch up or cross over those of the native-born with the time of their residency (approximately 10-15 years) in the host country.

If these are the characteristics of the immigrant population in general, then according to the intergenerational transmission theory,[3] the children of immigrant families are likely to have higher levels of observable and unobservable characteristics transmitted from their parents. Economic theory suggests that a higher level of resources of immigrant families in Canada would lead to a higher level of child outcomes in Canada.[4] Available information on Atlantic Canada suggests that compared to families with children in Canada as a whole, those in Atlantic Canada are poorer.[5] This phenomenon is also observed within the immigrant population. On the other hand, immigrants in Atlantic Canada tend to be well educated and perform better compared with native born-Canadian (see Table A3 in Appendix 1). The region currently receives only 2% of the immigrants arriving in Canada although it accounts for 8% of Canada's population and almost half of the immigrant taxfilers destined for the Atlantic provinces between 1980 and 1995 had moved out the region by 1995 (APEC Summer 2001). This number partly reflects the relative economic conditions in Atlantic Canada, and it also indicates that immigrants have less preference to settle in Atlantic Canada. This may be because this region provides less labour market opportunity for immigrants. This leads to an important question in undertaking comparative research on children: do the children of immigrant families in Atlantic Canada have the similar child outcomes as do their counterparts in Canada as a whole? if not, why?

2. Purpose

The purpose of this study is:

I) to compare the educational outcomes of children in immigrant families with those of NBC families in Canada[6]

II) to compare the educational outcomes of children of immigrants families with those of NBC families in Atlantic Canada

III) to compare the educational outcomes of children of NBC families in Atlantic Canada with those in Canada as a whole

IV) to compare the educational outcomes of children of immigrant families in Atlantic Canada with those in Canada as a whole

3. The data and measurement of child outcomes

The Cycle 3 (1998/99) Shared File data from the National Longitudinal Survey of Children and Youth (NLSCY[7]) are used in this study. The NLSCY is a joint project of Human Resources

Development Canada and Statistics Canada. It is a long–term survey designed to measure child development and well being in Canada. The survey gathers information on demographic variables, socio-economic background, child health and development, behaviour, relationships, education, literacy, leisure activities, family functioning and parenting, childcare arrangements and family custody history.

The first cycle of the survey was conducted in 1994-95. The data for Cycle 2 was collected between the fall of 1996 and spring of 1997. The data for Cycle 3 was collected between the fall of 1998 and summer of 1999. The sample size of the Cycle 3 survey data is 31,963 observations. From each household, a person aged 15 years or older, and most knowledgeable about the child (PMK), was chosen to answer the questions. For all children in the Cycle 3 who were attending school, information was collected from the school teacher and the principal, and from skill tests. Immigrant families who have school-aged children are well represented in the NLSCY. For instance, the percentage of children in school in the NLSCY data who have a foreign-born PMK is 18.3%,[8] while in the 1996 Canadian Census, the percentage of foreign born-women who have at least one unmarried child living at home is 17.6% (Worswick 2001).

Measures of educational outcomes

Two types of educational outcomes provided in the NLSCY are examined in this study: the PMK's assessment about the child's overall academic achievement and math computation tests scores. The PMK was asked, "is the child doing over all – very well, well, average, poorly, very poorly?" This is an ordered variable, which provides only rankings.

Math computation tests scores are also provided in the NLSCY. The math computation test in the NLSCY is a shortened version of the Mathematics Computation Test of the Standardized Canadian Achievement Tests, Second Edition (CAT/2) designed to measure achievement in basic skills. The tests were administered in school. School children in grade 2 or higher were given a brief mathematics test of about 15 questions. For grade 2 children, the interviewer read the question and recorded the answers on an answer sheet. For children in grade 3 or above, the child read the question and gave the interviewer the answer. During the household interview, parents were asked to agree to the tests being administered to the child at school. Each child who took the test was given a gross score and a scaled score. The gross score is obtained by adding the number of correct answers. The scaled score is derived from standards established by the Canadian Test Centre (CTC). The CTC developed these standards from a sample of the Canadian children from all 10 provinces of the country. The scaled CTC scores range from 1 to 999. They are units of a single scale with equidistant intervals that cover all the grade levels.

To allow for comparisons of scores to be made across age groups, normalized scaled scores[9] are used in this study. The scale scores are normalized for each grade levels by dividing the individual score with the mean value of the academic grade that the child is in. For example, if the child is in Grade 3, the scaled score of the child is divided by the mean value of the children in Grade 3.

Although mathematics scores provide an objective measure of one dimension of a child's educational outcomes, however, as mentioned in Section 1**,** math scores are highly correlated with the overall school performances of children. Hence, the results from the two measures are comparable.

4. Methodolgy

4.1 Ordered logit models for the PMK's assessment of child's overall performances

The PMK's rating of child's overall performance is a categorical and ordered variable. For this ordinal child outcome variable, ordered logistic models are employed for empirical estimation. **The PMK's rating of a child's overall performances takes the following values: 0 = very well, 1 = well, 2 = average, 3 = poorly and 4 = very poorly.**[10] When response categories are ordered, logits can directly incorporate the ordering. The *j*th cumulative odds is the probability of giving a response in category *j* or lower, as opposed to giving a response in category *j+1* or higher.[11] For a vector of predictors, X_k, the log of the *j*th cumulative odds for the child outcomes of native-born Canadian (NBC) and immigrant families can be written as:

$$(4.1) \qquad \text{Logit}\left[P(Y_{fk} \le j)\right] = \text{Log}\left(\frac{P(Y_{fk} \le j)}{1 - P(Y_{fk} \le j)}\right)$$

$$= \text{Log}\left(\frac{p_1 + p_2 + \ldots + p_j}{p_{j+1} + p_{j+2} + \ldots + p_J}\right), j = 1, \ldots \text{J-1}.$$

$$= \mu_j + \alpha \mathbf{I} + \mathbf{x}\mathbf{b_N} + \mathbf{x_D}\mathbf{b_D} + \varepsilon_1$$

Where

P denotes the probability,

Y_{fk} denotes the responses of ordinal outcomes of the *k*th child of the *f*th group,

Subscript, f = (N, I) references the NBC and immigrant groups,

π_i denotes the probability of the *i*th category,

x references a vector of explanatory variables that affect educational outcomes,[12]

$\mathbf{x_D}$ is the vector of interacted variable(**x*I**);

μ_j are the parameters to be estimated for the intercept terms of the ordered logit model, and α is the parameter to be estimated that will capture any differences in the intercept terms of the NBC and immigrant families;

$\mathbf{b_N}$, is the vector of parameters to be estimated describing the effect of **x** on the log odds of response in category *j* or above for the NBC group, and $\mathbf{b_D}$'s is the vector of parameters to be estimated to capture the differential marginal impacts on the probabilities of children of immigrant families;

ε_1 is the effect of unobserved characteristics and is assumed to be independent, identically, and normally distributed random variables with mean zero and variance $\sigma_{\varepsilon 1}^2$.

In an ordered logit model, when a dependent variable has *n* response categories (here there are 4 response categories), an estimated coefficient gives the marginal impact on the log of the *j*th cumulative odds, which is the probability of having a response in category *j* (say, good performance category) or lower as opposed to giving a response in category *j*+1 (say, very good performance category) or higher. Likewise, the coefficient of an interaction variable gives the differential marginal impact for the children of an immigrant group compared to those of the NBC group (the comparison group). Since the response categories in the dependent variable- the PMK's assessment of child's overall performances- is ordered in such a way that higher values are assumed to represent higher outcomes, a positive and significant coefficient of an explanatory variable[13] in an ordered logit model[14] in this study means the cumulative odds of the *j*th response category would increase with an increase in that variable. In other words, the probability of being in the highest response category would increase; and the probability of being in the lowest response category would decrease. Moreover, a higher value of an intercept term means a higher probability for a higher response category.

