FITTING IN:
HUMAN CAPITAL ASSIMILATION OF CHILDREN OF IMMIGRANT FAMILIES IN CANADA

by

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Dedicated to

my husband, Faruq Mahmud Hossain,

sister, Atia Ahmed,

brother-in-law, Zahurul Hossain, and

brother, Muzammel Ahmed

TABLE OF CONTENTS

	Page
Table of contents	v
List of illustrations	x
List of Tables	xi
Abstract	xv
Acknowledgement	xvi
1 Introduction	1
1.1 Purposes of the study	4
1.2 Focus of the study and its importance	4
1.3 Hypotheses about the nature of selection of immigrants and their children	9
1.4 Constraints and limitations of the study	11
1.5 Contribution of this study	12
1.6 Organization of the study	13
2 A review of the literature	
2.0 Introduction	14
2.1 Children's outcome of immigrant families	14
2.2 Covariates of child outcome	18
2.2.1 Endowments	19
2.2.2 Investments in children	20
2.3 Related theories	30
2.3.1 Becker (1981) model of inter-generational transmission	30
2.3.2 Model of immigrants' assimilation and selection	33
2.4 Differences in resources, opportunities, and environment	43
2.5 Conclusion	48

TABLE OF CONTENTS

(continued)

3 Models of child outcomes and sources of their variations

3.0 Introduction 51

3.1 A structural model of child outcomes 52

3.2 Sources of variation in child outcomes 60

3.3 Parents' selectivity in unobserved characteristics and child outcomes 69

3.4 The time of residency of immigrants and child outcomes 70

3.5 Conclusion 71

4 Data, variables, and methodology of empirical models

4.0 Introduction 72

4.1 The data 72

4.2 Measures of health and educational outcomes 74

4.3 Empirical models of child health and educational outcomes 77

4.3.1 Ordered logit model of health and educational outcomes 77

4.3.2 OLS and Heckman's (1979) two-stage models for mathematics computation test scores 82

4.4 Definitions of the study groups 84

4.5 The estimation sample 90

4.6 Specification of independent variables 92

4.7 Selectivity tests 99

4.8 Constraints of the study 100

TABLE OF CONTENTS

(continued)

5 Comparison of mean resources and outcomes of native-born Canadian and immigrant families

5.0 Introduction 102

5.1 A comparison of average resources (inputs) of native-born Canadian (NBC) and immigrant families 110

5.2 A comparison of the mean resources in the different immigrant sub-groups within the immigrant population 113

5.3 A comparison of the average health and educational outcomes of children in NBC and immigrant families 118

5.4 A comparison of the average health and educational outcomes of children in different immigrant sub-groups 119

5.5 Summary of the findings 129

6 Results and discussion

6.0 Introduction 132

6.1 Ordered logit estimates of the PMK's assessment of child's health 136

6.1.1 Ordered logit estimates of the NBC group, the combined immigrant group, and the all parents immigrant group 136

6.1.2 Ordered logit estimates of different immigrant sub-groups 142

6.1.3 Simulated probabilities of children being in different health categories: variation and the nature of selection in health outcomes measured by the PMK 149

6.1.4 Association of time of residency of immigrants and the health outcomes of their children: the ordered logit estimates of the sample of immigrants 168

TABLE OF CONTENTS

(continued)

6.2 Ordered logit estimates of the teacher's assessment of the child's overall performance 174

6.2.1 Ordered logit estimates of the children of the NBC group, the combined immigrant group, and the all parents immigrant group 175

6.2.2 Ordered logit estimates of different immigrant sub-groups 178

6.2.3 Simulated probabilities of different levels of school performances of children 187

6.2.4 The association of time of residency of immigrants and the school performance of their children: ordered logit estimates of the sample of immigrants 197

6.3 The OLS estimates of mathematics scores of children 201

6.3.1 A comparison of estimates of the NBC group, the combined immigrant group, and the all parents immigrant group 202

6.3.2 A comparison of the estimates of the children in the NBC group and the different immigrant sub-groups 203

6.3.3 Simulated mathematics scores of children: variation in scores and the nature of selection 209

6.3.4 The association of time of residency of immigrants and mathematics scores of children: the OLS estimates 217

6.4 Summary of findings 219

7 Summary and Conclusion 221

TABLE OF CONTENTS

(continued)

Appendix 1	**Income and Inequality**	233
Appendix 2	**Explanatory variables and their expected association with child outcomes**	234
Appendix 3	**Findings of the PMK's assessment of child's health**	243
Appendix 4	**Health Utility Index and its findings**	247
	Appendix 4.1 Health Utilities Index Mark III	
	Appendix 4.2 Tobit estimates of the Health Utility Index model of children	
Appendix 5:	**Some findings of mathematics test scores**	268
References		273

LIST OF ILLUSTRATIONS

Graph 3.0	The sources of variation in child outcomes between families	51
Graph 3.1	Different input levels and different child outcomes	61
Graph 3.2	Different productivity coefficients of children and different child outcomes	62
Graph 3.3	Higher productivity coefficients and higher input levels, and higher child outcomes	64
Graph 3.4	Differences in parental constraints and different child outcomes	65
Graph 3.5	Different parental preferences and different child outcomes	67
Graph 3.6	Different constraints and preferences, and different child outcomes	68
Graph 5.1	Average equivalent incomes of different groups	107
Graph 5.2	Percentage of families in different groups who own houses	107
Graph 5.3	Family characteristics of different groups	108
Graph 5.4	Percentage of children in different groups who attend private schools and who have more missing days of school	108
Graph 5.5	PMK's characteristics in different groups	109
Graph 5.6	Family dysfunction, negative parenting, and residential movements in different groups	109
Graph 5.7	Percentages of children in different health categories	126
Graph 5.8	Percentages of children in different school performance categories	127
Graph 5.9	Standardized mathematics scores of children in different groups	128

LIST OF TABLES

Table 2.1	Level of education	45
Table 2.2	Main occupation of immigrants and non-immigrants	45
Table 2.3	Unemployment Insurance (UI) participation by immigrants and native-born (% of individuals receiving UI benefits)	46
Table 4.1	Number of observations for individual variables	91
Table 4.2	Sample size and percentage of NBC children in different groups	92
Table 4.3	Explanatory variables in the base health and educational outcomes models	96
Table 4.4	Additional explanatory variables in the extended models	98
Table 5.1	Comparisons of average resources of immigrant and NBC families: *T*-tests	104
Table 5.2	Comparisons of characteristics of different immigrant sub-groups : *T*-tests	105
Table 5.3	A comparison of average health and educational outcomes of children in NBC and immigrant families: *T*-tests	122
Table 5.4	Comparisons of average health and educational outcomes of children in different immigrant sub-groups: *T*-tests	124
Table 6.1	Ordered logit estimates of base health outcome model of children in NBC and immigrant families	144
Table 6.2	Ordered logit estimates of extended health outcome model of children in NBC and immigrant families	145
Table 6.3	Ordered logit estimates of extended health outcome model of children in NBC and immigrant families excluding siblings	146

LIST OF TABLES
(continued)

Table 6.4	Ordered logit estimates of extended health outcome models of the NBC group and different immigrant sub-groups	147
Table 6.5	Ordered logit estimates of extended health outcome models of the NBC group and different sub-groups excluding siblings	148
Table 6.6	Average predicted conditional probabilities of different health categories of children	165
Table 6.7	Average predicted conditional probabilities of different health categories of children with the resources of the children of the NBC group	166
Table 6. 8	Average predicted conditional probabilities of different health categories of children with the resources of children of different immigrant groups	167
Table 6.9	Ordered logit estimates of the association of time of residency of immigrants in Canada and health outcomes of children: a comparison among immigrant sub-groups	173
Table 6.10	The ordered logit model of school performance of children of the NBC and immigrant groups: estimation with the HUI of children	180
Table 6.11	The ordered logit model of school performance of children of NBC and immigrant families: estimation without child's health	182
Table 6.12	Ordered logit model of school performance of children of NBC and immigrant families: estimation with the PMK's assessment of child's health	183
Table 6.13	The ordered logit model of school performance of children of the NBC group and the immigrant sub-groups	185

LIST OF TABLES

(continued)

Table 6.14	Average predicted conditional probabilities of different school performance categories of children	194
Table 6.15	Average predicted conditional probabilities of different school performance categories of children with the resources of the children of the NBC group	195
Table 6.16	Average predicted conditional probabilities of different school performance categories of children with the resources of children of different immigrant groups	196
Table 6.17	Ordered logit estimates of the association of time of residency of immigrants and school performance of children	199
Table 6.18	The OLS mathematics score model of children of NBC and immigrant families	205
Table 6.19	OLS mathematics score model of children of the NBC group and the immigrant sub-groups	207
Table 6.20	Average predicted conditional mathematics scores of children	214
Table 6.21	Average predicted conditional mathematics scores of children with the resources of the children of the NBC group	215
Table 6.22	Average predicted conditional mathematics scores of children with the resources of children of different immigrant groups	216
Table 6.23	OLS estimates of the association of time of residency of immigrants and mathematics scores of their children	218
Table A1.1	GNP and Income Inequality	233
Table A3.1	Ordered logit estimates of health model with ethnic working hours of PMK	243
Table A3.2	Ordered Logit model of health outcome of children of native-born Canadian and immigrant families: estimation from separate samples with actual working hours	244

LIST OF TABLES
(continued)

Table A3.3	The ordered logit extended model of health outcome of children of different immigrant sub-groups: the estimation from separate samples with actual working hours	245
Table A3.4	Simulated probabilities of being in different health categories of children using coefficients from the separate regression models	246
Table A4.1	Mark III health status classification system and multi-Attribute utility function (Simplified format on Dead/Perfect Health scale)	252
Table A4.2	Tobit model of health outcome of children of NBC and immigrant families: the estimation from pooled samples	261
Table A4.3	Tobit model of health outcomes: estimation from pooled samples of the NBC group and different immigrant sub-groups	262
Table A4.4	Average predicted conditional HUI value of children	264
Table A4.5	Average predicted conditional HUI value of children with the resources of the children of the NBC group	265
Table A4.6	Average predicted conditional HUI value of children with the resources of children different immigrant groups	266
Table A4.7	Tobit estimates of association of time of residency of immigrants and the health outcomes of children	267
Table A5.1	The Probit model of presence in mathematics test: the estimation from the full sample	268
Table A5.2	The Heckman mathematics scores model of children of NBC and immigrant group: the estimation from the pooled samples	269
Table A5. 3	The Heckman model of mathematics score of children of the NBC and immigrant sub-groups: the estimation from pooled samples with PMK's assessment of child's health	271

ABSTRACT

This study develops a theoretical model of the sources of variation in child outcomes between families. Differences in the productivity coefficients of children and differences in the inputs available to the children are the broad sources of variation. Empirically, this study undertakes three comparisons using Cycle 2 (1996-97) data from the National Longitudinal Survey of Children and Youth (NLSCY) in Canada. First, the study compares the health and educational outcomes of children of the Native-born Canadian (NBC) group with those of the immigrant group in general. Differences are also investigated within the three immigrant sub-groups: the American immigrant group, the European immigrant group and Asian immigrant group. Second, this study tests the hypothesis that the children of any immigrant group in Canada would have a higher level of health and educational outcomes for the same level of resources. Third, the study examines the association of time of residency of immigrants in different groups and the health and educational outcomes of their children.

Two alternative definitions of an immigrant family are examined in this study. A combined immigrant family is defined as one in which at least one of the parents is foreign-born; while an all parent immigrant family is defined as one in which one or both parents with whom the child lives are foreign-born. Health outcomes are measured by the PMK's (person most knowledgeable about the child) assessment of the child's health. Educational outcomes are measured by the teacher's assessment of the child's overall performance and by mathematics test scores. Ordered logit models are employed for the PMK's assessment of the child's health and the teacher's assessment of the child's overall performance. OLS and Heckman's two-stage models are used for the math scores. The children selected for analysis are 6 to 13 years of age.

The NLSCY data suggest that the health outcomes of children in the combined immigrant group are similar to that in the NBC group. However, the health outcomes in the all parents immigrant group and the Asian immigrant group are slightly lower. Among the immigrant sub-groups, the American immigrant group has the highest outcomes. The health status of children of any immigrant group is likely to be better than that of the NBC group if they were provided the resources of the children of the NBC group. Also, there is statistical evidence that the health status of children of immigrant families would improve with the time of residency of immigrant parents, if it were lower initially.

The findings from the educational outcomes suggest that the outcomes of any immigrant groups are significantly better than those of the NBC group, and the American immigrant group has the highest outcomes. The educational outcomes as measured by the teacher's assessment would be better even for the same level of resources. There is, however, mixed evidence that the mathematics performances of children in immigrant families would be better than those in the NBC families for the same level of resources. There is no evidence that the educational outcomes of children would improve with the time of residency of immigrant parents in Canada. The findings of this study demonstrate that the children of immigrant families are assimilating human capital and fitting into Canadian society quite well.

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CHAPTER 1
Introduction

1.0 Introduction

Canada is a land largely settled and built by immigrants and their children. According to the 1996 Census of Canada, immigrants comprise 17.4% of the total population. The immigrant population, as a source of population and labour force growth, has played, and continues to play, a significant role in the development process of Canada. The social and economic impact of immigration is determined not only by the characteristics of immigrants themselves, but also by those of their offspring. The economic, social and physical condition of the children of immigrant families reflects the long-term consequences of immigration policies. A principal goal for a society is to obtain the most efficient, productive and non-discriminatory utilization of resources. Hence, it is necessary to recognize the importance of the immigrant population as well as its children. However, while research on immigration is vast, comparative economic research on the children of immigrant families in Canada is almost absent.[1]

Where the children of immigrant families fit in Canadian society in terms of human capital formation should be an overarching issue for policy makers as these children could be a hope or stress for Canadian society. For this reason, it is essential to undertake comparative research on the health and educational outcomes of children of immigrant and native-born Canadian (NBC) families to establish whether there is a gap among child outcomes. Such a gap may reflect the pattern of economic and social disparities between the two groups. This leads to a number of related questions. How is the health status of children of immigrant families compared to their counterparts? Are the children of immigrant families behind in school compared to the children of NBC families? If so, is it because of fewer resources? Do the health and educational outcomes of children of immigrants vary within the immigrant population? Do these outcomes change with the time of residency of their parents in Canada? The answers to these questions may

[1] To the author's knowledge, Worswick (2001) is the first economic study of educational outcomes of children of immigrants in Canada. See Chapter 2 for more details.

indicate whether the children of immigrant families are fitting into Canadian society in terms of human capital formation.

Available information on the immigrant population suggests that, on average, immigrant families have higher levels of the observable resources that affect child development outcomes.[2] 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. Because the health of immigrants is screened, this results in a higher health status. This information indicates that the average health and educational outcomes of children in the immigrant families are likely to be better than that in the NBC families.

In the immigration literature, research on economic assimilation (a positive change in labour market outcomes with the time of residency in the host country) and self-selection[3] (a higher labour market outcomes of immigrants compared to observably comparable native-born) of immigrants is prominent. Research on self-selection of immigrant populations suggests that immigrant populations may be positively selected in terms of unobservable characteristics such as drive, ability, motivation, attitude, farsightedness, ambitiousness, and willingness to work hard. 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, which denote "differential cultural capital." Also, research on economic assimilation[4] shows that the average labour market outcomes of immigrant families are

[2] See Chapter 2 for detailed information.

[3] Chiswick (1978) and Borjas (1985, 1987, 1991) are prominent models of immigrants' assimilation and self-selection.

[4] For example, see Chiswick (1978, 1986a), Blau (1980), Carliner (1980), Defreitas (1980), Long (1980), Tienda (1983), Borjas and Tienda (1985), Borjas (1985), Poston (1988), Jensen

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,[5] 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 observable resources would lead to a higher level of outcomes. Moreover, the association between the observable resources and child outcomes is likely to be stronger for the immigrant group than for the NBC group because of a higher level of differential cultural capital. In the immigration literature, the later finding would be consistent with a positive selectivity hypothesis: a higher level of outcome for the same level of observable resources. Furthermore, the outcomes of children of immigrants are likely to improve with the time of residency of their parents as they assimilate in the host country.

The immigrant population, however, is not homogeneous; immigrants come from a wide variety of countries and, as result, have different cultural and economic backgrounds. Research on immigrants' assimilation and selection also shows that the above characteristics of the immigrant population may not be applicable to each and every national origin. All immigrants may not be positively selected, and the assimilation rate may vary. Borjas (1985, 1987, 1991) shows that there is no general law stating that all immigrants must be positively selected, and the speed of assimilation differs with national origin and for cohorts in the U.S. For example, immigrants from the advanced industrialized countries assimilate rapidly compared to those from the Third World countries. He also shows that the assimilation rate of recent cohorts is slower compared to earlier cohorts, irrespective of country of origin. Green (1999) finds that an immigrant's adjustment is related to the

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(1988), Duleep and Regets (1992, 1996, 1997), Jasso and Rosenzweig (1990), Lalonde and Topel (1991), and de Silva (1997).

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

characteristics used in immigrant selection in the entry. In particular, immigrants who are not fluent in English or French perform less well in Canada. He argues that lack of fluency might be a signal for low-ability individuals. Some other studies[6] find only modest evidence of assimilation for recent immigrant cohorts, who arrived after 1965, but significant evidence of "permanent" or cohort effects. McDonald and Worswick (1999) provide evidence of positive assimilation of immigrants from English speaking backgrounds but not for those who are from non-English speaking backgrounds. These variations in the characteristics of the immigrant population suggest that the health and educational outcomes of children of immigrant families will also vary depending on the country of origin. Research on children of immigrant families would help examine the relationship of the above characteristics of immigrants and the outcomes of their children.