4.2 OLS[15] model for mathematics computation test scores

The math score variable is a continuous variable. An OLS model is chosen for this variable as shown below:

(4.2) $Y_{fk} = \mu_j + \alpha I + \mathbf{x_N b_N} + \mathbf{x_D b_D} + \varepsilon_1$

where Y_{fk} denotes the math computation score of the *k*th child of *f*th family.

4.3 Definitions of the study groups

As stated, this study uses data from the Cycle 3 of the NLSCY to study the educational outcomes of children of native-born and foreign-born families in Canada. The definition used is based mainly on the objective of the study and also on the number of observations to run regression models for the immigrant group. Since the study is linked to immigration literature which mainly discusses the labour market outcomes of foreign-born people, the definition of an immigrant family is chosen based on the birthplace of parents. The limitation of this data set for this study is that the number of observations for the immigrant group is very small when the two-parent families with different birthplace are excluded and the findings would be less reliable. Considering this limitation, an immigrant family is defined as one in which *at least one* of the parents with whom the child lives is foreign-born while an "NBC family" is defined as one in which all the parents with whom the child lives are native-born Canadian (NBC).

4.4 The estimation sample

Educational outcomes are available for children aged 6 years and older. To select the initial sample for this study the following children were excluded:

I) The children aged less than 6 years;
II) The children whose parents' birthplaces were unknown (the PMK and the spouse of the PMK) of the child were unknown;
III) The children who were living without a parent;

Because of these exclusions, the initial sample size for this study is 10,269 observations. Among the observations, 2,159 are from Atlantic Canada. The number of observations for the immigrant families is 1,242 for Canada as a whole and only 100 for Atlantic Canada. As explained above, sample sizes vary for different questions because of missing values and as a result, the sample sizes for the regression models were even smaller than the above sizes.

4.5 Specification of the independent variables

The models of educational outcomes are specified considering the theoretical knowledge and availability of data. Table 4.1 lists the independent variables in the educational outcomes of children aged 6-15 years.

Table 4. 1 Explanatory variables in educational outcomes models

Explanatory variables	Expected sign
Birthplace (=1, for immigrant group, = 0, for NBC group)	Positive
Age of the child	Uncertain
Gender (=0, if the child is a boy,= 1, if a girl)	Uncertain
PMK's assessment of child's health (=1, child's health is fair or poor, =0, otherwise)	Negative
Equivalent Income($)[1]	Positive
House (=0, if any family member owns the house, = 1, if not)	Negative
Lone-parent (=1, if the child lives with a lone-parent, = 0, otherwise)	Negative
Age of mother(years) at birth of child	Positive
Years of education of PMK	Positive
Weekly working hours of PMK[2]	Negative
Poor health of PMK(=1, if health status of PMK is poor or fair, = 0, other wise)	Negative
Number of residential movement	Negative
Rural area (= 1, if child lives in rural area, = 0, otherwise)	Negative
Employment income (= 1, if the main source of income of the family is from employment income, = 0, otherwise)	Positive
Job rank of parents (a lower value indicates higher job status)[3]	Negative
Family dysfunction[4](a higher value indicates lower value of family functioning)	Negative
Negative parenting style[5](a higher value indicates higher level of ineffective and hostile parenting style)	Negative
Private (= 0, if the child attends a public or Catholic school, = 1, otherwise)	Positive
Missing days (= 0, if missing days of school are less than 3 days, = 1, otherwise	Negative

Notes

[1] Equivalent income is defined as household income divided by the equivalent scale = household income before taxes/square root of family size.

[2] This variable is the number of hours per week usually worked at current job(s). If the PMK is a full-time mother then it takes the value 0.

[3] If the PMK is the only working person in the household, then the *job rank of the parents* is the Pineo socio-economic classification of her main job. If both the PMK and her spouse work, this variable is the Pineo socio-economic classification of the main job the spouse/partner. If neither of them works, the value is set to 17, the lowest category.

[4] This is a derived variable in the NLSCY. The score of this variable is derived using the unweighted items of the following variable:

A) Planning family activities is difficult because we misunderstand each other;
B) In times of crisis we can turn to each other for support;
C) We cannot talk to each other about sadness we feel;
D) Individuals (in the family) are accepted for what they are;
E) We avoid discussing our fears or concerns;
F) We express feelings to each other;
G) There are lots of bad feelings in our family;
H) We feel accepted for what we are;
I) Making decisions is a problem for our family;
J) We are able to make decisions about how to solve problems;
K) We don't get along well together; and
L) We confide in each other.

In order to calculate the scores, the items values were reduced by 1(i.e. a value of 1(strongly agree) was recoded to 0, 2 was recoded to 1, 3 to 2, and 4 to 3). This was done in order to associate a value of zero for the lowest score. The values were reversed for A, C, E, G, K, and I. Since the score indicates rank, the lower the value, the better the family functioning scores. In other words, a higher value indicates a higher level of family dysfunction. The magnitude of its coefficient does not have a usual interpretation.

[5] For children aged 6-11 years, ineffective parenting style scores (standardized) as derived in the NLSCY are used to denote negative parenting style. For the children who are 12 and 13 years old, parental rejection scores (standardized) are used to denote negative parenting style.

5.0 Results and Discussion

5.1 Ordered logit estimates of the PMK's assessment of child's over all performance

The pooled sample of the NBC group and the immigrant group are used to estimate the ordered logit models of the PMK's assessment of child's overall performance. SAS software and cross-sectional weights are used in the estimation procedures. The estimated models for the NBC group and the immigrant group with an intercept term are presented in Tables 5.1. The 2nd column presents the estimated coefficients for Canada as a whole, while the 3rd column presents those for the Atlantic Canada. For both models, the comparison group is the NBC group. The results of this model indicate that most of the estimated coefficients that are significant have the expected signs. The focus of this variable is the birthplace variable. The coefficient of birthplace variable suggests that school performances of children of immigrant families are higher for Canada as a whole, while for Atlantic Canada the difference is not statistically significant.

Some notable findings from these models are that household income, house ownership, education level of PMK, higher job rank of parents, child's good health are positively associated with child's school performances while, lone parent status, mother's age at child's birth, working hours of the PMK, rural area, negative parenting style, family dysfunction, and missing days of school are negatively associated. It is interesting that the girls and the students in the private schools perform better compared to their counterparts. It is unexpected that the employment income has negative effect.

Table 5.2 compares the ordered logit estimates of the immigrant group with those of the NBC group using interaction models. The focus of these tables is on the coefficients of the *birthplace* and interaction variables. The coefficient of the *birthplace* variable shows the differences in the intercept terms of the two groups, whereas, the coefficient of an interaction variable shows the differences in the slope coefficients of that variable in the two groups. The 2nd column compares the coefficients of two groups for Canada as a whole, whereas, the 3rd column compares those for Atlantic Canada.

The slope coefficient of *birthplace* is negative and significant. This means that, if all other covariates were given zero values, the probability of the highest performance category, and that of the lowest performance category, would be lower for the children of the immigrant group for Canada as a whole. The slope coefficients of "income" "years of education of PMK" "working hours of PMK," "occupational status of parents" rural area," "parenting style," and 'missing days of school" are significantly larger (in absolute sense) for the children of the immigrant group compared to those of the NBC group. The larger slope coefficients here indicate that the strength of association of these covariates with the educational outcomes is higher for the immigrant group. In other words, these variables are more important for the immigrant group. Descriptive statistics in Appendix 1 demonstrates that regarding these variables this group is in an advantaged situation.