1.1 Purpose of the study

The purpose of this study is:

I) to compare the health and educational outcomes of children in different immigrant families with those of NBC families;

II) to compare the health and educational outcomes of children of immigrants families in general with those of NBC families for the same level of resources. In other words, the objective is to test the hypothesis that the children of immigrant families in general are a positively selected sample;[7]

III) to compare the health and educational outcomes of children of the American immigrant group, the European immigrant group, and the Asian immigrant group with those of the NBC group for the same level of resources;

IV) to examine the relationship of the health and educational outcomes of children in different immigrant groups and the time of residency of their immigrant parents in Canada.

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[6] Borjas (1985, 1993, 1995), Yuengert (1994), Baker and Benjamin (1994), and Bloom, Grenier and Gunderson (1995).

[7] This is an econometric concept of sample selection. In fact, the children of immigrants do not

1.2 Focus of the study and its importance

The area of this study covers several dimensions. The focus of the study and its importance is discussed below.

Human capital of children

This study examines the health and educational outcomes of children in Canada. Among all of the child development outcomes, health and school performance are the most basic factors that help predict the future prosperity of a child as well of a society. These two factors form human capital, which affect the labour market outcome of a child when he/she becomes an adult. In the aggregate, human capital is a significant determinant of the economic growth of a country. Health is the most desirable outcome, as it is linked with all other outcomes. Good health affects a person's ability to realise fully his/her potential. A child's school performance contributes to his/her subsequent outcomes such as post schooling experience and potential earnings. Jencks et al. (1979) find that academic skills measured in grade school are significant predictors of later educational attainment, occupational status, and earnings. Currie (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. Since the health and school performance, human capital, of a child is the foundation of his/her socio economic success and prosperity, research on children's health and school performance would provide useful information for policy makers to develop effective programs to help children succeed in adult life.

The relationship of immigrants' selection and assimilation with human capital of children

Another objective of this study is to test the hypothesis that the children of immigrant families are a positively selected sample. If immigrants are taken to be positively selected their children are also likely to be positively selected. In other words, for the same level of

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go through the process of selection, as their parents do.

resources, the children of immigrant families will have higher health and educational outcomes compared to those of the NBC families. On the other hand, if the children of immigrant families are negatively selected, this may impose an extra burden on Canadian society to provide necessary services. This study will provide information about whether, or not, the children of immigrant families are a positively selected sample. This information about children can be compared to the available literature on immigrants. In this way, the relationship of immigrants' selection and children's outcome can be determined.

The time of residency of immigrants in the host country reflects the opportunity of immigrants to assimilate both economically and culturally. The labour market assimilation of immigrant parents is likely to affect the human capital of children. If immigrants assimilate rapidly with the time of residency, and if parents transmit their resources to their children, the human capital of the children in the immigrant families would catch up to that in the NBC families if it were lower initially. On the other hand, if immigrants fail to assimilate to the labour market, they are more likely than NBCs to be unemployed, to lie below the poverty line, and to qualify for public assistance. A lower parental outcome is likely to lead to a lower child outcome according to the intergenerational transmission theory. As a result, the children of immigrant families could lag behind in terms of developmental outcomes, which would be a great concern for Canadian society. If these disparities persist with the time of residency, it would reflect social inequity. The fear that unassimilated immigrants will form a permanent underclass and have a major detrimental impact on the economic standard of the whole nation as well as on child development outcomes is a serious concern. Thus, for policy purposes, it would be helpful to study how the health and educational outcomes of children change with the time of residency of their immigrant parents in Canada.

Child outcomes of different immigrant groups and the success of immigration policies in selecting immigrants

The health and educational outcomes of children depend on the resources and opportunities available to them. There are variations in the resources and opportunities in different immigrant families depending on the country of origin. For example, Dudley and Poston (1995) show that immigrants from West European countries have above average income and education, whereas, immigrants from Latin American countries have below average income and education. Portes (1996) shows that Asian Indians and Taiwanese are the most educated groups and Mexicans and Salvadorans are the least educated groups in American society. According to Borjas (1985), the post-war cohorts of immigrants in the U.S. performed less well in the labour market compared to earlier cohorts. This information indicates that child outcomes among different immigrant groups could vary because of variation in parental resources of different groups.

This study aims to examine the health and educational outcomes of children of three immigrant sub-groups: the American immigrant group, the European immigrant group, and the Asian immigrant group. As stated before, child outcomes reflect the long-term consequences of immigration policies. Research on comparative child development outcomes of different immigrant groups would be useful in evaluating the success of past immigration policies. Immigration policies in Canada have undergone many changes.[8]

[8] In 1962, the federal government replaced its discriminatory immigration policy based on national origin with a policy that selected immigrants according to a specific set of criteria. This was followed in 1967 by the introduction of the Point System. The Point System allows immigration authorities to objectively select immigrants according to the demand for various skills and occupations within the Canadian economy. Points are awarded based on a candidate's age, education, training, experience, personal suitability, occupational demand, arranged employment and knowledge of official languages. Canada also admits, without any economic assessment, convention refugees and individuals in refugee-like situations for humanitarian purposes. These policy changes relative to the entry requirements of immigrants into the country shifted Canada's immigration population inflow from its traditional sources of immigrants, in particular Great Britain and Eastern Europe, towards less-developed regions. Also, the largest proportions of immigrants arriving in Canada are in economic class. For example, in 1994, 49% of new arrivals were economic class, 42% were in social or family class and 9% were admitted on humanitarian

Since 1967, new policies have given more emphasis on skills and shifted geographic origins from traditional sources towards less developed regions.[9] With this change in immigration policy, there exists both a hope and a fear about the performance and potential of Canadian society. The hope is that the emphasis on skills and education encourage immigrants who are more able to assimilate. Moreover, immigration legislation in Canada tries to ensure the health of those entering the country by screening their health status. Since parents' health is an important determinant of child health and educational outcomes, this procedure is likely to have positive effects on the health and educational outcomes of their children. In other words, this procedure is likely to bring a 'healthy immigrant effect' (Dunn and Dyck 2000).

The fear comes from the poor labour market performance of recent immigrant waves compared to earlier waves. Recent immigrants have had more severe adjustment difficulties whereas the earlier groups were able to establish themselves in the host country in a relatively short time. This pattern may be an indication of negative selectivity (a lower level of productivity for the same level of observed characteristics) of recent immigrant population, which in turn, might affect child development outcomes negatively. Also, the average life expectancy of the Third World countries is lower which may have a negative effect on the health status of children. According to Dunn and Dyck (2000), immigrants from the countries with poorer health status may be of concern in terms of their future health care utilization. Research on the health and educational outcomes of children of different national origins would help evaluate the past immigration policies, and redirect (if needed) them to attract those immigrant groups that are more likely to produce better child outcomes and, hence, higher future productivity, growth and welfare.

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grounds (Citizenship and Immigration Canada, 1996).

[9] Until about the early 1970s, the majority of immigrants to Canada came from the US, Britain, and other European countries. By contrast, the majority of recent immigrants are of non-European background. Whereas, during the1950s, for example, over 80% of all immigrants arriving in Canada each year were from Europe; by 1994, however, just 17% of immigrants were from Europe, and 74% were from Asia (Citizenship and Immigration Canada, 1996).

1.3 Hypotheses about the nature of selection of immigrants and their children

According to intergenerational transmission theory, parents transmit a portion of their observable and unobservable characteristics to their children. As mentioned before, immigrants' selections are related to their having a higher or lower level of unobservable characteristics such as drive, attitude, and motivation. These characteristics are termed in this study as "differential cultural capital." The immigrant parents would transmit their higher (lower) level of differential cultural capital to their children that would shift the health and educational outcome function of their children upward (downward) compared to that of the NBC group. This is likely to be reflected in a stronger (weaker) association of child outcomes and observable resources. As a result, with the same observable resources, the health and educational outcomes of children are expected to be higher (lower) for immigrant families than for NBC families. Indirectly, this would imply that the children of immigrant families would be positively (negatively) selected. In other words, the selectivity of parents and children are likely to be positively associated. In this study, the selectivity tests are not performed on the immigrant parents, but on their children. The nature of selection of different immigrant groups is predicted based on the available research on the immigrant population.

As previously noted, Chiswick (1978), asserts that the immigrant population is positively selected, that is, they have a higher level of outcome for the same level of observable resources. His hypothesis implies that the children of any immigrant group would be a positively selected sample. On the other hand, Borjas (1985, 1987, 1991) argues that:

A) A positive selection in the host country is most likely to occur when the country of origin and the host country have similar characteristics, say, the same level of industrialization, political system, and economic development, but the country of origin has a more equal distribution of income compared to the host country. The country of origin taxes high ability workers and insures low ability workers against poor labour market outcomes compared to the host country.

B) A negative selection in the host country is most likely to occur when the country of origin and the host country have similar economic and political systems but the country of origin has a higher level of inequality as compared to the host country.

These insights are expected to have the following implication for the nature of the selection of the American, European, and Asian immigrant groups and their children in this study. The American immigrants who immigrated during 1970s in Canada are likely to be positive selected. The reason is that the two countries resemble each other in terms of their level of economic development and political system, but income inequality in the U.S. was slightly lower when the immigrants immigrated to Canada.[10] Thus, American immigrant families in Canada had a positive differential cultural capital compared to comparable NBC families 20-years ago. A positive intergenerational impact of immigrants' selection indicates that the American immigrant families will transmit that differential cultural capital to their children. For that reason, the children of the American immigrant group are likely to be a positively selected sample, and hence, the health and educational outcomes of children are likely to be higher for the American immigrant group than for the comparable NBC group. Since Borjas finds that the European immigrants are positively selected and the Asian immigrants are negatively selected in the U.S., the children of the European immigrant group are likely to be a positively selected sample and the children of Asian immigrant group are likely to be a negatively selected sample in Canada.

Moreover, as mentioned before, McDonald and Worswick (1999) show that the immigrants from English speaking backgrounds perform better. In this sense, the children of the American immigrant group may perform better for the same level of resources. Moreover, Green (1999) argues that fluency in English might be a signal for high-ability individuals.

[10] The average years since the American immigrants came to Canada is approximately 20 years from the Survey Year, 1996/97. See Appendix 1 for information about inequality in Canada and the U.S. during that time.

If this is the case, then the children of the American immigrant group are also likely to be positively selected according to this hypothesis. Applying these arguments, it can also be predicted that the children of the Asian immigrant group would perform poorer as most of their parents do not come from English speaking backgrounds.

1. 4 The constraints and limitation of the study

This study uses data from the master file Cycle 2 (1996-7) of the National Longitudinal Survey of Children and Youth (NLSCY) in Canada.[11] Because of using this data set some constraints and limitations are inexistent:

I) A serious problem with this data set is missing values. This problem has caused a relatively smaller sample size for the immigrant group compared to the NBC group. The sample size problem is more severe for the immigrant sub-groups. As a result, the findings may be less reliable for the immigrant group, particularly, for the immigrant sub-groups compared to the NBC group.

II) This study examines the relationship of the time of residency of immigrants and the health and educational outcomes of children using cross sectional data that may not reflect the long-term relationship if there is any structural changes in the long run.

III) The math test scores or the teachers assessment the child's overall performance in a cross section may not reflect the long-term educational outcomes of children.

IV) The children of the studied sample are less than or equal to 13 years of age. A testing of the assimilation hypotheses on this age group may not reflect the assimilation effect on the educational outcomes of older children.

V) This study does not test the selection and the assimilation hypotheses on the parents of children in Canada. Rather, it accepts the nature of selection and pattern of assimilation of immigrants from different groups available in the literature[12] and tries to predict the same for the children of immigrants. Since most of the studies examine the nature of selection and assimilation of immigrants in the U.S. this

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11 See Chapter 4 for more details.

prediction for the children of immigrants in Canada may not be appropriate. However, this could be a topic of future research.

VI) The empirical models of this study do not consider the simultaneous relationship of child outcomes and family resources that could create some endogeneity bias in the estimates.

1.5 The contribution of this study

From a theoretical point of view, this study builds a model of the process of child development that integrates the optimization process of parents and the child, and considers the possibility of a simultaneous relationship of parental investment and child outcomes. Further, it explains the sources of variation of child outcomes in terms of the productivity levels of children, and preferences and constraints faced by both the parents and the child. This theoretical framework makes a unique contribution to the literature of child outcome models.

Empirically, this thesis provides information on the resources available for the children of immigrant families and their variation in human capital formation. Typically, the immigration literature provides information about the whole immigrant population in North America or in Canada, but does not disaggregate according to whether or not children are present in the family. There has been little research on resources available for children of immigrant families in Canada and their health and educational outcomes. This study examines the two alternative definitions of an immigrant family. It also investigates the differences in the health and educational outcomes of children of three immigrant sub-groups: the American immigrant group, the European immigrant group and the Asian immigrant group. By carrying out a comparative research in these areas, this study makes a positive contribution to the literature. Most importantly, to the author's knowledge, there is no study that applies the intergenerational transmission hypothesis on immigrants'

[12] Chiswick (1978), and Borjas (1985, 1987,1991) are studies of immigrants in the U.S.

assimilation or immigrant's selection. By examining these three hypotheses on the children of immigrant families in Canada, this research makes a unique contribution to the literature. This line of research will also make a positive contribution to the child development literature. In addition, this thesis provides valuable information for the design and implementation of optimal and equitable development programs for the children in Canada.

1.6 Organization of the study

This study is divided into seven chapters. Chapter 2 is a review of the literature; which focuses on the children's outcome of immigrant families, the covariates of child outcomes, differences in resources available to children of native-born and immigrant families, and the theories of immigrants' assimilation and selection, and intergenerational transmission that are applied to the hypotheses of the study. Theoretical models of child outcomes and sources of variations are developed in Chapter 3. Chapter 4 describes the empirical models, data, variables, and methodology used in this study. Mean values of the health and educational outcomes of children, and their covariates are compared in Chapter 5. Empirical findings are presented and discussed in Chapter 6. Chapter 7 summarizes the findings and makes concluding comments.

CHAPTER 2

A Review of the Literature

2.0 Introduction

As mentioned in Chapter 1, with the exception of Worswick (2001), very little economic research has been carried out on the children of immigrant families in Canada. Sociologists, development psychologists, demographers, and economists[13] have done a vast amount of research, however, on the development outcomes of children. This chapter reviews the relevant literature in four areas: outcomes of children of immigrant families in Canada and in the U.S.; covariates of child outcomes; theories of intergenerational transmission, immigrant's assimilation and selection; and resources available to immigrant and native-born families in Canada.

2.1 Children's outcome of immigrant families

Studies on the children of immigrants in Canada

Munroe-Blum et al. (1989) examine the psychiatric disorder, school performance and service utilization of immigrant children aged 6-16 years in Canada using data from the Ontario Child Health Study collected in 1983. The study uses two definitions of immigration status: "children born outside Canada" and "language spoken other than English or French." The total number of observations was 2,852; 251 children were born outside of Canada. The method used in the study is logistic analysis where teacher's assessment of school performance, mother's assessment of psychiatric disorder and health services utilization in the last six months were the dependent variables. The study finds that compared to non-immigrant children, immigrant children are more likely to reside in urban areas; are at higher risk for social disadvantage; are more likely to live in overcrowded condition; as likely to live in subsidized housing, and less likely to live in a family which depends mainly on welfare assistance. The bivariate results indicate that being an immigrant child is not a risk indicator for psychiatric disorder or poor school performance. Although the utilization rate of ambulatory medical services is similar, that of mental health and social services is significantly lower for the immigrant children than for the native-born.

[13] Research on children's outcomes carried out by economists is relatively rare.

It is important to note that the results of the study do not vary with the definition of immigration status.

Beiser et al. (1998) examine children's mental health outcomes (conduct disorder, hyperactivity, emotional disorder) in Canada using data from the first cycle of the National Longitudinal Survey of Children and Youth. The study uses the information that recent immigrants (who have been living in Canada for less than 10 years) are typically poorer than their host country counterparts and examines the factors that mediate the effect of poverty on their children's mental health outcomes: family functioning, parental depression, single parent family status, family drinking problems, parenting behaviour and child care by parents. Using descriptive statistics and multiple linear regression models, the study finds that despite the fact that new immigrants have a higher poverty rate (30%) than do the native-born (13.2%), the children of new immigrants have a lower rate of mental health problems than do the children of the native-born. Further, familial factors mediated the effects of poverty on native-born Canadian children's mental health. This was not the case for new immigrant families for whom poverty may represent an inevitable part of the resettlement process. According to the authors, these findings indicate that Canada's immigration policies and practices have resulted in an effective selection of healthy, resilient, and success-bound families and children. Creative job training programs, equity in job access, and recognition of foreign credentials of immigrants, however, would be useful to implement in order to improve the economic condition of new immigrants and the health status of their children.

Worswick (2001) analyzes the school performance (ability at reading, writing, mathematics, and overall aptitude) of children of immigrants in the Canadian school system using data from the first three waves of the National Longitudinal Survey of Children and Youth. Immigrant parents are identified according to the immigration status of the Person-Most-Knowledgeable (PMK). The association of PMK's mother tongue, the child's gender, and the education level of both the PMK and the PMK's spouse on the educational outcomes of children are examined. The assessments of the children's performances by parents and teachers are studied using fixed effect estimation method. The test scores models are estimated using standard regression analysis. Discrete assessments of performance of the child by the PMK and the teacher are examined using linear probability models. The results of the study indicate that, 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 in reading, writing and composition compared to the children of immigrants whose first language is neither English nor French. The results also suggest 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.

Studies on the children of immigrants in the U.S.