On the other hand, the slope coefficients of "age of the child," " gender of the child" "health status of child," " house ownership," "lone parent status," "age of mother," and "missing days of school" are significantly smaller (in an absolute sense) for the children of the combined immigrant group than for the children of the NBC group. The smaller slope coefficients indicate that the strength of association of these resources with the educational outcomes is lower for the immigrant group. For Atlantic Canada, most of the cases are similar to that of the Canada as a whole. However, in few cases, the relationships are different. For example, in Canada as a whole, "house,"

"child's health," and family dysfunction variables have smaller slope coefficients for the immigrant group than for the NBC group, while for the Atlantic Canada, these variables have larger slope coefficients for the immigrant group. On the other hand, "the years of education of the PMK," and "working hours of the PMK" variables have larger slope coefficients for the immigrant group than for the NBC group in Canada as a whole, while in Atlantic Canada, the opposite findings exist.

The log-likelihood ratio tests in both columns suggest that the slope coefficients of the *birthplace* and the interaction variables are jointly significantly different from zero. This, in turn, implies that the regression models of the immigrant groups are different from that of the NBC group.

5.2 Predicted probabilities of different levels of school performances of children: variation in school performances in Canada as a whole

In this section, the probabilities are predicted[16] for three performance categories: i) very well ii) well and iii) average. The predicted probabilities of these three performance categories are shown in each box of the Table 5.3.

Consider first for Canada as a whole. Compare the second case, $\overline{\hat{P}(X_I, \hat{\boldsymbol{b}}_I)}$, with the first case, $\overline{\hat{P}(X_N, \hat{\boldsymbol{b}}_N)}$. The first entry in each box gives the probability of children being in the very well category. The average predicted conditional probability of the NBC group is 0.47, and that of the immigrant group is 0.50, a 3-percenatge point higher probability. The difference is almost the same even when the second performance category is chosen. In each case, the difference is significant although the difference is small for the third category. Since probability is higher for the higher performance category, these values suggest that the school performance of the children of the immigrant group is better than that of the NBC group.

These findings of educational outcomes demonstrate that the change in the immigration policy that gave emphasis on the skill of immigrants caused a "skilled immigrant effect" in the educational outcomes of children (see Ahmed 2002).These findings are consistent with Chiswick's (1978) hypothesis.

5.3 Predicted probabilities of different levels of school performances of children: variation in school performances in Atlantic Canada

For the first category, the average predicted conditional probability of the NBC group is 0.46, and that of the immigrant group is 0.54, an 8-percenatge point higher probability. The differences are 6-percentage point and 4-percentage point for the other two categories respectively. In each case, the difference is significant. These values suggest that the school performance of the children of the immigrant group is better than that of the NBC group even in Atlantic Canada.

Findings are more interesting if outcomes are compared within each group. For the NBC group, school performances are slightly poorer for Atlantic Canada compared to the national average. This finding is expected as the families with children in Atlantic Canada have lower resources. On the other hand, for the immigrant group, school performances of children are better in Atlantic Canada compared to that in Canada as a whole. This finding is interesting and needs more research to look for the reasons.

5.4 The variation in school performances for the same level of resources

Consider columns 4-6 in Table 5.3, which presents the simulated probabilities of different school performance categories of children of the NBC group under alternative hypothetical states.[17] Since

the resources are constant in each case, the outcomes of two groups can be compared for the same level of resources.

Compare the first case, A) $\overline{\hat{P}(X_N, \hat{\boldsymbol{b}}_N)}$, with the second, B) $\overline{\hat{P}(X_N, \hat{\boldsymbol{b}}_I)}$. Consider the first number, which is the probability of children being in *the very well* category. The probability is 0.468 for the NBC group with the NBC group coefficients, and 0.482 with the immigrant group coefficients. The difference appears to be the same for the second performance category. The *t*-ratio suggests that this 1% difference is significant. Hence, this test indicates that although the difference is very small in magnitude, there is statistical evidence that the educational outcomes of children of this group would be higher than those of the NBC group even for the same level of resources in Canada as whole.

This finding suggests that not only the existing probability for highest performance category is higher for the immigrant group, it would also be higher for the same level of resources. However, there is no need to change the resource level of the immigrant population in general, because the existing probability is already higher with their own resources (50% with their own resources vs 48% with the NBC resources).

A similar comparison for Atlantic Canada indicates that there is statistical evidence that the immigrant group would have slightly higher educational outcomes of children compared to the NBC group even for the same level of resources (the difference is statistically insignificant). This indicates that they may have some "differential cultural capital" which is favourable to educational outcomes of children. Their actual total outcomes, and the hypothetical outcomes suggest that they have a higher level of observable as well as unobservable resources which may have caused them to have a higher level of educational outcomes. Since the educational outcome with the resources of the NBC group would be lower than those with their own resources it is not recommended to change their resource levels which seem already higher (54% with their own resources vs. 46% with the NBC resources).

5.5 OLS estimates of mathematics scores

The mathematics scores of children in this study is a continuous variable. After an adjustment for each grade level,[18] the mean score of children in each grade level becomes 1. The results of the OLS estimates are presented in Tables 5.4 and 5.5.

Table 5.4 presents the estimated coefficients of the NBC group and the immigrant group assuming the slope coefficients are same for two groups, while Table 5.5 presents those permitting variation in slope coefficients for the two groups. The slope coefficient of an explanatory variable gives the rate of change of mathematics performance as a result of change in that variable. A larger value (in an absolute sense) indicates a stronger association of mathematics performance with that variable. The slope coefficient of an interaction variable gives the differential marginal impact of that variable on the mathematics scores of the children of an immigrant group compared to that of the NBC group. The NBC group is the comparison group. As mentioned before, the same sign of the coefficients of an interaction variable and the non-interacted variable would indicate that the children of the immigrant group have a stronger association of the observable resources with mathematics performance.

The coefficient of the *birthplace* variable in the Table 5.4 captures differences in levels of mathematics performance of the children in the NBC group and immigrant group. A higher value

in the second column indicates a higher level of mathematics performance for the immigrant group for Canada as a whole. The coefficient of *birthplace* variable in the third column, however, indicates that there is no significant difference between the two groups in Atlantic Canada. The other estimated coefficients that are significant have expected signs. As expected, "household equivalent income," "years of education of the PMK," "private school," have positive and significant association with mathematics scores of children. Similarly, the coefficients of" working hours of PMK," "job rank of parents," "negative parenting," and "missing days of schools" are negative and significant, as expected.

Table 5.5 compares the mathematics scores model of the children of the immigrant group with that of the NBC group permitting the slope coefficients to vary. The slope coefficient of the *birthplace* is positive and significant for Canada as a whole but not for Atlantic Canada. The slope coefficients of "age of child" "lone-parent status" "house," "job rank of parents," and "residential movements" "negative parenting style" are significantly larger (in absolute sense) for the children of the immigrant group compared to those of the NBC group. For example, the slope coefficient of "house" variable is 3-percentage point higher for the children of the immigrant group. These variables are more important to the combined immigrant group for better mathematics performances. Descriptive statistics show that this group is in an advantaged condition regarding these variables. On the other hand, the slope coefficients of "equivalent income," "years of education of the PMK," "private school" and are significantly smaller for the children of the immigrant group than for those of the NBC group. This means that the above variables are less important for the children of the combined immigrant group to perform well in mathematics.

An examination of the third column demonstrates that the results vary if Atlantic Canada is considered. The coefficient of the *birthplace* is insignificant similar to the previous case. The interaction variables are insignificant. The F test result shows that the coefficients of *birthplace* and the interactions terms are jointly different from zero. This implies that the regression models of the immigrant group and the NBC are significantly different both in Canada as a whole and in Atlantic Canada. In the next section, the simulated mathematics scores of the different groups for the same level of resources are reported.

5.3.3 Simulated mathematics scores of children: variation in scores

It has already been mentioned that, with the information on the resource levels of each child and estimated coefficients of different groups, it is possible to simulate the conditional mathematics scores of children of one group in different hypothetical situations.[19] For the purposes of analysis in this section, the average conditional expected mathematics scores are simulated for these four hypothetical states. The results are presented in Table 5.6.