Carliner (1995) studies the English language ability of U.S. immigrants and their children using data from the 1980 and 1990 U.S. Census of Population. The study examines the impact of education, sex, country of origin, age at entry, years since entry, and year of entry on language skills. The main finding about the children of Hispanic or East Asian immigrants who had come to the U.S. during the past 30 years is that a substantial fraction of these children were not fluent when they entered grade school; at most 3 to 5% of these groups reported speaking poorly or not at all. Education, age at arrival, sex, and region of origin affect English skills. An additional year of schooling increases the probability of fluency by about 5 percentage points. For immigrants in their 20s, each additional year of age at arrival lowers the probability by about 1.7 percentage points. Women, especially East Asian and European women, are slightly more likely to be fluent than men. Geographic distance from the U.S. is negatively related to the probability of being fluent in English.

Currie (1995b) compares the impact of Medicaid eligibility on public and private health insurance coverage and on the utilization of medical services among children of native-born and immigrants in the U.S. using data from the 1989 to 1992 National Health Interview

Survey. State rules and information about family characteristics are used to evaluate the Medicaid eligibility of each child. Applying instrumental variable methodology, where eligibility is instrumented using an index of the generosity of state Medicaid regulations, the study finds that the children of recent immigrants and immigrants in border states are more likely than other children to be eligible for Medicaid, but less likely to use health care. Recent expansion of eligibility had negligible effects on Medicaid coverage among the children of immigrants, but rose among the children of native-born. Becoming eligible for Medicaid reduces the probability that a child went without a doctor's visit more for the children of immigrants, but increased the hospitalization rate only among children of the native born. Hence, recent expansion drew many previously unserved children of immigrants into care without increasing the number of visits by infra-marginal users.

Card et al. (1998) compare the economic performance of immigrants with that of their children using data from the 1940 and 1970 U.S. Census of Population, and from (1994-96) Current Population Surveys. Using cohort level data for different immigrant groups they examine the rate of "intergenerational assimilation"[14] between immigrant fathers and second-generation sons and daughters. They find that a significant intergenerational links exists between the economic status of immigrant fathers and the economic status and marriage patterns of their native-born sons and daughters. This linkage works mainly through education: children of better-educated immigrants have higher levels of education, higher earnings, and are more likely to marry outside of their father's ethnic group. Their findings suggest that the changes in the ethnic composition of immigrant flows have caused a decline in the relative economic status of immigrants as a whole between 1940 and the mid-1990s and a decline in the relative status of the second generation who are in the lower deciles of the wage distribution. The authors do not find any evidence, however, that the degree of intergenerational assimilation has declined systematically between the cohort of second-generation children (those born in the U.S. whose mother and father were immigrants) raised in the 1940s and 1950s and those raised in the 1960s and 1970s.

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[14] Intergenerational assimilation is measured by intergenerational correlation in education or earnings, or by inter-ethnic marriage patterns. This is discussed in further detail in Section 2.3 of

Moreover, the second-generation children continue to have higher education and wages than children of comparable U.S.-born parents, as their parents did in the past. They conclude that, others things being equal, being a child of immigrants is associated with a greater socio-economic success in the U.S.

2.2 Covariates of child outcomes [15]

Although the literature on the children of immigrant families is sparse, that on children's outcome has been vast. It is worth reviewing this literature to specify the health and educational outcome models of this study. To include the explanatory variables and to predict the nature of the relationship of these variables with the health and educational outcomes of children, the focus of this section is on the covariates of child outcomes.
Broadly speaking, the covariates of child outcomes refer to any factor that is associated with child development outcomes. Given this definition, it is very difficult to list all the factors that affect child outcomes. One problem is that concept of child outcome is not specific. For example, an outcome could be a health, education, labour market outcome, cultural outcome, child's personality and behaviour. The concept of child outcome also varies depending on the age of a child. Another related problem is that all the factors that are related to a specific outcome are not exactly known.

Social scientists from different disciplines study the covariates of child outcomes from different perspectives. Economists emphasize the predictors that are related to parental and public investments, and the endowments in human capital formation of children.[16] Also, the methodology they apply to examine the relationships of child outcomes and their covariates often vary from other disciplines. Sociologists examine other societal variables, beyond economic variables, such as family structure, family connection, peer group characteristics,

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this chapter.

[15] This section draws heavily on (Haveman and Wolfe 1995)

[16] For example, Leibowitz (1974), Becker and Tomes (1979, 1986), and Goldberger (1979) develop economic models of children's attainment. Parents' education, work and occupational status, age and health status, ability, family income, assets, house ownership, and welfare assistance, decision to live in an urban/rural location, are prominent examples of parental investment in children. Examples of public resources are schools, libraries, hospitals, recreational

mother's age at the birth of a child, and marriage status of parents, personality of parents, neighbourhood environment, race, ethnicity, religiosity, and birth order of the child.[17] Development psychologists emphasize the predictors that are related to the psychological development of a child, such as home environment, sources of parental income, parental divorce and separation, parenting, parental motivation and expectation, relationship with peers and friends, school and community environment, and change in geographic location.[18] Although the unobservable characteristics of parents such as parental ability, motivation, and drive affect children's success (Haveman and Wolfe 1994), this review examines the covariates of child health and educational outcomes that are observable, and surveys the nature (positive or negative) of their association.

2.2.1 Endowments

Endowments are resources that are difficult to change by individual choice. For example, people cannot change their ethnicity. Similarly, it is also difficult to change religious or cultural beliefs. The health and educational outcomes of children could differ because of inheritance of different endowments by different families. A review of the studies that find endowments to be important covariates of child development outcomes is presented below.

Ethnic and religious background of the family

Bradley and Caldwell (1984a, 1984b) find that ethnicity is a significant determinant of child outcomes. Some studies find that home environment and family socialization practices, specifically, the types of learning practices provided to the children, vary with different ethnic groups.[19] These learning practices cause variation in cognitive skills amongst children of different ethnic groups. Borjas (1992, 1994) finds that ethnicity is associated with the human capital accumulation process. Goldhaber and Brewer (1997) find that Black and Hispanic students have lower predicted mathematics scores, on average, than do white

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facilities, police, counselling, employment opportunities, and economic condition of the state.

[17] For example, see Jenks and Mayer (1990), and Brooks-Gunn et.al. (1993).

[18] For instance, see Elder (1974), McCubbin et al. (1980), Bronfenbrenner (1989), and Seltzer (1994).

[19] For instance, see Wachs and Gruen (1982), Bradley et al. (1989), Berlin et al. (1995), and Brooks-Gunn et al. (1996).

students in the U. S.

Like ethnicity, the religious affiliation of the family also influences their choices. Chiswick (1986b) finds that Jewish mothers make greater investments of their time in the home-produced human capital of their children. Stortfer (1990) shows that coming from a Jewish background has a strong effect on parental investment in children. The author attributes the relatively high-test scores of Jewish children to the "maternal and educational emphasis provided in traditional Jewish homes."

Cultural and socio-cultural differences between family lives

According to Hill and O' Neil (1994), family culture affects the decisions about the extent and nature of the family's investment in their children. Families that place a high value on educational achievement are likely to allocate more of their resources to the provision of mental stimulation to children. Parental ethnic background influences maternal and paternal values and assumptions that affect home environments. As a result, social outcomes and cognitive outcomes of children are expected to be different for families of different cultural background. For example, Reischauer (1980) and Fuchs (1983) attribute the scholastic success of Japanese children to the strong role played by the *kyoiku mama* or "education mother" as the Japanese mother is often termed. The educational success of children of recent Asian immigrants in the U.S. is often explained as a product of the cohesiveness of Asian families and achievement-oriented cultural values (Schneider and Lee 1990, Caplan, Choy, and Whitmore 1991, and Feigin 1995).

2.2.2 Investments in children

Investments are variables that vary depending on the choice made by individuals, families or society. For example, people can change their income or education level by choice. Hence, these variables are considered as investment. Investment in children is a broad predictor of child outcome. The studies that describe the investments in children and how they are associated with children's health and educational outcomes are reviewed below.

Income and wealth

Hernandez (1993) asserts that the income of the family in which a child grows up indicates a level of economic resources available to a child. Many studies find that family income and wealth are significantly associated with health and educational performance of children.[20] According to Salkind and Haskins (1982), the negative income tax experiments conducted in the 1970s in the U.S. provide evidence that increases in income can improve the educational achievement of low-income children. According to Haveman and Wolfe (1994), stability of income over time is more important for children's success than the present income. Mayer (1997), and Blau (1999) find that child outcomes are more strongly related to permanent income than to current income. This finding is reinforced by Curtis et al. (2001) who find that it is low permanent income that is associated with poor cognitive outcomes rather than low current income.

Family size

The size of a family is determined by the choice of parents, and affects children's health and educational outcome in many ways. Leibowitz (1974) argues that the children in smaller families receive more time inputs from parents. Becker and Tomes (1976) argue that because siblings are competitors for the limited time and financial resources of their parents, the larger the number of siblings, the less time the parents can devote exclusively to each child and the fewer are the financial resources. Hence, there is a trade-off between child quantity and child quality. Hanushek (1987) further distinguishes between public time which all children share and private time, which is child specific. As family size increases, public time is necessarily substituted for private time with an expected negative effect on development outcomes of children. Hernandez (1989), on the other hand, argues that growing up in a large family can be beneficial because brothers and sisters share the companionship of childhood, which is likely to positively affect child development outcomes. Hernandez (1993), however, argues that having brothers and sisters could be a mixed blessing for a child. Belmont and Morolla (1973), Hanushek (1992) and Hill and

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[20] For instance, Sewell and Hauser (1975), Comia (1984), Haveman and Wolfe (1994), Hill and O'Neill (1994), Lipman et al. (1994), Knox (1996), and Dooley et al. (1998).

O'Neill (1994) find that a larger family size has a significant negative impact on the cognitive achievement of children.

Parents/Mother's education

Although parents' education affects their income, which in turn affects child outcomes, it also has some independent effects on child's health and educational outcomes. Studies that included this variable in models of children's attainment find it has a significant and positive association with children's attainment.[21] Leibowitz (1974) argues that educated parents spend more quality time with their children than do less educated parents. Parcel and Menaghan (1994) assert that the education of parents is perhaps one of the fundamental economic factors that affects child developmental outcome because education reflects the knowledge, experience and aspirations that parents bring to their children. Worswick (2001) finds that parents' education is strongly associated with children's school performances.

Leibowitz (1974) also argues that since mother's time expenditures on children typically exceed those of fathers, mother's education is more important than that of father's for children's attainment. Edwards and Grossman (1977) find that mother's schooling has a larger impact on cognitive development than does father's schooling. Hill and O'Neill (1994), and Rosenzweig and Wolpin (1994) find mother's education makes a positive and statistically significant contribution to children's cognitive achievement.

National censuses and surveys from many different countries have shown that the association of child-health and mother's education persists after controlling for socio-economic status.[22] Cleland (1989) argues that education probably enhances knowledge about effective ways to prevent, recognize, and treat childhood illnesses. In his review of the literature, Barrera (1990) presents four explanations of how mother's education affects child's health. First, it increases the economic resources available to the family through

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[21] See Haveman and Wolfe (1995) for a review of these studies.
[22] See Grossman (1982), Cornia (1984), and Grosse and Affrey (1989).

assortive mating with richer men, through her own increased earnings from market efficiency gains (Schultz 1984, Ware 1984), and through an increase in full incomes brought about by non-market efficiency gains (Michael 1973). Second, it enhances the productivity of health inputs through an increase in the mother's non-market efficiency (Michael 1973, Welch 1970, and Rosenzweig and Shultz 1985). Third, it improves the allocation of resources due to better knowledge and access to information (Welch 1970). Mother's education improves child health by increasing technical efficiency or productivity of health inputs and also by reducing cost of information on choice of technology (Schultz 1984). Finally, it affects household preferences given prices, income, efficiency and information (Caldwell 1979).

Mother's employment and work time

Like mothers' education, her employment and work time also has some independent effects on child's health and educational outcomes. The literature suggests that mother's employment time may have mixed impacts on health and educational outcomes of children. One obvious and beneficial effect of mother's employment in a two-parent family is that working parents can earn more income than one parent alone is likely to earn (Parcel and Menaghan 1994). This earning power, however, gives more economic control to her, which affects child outcome in a different direction. The "good mother" hypothesis asserts that the average mother has greater concern for her children's welfare than does the average father; a greater maternal economic control should result in a greater proportion of family income being directed to the children's interests (Schultz 1991, Thomas 1990, Phipps and Burton 1992, and Browning et al. 1994).

Hoffman (1989) argues that parents in dual earner families place greater stress on independence training for children that do other parents, and independence is a characteristic that becomes advantageous during adulthood when occupations with high social prestige and high incomes are at stake. Glenna (1988) notes that children whose mothers are employed exhibit less sex-role traditionalism and more egalitarian sex-role attitudes than do children whose mothers are not employed. These studies conclude that daughters may benefit from mother's employment in their social adjustment, school performance and occupational attainments. Haveman, Wolfe and Spaulding (1991), Vandell and Ramanan (1992), and Kaestner and Corman (1995) find positive effects of maternal employment on the cognitive development of children.

On the other hand, mother's employment and working time reduces home time for the child. Coleman (1988) expresses concern that job holding will weaken the "social capital" that depends on the relationship in which children are embedded. In this case, long hours of paid work may negatively affect mother's parenting style, her ability to provide a supportive home environment and help children progress cognitively. The "working mother" hypothesis suggests that the mother's absence from the home may be the source of developmental problems in children, manifested in reduced achievement in a variety of dimensions. Hetherington et al. (1983) and Desai et al. (1989) report that for children under age 4, mothers' employment appears to have an adverse effect on intellectual performance if the mother is employed during the first year of the child's life. Blau and Grossberg (1991), Mott (1991) and Ruhm (2000) find a significant detrimental impact of maternal employment on the cognitive development of children.

Parent's occupational prestige

Not only is parental employment and working hours associated with child outcomes, but also the occupation of working parents. The actual paid working condition that parents face in their jobs is an important determinant of parental child rearing values. Gecas (1979) asserts that having a parent in a complex job can be a resource for children in that it sets a high expectation level regarding self-direction and intellectual flexibility, qualities that should increase children's socio-economic well being as they grow up. According to Parcel and Menaghan (1994), parents with high levels of occupational complexity will encourage children to internalize behavioural norms. Khon and Schooler (1978) argue that the conditions of work that are more common in less well-paid jobs: routinization, low autonomy, heavy supervision, and little demand or opportunity for substantively complex work- reduces intellectual flexibility, which is an important component of cognitive skills.

The distress caused by low occupational standing has predictable intergenerational impacts. Parents with higher distress display less attentive, responsive, and stimulating parental behaviour and provide less optimal child-rearing environments (Menaghan 1983a, 1983b). Thus, parental occupational prestige is likely to be positively associated with child developmental outcomes.

Mothers age at child's birth

Mother's age at the birth of her child is likely to be associated with the developmental outcomes of the child. Parcel and Menaghan (1994) argue that maturity, sense of control and patience of a mother increase with her age and they affect child development. Edwards and Grossman (1977) argue that mother's age at the time of birth can be considered an endowment as relatively older mothers have been found to have a greater frequency of infants in poor health, while relatively young mothers are likely to have "unwanted" births and consequently receive poorer parental care. Shariff and Ahn (1995) find that mother's age at her child's birth has a positive association with child health. Hill and O'Neill (1994) find a positive and significant association between mother's age at the birth of her child and the cognitive skills of children.

Mother's health

The health of a mother is likely to affect the health and educational outcomes of children. This factor has a positive bearing on the child's health through better birth weights (Barrera1990). Graham (1972) and Schultz (1987) show that children of healthy mothers exhibit a better health performance. Poor parental mental health has been stated as a risk factor for psychiatric disturbances in immigrant and refugee children (Mccloskey and Locke 1995, and Mghir et al. 1995). Since a mother is mainly responsible for taking care of the children, mother's health, especially when the child is dependent on her, may be an important factor that might affect child health.

Structure of family

According to Havemen and Wolfe (1994), characteristics of families and of the parents are social capital, which affect the child's intellectual and behavioural outcomes. Brandwein, Brown, and Fox (1974) find that children in families headed by a female may suffer more from maternal than paternal deprivation because such mothers are forced to spread their time and energy beyond their prior tasks. Judith, et al (1980, 1989) find that children in mother-only families are exposed to more parental stress and may feel more distressed, depressed, fearful, sad, rejected and worried than are children who live with two parents. Elder (1974) and Seltzer (1994) assert that these stressful events during childhood may displace an individual from an equilibrium path of development. A number of studies find a significant and negative impact of lone parent status on children's educational attainment.[23] Krein and Beller (1988) find a negative effect of living in a single parent family on educational attainment of children that increases with the number of years spent in this type of family, and is greater for boys than for girls. Other studies find that lone mother status is strongly associated with psychiatric disorders, poor school performance and social problems.[24]

Residential move

Residential movement changes the known environment of the child, and hence, is likely to have an impact on child outcome. Development psychologists find that challenges and disruptions that often accompany a residential move are often difficult to deal with and create stress and insecurity for the children, which can create lower school performance (Haveman et al. 1991, Haveman and Wolfe 1994).

Neighbourhood

The quality of neighbourhood where the child lives and learns is likely to affect his/her outcomes. Both neighbourhood quality and child outcomes are multi-dimensional concepts. Some dimensions of neighbourhood quality can be measured objectively: the percentage of low-income families, residents with low occupational status, lone-parent families, unemployed residents, public assistance recipients, residents with low level of

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[23] Blau and Duncan (1967), Freeman (1974), Featherman and Hauser (1978), Haveman et al. (1991) Sandefur et al. (1992) and McLanahan and Sandefur (1994).

education, residents with different race and ethnicity, criminal activities. Other dimensions could be measured subjectively: safety, cleanliness, environmental condition, social support, drinking problems, lack of availability of public facilities. Similarly, child outcomes are also multi-dimensional. For example, health, behaviour, and cognitive skills are some important dimensions of child outcomes, which could be measured subjectively or objectively. Thus, different dimensions of neighbourhood quality could be related to different dimensions of child outcomes.