Average predicted conditional mathematics scores and their differences

Consider Table 5.6. It presents the average predicted conditional mathematics scores of different groups with their own group coefficients and the resources of the children of that group. A comparison of the second case with the base case suggests that the average predicted conditional mathematics scores of the children of the immigrant group is 3% higher than that of the NBC group (1.01 for NBC group and 1.04 the immigrant group) and the difference is statistically significant. The same applies to the children of the Atlantic Canada. Note that the average predicted conditional mathematics scores are close to the simple mean scores as presented in Appendix 1 which indicates that the OLS models are well-fitted model. A comparison within the group suggests that the children of the NBC group perform poorer in Atlantic Canada than in Canada as a whole

(1.00 in Atlantic Canada vs. 1.01 in Canada as whole), while there is no significant difference in outcomes for the immigrant group in Atlantic Canada and in Canada as whole.

Comparison of math scores for the same level of resources

Consider columns 4-6 of Table 5.6. These values are simulated selecting the sample of the NBC group and giving the coefficients of the immigrant group. The differences and the t-ratios suggest that there is evidence that the children of the immigrant group would have a higher level of math scores for the same level of resources. This applies both in Atlantic Canada and in Canada as a whole.

6. Summary and concluding comments

The descriptive statistics reveal that, on average, any immigrant group in Canada has the following characteristics: a higher level of education, a higher age of mother at the birth of her child, a higher percentage of urban residents, a higher percentage of children who attend private schools, and a larger family size. These characteristics of the immigrant group are also observed in Atlantic Canada. On the other hand, NBC group in Atlantic Canada has fewer economic resources compared to the national average. For example, average household income of families with children is lower in Atlantic Canada.

Ordered logit results of the PMK's assessment of child's overall performances suggest that the educational outcomes of children of the immigrant group are significantly better than that of the NBC group; they would be better even for the same level of resources.

A comparison of average predicted conditional probabilities across the groups suggests that the educational outcomes of children of the immigrant group are considerably higher than those of the NBC group. The findings are consistent with the results of Worswick (2001) and Ahmed (2002).

For the same level of observable resources, the immigrant group would also have higher level of outcomes. This indicates that immigrant group may have a higher level of unobservable resources. Findings are similar for Atlantic Canada.

Comparisons within each group suggest that within the NBC group, educational outcomes of children are poorer in Atlantic Canada compared to the national average. On the other hand, within the immigrant group, outcomes are higher for the children in Atlantic Canada compared to the national average. Findings from Mathematics scores are also the similar. Thus educational outcomes are robust to subjective and objective measures.

The findings of the educational outcomes of children suggest that the change toward an immigration policy that gave emphasis on the skills of immigrants and which shifted the country of origin does not have any detrimental impacts on the Canadian economy. Rather, it has an obvious "skilled immigrant effect" on child outcomes in Canada. This "skilled immigrant effect" is likely to have a positive long-term impact on the socio-economic condition in Canada as well as in Atlantic Canada. To conclude, the better educational outcomes of children of any immigrant group compared to the NBC group suggest that Canadian immigration policy is successful in selecting those immigrants who contribute to Canadian society as their children have higher educational outcome. However, to maximize the benefits of immigration, government of Canada needs to encourage the immigrants to stay in Atlantic Canada by providing more labour market opportunities. Similarly, to reduce the provincial gap in children's outcomes more resources need to be provided in the families with children in Atlantic Canada.

Table 5.1:Ordered logit model of school performance of children without interaction variables

Variables	**Estimated Coefficients(standard error)**	
Groups	**Canada**	**Atlantic Canada**
Intercept 1	-0.4938(0.00935)[a]	0.8746(0.0332)[a]
Intercept 2	0.3016(0.00934)[a]	1.6050(0.0333)[a]
Intercept 3	1.5749(0.00944)[a]	2.8968 (0.0339)[a]
Age of the child	-0.00745(0.000286)[a]	-0.0274(0.00099)[a]
Gender (=0, if the child is a boy,= 1, if a girl)	0.4249(0.00150)[a]	0.2493(0.00529)[a]
Poor child health (=1, child's health is fair or poor, =0, otherwise)	-0.7056(0.00572)[a]	-0.6822(0.0235)[a]
Equivalent Income($)[1]	0.0246(0.000386)[a]	0.0246(0.00242)[a]
House (=0, if any family member owns the house, = 1, if not)	-0.1307(0.00242)[a]	0.0315(0.00926)[a]
Lone-parent (=1, if the child lives with a lone-parent, = 0, otherwise)	-0.2990(0.00740)[a]	-0.2680(0.0236)[a]
Age of mother(years) at birth of child	-0.00239(0.000173)[a]	-0.0125(0.000613)[a]
Years of education of PMK	0.0827(0.000401)[a]	0.0744 (0.00156)[a]
Weekly working hours of PMK	-0.00231(0.000043)[a]	-0.00371(0.000148)[a]
Job rank of parents (a lower value indicates higher job status)	-0.0162(0.000198)[a]	-0.0317(0.000728)[a]
Poor health of PMK(=1, if health status of PMK is poor or fair, = 0, other wise)	0.1042(0.00303)[a]	-0.0602(0.0103)[a]
Number of residential movement	0.0493(0.000749)[a]	0.0216(0.00238)[a]
Rural area (= 1, if child lives in rural area, = 0, otherwise)	-0.0150(0.00212)[a]	-0.0753(0.00569)[a]
Employment income (= 1, if the main source of income of the family is from employment income, = 0, otherwise)	-0.0577(0.00383)[a]	-0.0425(0.00968)[a]
Negative parenting style(a higher value indicates higher level of ineffective and hostile parenting style)	-0.3048(0.001480)[a]	-0.4584(0.00531)[a]
Family dysfunction(a higher value indicates lower value of family functioning)	-0.00677(0.000156)[a]	-0.00729(0.000567)[a]
Private (= 0, if the child attends a public or Catholic school, = 1, otherwise)	0.0914 (0.00342)[a]	-0.7763(0.0286)[a]
Missing days (= 0, if missing days of school are less than 3 days, = 1, otherwise	-0.1336(0.00114)[a]	-0.1534(0.00412[a]
Birthplace (= 1, if parents are foreign born, = 0, otherwise)	0.0846(0.00183)[a]	-0.00994(0.0136)
-2LOGL(Intercept and covariates)	5150831.4	7709.7483
Chi-square (score test) with 38 DF	28963.8459	7709.7483
Sample Size	6359	1539
Note: *a* denotes significant at the 1% levels, *b* denotes significant at the 5% level and *c* denotes significant at the 10% level		
Source: Calculated by the author using the NLSCY (1998-99) Cycle 3 data		

Table 5.2:Ordered logit model of school performance of children with interaction variables