Curtis, Dooley and Phipps (2001) provide four reasons for the association of characteristics in the neighbourhood and the well-being of children: the physical condition of the neighbourhoods, such as, risk of injury or access to public facilities for children; human resources in the neighbourhood that affects the organized activities, crime rates, and quality of role models may affect the child well-being; neighbourhood quality reflects the permanent income of a family which is likely to be strongly correlated with child-well being; and variation in subjective and objective measures may have a differential impact on child well-being.

According to Wilson (1987), individual motivation, neighbours' status, education level and performance or values influence the aspiration, ambition and drive of children. Ecological models used by developmental psychologists view individual development as the product of the interaction of personal traits and a variety of "ecosystems": family, relatives, peers, community, schools, and the welfare/criminal justice systems (Bronfenbrenner, 1989). Jencks and Mayer (1990) review the effects of neighbourhood characteristics on a variety of child outcomes and conclude that favourable neighbourhood characteristics are positively associated with children's educational attainment.

According to "contagion theory" or theories of "collective socialization", a good neighbourhood environment confers benefits on the children that they grow up in it.[25]

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[24] Dooley and Lipman (1996), Curtis et al. (1996), Dooley et al.(1999), Curtis et al. (2001).

[25] See Hetherington (1972), and Chase-Lansdale and Hetherington (1991) for a review of the

Datcher (1982) found that a 10% increase in the neighbourhood's mean income was related to about a tenth of a year of additional schooling in the U.S. for both blacks and white. The study also suggests that racial integration has a positive effect on schooling attainment. Corcoran et al. (1992) and Crane (1991) also find a significant positive impact of good neighbourhood on schooling attainment of children. On the other hand, "competition" or "relative deprivation" theories suggest that growing up in a "good" neighbourhood may have an adverse effect on a child, especially if the child is from a poor or minority family. A typical example of this phenomenon is the potentially discouraging effect on grades and class rank that may be experienced by a poor child attending an affluent school, compared with attending a school populated by other poor children (Haveman and Wolfe, 1994).

Curtis, Dooley and Phipps (2001) examine the association of child outcomes and neighbourhood quality in Canada using the National Longitudinal Survey of Children and Youth. Subjective assessments of three dimensions of neighbourhood quality are used: safety, cohesiveness and problems. To measure child well-being, five indicators are used in this study. These are: conduct disorder, hyperactivity score, emotional disorder score, Peabody Picture Vocabulary Test score, and non-sport related accidents in the neighbourhood. Their findings indicate that better quality neighbourhoods are generally associated with higher levels of child well-being, but the results vary depending on the dimensions of neighbourhood. For example, social cohesion is related to all dimensions of well-being but not with non-sport related injuries; safety is more related to emotional disorder or conduct disorder than other dimensions; and neighbourhood problems are related to worse child outcomes.

Parenting

Parenting styles and child behaviour and development are related (Patterson et al. 1989). Rutter (1990) suggests that the positive things that parents do with their children have a major influence on their development. Kagan (1994) asserts poor parenting (uncaring on

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literature.

the one hand or overprotective on the other) is strongly related to children's behavioural problems. Landy and Kwan (1998) suggest that the effect of parenting practice is a very important on the development of children in at-risk situations, such as growing up in a lone-parent family, with a teenage mother, in a dysfunctional family, in a family with less social support. Hoghughi (1998) suggests that parenting problems are critical to the development of childhood disorders. Beiser et al. (1998) find that children's emotional problems are more closely associated with ineffective parenting than are other family characteristics.

Studies in Canada by Chao and Willms (1998) and Ross et al. (1998) find parenting style is strongly associated with child health. Feinstein and Symons (1999) suggest that parenting style is a key determinant of both child health and academic achievement. Some studies find simultaneous relationships between child behaviour and parenting styles.[26]

Receipt of public assistance

Not only the income of the family, but also the sources of income could affect children's outcomes. The "welfare culture" hypothesis emphasizes the harmful effects that parental "dependence" on public assistance may have on children's aspirations and on their capacity for independent actions (Macaulay, 1977). Murray (1984, 1986) argues that the welfare system undermines initiative and self-esteem and promotes irresponsible behaviour of parents that may have detrimental effects on child outcome. Currie and Cole (1993) argue that the mothers in the U.S. who participate in Aid to Families with Dependent (AFDC)[27] have access to a range of other welfare services, for example, Medicaid. Given the level of income, a positive relationship between child health and welfare participation may exist, which might reflect access to these services. Levine and Zimmerman (2000) argue that parental welfare participation could benefit younger children in some cases by allowing mother to spend more time with their children. On the other hand, welfare receipt reduces the motivation of parents to invest in the human capital or development needs of their children, which may have adverse effects on their outcomes. Gruber (2000) argues that

[26] See O'Connor et al. (1998), Feinstein and Symons (1999), Rubin et al. (1999), Burton et al. (2001) and Hou (2001).

welfare dependency help smooth transitory fluctuations in the family's income and helps stabilize consumption, which could be beneficial to child well-being.

Offord, Boyle and Szatmari (1987) find a higher rate of psychiatric disorders in the children whose families receive welfare income than in the children from families with no welfare income. A number of studies find a significant and negative impact of welfare participation on cognitive skills and attainments of children.[28] Hill and Duncan (1987) find that the participation of the family in welfare programs has a negative and significant effect on the educational attainment of daughters.

Public policies and resources

According to Coleman (1988), public policies and resources form social capital that can contribute positively to children's attainment. Hernandez (1993) argues that public policies, such as employment, income and tax and health policies, alter parent's choices in ways that influence the resources that is available to their children. These policies could affect children's outcomes either positively or negatively. Haveman and Wolfe (1995) argue that public investment in children determines the opportunities available to both children and their parents, and sets the environment within which the families and children make their choices.

2.3. Related Theories

To predict the nature of selectivity of children, a brief description of the models of intergenerational transmission, immigrants' selection and assimilation is presented in this section.

2.3.1 Becker (1981) model of intergenerational transmission

According to Becker (1981), children's outcomes depend partly on the expenditures made by their parents and the family endowments.[29] Greater parental resources lead to larger

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[27]This program was replaced by Temporary Assistance to Needy Families (TANF) in 1996.
[28]See Haveman, Wolfe and Spaulding (1991), Hill and O'Neill (1994), Kaestner and Corman (1995), and Levine and Zimmerman (2000).
[29]Becker (1981) is an extension of the intergenerational transmission model developed by

investments in children, which in turn results in higher children's attainment. The model assumes that children are passive and do not make independent decisions. This model also assumes that all of the children in a family are identical. It is an altruist model of intra-family allocation. Parents are altruists who maximize the altruist's utility function subject to the family's resources: the sole objective for intergenerational transfers is to increase children's lifetime welfare. Children's utilities are taken as arguments of their parent's utility function.

The model relates the future income of children (the same concept can also be applied to the health and educational outcomes of children) to the current income and endowments of their parents. The concept of endowment in his model is the fundamental part of his analysis. It is a broad concept, which includes the reputation and contacts of the family, their genetic inheritance, their values, and skills absorbed through membership in a particular family culture.

According to the model, the income of the child when he becomes an adult depends on the stock of human capital that the child would have in period $t+1$ in the absence of any transfers, either from parents or from other sources, called his endowment of human capital, e_{t+1}, plus the increase in his human capital resulting from any transfers. In other words, the total capital of children equals the sum of the capital invested in them, their endowment, and their "capital gain" due to luck in the market sector. This is expressed in the following equation:

(2.1) $I_{t+1} = w_{t+1} y_t + w_{t+1}e_{t+1} + w_{t+1}u_{t+1}$

where I_{t+1} = income of the child when he becomes an adult

$w_{t+1}y_t$ = the capital invested in the child

$w_{t+1}e_{t+1}$ = their endowment

$w_{t+1}u_{t+1}$ = capital gain due to luck in the market sector

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Becker and Tomes (1979). These models analyze how children's outcomes are affected by the transmission of observable and unobservable resources of their parents.

The income generating equation of children is:

(2.2) $$I_{t+1} = \alpha(1 + r_t)I_t + \alpha w_{t+1} e_{t+1} + \alpha w_{t+1} u_{t+1}$$
$$= \beta_t I_t + \alpha w_{t+1} e_{t+1} + \alpha w_{t+1} u_{t+1}$$

where $\beta_t = \alpha(1+r_t)$.

Also,

(2.3) $$w_{t+1} y_t = \beta_t I_t - (1-\alpha) w_{t+1} e_{t+1} - (1-\alpha) w_{t+1} u_{t+1}$$

where y_t = is the investment in each child,

I_t = is the wealth of parents

w_{t+1} =the value of each unit of capital in generation t+1,

r_t =is the rate of return per generation,

α is the fraction of family income that is spent on children,

β is the propensity to invest in children;

The endowment generating-equation is:

(2.4) $$E^c_{t+1} = \sum_0^T f_j \overline{e_{t-j}} + h_p e^p_t + \sum_0^T \sum_0^T h_{jk} e^k_{t-j} + q^c_p + \sum_0^T q^c_k + v_{t+1}$$

where E^c_{t+1} = is the endowment of a child with a parental endowment equal to e^p_t

e^k_{t-j} = the endowment of the kth member of his family in generation t-j,

h_p and h_{jk} = measures of the fraction of e^p_t and e^k_{t-j} respectively that are transmitted to or inherited by this child,

$\overline{e_{t-j}}$ = the average endowment in generation t-j,

$f_j \overline{e_{t-j}}$ = is a factor to incorporate the influence of the culture, or social capital of all families in generation t-j.

q^c_p and $\sum_0^T q^c_k$ represent expenditures by parents and by all other family members respectively that directly raise the child's endowment,

v_{t+1} = the influence of unobserved variables.

The Becker model is known as a wealth model: parents are concerned with the distribution of wealth, not with its composition. They provide each child with the wealth maximizing level of schooling, investing in the schooling of each child until the marginal rate of return to schooling equals the market rate of interest. Additional resources are given as transfers. The wealth model owes its name to its assumption that earnings and transfers are perfect substitutes.

Becker argues that parents and family members transfer human capital as well as nonhuman capital to their children for their future well-being. The main point of the model is that the income of children when they become adult would be better, the higher the income and propensity of parents to invest in their children, the higher the endowments of parents and the other family members. The arguments of the model can be applied to other developmental outcomes of children as well. This model indirectly also indicates that, in addition to observable resources, children are also expected to inherit the unobserved qualities of parents, such as abilities, drive or motivation, through intergenerational transmission and these qualities would be reflected in their developmental outcomes such as health and school performance.

2.3.2 Model of immigrants' assimilation and selection

The immigrants' assimilation and self-selection hypotheses are closely related.[30] Immediately upon arrival, immigrants may differ from natives in customs, language, labour market characteristics and other characteristics. Moreover, they have less information about the host country. Over time, the differences begin to narrow as the native-born children of immigrants become indistinguishable from the native population. The concept of economic assimilation focuses on the question of what happens to the relative earnings of immigrants compared with comparable natives as the immigrants learn about, and adapt to, the labour market of the host country. In this context, assimilation is defined as the rate at which the

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[30] See Chiswick (1978, 1986a), Carliner (1980), Defrietas (1980), Blau (1980), Borjas (1982), Tienda (1983), Borjas and Tienda (1985), Poston (1988), Jensen (1988), Duleep and Regets (1992, 1996, 1997), Jasso and Rosenzweig (1990), LaLonde and Topel (1991), de Silva (1997).

market of the host country. In this context, assimilation is defined as the rate at which the earnings differential of native-born and immigrants diminishes with time as both groups age. A variable widely used to denote the assimilation of immigrants is the time of residency in the host country.

The concept of selectivity compares the earnings and productivities of immigrants compared to the average earnings and productivities of the population of the home or the host country. The concept of "self-selection in immigration" indicates that for the same level of observable characteristics, such as schooling, age, and other demographic characteristics, immigrants in the host country have more innate ability or motivation relevant to the labour market than native-born persons. In this sense, a positive selection (negative selection) indicates higher (lower) than average earnings and productivities of immigrants than observably comparable native-born persons. In other words, a positive selection implies a stronger association[31] of observable resources and earnings for immigrants compared to native-born persons, and a negative selection implies a weaker association. The assimilation and selectivity hypotheses indicate that the earnings of immigrants may cross over those of native-born after few years, if lower initially, because of assimilation and self-selection in the host country.

The Chiswick (1978) model

The pioneering study of Chiswick (1978) examines immigrants' assimilation and self-selection for the earnings of foreign-born men in the U.S. This study measures the extent of economic assimilation experienced by immigrant men enumerated in the 1970 Census cross-section. The study compares the earnings of a typical immigrant to the earnings of a "demographically comparable" native-born person where education, age, sex, marital status, region of residence, health, hours of work, and other observable demographic characteristics are constant. By contrasting the earnings of immigrants to those of their native counterparts at every age, the author calculates the assimilation rate and ascertains that the wage of immigrants catches up to that of comparable native-born after a few years. The following

[31] The association could be positive or negative.

model is used to observe how immigrants respond to the assimilation process in the U.S.:

(2.5) $\ln w_i = \mathbf{X}_i\beta + \mu t_i + \varphi t_i^2 + \varepsilon_i$

where w_i is the wage rate of immigrant i; $\mathbf{X}_i$ is a vector of his/her socio-economic characteristics; t_i is for years since immigration; and the coefficient μ measures rate of assimilation. Hence, a positive value of μ and smaller starting wage for foreigners have been interpreted in his study as evidence in favour of the assimilation hypothesis.

The results of the study indicate that at the time of entry into the U.S., the annual earnings of immigrant men are 15% lower than the earnings of native men with the same schooling, age, number of weeks worked, and other demographic characteristics. The earnings of immigrants, however, grow at a much faster rate than the earnings of comparable natives; after 10-15 years immigrants' earnings overtake the earnings of native born and after thirty years in the U.S., the typical immigrants actually earn 10% more than a demographically comparable native. The study examines the earnings of Mexican, Cuban, Asian and African origin immigrants and the conclusions are robust to national origin.

The results have been explained by three hypotheses. First, initially immigrants do not possess the human capital valued by the host country, which results in relatively low earnings on entrance to the labour market. Second, due to the increased investment in human capital undertaken to adjust to the needs of the new working environment, earning growth of immigrants are much higher than those of comparable native-born. Third, immigrants are highly motivated and more able; they are positively selected which help them overcome the initial crisis and eventually earn even more compared to native-born.

Since the publication of this model by Chiswick (1978), a large literature has developed.[32] These subsequent studies expanded the literature by analysing both male and female immigrants, studying alternative data sets, and focusing on the specific immigrant

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[32] For instance, see Chiswick (1980), Carliner (1980), Defrietas (1980), Blau (1980), Borjas (1982), Tienda (1983), Borjas and Tienda (1985), Poston (1988), Jensen (1988), and Jasso and Rosenzweig (1990).

populations. They demonstrate the empirical regularity in the cross section. Borjas (1985) raises the possibility, however, that the overtaking findings could be due to the fact that cross-sectional regressions confuse ageing and cohort effects.

The Borjas (1985) model

Borjas (1985) is the first study that examines the assimilation and self-selection hypothesis based on synthetic panel data of U.S.[33] According to Borjas, since the earnings growth of a cohort in a cross section can be attributed to assimilation effect and changes in cohort quality, the cross section studies, that draw inferences from a single snapshot of the immigrant population, are likely to suffer from two problems. First, a large fraction of immigrants eventually return to their country of origin, which contaminates the cross sectional comparisons of immigrant earnings. Immigrants may leave the country either because of failure or because of unexpected success. Regardless of the causes, the fact that return migration is an important phenomenon implies that the cross sectional comparisons of immigrant's economic assimilation are incorrect. Second, cross-sectional comparisons make the implicit assumption that the skill composition or productivity level of successive immigrant waves is constant, which may not be correct. With a change in immigration policy, it is likely that the skill level of recent immigrants is lower compared with the earlier cohorts. This would imply that, in a cross section, the earnings of the most recent immigrants will be lower, while the earnings of the earlier, more productive waves will be relatively higher, even if immigrants do not experience any labour market assimilation. Thus, the positive correlation between immigrant earnings and years of residence in the United States observed in the cross section could arise because immigrants "adapt" rapidly to the U.S labour market or because earlier waves of immigrants differ in substantial ways (labour market productivities, unobserved abilities or skills) from more recent waves.

Borjas argues that cross-sectional income growth can be attributed to two effects for any cohort *k*: within-cohort growth effects (assimilation) and across-cohort growth effects (quality differential across cohorts). To separately identify ageing (assimilation) and cohort

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[33] Borjas (1987, 1991) studies are the expansion of Borjas (1985).

effects, the Heckman and Robb's (1983) method is used in Borjas' study. The data comes from the 1970 and 1980 Public Use Samples from the U.S. Census. The study chooses a random sample from the above two data sets in such a way that creates a synthetic panel data. For an immigrant population sampled in 1980, one decade of income growth is described as:

$$(2.6) \quad [\hat{y}_{80,k} - \hat{y}_{80,k+10}] = [(\hat{y}_{80,k} - \hat{y}_{70,k}] + [\hat{y}_{70,k} - \hat{y}_{80,k+10}]$$

$$= \text{within-cohort growth} + \text{across-cohort growth}$$

where y(80, k) and y(70,k) denote the predicted earnings of cohort *k* sampled in 1980 and 1970, respectively; y(80,k+10) denotes the predicted earnings in 1980 for the cohort who arrived 10 years after cohort *k*.

The first term on the right-hand side of equation (2.6) represents the within-cohort growth for cohort k over the decade. According to Borjas, this is the true assimilation effect. The second term estimates the difference in earnings over the decade for persons with a given number of years since immigration. Thus, the second term allows a comparison of different cohorts at the same career point in the destination country. But if immigrant's quality has been changing, this across-cohort effect contains a bias. Quality refers to generally unobserved factors that contribute to an immigrant's productivity potential. In that case, the estimation of life cycle earnings from cross sectional snapshots of immigrants with a given level of education and experience will be biased by the effects of these unobserved quality factors or ability that affect earnings potential. This is the reason why the earnings of each successive wave of immigrants could decline with time, causing the second term to be positive, and indicate quality degradation. Thus, this equation indicates that the cross section growth could be biased by the existence of quality differentials across cohorts; and hence, it may not necessarily represent the true assimilation effect.

Since there is also a possibility that the within-cohort growth can be biased by any changes in aggregate labour market conditions, Borjas estimates the earnings growth of immigrants relative to a base of native workers by allowing the socio-economic vector X to have a different effect between the native and the foreign born, and across different time periods. For an immigrant population sampled in 1980, one decade of income growth relative to natives is described as:

$$(2.7) \quad [(\hat{y}_{80,k} - \hat{y}_{80,n}) - (\hat{y}_{80,k+10} - \hat{y}_{80,n})]$$
$$= [(\hat{y}_{80,k} - \hat{y}_{80,n}) - (\hat{y}_{70,k} - \hat{y}_{70,n})] + [(\hat{y}_{70,k} - \hat{y}_{70,n}) - (\hat{y}_{80,k+10} - \hat{y}_{80,n})$$

The first bracketed term in the right hand side in (2.7) gives the difference in the relative earnings of cohort *k* between 1980 and 1970. This within-cohort effect measures the rate at which the earnings function of immigrants and natives are converging. The second bracketed term, like before, gives the across-cohort effect relative to natives.

Borjas estimates the wage growth for the male persons aged 18-54 in 1970 and 28-64 in 1980. There are four major findings of the study. First, immigrants' assimilation is not as fast as the cross-sectional studies indicate. Second, the more recent immigrant waves performed substantially worse in the labour market than the early post-war waves. Third, there is little likelihood that the most recent immigrant waves would ever earn substantially more than natives of comparable age and education would. Fourth, there are strong racial/ethnic differences in the rate at which the earnings of immigrant cohorts actually increased over the 1970-80 period.

The study examined the earnings for each of the six major immigrant groups separately: Mexican (18% of the male immigrant population as of 1980), Cuban (5.3%), other Hispanic (9.7%), Asian (15.9%), White (45.4%), and black (5.7%). The results indicate that within cohort growth is negative or zero for white and black immigrants, but is overwhelmingly positive for Asian, Mexican, and Cuban immigrants. Using this methodology, other studies draw similar conclusions.[34]

[34] Chiswick (1986), LaLonde and Topel (1990, 1991), Borjas (1987, 1991), and Friedberg (1991) are notable.

The Borjas (1987, 1991) models [35]

Borjas (1987) extends the earlier theoretical model of determinants of immigrants' selection in the host country and tests empirically using synthetic panel data. The empirical results of the study reveal that positive selection is more likely to characterize immigrants from the advanced industrialized countries and negative selection is more likely to characterize immigrants from the Third World countries. Borjas (1991) expands the model including selection in both unobserved and observed characteristics. According to Borjas (1991), the selection in unobserved characteristics is likely to be more important empirically since observed characteristics explain much less than a third of the variance in wage rates or weekly earnings.

Borjas derives some insights about the nature of selectivity that are likely to characterize the immigrant population in the host country, and tests the hypotheses using synthetic panel data of 1970-1980 U.S. Censuses.[36] Migration, in the model, is assumed to flow from country 0, the country of origin or the "home" country, to the country 1, and the country of destination (U.S.) Residents of the home country face an earnings (*w*) distribution given by:

$$\text{(2.8)} \qquad \ln w_0 = X\delta_0 + \varepsilon_0$$

where X is a vector of socio-economic characteristics with value δ_0 in country 0, and the disturbance ε_0 is independent of X and is normally distributed with mean zero and variance σ_0^2. The earnings distribution facing individuals in the destination country is given by:

$$\text{(2.9)} \qquad \ln w_1 = (1 - M)\, X\delta_n + M\, X\delta_1 + \varepsilon_1$$

where **M** is a dummy variable indicating whether the individual is foreign born or native. The vector δ_n gives the value that the host country attaches to the socio-economic

[35] While Borjas (1987) and Borjas (1991) are similar models, the later expands the former model in a number of ways: a theoretical framework is developed which provides information about how selectivity bias may be created in observed characteristics of immigrants; empirical earnings functions are presented that focus on the roles played by selection in both observed and unobserved characteristics; a study is conducted on the selection biases created by the sorting of migrants among three potential countries of destination: Australia, Canada and the United States.

[36] The model is based on Roy (1951), which examines the impact of self-selection in

characteristics X for natives, which could be different from the vector δ_1 the value for the migrants. The disturbance ε_1 is again independent of X (and M) and is normally distributed with mean zero and variance σ_1^2. Finally, the random variables ε_0 and ε_1 have correlation coefficient ρ

The purpose of the study was to obtain an insight about the questions of what types of selection in the unobserved characteristics, ε, are created by the endogenous migration decision; and what types of selection in the observed characteristics, X, is created by the endogenous migration decision. In order to answer these questions, Borjas formulates an index function[37] to ascertain the migration decision:

(2.10) $I = \ln [w_1/(w_0+C)] \approx [X(\delta_1 - \delta_0) - \pi] + (\varepsilon_1 - \varepsilon_0)$,

where C gives the unobservable level of mobility costs, and π gives a "time equivalent" measure ($\pi = C/w_0$) of the costs of migrating to the host country and for the analysis it is assumed constant across individuals.

(2.11) $P(X) = pr\{v > -[X(\delta_1 - \delta_0) - \pi]\} = 1 - \Phi(z)$,

where $v = \varepsilon_1 - \varepsilon_0$, $z = -[X(\delta_1 - \delta_0) - \pi]/\delta_v$ and Φ is the standard normal distribution function. If the characteristics X have a joint density function given by f (x), then the emigration rate from country 0 is given by:

(2.12) $P = \int_{x \in \Omega} P(x) f(x)dx$

According to these equations, the emigration rate is a negative function of mean income in the home country ($\mu_0 = X\delta_0$), a positive function of mean income in the host country ($\mu_1 = X\delta_1$), and a negative function of migration costs.

With the help of these five equations, Borjas derives the selection biases created by the endogenous migration decision that characterizes the pool of migrants in terms of both

occupational choice on the income distribution.

[37]The economic content is based on the models by Hicks (1932) and Sjaastad (1962)

unobserved and observed characteristics. Under the normality assumptions, the conditional means are given by

(2.13) $E(\ln w_0 \mid X, I > 0) = X\delta_0 + (\sigma_0\sigma_1/\sigma_v)(\varrho - \sigma_0/\sigma_1)\lambda$

(2.14) $E(\ln w_1 \mid X, I > 0) = X\delta_1 + (\sigma_0\sigma_1/\sigma_v)(\sigma_1/\sigma_0 - \varrho)\lambda$

where $\lambda = \phi(z)/P(X)$, and ϕ is the density of the standard normal.[38] The variable λ is inversely related to the emigration rate and will be positive as long as some persons find it profitable to remain in the country of origin. The second term in (2.13) and (2.14) define the selection biases generated by income maximizing behaviour.

Suppose, Q_0 and Q_1 measure the "quality", in terms of unobserved characteristics, of the migrant pool in the home country and in the host country, respectively; $Q_0 = E(\varepsilon_0 \mid X, I > 0)$, $Q1 = E(\varepsilon_1 \mid X, I > 0)$, and $k = \sigma_1/\sigma_0$. The Borjas models indicate that the following kinds of selection biases are likely to be generated by the endogenous migration decision:

i) Positive selection in both countries: $Q_0 > 0$ and $Q_1 > 0$

In words, this type of selection means the migrants have above average earnings in the country of origin (for given characteristics X) and also have earnings in the host country that exceed the earnings of comparable natives in the host country. An inspection of (2.13) and (2.14) shows that the necessary and sufficient conditions for this type of selection to occur are:

(2.15) $\varrho > 1/k$, $k > 1$

i.e. there is a strong positive correlation between the earnings a worker may expect in the home country and the earnings the same worker may expect in the host country,[39] and the host country has a more unequal income distribution than does the home country. This condition also explains how brain drain is generated.

[38] Heckman (1979) introduced the selectivity term, λ.

[39] When the sending country and the host country are both market economies, ϱ is positive and

ii) Negative selection in both countries: $Q_0 < 0$, $Q_1 < 0$

In words, this type of selection implies that the immigrants have below-average earnings in the country of origin, holding the characteristics constant, and also have below average earnings compared to comparable natives in the host country. The necessary and sufficient conditions for negative selection to occur are:

(2.16) $\varrho > k$, $k<1$

In words, negative selection also requires that ϱ be sufficiently positive but the income distribution in the country of origin being more unequal than that in the host country.

(iii) Negative selection in the country of origin but positive selection in the host country: $Q_0 < 0$, $Q_1 > 0$

Necessary and (sufficient condition) for this to occur is:

(2.17)) $\varrho < \min(1/k, k)$

These three cases summarize the nature of selection of the migrant pool in each of the two countries. Thus, the model indicates that the selection biases will depend on a number of parameters that are difficult to measure directly. However, it seems that if the home country and the host country are both market economies; ϱ is likely to be positive and strong and the nature of selection biases can be predicted from the ratio of variances in the income distribution of the two countries. Conversely, it is likely that ϱ is negative for countries that have non-competitive political systems. Hence, it is likely that migrants from those countries will outperform the average workers in the host country.

Borjas (1987, 1991) measures the quality differential of immigrants aged 25-64 in the U.S. from 41 countries. Quality differential is measured by wage differential between immigrants and natives for the same measured skills. Data are used from the 1970 and 1980 U.S. Censuses are used to measure the effect of skill composition of various cohorts

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strong.

and assimilation on the quality differential. Borjas (1987) estimates the determinants of the four factors: entry wage differential; rate of assimilation; change in cohort quality; and emigration rate. Borjas (1991) also simulates the determinants of the two other factors: selection in unobserved characteristics in the U.S.; and selection in education.

Some interesting findings of the two studies are:

i) the immigrants from free countries have higher entry wage rates and lower assimilation rates than immigrants from countries with a long history of political repression;

ii) immigrants from countries with more income inequality have lower entry wage;

iii) immigrants from English speaking countries have much higher wage growth than do the immigrants of the non-English speaking countries;

iv) the age at immigration has a positive impact on the rate of assimilation;

v) immigrants from the European countries (particularly, Western European countries) are positively selected; they tend to do quite well relative to white natives of comparable socio-economic characteristics;

vi) immigrants from Asian and Latin American countries do not perform well in comparison to white natives of equal observable skills;

vii) the average quality of recent immigrants in the U.S. has declined;

viii) the mean level of educational attainment in the country of origin has a positive effect on the mean educational attainment of immigrants in the U.S.

The above findings indicate that immigrants from wealthier countries have higher assimilation rates than do the poorer countries; and immigrants from developed countries with lower inequality and politically competitive system are positively selected while those of less developed countries are negatively selected.

2.4 Resources, opportunities, and environment

The health and educational outcomes of children of immigrant families could be different because the resources and opportunities, the determinants of child outcome, that are available to children are different for native-born and immigrant families. These are the social determinants of children's outcomes. This section gives a picture of how resources, opportunities, and environment vary for the whole immigrant population compared to the native-born population.[40]

Level of earnings, wages, and house ownership of immigrants

Average annual earnings and average hourly wages of immigrants are higher than those of native-born Canadians (NBC). According to Lin (1997), the average annual earnings of immigrants (without any control variables) was $25,676 in 1988 compared to $23,462 for the NBC. The average hourly wages of immigrants and NBCs were, respectively $13.01 and $12.58; the average annual hours worked were 1,865 and 1,762 respectively. On average, immigrant paid employees earned over $2,200 more than their native-born counterparts did in 1988.

According to the 1991 Census, the level of earnings of immigrant women was substantially lower than that of NBC women. For example, the average wage level (unadjusted) of immigrant women was 84% of that of native-born women. Women immigrants were much more heavily concentrated in manufacturing and to a smaller extent in accommodation, food and beverage services. For example, while 8.7% of NBC women were employed in manufacturing; 19.2% of women immigrants were in this industry group. According to Dunn and Dyck (2000) 68% of immigrants are owners of a house compared to 69.4% of NBCs.

Education level

Table 2.1 shows that, on average, the level of education is higher for immigrants compared to NBCs. The percentage of immigrants who have Bachelor's degree and who have university education is also higher compared to non-immigrants.

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[40] The information presented in this chapter is collected from the immigration literature, and applies to the whole immigrant population. Chapter 5 presents the characteristics of immigrant families collected from the 1996/97 cycle of National Longitudinal Survey of Children and Youth; they apply only to families who have children aged 6-13.

Table 2.1: Level of education

Level of Education (1993)	Non-Immigrants (%)	Immigrants (%)
Never attended	0.4	1.2
1-4 years of elementary	1.3	3.4
5-8 years of elementary	10.3	13.4
9-10 years of elementary & secondary	13.5	7.8
11-13 years :no graduation	7.3	4.3
Graduated high school	14.7	17.4
Some non-university post secondary	8.8	6.1
Some university (no certificate)	4.9	4.6
Non-university post secondary	25.7	26.0
University below Bachelor's	1.7	1.6
Bachelor's degree	7.4	8.0
University certificate above Bachelor's	3.9	6.1
Source: Rappek et.al (1997)		

According to the 1991 Census, female immigrants have a higher level of education than NBC women do. For example, while 7.3% of NBC women had 18 or more years of schooling, for female immigrants this proportion was 11.1%. Similarly, while 10.6% of native-born women had six or more years of university education, 12.2% of female immigrants have this level of university education. Immigrants are not, however, a homogenous population. Dudley and Poston (1994) found that immigrants from United Kingdom, Africa, the Middle East, Hong Kong, and the Philippines have more years of education, on average, compared with NBC whereas immigrants from other countries have fewer years of education.

Occupations of immigrants

Table 2.2: Main occupation of immigrants and non-immigrants

Occupation (1993)	**Native-born(%)**	**Immigrants(%)**
Professional/high-level Management	14.0	14.7
Semi-professional, technical, mid-management	10.2	12.6
Supervisors, foremen/forewomen	16.5	14.8
Skilled workers/employees/farmers	18.8	17.0
Semi skilled workers/employees	21.2	21.8
Unskilled workers/ employees/farm labourers	19.3	19.1
Source: Rappek et al. (1997)		

According to Green (1999), immigrants are more likely to be in professional and more skilled manufacturing occupations compared to non-immigrants (see Table 2.2).

Unemployment rate

Among those 16-64 years of age who were not full-time students in 1988, 11.3% of the foreign born experienced unemployment, compared to 14.3% among the domestically born. Among those with paid employment, the proportion being employed full time was 88.7%, but only 84.1% among non-immigrants. McDonald and Worswick (1997) presents the unemployment experience of natives and immigrants for the period 1982 to 1993 and find that the unemployment rate is higher for the NBCs than for the immigrants except in 1991 and 1993. According to Statistics Canada (1989), immigrants have a lower unemployment rate than do the NBCs (8.2% vs.10.8%). The unemployment rate of immigrants increases, however, with the time since arrival. Immigrants who came moderately recently, during the 1978-82 period, report an unemployment rate of 11.5%, slightly higher than the 10.8% for the native born. Those who arrived during 1983-86 period, report an unemployment rate of 16%.

Employment insurance utilization

With respect to immigrant participation in Employment Insurance (EI), evidence shows that immigrants have a lower rate of utilization than do the native-born.[41]

Table 2. 3: Unemployment Insurance (UI) participation by immigrants and the native-born (% of individuals receiving UI benefits)

Birth Place	1987		1991	
	Male	Female	Male	Female
Native-born	13.43	11.83	16.48	15.05
Foreign-born	10.71	10.23	13.59	12.98
Source: de Silva (1997)				

The table shows that immigrants use less UI than do the native-born. According to de Silva (1997), there is considerable variation in UI participation across ethnic groups. Jews,

[41] In 1996, the Employment Insurance (EI) program came into effect in Canada, replacing the previous Unemployment Insurance program. Bill C-12 came into effect on July1, 1996.

Chinese, Dutch, and the British had relatively low rates, whereas the Portuguese, Poles, South Asians, and other Asians had consistently high rates. According to Baker and Benjamin (1995), immediately after their arrival, immigrant men are significantly less likely to draw UI benefits and social assistance than their native born counterparts but with the time of residency in Canada their UI participation increases by 2-percentage points each year.

Urban dwellers

According to Citizenship and Immigration Canada (1996), in 1991, 84% of all immigrants, compared with 56% of the NBC population, were residents of a CMA.

Demographic composition

Denton et al. (1997) provide information about the demographic composition of the immigrant population. In the most recent decade (1986-96), about 66% of all immigrants were in the working-age range, taking 20-64 as a rough approximation to that range, compared with 61% for the population; 54% were in the younger half of the range, 20-44, compared with 42% for the population. Only 4% of all immigrants were 65 and older, compared with 11% for the population.

Marital status

Dunn and Dyck (2000) report that the percentage of immigrants who are married or common-law relationship is higher than that of the NBCs (61.9% vs. 59.9%). Similarly, the percentage of immigrants who are single is significantly lower than that of the NBCs (14.2% vs. 19.9%).