Variables	**Estimated Coefficients**	
Groups	**Canada**	**Atlantic Canada**
Intercept 1	-0.2857(0.0108)[a]	0.7474(0.0344) [a]
Intercept 2	0.5157(0.0108) [a]	1.4846 (0.03450 [a]
Intercept 3	1.7956(0.0108) [a]	2.7823(0.0351) [a]
Age of the child	-0.0184(0.000325) [a]	-0.0257(0.00102)
Gender (=0, if the child is a boy,= 1, if a girl)	0.4378(0.00171) [a]	0.2711(0.00540) [a]
Poor child health (=1, child's health is fair or poor, =0, otherwise)	-0.8154(0.00686) [a]	-0.6931(0.0239) [a]
Equivalent Income($)[1]	0.0175(0.000440) [a]	0.0220(0.00253) [a]
House (=0, if any family member owns the house, = 1, if not)	0.00482(0.00282) [c]	0.0249(0.00930) [a]
Lone-parent (=1, if the child lives with a lone-parent, = 0, otherwise)	-0.3872(0.00784) [a]	-0.2642(0.0236) [a]
Age of mother(years) at birth of child	-0.00608(0.000202) [a]	-0.0131(0.000629)
Years of education of PMK	0.0761(0.000475) [a]	0.0872 (0.00165) [a]
Weekly working hours of PMK	-0.00212(0.000049) [a]	-0.00422(0.00015) [a]
Job rank of parents (a lower value indicates higher job status)	-0.0156(0.00023) [a]	-0.0298(0.00074) [a]
Poor health of PMK(=1, if health status of PMK is poor or fair, = 0, other wise)	0.1241(0.00350) [a]	-0.1078(0.0106) [a]
Number of residential movement	0.0322(0.000844) [a]	0.0190 (0.00242) [a]
Rural area (= 1, if child lives in rural area, = 0, otherwise)	-0.00748(0.00223) [a]	-0.0960(0.00582) [a]
Employment income (= 1, if the main source of income of the family is from employment income, = 0, otherwise)	0.0546(0.00425) [a]	-0.0867(0.00987) [a]
Negative parenting style(a higher value indicates higher level of ineffective and hostile parenting style)	-0.3175(0.00168) [a]	-0.4628(0.00539) [a]
Family dysfunction(a higher value indicates lower value of family functioning)	-0.00772(0.000179) [a]	-0.00625(0.000576) [a]
Private (= 0, if the child attends a public or Catholic school, = 1, otherwise)	0.1004 (0.00413) [a]	-0.7915(0.0287) [a]
Missing days (= 0, if missing days of school are less than 3 days, = 1, otherwise	-0.1283(0.00130) [a]	-0.1529(0.00421) [a]
Birthplace (= 1, if parents are foreign born, = 0, otherwise)	-0-0.6391(0.0013) [a]	0.2538(0.1975)
Age of the child* Birthplace	0.0481(0.000696) [a]	0.00825(0.00627)
Gender * Birthplace	-0.0461(0.00361) [a]	-0.5311(0.0326) [a]
Poor child health* Birthplace	0.40689(0.0129) [a]	-0.6841(0.1515) [a]
Equivalent income* Birthplace	0.0315(0.000962) [a]	0.00522(0.0127)
House * Birthplace	-0.5044(0.00573) [a]	0.0412(0.1412)
Lone- parent * Birthplace	0.6705(0.0243) [a]	
Age of mother * Birthplace	0.0110(0.000398) [a]	0.0593(0.00343) [a]
Years of education of PMK* Birthplace	0.0343(0.000903) [a]	-0.1546(0.00653) [a]
Working hours of PMK* Birthplace	-0.00112(0.000104) [a]	0.0126(0.00116) [a]
Job rank *Birthplace	-0.00491(0.000465) [a]	-0.0637(0.00536) [a]
Poor health status of PMK* Birthplace	-0.0679(0.00716) [a]	1.3617(0.0701) [a]
Residential movement* Birthplace	0.02759(0.00190) [a]	-0.00713(0.0175)
Rural area* Birthplace	-0.15219(0.00793) [a]	0.3888(0.0367) [a]
Employment income *Birthplace	-0.5460(0.0100) [a]	1.3074(0.0736) [a]
Negative parenting style *Birthplace	-0.0177(0.00366) [a]	-0.2991(0.0383) [a]
Family dysfunction *Birthplace	0.00469(0.00038) [a]	-0.0482(0.00397) [a]
Private *Birthplace	0.0421(0.00755) [a]	
Missing days *Birthplace	-0.0184(0.00277) [a]	-0.0536(0.0254) [b]
-2LOGL(Intercept and covariates)	5123770.8	405564.68
Chi-square (score test) with 74 DF	64998.2978	9602.8108
Log-likelihood ratio = $-2(L_R - L_U) \equiv \chi^2(20)$	1683830.1 [a]	17135.34 [a]
Sample Size	6359	1539
Note: *a* denotes significant at the 1% levels, *b* denotes significant at the 5% level and *c* denotes significant at the 10% level Source: Calculated by the author using the NLSCY (1998-99) Cycle 3 data		

Table 5.3: Average predicted conditional probabilities of different school performance categories of children

Predicted conditional probabilities with group coefficients (β_G) and resources (X_G)	Estimated values	Differences	Average predicted conditional probabilities with coefficients of different groups and with NBC resources	Estimated values	Differences
Canada					
1) $\overline{\hat{P}(X_N, \hat{b}_N)}$	0.468 0.657 0.869		**A)** $\overline{\hat{P}(X_N, \hat{b}_N)}$	0.468 0.657 0.869	
2) $\overline{\hat{P}(X_I, \hat{b}_I)}$	0.501 0.682 0.881	**(1)-(2)** -0.03[a] -0.03[a] -0.01[b]	**B)** $\overline{\hat{P}(X_N, \hat{b}_I)}$	0.482 0.665 0.871	**(A)-(B)** -0.01[a] -0.01[a] -0.00
Atlantic Canada					
1) $\overline{\hat{P}(X_N, \hat{b}_N)}$	0.455 0.644 0.863		**A)** $\overline{\hat{P}(X_N, \hat{b}_N)}$	0.454 0.644 0.863	
2) $\overline{\hat{P}(X_I, \hat{b}_I)}$	0.538 0.713 0.895	**(1)-(2)** -0.08[a] -0.06[a] -0.04[a]	**B)** $\overline{\hat{P}(X_N, \hat{b}_I)}$	0.455 0.641 0.860	**(A)-(B)** -0.001(0.002) 0.003(0.002) 0.003(0.002)

Notes: 1. $\overline{\hat{P}(X_G, \hat{b}_G)}$ denotes the average predicted conditional probabilities with the resources of the children of the group *G* and with coefficients of group *G*, where *G* =*N* denotes NBC group; *G*= I denotes combined immigrant group;

2. The first entry in each box denotes the probability of being *in the very well category;* the second entry in each box denotes the probability of being in the very well or well category; and the third entry in each box denotes the probability of being in the *very well or well or average* category.

3. The regression coefficients of this Table come from those of Table 5.2

4. a denotes significant at the 1% levels, b denotes significant at the 5% level.

Source: Calculated by the author using the NLSCY (1998-99) Cycle 3 data

Table 5.4:The OLS mathematics score model of children of NBC and immigrant families without interactions

Variables	Estimated Coefficients	
Groups	**Canada**	**Atlantic Canada**
Intercept	1.02366(0.02818) [a]	0.93194 (0.05391) [a]
Age of the child	-0.00249(0.00094604) [a]	-0.00185(0.00181)
Gender (=0, if the child is a boy,= 1, if a girl)	0.00319(0.00445)	-0.00385 (0.00848)
Poor child health (=1, child's health is fair or poor, =0, otherwise)	-0.07114(0.02238) [a]	0.01775(0.03917)
Equivalent Income($)[1]	0.00282(0.00108) [a]	0.00872(0.00337) [a]
House (=0, if any family member owns the house, = 1, if not)	-0.00741(0.00766)	-0.03655(0.01523) [a]
Lone-parent (=1, if the child lives with a lone-parent, = 0, otherwise)	0.03613(0.02406)	-0.02709(0.03670)
Age of mother(years) at birth of child	0.00093682(0.00051109) [c]	0.00167(0.00098016) [c]
Years of education of PMK	0.00395(0.00115) [a]	0.00775 (0.00256) [a]
Weekly working hours of PMK	-0.00019932(0.00012997) [c]	0.00010361(0.000232)
Job rank of parents (a lower value indicates higher job status)	-0.00255(0.00058673) [a]	-0.00215(0.00114) [b]
Poor health of PMK(=1, if health status of PMK is poor or fair, = 0, other wise)	-0.01273(0.00957)	-0.01815(0.01528)
Number of residential movement	-0.00000276(0.00218)	-0.00101(0.00366)
Rural area (= 1, if child lives in rural area, = 0, otherwise)	-0.00060126(0.00611)	-0.01514(0.00914) [c]
Employment income (= 1, if the main source of income of the family is from employment income, = 0, otherwise)	0.00154(0.01169)	-0.01908(0.01578)
Negative parenting style(a higher value indicates higher level of ineffective and hostile parenting style)	-0.01498(0.00430) [a]	-0.01379(0.00812) [c]
Family dysfunction(a higher value indicates lower value of family functioning)	0.00056979(0.00046368)	-0.00036858(0.00092542)
Private (= 0, if the child attends a public or Catholic school, = 1, otherwise)	0.04842(0.00975) [a]	-0.03321(0.06058)
Missing days (= 0, if missing days of school are less than 3 days, = 1, otherwise	-0.01971(0.00350) [a]	-0.01381(0.00666) [b]
Birthplace (= 1, if parents are foreign born, = 0, otherwise)	0.02357(0.00548)[a]	0.01162(0.02204)
R^2	0.0741	0.1012
Overall F test	13.38 [a]	5.21 [a]
MSE	2.32995	1.40168
Sample Size	3196	899