Health status

As mentioned earlier, immigrants are screened for health status. This is likely to ensure that average health status of immigrants is good. Chen *et al* (1996a) finds that immigrants are generally in better health than are non-immigrants, as measured by the prevalence of chronic conditions and disability. Chen *et al.* (1996b) find that immigrants typically have more years free of disability and dependency, and longer life expectancies than their non-immigrant counterparts. Dunn and Dyck (2000) find that immigrants have fewer drinking problems. They also find that compared to NBCs, immigrants, particularly those originated from Asia, Africa or South America, are more likely to report poor health status, but less likely to report unmet needs for health care.

Mobility rates

The immigrant population, as a whole, is less mobile inter-provincially than is the NBC population. According to Lin (1997), the overall migration rate among immigrants is under 60% of that among non-immigrants (0.4% vs. 0.7%).

2.5 Conclusion

The review of the literature of child outcomes of immigrant families indicates that economics research on health and educational outcomes of children of immigrant families is relatively rare both in Canada and in the U.S. Among the three studies in Canada, the first one (Munroe-Blum et al 1989) that examines the mental health and school performances of children born outside of Canada, uses the data from Ontario Child Health Survey collected in 1983. The sample for the immigrant group (251 children from Ontario) is less likely to represent all Canadian children and the findings are also less likely reflect the impact of changes in the immigration policies during 1970s and 1980s on child outcomes. Also, the simple logistic models on the outcome variables that are ordered give less information about the children's outcome. The second study (Beiser et al.1998) that examines the mental health of children uses a nationally representative data set, but it also suffers from methodological problems. It uses linear regression models on ordered outcome variables. Moreover, mental health alone does not reflect the overall health status of children of immigrants. The most recent study (Worswick 2001) that examines school performance uses data from the three waves of NLSCY and is likely to provide better information than do the other two. The study, however, does not compare the educational outcomes of children of immigrants and those of NBCs for the same level of resources; and does not examine the relationship of time of residency of immigrants and children's outcome.

Moreover, this study has some methodological deficiencies that are worth mentioning: 1) it applies a simple linear probability model on the dependent variable with ordinal responses, which is less likely to reflect the true estimates, 2) it does not distinguish between the outcome of immigrant families in which one parent is immigrant and in which all parents are immigrant, 3) it does not include some important determinants of educational outcomes, such as the income of the family or the health status of child, 4) it uses a combined sample of three waves where the same children are present; as a result, the errors are likely to be correlated and reduce the efficiency of the estimates, and 5) the study defines an immigrant family based on the birthplace of the PMK; as this study does not consider the birthplace of the spouse or the partner of the PMK, it may not measure an immigrant family accurately.

The review of the studies in the U.S. also suggests that the health and educational outcomes of children of immigrant families is relatively under-studied. Since immigration remains at the forefront of policy debates in both countries, comprehensive research in this field is essential for the evaluation of immigration policies, and to undertake effective child development programs to reduce social inequality if any exists.

The review of the theories and the available information on the resources and opportunities helps predict the health and educational outcomes of children of the native-born Canadian and immigrant families. The available information on immigrant population in Canada suggests that the immigrant population has a higher level of observable resources, such as income, education, occupational prestige, health status, marital status, and employment rate compared to the native-born population. The intergenerational transmission hypotheses suggest that this higher level of resources of parents would lead to a higher level of health and educational outcomes of children in the immigrant families.

The selectivity hypotheses suggest that the immigrant population may be positively selected in terms of unobservable characteristics. It indicates that the immigrants may have a higher level of unobservable characteristics, such as drive, motivation, and ability. In other words, they may have a higher level of "differential cultural capital" compared to the native-born population. The intergenerational transfer hypotheses suggest that if this were the case, the health and educational outcomes of children would be higher for immigrant families even if the observable characteristics were the same for the native-born and immigrant families. Alternative hypotheses also suggest that the nature of selectivity varies with national origin, and hence, the nature of selection of the children of immigrant families may vary with national origin of parents.

The assimilation hypotheses suggest that the resources and opportunities of immigrant parents improve with the time of residency in Canada. If parents' assimilation affects the health and educational outcomes of their children, then these outcomes of immigrant families are also likely to improve with the time of residency of immigrant parents. The studies on the immigrants' assimilation also provide evidence that the assimilation rates vary with the national origin of immigrants. Hence, the association of time of residency of immigrants and the health and educational outcomes of children may vary with national origin of immigrants as the assimilation rate varies.

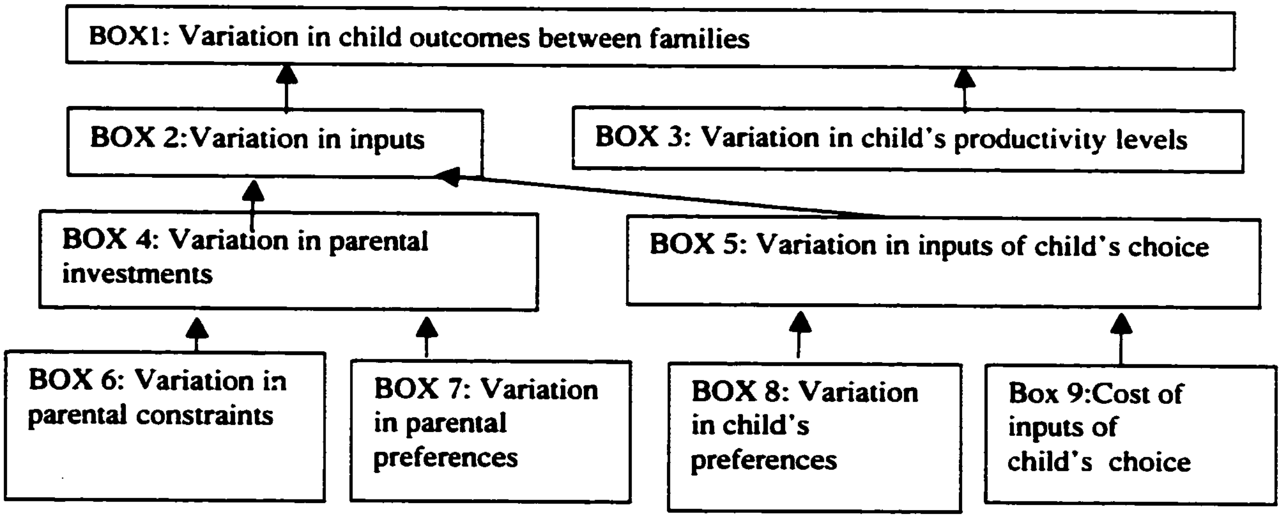
CHAPTER 3

Models of Child Outcomes and Sources of their Variation

3.0 Introduction

Child outcomes could vary between an NBC family and an immigrant family for many reasons. Suppose that the measured average child outcome level is higher for the children in the immigrant families than for those in the NBC families. In terms of outcome technology, discussed in the following section, the two broad sources of variation in child outcomes are inputs and productivity of the children. In terms of the structural model of the child outcome process, presented below, the sources of variation in inputs,[42] which in turn, cause variation in child outcomes, are constraints and/or preferences of parents and/or children, the market price of child outcome (if it exists),[43] and monetary and/or psychic costs of inputs of child's choice. Graph 3.0 provides an inverse-tree model of the sources of variation in child outcomes between two families.

Graph 3.0: The sources of variation in child outcomes



[42] In the empirical section, the word *input* is replaced by *covariate*.

[43] Since the children in this study are below or equal to 13 years of age, it is assumed that no market price exists for child outcomes; a shadow price, however, may exist.

The direction of the arrow keys in the above model indicates the source of the variation. For example, the two upward arrow keys from Box 2 and Box 3 to Box 1 indicate that the variation in child outcomes are caused by two factors: inputs, and child's productivity. The upward arrow keys from Box 4 and Box 5 to Box 2 indicate that variations in parental investment and those in inputs that the child could choose are the two sources of variations in inputs of child outcomes. The directions of the arrow keys from Box 6 and Box 7 to Box 4 implies that parental constraints and preferences are the sources of variations in parental investment, and hence, the sources of child outcomes. Similarly, the arrow keys from Box 8 and Box 9 to Box 5 indicate that a child could choose different bundle of inputs depending on his/her preferences and the cost of the inputs.

One could further derive the sources of variation in each of the boxes shown in Graph 3.0 and link these sources to the variation in child outcomes. For example, differences in parental constraints might arise from variations in many factors, such as education levels, labour market experiences, and local labour market conditions. Similarly, the productivity of children may vary with different factors, such as culture and birthplace. Before providing a more detailed description of how each of the sources of variation could cause differences in child outcomes, a structural model is discussed in the following section.

3.1 A structural model of child outcomes[44]

Child outcomes have many dimensions. Economists are usually interested in children's economic outcomes, such as human capital accumulation and labour market outcomes.[45] To examine the differences in child outcomes of two groups, it is necessary to understand the process of child outcomes. Although child outcomes are not physical outcomes, an economist's way of thinking about a process is to link it with a production technology, a

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market price exists for child outcomes; a shadow price, however, may exist.

[44] This theoretical model is for child outcomes in general. It is neither limited only to children who are aged 6-13, nor is it limited only to health and educational outcomes of children. The conditions will apply, however, in the empirical work that follows.

[45] Sociologists and development psychologists are interested in socio-cultural and psychological outcomes, such as peer relationships, personality development, behavioural problems, drug problems, and religious outcomes.

relationship that transforms inputs into output. A child outcome production function or technology could be viewed as a relationship that shows how resources, opportunities and the environment affect child outcomes. Within the framework of an economic model, the child outcome process can be compared to that of a physical output, in the sense that different child outcomes result from different combinations of socio-economic and cultural factors.

The Canadian Council on Social Development (1997) compared the child development process to a "black box" where children and their environment go and then come out transformed. It is compared to a black box not only because the process cannot be observed clearly, but also because it is variable and complex. For instance, if child outcomes refer to educational outcomes of children, this could refer to many dimensions. Years of education could be one type of educational outcome; while a degree in medicine or computer science could be another type. Any incident that occurs during the life span of a child affects his/her physical/psychological development. The incidents that happen during childhood build the foundation of developmental outcomes. Furthermore, it is complex to quantify the impact of all the events that occur during childhood. Hence, finding the real child outcome technology could be complicated and difficult. A better understanding of the process, however, might help in specifying a function that is closer to the real relationship. More research may help discover the true relationship between different socio-economic-cultural factors and child outcomes.

Neo-classical economists consider relationships as optimization processes. Any output is the result of an optimization process: a producer minimizes costs to produce a given amount of output; or maximizes profit (net benefit) with given input and output prices. Here, the producer is an agent who combines the inputs in order to optimize the objective function. When the child outcome process is compared with that of a physical output a debate arises about the agent of child outcome production: who are the producers of child outcomes? Do the children themselves, or their parents, combine the inputs? Younger children are less likely to make a rational decision. Hence, child outcomes may not result from an optimization process if it is assumed that children are the agents of child outcome production. Although the children do make some decisions, younger children are very much dependent on their parents. Parents provide inputs and resources for their children. Providing a good environment for their children, parents derive satisfaction. According to Haveman and Wolfe (1994: 30-1)

> ... parents seek to maximize either their own well-being, or the well-being of a broader unit consisting of themselves and their families. Parents make choices that reflect their objectives (or "tastes"), and in so doing they establish the environment in which their children are raised. They choose how many children to have, and when; whether or not to work, and how much to earn; where and in what sort of conditions to live; how much time to spend with their children, and the quality of time; whether or not to seek and accept welfare benefits; what goods and services to buy and how to allocate these across the members of their families; where to send their children to school, and how much time to spend monitoring their success in school; and whether to stay married, even if the relationship is not a rewarding one, or to divorce. All of these choices (and many others, as well) have influences on their children; all set the family based environment in which their children grow up.

Since parents make most of their decisions and provide the inputs and environment for the child one could postulate that child outcomes of younger children directly result from the optimization of the objective function of the parents subject to the constraints they face. On the other hand, children do make their own choices, whether rational or not, and they have their own characteristics. They become more rational as they age and their choice set gets larger. Hence, different modeling techniques may be required depending on the age of the children to reflect better child outcome processes.

Although parents consider the constraints made by the child's choices, characteristics and the nature of the technology, they may not be able to predict it completely. In other words, some unobservable characteristics or events of the child that parents cannot predict are likely to exist, which could cause child outcomes to be different from what they would expect from their optimization process. Hence, the argument that child outcomes are the direct result of the optimization process of parents may not be completely correct for children who are below, say, 13 years of age. For example, suppose that the mathematics computation test scores measure the educational outcome of a child. Parents provide all the resources and environments knowing the child's characteristics, and give all the guidelines about how to write it, but parents cannot write the test for the child. Thus, it is the child who completes the final stage of production. In this stage, the child's choice, as well as some unobserved events or characteristics could cause the results to be different from what parents predicted. In my view, not child outcomes, but most of the observed level of inputs of child outcomes results directly from the optimization of the objective function of the parents. Once parents choose the optimum investment for the child, he/she combines it with another bundle of inputs of his/her choice. These two types of input bundles could be substitutes or complements in the production technology. Parental investment is given for the child and one could assume that the cost of that bundle is zero for the child, but not for the parents. There are costs for the child, however, associated with the bundle that he/she chooses. For example, if a child spends more time in studying, he/she has less time for watching television.

As mentioned earlier, parents can change the investment depending on the choice set and productivity of the child. From a narrow economic point of view, if the marginal productivity of parental investment were higher for one child compared to another, one would expect parental investment to be higher for more productive children. Yet, this pattern may not apply to investment in children's outcomes. Parents may want to provide either an equal opportunity to each child or they may want to achieve equal outcomes for each child. To achieve the same outcome, parents may give more time to a disabled child compared to a healthy one. In this case, the narrow neo-classical prediction would not be valid.

The special feature of the goods and services that parents choose for their children is that they not only give direct utility to the parents, but also indirect utility through child outcomes. For example, parents spend time with their children for two reasons: First, it gives a direct utility to parents; second, it positively affects child outcomes from which parents derive utility indirectly. For deriving indirect utility, parents consider the production function for child outcomes while optimizing their own objective function as a consumer. Thus, simultaneity may exist between the child outcome production and parental investment in children: a child may consider the parental investment while choosing the optimum bundle of his/her choice variables; and parents may also consider the outcome function of the child, and change the investment depending on the productivity of the child.

3.1.1 Child outcome technology: a basic economic model

Suppose, Y is the child outcome, X is the vector of observed inputs that are provided by the parents, Z is the vector of variables that the child can choose when producing the outcome; and ξ is a vector of unobserved events that affect child outcomes. A general child outcome technology can be written as:

3.1 $$Y = Y(Z, \overline{X}, \xi)$$

Most of the theoretical economic models of child outcome,[46] except Rosenzweig and Schultz (1982), assume that child outcome directly results from the optimization of the utility function of the parents. In my view, it is not Y (child outcome), but X (parental investment in children) results from the optimization of objective function of parents subject to constraints they face. In other words, parents choose X (parental investment in children), together with another bundle of goods, Q (parental consumption), to optimize their objective function given the constraints. From an economic point of view, Y results from the maximization of the net benefit function of the child.

Net benefit function of the child

Assume the child outcome can be measured.[47] Let the benefit (price) per unit of child outcome, Y be denoted by P_Y, and the vector of prices (per unit cost) of the input bundle of the child's choice (Z) be P_Z. Note that the price of output or costs of inputs could be psychic as well as monetary. In addition, note that the price (benefit) of child output

[46] See Becker and Tomes (1976), Becker (1981), Rosenzweig and Wolpin (1988), Datcher-Loury (1989), Team (1992), Thomas (1994), Barrera (1990), and Pitt and Rosenzweig (1990).

would depend on the demand for child outcomes. For example, suppose that educational achievement of the child is the targeted child outcome. The higher the demand for educational achievement, the higher would be the price or benefit. Assume also that the cost of parental investment is zero to the child, but not to the parents. The net benefit function of producing the child outcome could be written as:

$$3.2 \qquad P_Y Y(Z, \overline{X}, \xi) - P_Z Z$$

Maximization of this net benefit function with respect to Z gives the optimum amount of input of Z, the input bundle of child's choice. The first order necessary conditions for maximization are:

$$3.2a \qquad P_Y Y_z (Z, \overline{X}, \xi) = P_z$$

where Y_z is the marginal contribution of Z. The final child outcome results from the combination of Z, the input bundle of child's choice, and X, the parental investment in children, and can be obtained from the production technology given in equation 3.1.

3.1.2 Determination of parental investment in children

Assume that the parental investment in children, X, is a bundle of normal consumer goods and services of parents, which affect child outcomes. As discussed in the previous section, parents choose this bundle because it gives them a direct utility and also an indirect utility through child outcomes. Assume parental preferences are the same within households.[48] Besides child related goods, parents also consume another bundle of goods, Q. Parents face the following constrained optimization problem:

$$3.3a \qquad \text{Max } U = U(Q, X(Y))$$

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[47] This may not be a realistic assumption in most of the cases, but it is not unlikely in some cases.
[48] Becker (1964) is a prominent model of common preferences household behaviour, which assumes that all members of the household jointly maximize some household level welfare function. For individual preference function, which permit heterogeneity in preferences, see Manser and Brown (1980,) McElroy and Horney (1981, 1990), Chiappori (1988a, 1988b), Kooreman (1990), Behrman, Pollak and Taubman (1982, 1986).

3.3b Subject to $M = P_Q Q + P_X X$

where M is the income of the family, P_Q and P_X are the prices of Q and X, respectively. As an outcome of this household optimization program, there is a demand for each element of Q and X, the inputs in the utility function of the parents.

While there might be some other constraints that parents face, it is assumed that these constraints do not have any independent effect on the optimum bundle of investment in children.[49] The first order conditions for optimization are:

3.3c $U_Q = \lambda P_Q$

3.3d $U_x Y_x + U_x Y_Z = = \lambda P_x$

where U_Q is the marginal utility of Q, and λ is the Lagrange multiplier. Y_x and Y_Z are the marginal productivities of bundle of goods and services chosen by the parents and by the child in the production technology of the child.