Note: *a* denotes significant at the 1% levels, *b* denotes significant at the 5% level and *c* denotes significant at the 10% level

Source: Calculated by the author using the NLSCY (1998-99) Cycle 3 data

Table 5.5:The OLS mathematics score model of children with interactions

Variables	Estimated Coefficients(standard errors)	
Groups	**Canada**	**Atlantic Canada**
Intercept	0.97615(0.03293) [a]	0.89472(0.05586) [a]
Age of the child	-0.00156(0.00108)	-0.00131(0.00185)
Gender (=0, if the child is a boy,= 1, if a girl)	0.00638 (0.00507)	-0.00211(0.00861)
Poor child health (=1, child's health is fair or poor)	-0.07302(0.02437) [a]	0.02733(0.04046)
Equivalent Income($)[1]	0.00389(0.00121) [a]	0.00871(0.00347) [a]
House (=0, if any family member owns the house, = 1, if not)	-0.00062142(0.009)	-0.03789(0.01533) [a]
Lone-parent (=1, if the child lives with a lone-parent)	0.03163(0.02463)	-0.02391(0.03671)
Age of mother(years) at birth of child	0.00081562(0.000602)	0.00214 (0.00100) [b]
Years of education of PMK	0.00554(0.00137) [a]	0.00953(0.00269) [a]
Weekly working hours of PMK	-0.00028802(0.00015) [b]	0.0000872(0.000235)
Job rank of parents (a lower value indicates higher job status)	-0.00166(0.000679) [a]	-0.00173(0.00116)
Poor health of PMK(=1, if health status of PMK is poor or fair)	-0.01479(0.01063)	-0.02341(0.01572)
Number of residential movement	0.00084102(0.0026)	0.000106(0.00375)
Rural area (= 1, if child lives in rural area, = 0, otherwise)	0.00466(0.00642)	-0.01737(0.00931) [c]
Employment income (= 1, if the main source of income of the family is from employment income, = 0, otherwise)	0.00643(0.01328)	-0.02291(0.01605)
Negative parenting style(a higher value indicates higher level of ineffective and hostile parenting style)	-0.00990(0.00490) [a]	-0.01690 (0.00824) [b]
Family dysfunction(a higher value indicates lower value of family functioning)	0.00030814(0.000538)	-0.000316(0.000936)
Private (= 0, if the child attends a public or Catholic school, = 1, otherwise)	0.05529(0.01174) [a]	-0.03266(0.06067)
Missing days (= 0, if missing days of school are less than 3 days, = 1, otherwise	-0.02040(0.00396) [a]	-0.01466 (0.00678) [b]
Birthplace (= 1, if parents are foreign born, = 0, otherwise)	0.18437(0.06643) [a]	0.32027 (0.35997)
Age of the child* Birthplace	-0.00362(0.00228)	-0.00101(0.01322)
Gender * Birthplace	-0.00702(0.01084)	-0.06248(0.06854)
Poor child health* Birthplace	0.00789(0.06263)	-0.05334 (0.24425)
Equivalent income* Birthplace	-0.00552(0.00272) [b]	-0.01331(0.02567)
House * Birthplace	-0.02451(0.01820)	-0.11304 (0.21354)
Lone- parent * Birthplace	0.05815(0.11557)	
Age of mother * Birthplace	0.00064731(0.00118)	-0.00547(0.00778)
Years of education of PMK* Birthplace	-0.00435(0.00261) [c]	-0.01320 (0.01170)
Working hours of PMK* Birthplace	0.0004877(0.00032)	-0.00004988(0.0023)
Job rank *Birthplace	-0.00453(0.00139) [a]	-0.00911(0.00829)
Poor health status of PMK* Birthplace	0.00626(0.02522)	-0.00440 (0.12833)
Residential movement* Birthplace	0.00277(0.00504)	-0.01786(0.02969)
Rural area* Birthplace	-0.05403(0.02230) [b]	-0.00292(0.06759
Employment income *Birthplace	-0.01581(0.02872)	0.06027(0.12978)
Negative parenting style *Birthplace	-0.02063(0.01078) [b]	0.05025(0.07735)
Family dysfunction *Birthplace	0.00079677(0.0011)	0.00516(0.00786)
Private *Birthplace	-0.03662(0.02223) [c]	
Missing days *Birthplace	0.00589(0.00855)	0.04685(0.05157)
R^2	0.0834	0.1180
Overall F test (all the slope coefficients are jointly zero)	7.77[a]	3.30[a]
MSE	2.32476	1.40130
F test (the coefficients of the birthplace and interaction terms are jointly equal to zero)	1.81[c]	1.75[c]
Sample Size	3196	899

Note: *a* denotes significant at the 1% levels, *b* significant at the 5% level and *c* significant at the 10% level
Source: Calculated by the author using the NLSCY (1998-99) Cycle 3 data

Table 5.6 Average predicted conditional mathematics scores of children

Predicted conditional mathematics scores with group coefficients (β_G) and resources (X_G)	Estimated values	Differences	Average predicted conditional mathematics scores with NBC resources	Estimated values	Differences
Canada					
1) $\overline{\hat{Y}(X_N, \hat{b}_N)}$	1.01		**A)** $\overline{\hat{Y}(X_N, \hat{b}_N)}$	1.01	
2) $\overline{\hat{Y}(X_I, \hat{b}_I)}$	1.04	**(1)-(2)** -0.03 [a]	**B)** $\overline{\hat{Y}(X_N, \hat{b}_I)}$	1.03	**(A)-(B)** -0. 02 [a]
Atlantic Canada					
1) $\overline{\hat{Y}(X_N, \hat{b}_N)}$	1.00		**A)** $\overline{\hat{Y}(X_N, \hat{b}_N)}$	1.00	
2) $\overline{\hat{Y}(X_I, \hat{b}_I)}$	1.04	**(1)-(2)** -0.03 [a]	**B)** $\overline{\hat{Y}(X_N, \hat{b}_I)}$	1.02	**(A)-(B)** -0. 01 [a]

Notes:

1. $\overline{\hat{Y}(X_G, \hat{b}_G)}$ denotes the average predicted conditional mathematics scores with the resources of the children of the group *G* and with coefficients of group G, where *G =N* denotes NBC group; *G*= I denotes the immigrant group;
2. The regression coefficients of this Table come from those of Table 5.4
3. a denotes significant at the 1% level.

Source: Calculated by the author using the NLSCY (1998-99) Cycle 3 data

Appendix 1
Resources and Outcomes

Table A1: Economic indicators: Canada as a whole and Atlantic Canada

Variables	Mean values					Source
	Canada	Atlantic Provinces				
		NF	PEI	NS	NB	
GDP in 2001, expenditure based ($millions)	1,092,246	13916	3423	24,917	210,211	CANSIM II, table 380-0002
Unemployment rate in 2001	7.2	16.1	11.9	9.7	11.2	CANSIM II Tables 282-0022
Population in 2001	31,081,887	533,761	138,514	942,691	757,077	CANSIM II, table 051-0001
New Immigrants (July 1,2001-June 30,2002)	255, 888	417	146	1,591	762	CANSIM II, Table 051-004
University enrolment in 1998-99(full-time)	580,376	13,115	2,470	30,027	18,529	CANSIM, tables 00580701&0058 0702
University graduate	5,197665	82,165	22,930	168,965	117,500	1996 Census Nation Tables
Secondary school graduate in 1999	316,810	6,715	1,643	10,161	8,778	Statistics Canada Catalogue no. 81-229-XIB
Expenditures on education in 1999/2000($ millions)	67,696.7	1116.4	267.8	1,963.6	1,602.5	CANSIM II, tables 478-0004,478-0005, 478-0007,478-0015

Table A2: Mean values of inputs and child outcomes for Canada as a whole: *T*-tests

Variables	Mean values		Differences(standard errors)	t-ratios
	Native	Immigrant		
Sample size				
Age of the child	10.492	10.511	-0.019 (0.0677)	-0.29
Gender (= 1, if the child is a boy, = 0, if a girl)	0.4888	0.4743	0.0145 (0.0117)	1.23
Poor health of child (=1, If the health condition of the child is fair or poor, =0, otherwise)	0.0747	0.0636	0.0111 (0.0061)	1.84[c]
Equivalent Income ($)	3.0638	3.1446	-0.081 (0.0539)	-1.50
House (= 0, if any family members own the house, = 1, if not)	0.2097	0.21	-28E-5 (0.0097)	-0.03
Lone-parent (= 1, if child lives with a lone-parent, = 0, otherwise)	0.2007	0.1335	0.0672 (0.0091)	7.38[a]
Age of mother (years) at birth of child	27.823	29.862	-2.039 (0.1171)	-17.41[a]
Years of education of PMK	12.577	13.122	-0.545 (0.051)	-10.67[a]
Weekly working hours of PMK	21.816	23.382	-1.566 (0.4384)	-3.57[a]
Job rank of parents (a lower value indicates a higher job status)	9.2354	9.1323	0.103 (0.1131)	0.91
Health condition of PMK	2.97	2.8393	0.1307 (0.0226)	5.78[a]
Poor health condition of PMK	0.0909	0.1024	-0.011 (0.0068)	-1.67[c]
Residential movement	0.6981	0.587	0.1111 (0.0333)	3.34[a]
Rural area (= 1, if the child lives in a rural area, = 0, otherwise)	0.1683	0.0394	0.1289 (0.008)	16.02[a]
Employment income(= 1, if the family's main source of income is from employment income = 0, otherwise)	0.873	0.9135	-0.04 (0.0076)	-5.35[a]
Negative parenting style	1.014	0.9881	0.0259 (0.0126)	2.06[b]
Family dysfunction score	8.6331	9.1502	-0.517 (0.1186)	-4.36[a]
Private (= 0, if the child goes to public or catholic school, = 1, otherwise)	0.0537	0.0813	-0.028 (0.0057)	-4.83[a]
Missing days (= 0, if missing days of school are less than 3, = 1, if equal to or more than 3 days)	1.6424	1.633	0.0094 (0.0159)	0.59
Years since the family immigrated	.	18.913	. (.)	.
Very well performance	0.398	0.429	-0.031(0.0115)	-2.67 [a]
Very well or well performance	0.665	*0.713*	-0.049(0.011)	-4..44 [a]
Very well or well or average performance	0.891	*0.917*	-0.26(0.0071)	-3.65 [a]
Normalized math score	1.0082	1.0372	-0.029 (0.0047)	-6.22[a]

Note: *a* denotes significant at the 1% levels, *b* denotes significant at the 5% level and *c* denotes significant at the 10% level
Source: Calculated by the author using the NLSCY (1998-99) Cycle 3 data

Table A3: Mean values of inputs and child outcomes for Atlantic Canada: *T*-tests

Variables	Mean values		Differences(standard errors)	t-ratios
	Native	Immigrant		
Sample size				
Age of the child	10.632	10.71	0.078 (0.2932)	-0.27
Gender (= 1, if the child is a boy, = 0, if a girl)	0.4841	0.5796	-0.095 (0.051)	-1.87[c]
Poor health of child (=1, if the health of child is fair or poor)	0.06	0.0413	0.0188 (0.0241)	0.78
Equivalent Income ($)	2.3811	2.9447	0.564 (0.1469)	-3.84[a]
House (= 0, if any family members own the house, = 1, if not)	0.1742	0.0798	0.0944 (0.0383)	2.47[b]
Lone-parent (= 1, if child lives with a lone-parent, = 0, otherwise)	0.1976	0.1153	0.0823 (0.0406)	2.03[b]
Age of mother (years) at birth of child	27.026	28.986	-1.961 (0.5033)	-3.90[a]
Years of education of PMK	12.242	13.57	-1.328 (0.2175)	-6.11[a]
Weekly working hours of PMK	22.828	21.615	1.2129 (1.8968)	0.64
Job rank of parents (a lower value indicates a higher job status)	10.261	8.7008	1.56 (0.4742)	3.29[a]
Health condition of PMK	2.9482	2.9925	-0.044 (0.0987)	-0.45
Poor health condition of PMK (=1, if the health status of the PMK is fair or poor, =0, otherwise)	0.0804	0.0993	-0.019 (0.0279)	-0.68
Residential movement	0.6003	0.6936	-0.093 (0.1425)	-0.66
Rural area (= 1, if the child lives in a rural area, = 0, otherwise)	0.3228	0.292	0.0308 (0.0484)	0.64
Employment income(= 1, if the family's main source of income is from employment income = 0, otherwise)	0.8162	0.8858	-0.07 (0.0392)	-1.77[c]
Negative parenting style	0.9859	1.037	-0.051 (0.0527)	-0.97
Family dysfunction score	9.1757	8.8098	0.3659 (0.4982)	0.73
Private (= 0, if the child goes to public or catholic school, = 1, otherwise)	0.0132	0.0111	0.002 (0.0118)	0.17
Missing days (= 0, if missing days of school are less than 3, = 1, if equal to or more than 3 days)	1.6959	1.7804	-0.084 (0.068)	-1.24
Years since the family immigrated	.	22.916	. (.)	.
Very well performance				
Very well or well performance				
Very well or well or average performance				
Normalized math score	0.9782	0.995	-0.017 (0.0173)	-0.98

Note: *a* denotes significant at the 1% levels, *b* denotes significant at the 5% level and *c* denotes significant at the 10% level
Source: Calculated by the author using the NLSCY (1998-99) Cycle 3 data

Appendix 2
Simulation of school performance

1. Simulation of probability of school performances

For the purposes of simulation, the ordered logit model can be re-written for the NBC group and an immigrant group distinguishing the group model coefficients and individual resource vectors. A response category, *j*, in this study can take one of these four values: 0, 1, 2, and 3.[20] The probability of being in a response category *j* or lower for the *i*th child of an NBC family and that of an immigrant family can be re-written, respectively, as:

$$\text{(A1)}\quad P_{Ni}(Y_{Ni} \le j) = \frac{\exp(m_{Nj} + \sum_{g=1}^{t} b_{Ng} X_{gNi})}{1 + \exp(m_{Nj} + \sum_{g=1}^{t} b_{Ng} X_{gNi})}$$

$$\text{(A2)}\quad P_{Ii}(Y_{Ii} \le j) = \frac{\exp(m_{Ij} + \sum_{g=1}^{t} b_{Ig} X_{gIi})}{1 + \exp(m_{Ij} + \sum_{g=1}^{t} b_{Ig} X_{gIi})}$$

where P_{Ni} and P_{Ii} are the probabilities of *i*th child in the NBC group and in the immigrant group, *I*, respectively;
μ_{Nj} and μ_{Ij} are the intercept parameters of the NBC group and the immigrant group, *I* respectively;
Xg_{Ni} and Xg_{Ii} are the gth explanatory variable for the *i*th child in the NBC group and in the immigrant group, *I*, respectively;
g = (1,2,…,t) refers the explanatory variables, $X_{g,;}$
β_{Ng} and β_{Ig} are the regression parameters of the NBC group and an immigrant group, *I*.