Expression 3.3d implies that parents consider the child's marginal productivity of different bundles of goods and services while optimizing their objective function. Like any demand function, X depends on a vector of exogenous variables, Cp, which make up the constraints of the parents:

3.3e $X = X\ (Cp)$

In my view, this model of demand for investment in children is comparable to the intergenerational transmission model, since it indicates that the parental investment in children, X,[50] and hence, child outcomes, increases with increased endowments of parents. That is, parents transfer their resources and endowments to their children

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[49] For example, child characteristics, parental characteristics, job characteristics, public resources, and the state of the economy are also constraints for parents. The impact of these constraints, however, could be shown through an effect on the above constraint or the preference function. For instance, the child's age could affect the above preference function or the budget constraint of the parents, and hence, on the optimum amount of investment in children.

[50] Assume that X is a bundle of normal goods.

through investment. However, X competes with other goods and services, Q, that parents buy with their given endowments. Parental outcomes related goods and services, such as, parents' education are usually given when any investments are made for children. For example, parents may finish their schooling before the child is born. In this case, it could be assumed that parents' education is given when any investment is made for the child (after the child is born) and it is not competing with child outcomes. On the other hand, it can be argued that parents' education is competing with child outcomes if parents go to school after the child is born, as given money and time has to be divided between parents education and investment in children. In this case, the relative net economic cost of parental education and investing in children will influence the decision of how much investment in children is to be made. The impact of this event on child outcomes could be different from the previous one, where parents do not have to spend money and time for their own education. The utility maximizing principle implies that the higher the present value of net benefit associated with investment in children, the higher will be the investment; and hence, higher the child outcomes. Note that the demand function in equation 3.3e results from the maximization of a particular utility function. However, the demand function will be different if the form of the utility function changes. Hence, a more general demand function of inputs of child outcomes could be written as:

3.3f $\quad X = X\ (Cp, UP)$

where UP is the preference function of the parents. In this framework, parental demand for investment in children depends not only on the constraints, but also on the preferences. This indicates that the optimum investment in children could change because of any change either in constraints, or preferences; or both.

3.1.3 Child outcome technology: a broader economic model

Note that the child outcome technology in equation 3.1 is a simple one. It does not reflect how the optimization process of parents is related to the child outcome; and how parents could change their investment depending on the child's marginal productivity of different bundle of goods and services provided by the parents, as well as, those chosen by the children themselves. Substituting X = X(Cp, Up), in equation 3.1 gives an extended picture of the child outcome technology:

3. 4 $\quad Y = Y\ [Z, X(Cp, UP) = \overline{X}, \xi]$

This is a broader economic model of the child outcome technology. It integrates the optimization process of parental investment in children and the production technology of the child. It also integrates the simultaneous relationship of the child outcome and parental investment. Further, it shows that the inclusion of choice variables of the child, if any, and unobserved events in the child technology function can make the child outcomes different from the function that assumed that parents produce child outcomes directly.

3.2 Sources of variation in child outcomes

As previously discussed, a child outcome (Y) production function shows the relationship between inputs and outcome: Y = Y (Z, X (Cp, Up),). Let the expected child outcome be:

3.5 $\quad E\ (Y) = \beta X + \gamma Z$

Here β denotes the rate of change of E(Y) as a result of a change in X, $\delta E\ (Y)/\ \delta X$; and γ denotes the rate of change in E(Y) as a result of a change in Z. In other words, β and γ denote the productivity coefficients of X and Z, respectively. The above equation indicates that the expected child outcome could change as a result of any change in the inputs, X and/or Z; and/or any change in the productivity coefficients, β and/or γ. Hence, inputs and productivity are the two broad sources of variation in child outcome.[51]

The following sections provide a more detailed description of how each of the sources that could cause variations in child outcomes of two families: an NBC family, and an immigrant family.

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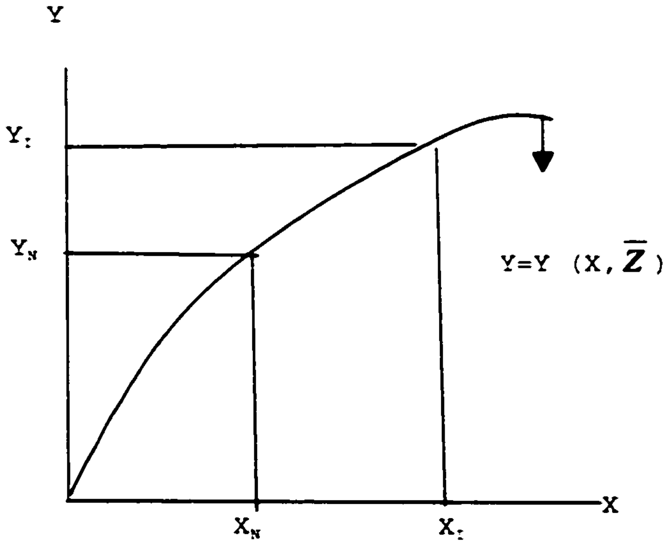
[51] Note that each of these sources could vary because of several other factors, as Graph 3.0 shows.

3.2.1 Variation in inputs

As mentioned, any change in parental investment (X) and or the inputs of child's choice (Z) could cause a change in child outcome (Y). Suppose that the variable input is X, and the children in both the groups have the same production technology, $Y = Y(X, \bar{Z})$, as shown in Graph 3.1. The graph indicates that the child outcome of an immigrant family could be higher because the parental investment is higher for the immigrant family. Note that the parental investment is determined from the optimization of the objective function of parents (equation 3.3a) subject to the budget constraint (equation 3.3b).

Graph 3.1: Different input levels and different child outcomes



Notation:
X = Parental investment in children
Y = Child outcome
$\bar{Z}$ = Fixed input used by the child
X_I = Input available to the children of the immigrant family
X_N = Input available to the children of the NBC family
Y_I = Child outcome of the immigrant family
Y_N = Child outcome of the NBC family

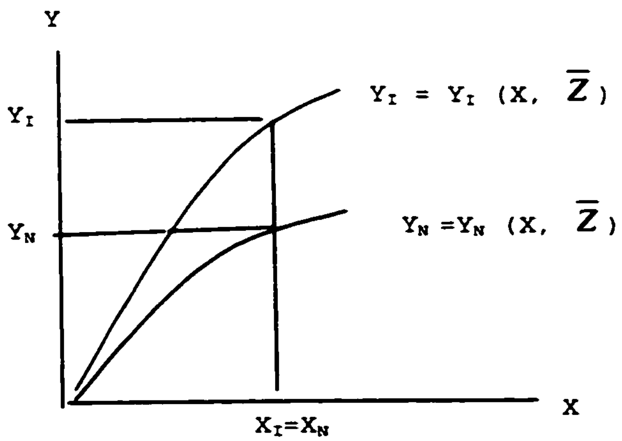
Graph 3.1 shows that, the parental investment for the children of an immigrant family (X_I) is higher than that of the NBC family (X_N). *Ceteris paribus*, this could result in a higher outcome for the immigrant family (Y_I) than for the NBC family (Y_N) as shown in Graph 3.1

above. In the same way, it can be shown that, *ceteris paribus*, child outcomes of two families could vary because of variations in the inputs of child's choice.

3.2.2 Variation in productivity levels of children

A child of one family could be a more efficient user of inputs compared to a child of another family. For example, suppose the child of an immigrant family may spends the money that she/he received from her/his parents (X) in buying fruit, and the child of the NBC family spends the same amount of money on ice-cream. It is likely that the impact of this same amount of money on health outcomes of the child would be higher for the immigrant family. Thus, it is possible that the same level of inputs could give different expected child outcomes because of the differences in productivity coefficients. In terms of equation 3.5, a larger value of β of the children of the immigrant family could cause a higher child outcome for them compared to those of the NBC family. This is shown in Graph 3.2.

Graph 3.2: Different productivity coefficients of children and different outcomes



Notation:
X = Parental investment in children
Y = Child outcome
$\bar{Z}$ = Fixed input used by the child
$X = X_N$ = Equal amount of parental investment in children
Y_I = Child outcome of the immigrant family
Y_N = Child outcome of the NBC family

$Y_I(X, \overline{Z})$ and $Y_N(X, \overline{Z})$ denote the child outcome technology of the immigrant family and the NBC family, respectively. The two graphs indicate that the relationship between parental investment and child outcome could vary. The children of the immigrant family have a higher slope coefficient than do the children of the NBC family. In other words, the productivity coefficient is higher for the immigrant family. In this case, holding other things constant, the same parental investment (X_I=X_N) could lead to a higher level of child outcomes for the immigrant family compared to the NBC family, as shown by the child outcome, $Y_I > Y_N$.

3.2.3 Higher productivity as well as higher levels of inputs[52]

Assume that the child outcome is higher for the immigrant family and one is looking for the causes. The child outcomes of an immigrant family could be higher compared to that of an NBC family because it is possible that the immigrant family has a higher level of inputs for the child, as well as, the productivity coefficient of the child is also higher compared to the NBC family. In terms of equation 3.5, an immigrant family could have larger values of both X and β and/or Z and γ. Graph 3.3 shows this case.

The outcome technology of the child of the immigrant family is denoted by the production function, Y_I, and the resource level is denoted by X_I. Those of the NBC family are denoted by Y_N, and X_N, respectively. The production function shows that even for the same level of inputs, the child outcome is higher for the immigrant family. Suppose, it also happens that parental investment (X_I) is also higher for the children of the immigrant family. The graph shows that because of a higher productivity coefficient and a higher level of resources, the child outcome of the immigrant family is higher than that of the NBC family as shown by $Y_I > Y_N$.

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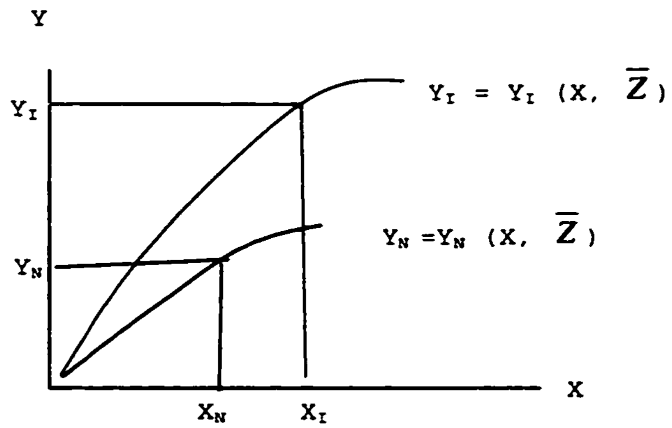
[52] If the children of one family have higher productivity coefficients and a lower level of inputs, or lower productivity coefficients and a higher level of inputs compared to those of another

Graph 3.3: Higher productivity coefficients and higher input levels, and higher outcomes



Notation:
X = Parental investment
Y = Child outcome
$\bar{Z}$ = Fixed input used by the child
X_I = Parental investment in children of the immigrant family
X_N = Parental investment in children of the NBC family
Y_I = Child outcome of the immigrant family
Y_N = Child outcome of the NBC family

3.2.4 Differences in parental constraints

The previous three graphs explain how the two broad sources could cause variations in child outcomes. Graph 3.0 shows the sources of variation of each of these two factors. In turn, these factors could cause variation in child outcomes. Graph 3.4 shows that the differences in constraints of parents could cause child outcomes to vary. Different constraints vector of the immigrant family and the NBC family may lead to different levels of investment in children.[53] This in turn leads to different child outcomes.

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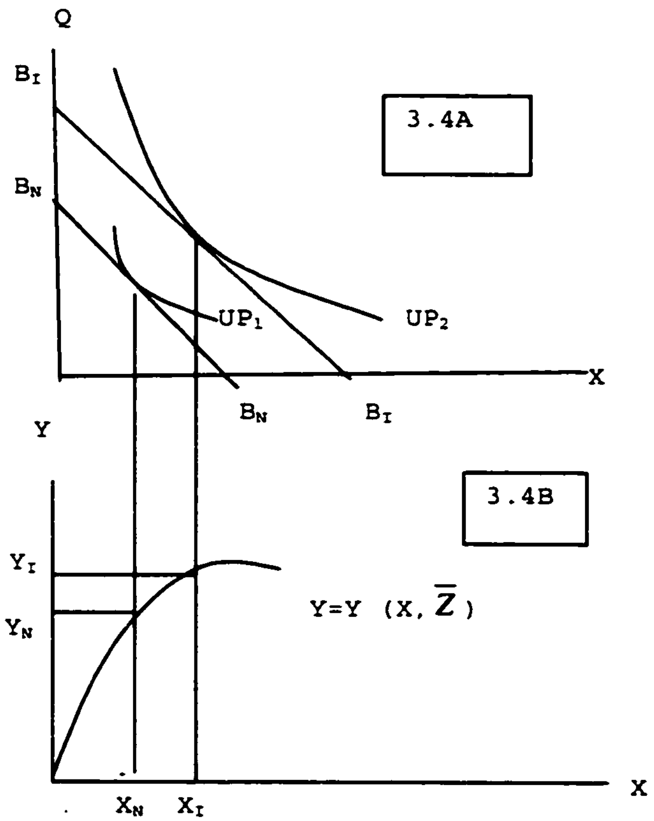
family, then it is uncertain which family would have better child outcomes.

Graph 3.4: Differences in parental constraints and different child outcomes



Notation:
X = Parental investment in children
Q = Another bundle of goods, other than X, consumed by the parents
Y = Child outcome
$\overline{Z}$ = Fixed input used by the child
X_I = Parental investment in children of the immigrant family
X_N = Parental investment in children of the NBC family
UP_i = Preference function of parents
B_NB_N =Budget constraint of the NBC family
B_IB_I =Budget constraint of the immigrant family
Y_I = Child outcome of the immigrant family
Y_N = Child outcome of the NBC family

[53] See Section 3.1.2 for the determination of parental investment.

Suppose, the budget constraints faced by the NBC family and the immigrant family are B_NB_N and B_IB_I, respectively. They may reflect the variations in income between the two families. This situation could lead to two different levels of parental investments in children for the two families: X_N and X_I, respectively. Suppose that the production technology of the children is same for the two families as denoted by $Y = Y(X, \bar{Z})$. Graph 3.4A shows that different parental constraints could cause two different levels of parental investments in children. The parental investment in children for the immigrant family is X_I, and that for the NBC family is X_N where $X_I > X_N$.

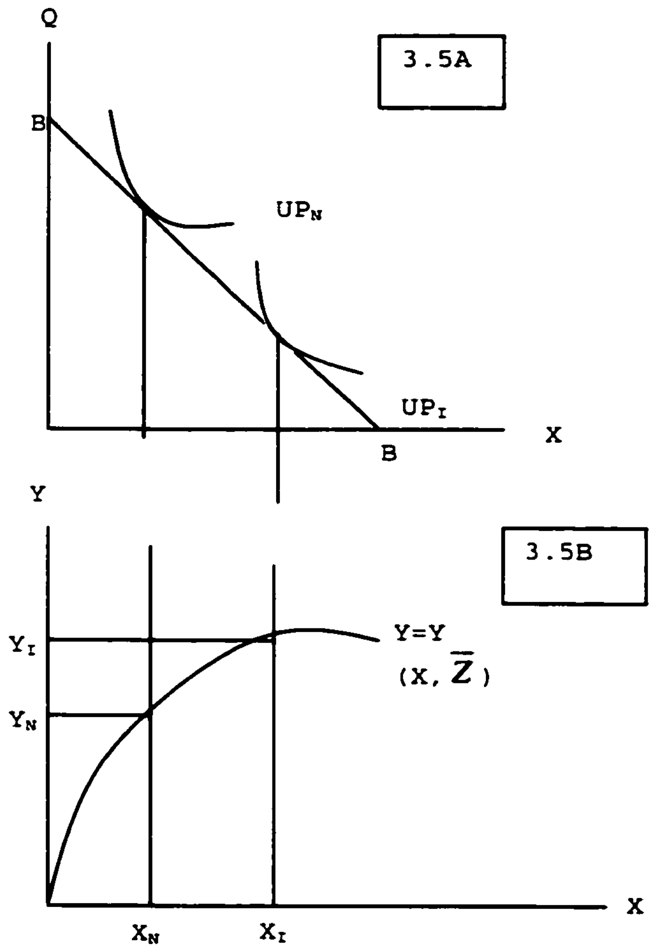
Graph 3.4B shows that these variations in parental investments cause two different levels of child outcomes: Y_I and Y_N for the immigrant family, and the NBC family, respectively. Here $X_I > X_N$ causes $Y_I > Y_N$. In other words, the differences in parental constraints of the two families could cause a variation in child outcomes.

3.2.5 Differences in parental preferences

The parental preference functions of the NBC family and the immigrant family could be different. Immigrant parents may prefer investment in children, X, to the bundle of other goods of their own consumption, Q. Holding the constraints constant, this could lead to different levels of investment in children. These, in turn, could lead to two different outcomes for the same child outcome technology as shown by Graph 3.5 below.

In Graph 3.5A, UP_I and UP_N denote different preference functions of the immigrant family and the NBC family, respectively. Suppose, the common budget constraint faced by the two families is denoted by BB. Because of different preferences, optimal amounts of investment in children are different as shown by X_N and X_I for the NBC family and the immigrant family, respectively. As indicated in graph 3.5B, this could lead to two different levels of child outcomes for the two families. The graph shows that in that situation the child outcome of the immigrant family, Y_I is higher than that of the NBC family, Y_N.