Table 5.2 presented the vector of estimated model coefficients for the children of each group, $\hat{b}_k$. Here the subscript, k = N for the NBC group, = *I*, for an immigrant group. Suppose, the resource level of *i*th child of different groups is denoted by the vector X_{ki}. Using the equations A1 or A2, it is possible to simulate the predicted conditional probability for each child being in one response category, say *very well* category, and the average predicted conditional probability for each group in the following four cases:

I) Select the sample of the NBC group; give each child the vector of own group coefficients, $\hat{b}_N$; and using the equation A1 simulate the predicted conditional probability for each child with his/her own resource vector, $X_{Ni,}$. Take the mean value of these probabilities, $\hat{P}_i(X_N, \hat{b}_N)$. This simulated value, $\overline{\hat{P}(X_N, \hat{b}_N)}$, denotes the average predicted conditional probability for the NBC group with its own group coefficients and with own resources of children. This is the base case.

II) Select the sample of children of an immigrant group; give each child the own group coefficients, $\hat{b}_I$; and using equation A2, simulate the predicted conditional probability for each child with his/her own resource vector, X_{Ii}. Take the mean value of these probabilities, $\hat{P}_i(X_I, \hat{b}_I)$. This simulated value, $\overline{\hat{P}(X_I, \hat{b}_I)}$ denotes the average predicted conditional probability for the immigrant group with its own group coefficients and with own resources of children.

III) Select the sample of the NBC group; give each child the vector of the immigrant group coefficients, $\hat{b}_I$; and using one of the above equations, simulate the predicted conditional

probability for each child with his/her own resource vector X_{Ni}. Take the mean value of these probabilities, $\hat{P}_i(X_N, \hat{\boldsymbol{b}}_I)$. This simulated value, $\overline{\hat{P}(X_N, \hat{\boldsymbol{b}}_I)}$ has two interpretations: it would denote the average predicted conditional probability of the NBC group with own resource levels but with the coefficients of the immigrant group; or it can be interpreted as the average predicted conditional probability for the children of the immigrant group with its group coefficients but the resource levels of the children of the NBC group.

IV) Select the children of the immigrant sample; give each child the vector of the coefficients of the NBC group, $\hat{\boldsymbol{b}}_N$; and using one of the above equations, simulate the predicted conditional probabilities for each child with his/her own resource vector, $X_{Ii,}$. Take the mean values of these expected conditional probabilities, $\hat{P}_i(X_I, \hat{\boldsymbol{b}}_N)$. This simulated value, $\overline{\hat{P}(X_I, \hat{\boldsymbol{b}}_N)}$, has also two meanings as does the previous case: it may be interpreted as the average predicted conditional probability of the immigrant group with own resource levels but with the NBC group coefficients; or it can be interpreted as the average predicted conditional probability for the children of the NBC group with its group coefficients but with the resource levels of the immigrant group.

2. **Simulation of mathematics tests score**

The predicted mathematics score of a child of the NBC group and the immigrant group from an OLS model could be written as:

(A3) $\hat{Y}_{Ni} = \mu_N + \sum_{g=1}^{t} \beta_{Ng} X_{gNi}$

(A4) $\hat{Y}_{Ii} = \mu_I + \sum_{g=1}^{t} \beta_{Ig} X_{gIi}$

where Y_{Ni} and Y_{Ii} are the mathematics score of *i*th child in the NBC group and the immigrant group, respectively;

μ_N and μ_I are the intercept parameters of the NBC group and the immigrant group, respectively;

Xg_{Ni} and Xg_{Ii} are the gth explanatory variable for the *i*th child in the NBC group and an immigrant group, *I,* respectively;

g = (1,2,…,t) references the explanatory variables, X_g;

β_{Ng} and β_{Ig} are the regression parameters of the NBC group and the immigrant group.

Table 5.5 reported the estimated OLS model coefficients for the children of each group, $\hat{\boldsymbol{b}}_k$. Here the subscript, k = N for the NBC group, = *I,* for the immigrant group.

Suppose, the resource level of *i*th child of different groups is denoted by the vector X_{ki}. Using equations A3 and A4, it is possible to simulate the predicted conditional mathematics scores for each child and the average predicted conditional mathematics scores for each group in different hypothetical states as described in the previous section.

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Endnotes

[1] See Table A1 in Appendix 1 and Ahmed (2002).

[2] For example, see Chiswick (1978, 1986), Blau (1980), Carliners (1980), Defreitas (1980), Long (1980), Tienda (1983), Borjas and Tienda (1985), Borjas (1985), Poston (1988), Jensen (1988), Lalonde and Topel (1991), de Silva (1997a. 1997b), Jasso and Rosenzweig (1985, 1990).

[3] Becker (1981) is a prominent model of intergenerational transmission.

[4] Literature on educational outcomes of children of immigrant families in Canada also show that, on average, school performances of children of immigrant families are higher than those in native-born Canadian families. See, for example, Ahmed (2002) and Worswick (2001).

[5] See Appendix 1.

[6] Using Cycle 2 data from the National Longitudinal Survey of Children and Youth, Ahmed (2002) also examined the educational outcomes of children in the immigrant families with those in the NBC families in Canada.

[7] See Statistics Canada (1998c)

[8] This percentage is generated using the sample weights.

[9] The robustness of the findings from the scaled scores was also tested using the raw scores.

[10] The order was reversed in estimation, and poorly and very poorly categories were merged in one category.

[11] See Agresti (1996)

[12] Each vector includes individual characteristics of the child, family characteristics and resources that affect educational outcomes of children.

[13] Assuming a higher value of that variable indicates a higher level.

[14] Descending order options is used in the logistic procedure statement. Without this option, an estimated coefficient would have the opposite sign.

[15] Mathematics computation scores are available only for the children who have responded (48%). Those who did not respond may not be random draws from the population of the children, and may have different characteristics. Those who have poor academic outcomes are most likely not to respond. Hence, selection bias may arise if OLS methodology is applied in this model. Ahmed (2002) applies the Heckman (1979) two-stage procedure methodology to test the presence of a sample selection bias in mathematics scores estimates. However, it is found that there is no selection bias. Hence, OLS model is chosen to estimate mathematics test scores in this study.

[16] Predicted cumulative probability for the jth category is:

$$P(Y \quad j) = \frac{\exp(\mu_j + \sum_{g=1}^{t} \beta_g X)}{1 + \exp(\mu_j + \sum_{g=1}^{t} \beta_g X} \qquad j=1,2, \ldots J$$

Where g = (1, 2,…, t) refers to the explanatory variables, μ_j and β_g are intercept parameters and regression parameters, respectively.

[17] See Appendix 2 for details.

[18] Mathematics score of a child is divided by the mean score in the grade level of the child.

[19] See Appendix 2.

[20] Remember that the PMK's assessment of child's overall performance variable has four response categories: poorly or very poorly = 0, average = 1, well = 2, and very well = 3.