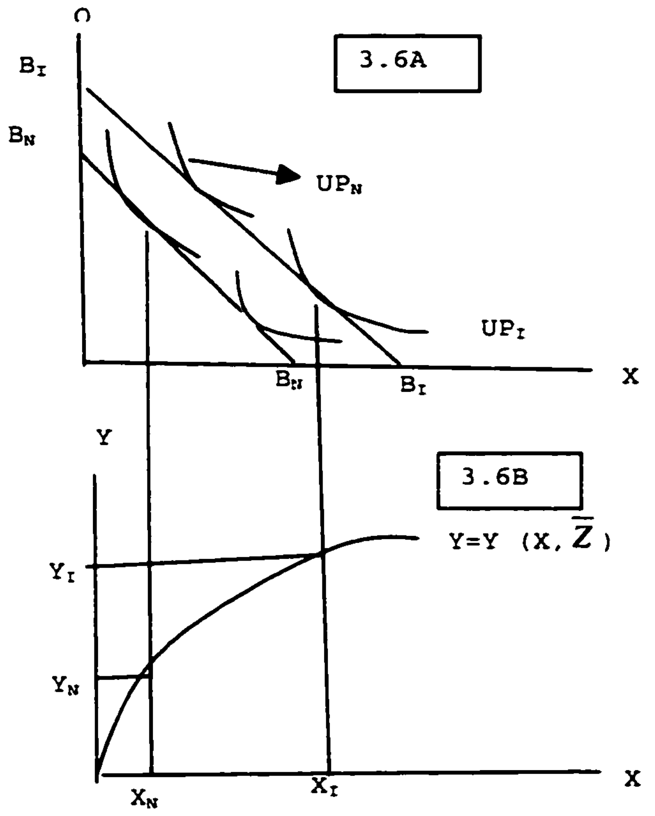
Graph 3.5: Different parental preference functions and different child outcomes



Notation:
X = Parental investment in children,
Q = Another bundle of goods, other than X, consumed by parents
Y = Child outcome
$\overline{Z}$ = Fixed input used by the children
X_I = Parental investment in children of the immigrant family
X_N = Parental investment in children of the NBC family
UP_N = Preference function of the NBC family
UP_I = Preference function of the immigrant family
BB =Budget constraint of parents
Y_I = Child outcome of the immigrant family
Y_N = Child outcome of the NBC family

3.2. 6 Differences in parental preferences and constraints[54]

Graph 3.6: Different constraints and preferences, and different outcomes



Notation:
X = Parental investment in children.
Q = Another bundle of goods, other than X, consumed by parents
Y = Child outcome
$\bar{Z}$ = Fixed input used by the children
X_I = Parental investment in children of the immigrant family
X_N = Parental investment in children of the NBC family
UP_N = Preference function of the NBC family
UP_I = Preference function of the immigrant family
B_NB_N =Budget constraint NBC parents
B_IB_I =Budget constraint NBC parents
Y_I = Child outcome of the immigrant family
Y_N = Child outcome of the NBC family

54 Suppose one group has higher income but lower preference for investment in children, or lower income but higher preference for investment in children compared to the other group. In

The child outcomes of an immigrant family could be higher because of a higher income as well as a higher preference for investment in children compared to those of the NBC family. Graph 3.6 shows this situation.

B_IB_I and B_NB_N are the budget lines faced by the immigrant family and the NBC family, respectively; UP_I and UP_N their preference functions. The two budget lines reflect that the immigrant family has a higher income than does the NBC family; the preference functions reflect that the immigrant family has also a higher preference for investment in children. Graph 3.6A shows that the optimal amount of parental investment is higher for the immigrant family compared to the NBC family: $X_I>X_N$. This situation leads to a higher child outcomes for the immigrant family compared to the NBC family as shown by $Y_I>Y_N$ in Graph 3.6B.

3.2.7 Different cost functions

If one group (child and/or parents) faces a lower cost to get the bundle of inputs (of child's choice or parental investment in children) of child outcomes compared to the other group, then, *ceteris paribus*, the optimum amount of child outcome of the first group is likely to be higher than that of the second group for the same cost. For example, suppose, the children of one group live in an urban area, and those of another group live in a rural area. As various facilities and opportunities, such as schools, libraries, and hospitals are more available in the urban areas, the children of the first group may face a lower cost of inputs of child outcomes, say schooling and health services, for the same expenditure. In this situation, the child outcomes of the first group are likely to be higher than those of the second group, as Graph 3.1 or 3.4B show.

3.3. Parents' selectivity in unobserved characteristics and child outcomes

Suppose that the parents have some unobserved characteristics, which an econometrician cannot measure. These unobserved characteristics are likely to influence their constraints (perhaps their preferences as well) and hence, investment in children. The econometrician

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these two cases it is uncertain which group will have higher child outcomes.

may observe the actual amount of investment in children but they do not know how much of this investment could be attributed to the unobserved characteristics of parents. Hence, the child outcomes that result from a higher (lower) level of parental investment because of the fact that parents are positively (negatively) selected, might be very difficult to estimate. Parents are likely to transfer some of their unobserved characteristics to their children, however, through heredity or teaching. Suppose parents are positively selected in terms of unobserved characteristics. It is likely that their children would inherit it. These characteristics would be reflected in their productivity coefficients. They are likely to produce a higher output with same inputs. Hence, differences in the productivity coefficients (regression coefficients) of the children would reflect the nature of selectivity of parents and children.

3.4 The time of residency of immigrants and child outcomes

As mentioned, one of the objectives of the study is to see how the time of residency of an immigrant parent affects the child outcome. In the framework of the structural model described above, it is clear that the time of residency of parents can exert its impact on child outcome through the parental investment in children, X_p. With the time of residency, parents' constraints as well as preferences could change. A change in constraints is likely to have a positive impact on investment in children, and thus on child outcomes. For example, the labour market outcomes of immigrant parents are likely to improve with their time of residency in Canada. This situation is likely to increase the investment in children and hence, the child outcomes. A change in parental preferences could have an ambiguous impact. For example, from my personal observation, I believe that an Indian mother would choose the investment in children, over other goods, Q, of her own consumption. In other words, her marginal rate of substitution of Q for X (MRS_{QX}) could be very high at the beginning of her stay in Canada. The time of residency in Canada, however, could change her preference function. She could prefer to have some time for herself, rather than spending it on her child. In other words, MRS_{QX} could decrease with time. Here the impact of the change in preferences and impact of the change in constraints could go in the opposite direction. I believe, however, that the change in preferences takes more time than the change in constraints. Hence, it is likely that net impact of time of residency on child outcome would be positive.

3.5 Conclusion

Child outcomes depend on the inputs, and productivity of children. Inputs could be chosen by the parents and by the children themselves. Parental preferences and constraints determine parental investment in children. Parental preferences could be influenced by a number of factors, such as culture, religion, birthplace, age of the child, age of the parents and their education level. Differences in parental constraints could also be attributed to variations in many factors, such as education levels, labour market experiences, and local labour market conditions. Similarly, the preferences and productivity of children may vary depending on a number of factors, such as age and gender, culture, and birthplace. The selectivity of parents is likely to affect the productivity or efficiency of children. The time of residency may influence the constraints as well as their preferences, which is likely to affect their investment in children.

CHAPTER 4

Data, Variables and Methodology of Empirical Models

4.0 Introduction

The focus of this study is on the health and educational outcomes of children aged 6-13 years in Canada. As described in the previous chapter, health outcomes are measured by the assessment of the person most knowledgeable (PMK) about the child's health; and educational outcomes are measured by the teacher's assessment of the child's overall performance and mathematics tests scores. This chapter presents a description of the data set, the estimation sample and the outcome variables. The employed empirical models for different outcome variables are also justified and specified. In addition, the study groups are defined based on the available information, and the constraints related to the data set are described.

4.1 The data

The Cycle 2 (1996/97) Master File data from the National Longitudinal Survey of Children and Youth (NLSCY[55]) 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 sample size of the Cycle 2 survey data is 20,025 observations. There were two major forums under which the data were collected, namely, the household collection and the school collection. In total, 13,248 households provided information for the children. Hence, on average, more than one child was surveyed from each household. In the case of twins, two children were selected. However, no more than two children were selected in cases where three or more

[55] See Statistics Canada (1998c)

siblings of the same age were present.

From each household, a person aged 15 years or older, and most knowledgeable about the child (PMK), was chosen to answer the questions. In the Cycle 2 survey, the mother of the child was the PMK in 91.5% of the sample (the biological mother, 90.2%). 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%,[56] 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).

For all children in the Cycle 2 who were attending school, information was collected from the schoolteacher and the principal, and from skill tests. PMKs gave their consent to contact the child's teacher and the school principal, and to administer a test of about 45 minutes designed to measure the child's mathematics computation and reading comprehension skills. School children in grade 2 or higher were given a brief mathematics and vocabulary/reading test of about 12 questions. Three teachers' questionnaires were completed depending on the circumstances of the child. For instance, a teacher's questionnaire was completed for students who had one teacher for the basic academic subjects; a different teacher questionnaire was completed for students who had different teachers for the basic academic subjects.

Note that despite the availability of the Cycle 1 data, only the Cycle 2 data are used in this study.[57] There are a number of reasons for this choice. First, two periods are not sufficient to conduct a longitudinal study. Applying a random coefficients model in this study implies that the slope coefficients would vary for every longitudinal observation, while applying the fixed effects method implies that the variation across the children can be captured by the parametric shifts (intercept shift). Since the time series for each child consists of only two periods, the findings from these models may not be reliable because it is less likely they

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[56] This percentage is generated using the sample weights.
[57] Recently, Cycle 3 data have become available.

would be stable in longer periods. In other words, they may not be generalizable. Second, the mathematics computation testing strategy was modified in Cycle 2 to offset the serious problem of the ceiling effect encountered during Cycle 1.[58] Hence, the scores in the two surveys may not be completely comparable. Finally, between the two surveys, the Cycle 2 is in current use.

4.2 Measures of health and educational outcomes

Health outcomes

The health status of children is measured by the PMK's assessment of the child's health.[59]

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[58] See Section 4.2 for details about mathematics comprehension tests.

[59] Children's health as measured by the Health Utility Index mark III (HUI3) is also used. It is a generic health status index, which attempts to synthesize both quantitative and qualitative aspects of health. The system has been developed at McMaster University's Centre for Health Economics and Policy Analysis. It is a comprehensive Health Status Measurement System (CHSMS) that provides a description of an individual's overall functional health based on eight attributes: vision, hearing, speech, mobility (ability to get around), dexterity (use of hands and fingers), cognition (memory and thinking), emotion (feelings), and pain and discomfort. The value ranges from 0-1 with 1 representing high overall function. HUI is a two-step generic approach to the assessment of health related quality of life (HRQL). The first step is to assess health status (defined by capacity), independently (at least conceptually) of the value that the respondent attaches to that health status. In the second step, a multi-attribute preference function is used to translate categorical health status, as defined in the first step, into cardinal scores on the scale of no impairments equal to 1.00 and dead equals to 0.00. Usually utility for each health status is assigned by the Standard Gamble (SG) method, which produces von Neumann-Morgenstern (vNM) utilities. With this technique, people are asked to choose between a gamble with a desirable outcome, with risk, p, and a less desirable outcome, with a risk, 1-p, and a certain option of intermediate desirability. The person is asked what probability of getting the desirable or less desirable outcome will make him/her indifferent between the gamble and the certainty. The probability, p, at the indifference point is the vNM utility of the current health state. The utility scores based on this theory have interval scale properties, which permit the construction of indices of health related quality of life.

However, there are controversies regarding the use of SG method in transforming health status to utility score. For example, utility obtained from health status of people with most chronic diseases does not approximate the gamble, as often there is no product that will make a patient completely well, nor is there one that is likely to kill her or him; also, the cognitive demands of the task are high as the respondents and patients have a difficult time in applying this (Kaplan 1998). There are other theoretical and methodological challenges associated with the application of HUI, as it is a utility based measure. Kahneman and Tversky (1983) have shown empirically that many of the assumptions that underlie economic measurements of choice are open to challenge. Kahneman, Slovic and Tversky (1982) argue that human information processors perform poorly at integrating complex probability information when making decisions that

The PMK was asked, "In general, would you say his /her health is excellent, very good, good, fair, or poor?" Since the answer to this question reflects the PMK's perception about the child's health, it provides information about the child's overall health status. This subjective measure[60] of the child's health focuses on larger issues of health and welfare. Since the PMK has the most information about the child's health, and this measure reflects parents' feelings about the child's health status, this assessment is likely to be strongly associated with health care utilization of children. An accumulating body of cross-cultural evidence indicates that subjective measures are strongly associated with morbidity, disability and mortality rate (Birren 1993, Dean 1993, Haga et al.1993, Marshall 1993). According to Albrecht (1994), subjective assessment is compatible with the definition of health used by the World Health Organization (1947): "Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity." This assessment also fits with a more market driven and competitive health care delivery environment where consumers' needs and preferences will be important considerations in the allocation of scarce resources (Albrecht 1994). Note that a single and global question was asked to the PMK to assess the health status of children. Many studies found that the scores from this single, global question is strongly associated with scores derived from more complex measures such as health status profiles and single index measures.[61] Finally, the simplicity of this single, global question is likely to produce higher response rates (Rowan 1992).

Educational outcomes

Two types of educational outcomes provided in the NLSCY are examined in this study: the teacher's assessment about the child's overall academic achievement and math computation tests scores. The teacher was asked, "would you rate this student's current academic achievement across all areas of instruction near the top of the class, above the middle of the

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involve risk. Considering the controversies involved in using the HUI approach, the analysis of the HUI results is presented in the Appendix. See Appendix 4 for a detailed discussion of the construction of the HUI and the empirical results.

[60]Since this measure is subjective, it could involve personal bias. Further, it provides only rankings; the estimated difference between two categories may not reflect the true differences in health.

class but not at the top, in the middle of the class, below the middle of the class but above the bottom, or near the bottom of the class?" This is an ordered variable, which provides only rankings. In the NLSCY, the teacher's assessment of the child's skill in mathematics is also provided. Since overall performance reflects a broader educational outcome, this variable is chosen over the child's skill in mathematics. Similarly, the teacher's assessment is chosen over the PMK's assessment[62] because a teacher can compare the child's performance among other children in the class; a PMK does not have that scope. Also, it is likely that the PMK's reporting may be upward biased, as the PMK may feel less inclined to report the true performance of the child when it is poor. Although a teacher may also do the same in some cases to seem like a better teacher, the extent of bias is likely to be less.

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.[63] 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

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[61] For example, see Rowan (1992), and Doll et al (1993).

[62] Models were also estimated for the PMK's assessment of child's overall assessment. The results seem similar in nature but the magnitudes of the coefficients are different.

[63] In Cycle 2, a different testing strategy from the one in Cycle 1 for mathematics was applied. First, a new indicator of mathematics skill was administered at the home to help identify more precisely the child's academic level. The indicator consists of five questions on mathematical concepts and applications with multiple-choice answers: the questions were also taken from CAT/2. Second, in the schools, there were separate versions of the mathematics tests for each academic grade level, a total of seven in all. Thus, students in Grade 2 completed the level 2 test, students in Grade 3, level 3 test, and so on to level 8 for students in Grade 8 or above. In some instances, students were given a higher level test: those who scored 9 or 10 out of a total of 10 on the skills indicator. This approach was used to offset the serious problem of the ceiling effect encountered during Cycle 1 with the mathematics test, especially in Grades 3 and 5. The mathematics scores in Cycle 2 are more representative than the scores in Cycle 1. For example, in Cycle 1, there were 38.0% of children in Grade 3 with a perfect score; while in Cycle 2, there are only 5.6% of children in Grade 3 with perfect score. Thus, the mathematics scores in the two cycles may not be completely comparable.

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, standardized scaled scores[64] are used in this study. The scale scores are standardized 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. The response rate in mathematics computation test was low and scores are available only for approximately 62% of children of the selected sample.

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

4.3 Empirical models of health and educational outcomes of children

The dependent variables in the empirical models of this study are the health and educational outcomes of children. The PMK's assessment of child's health, and the teacher's assessment of child's overall performances are ordered variables. Math computation test scores are continuous variables. Depending on the measurement of child outcomes, both linear and non-linear models are chosen for estimation.

4.3.1 Ordered logit model [65]

The PMK's assessment of child's health, and the teacher's rating of child's overall

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64 The robustness of the findings from the scaled scores was also tested using the raw scores.

65 See Appendix 4, where Tobit models are applied to HUI, a continuous variable.

performance are categorical and ordered variables. For these ordinal child outcome variables, ordered logistic models are employed for empirical estimation. The PMK-rated measure of the health status of child takes the following values:[66] 0 = fair or poor health, 1 = good health, 2 = very good health, and 3 = excellent health. Similarly, the teacher's rating of a child's overall performances takes the following values: 0 = below the middle of the class or near the bottom of the class, 1 = in the middle of the class, 2 = above the middle of the class, and 3 = near the top of the class.[67]

When response categories are ordered, logits can directly incorporate the ordering. The *cumulative probabilities* are the probabilities that the response Y falls in category *j* or below, for each possible *j*. For J response levels, J-1 cumulative logits can be computed. The *j*th cumulative probability is:[68]

(4.3a) $$P(Y \leq j) = \pi_1 + \pi_2 + \cdots + \pi_j, \; j = 1, \ldots, J$$

$$= \frac{\exp(\mu_j + \sum_{g=1}^{t} \beta_g X)}{1 + \exp(\mu_j + \sum_{g=1}^{t} \beta_g X}$$

where π_i denotes the probability of the *i*th category, g = (1, 2, ..., t) refers to the explanatory variables, μ_j and β_g are intercept parameters and regression parameters, respectively.

The ordered logit regression model is built around a latent regression that is described below.[69] Suppose the actual model is:

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[66] In the NLSCY data, the variable has the following categories: 1 = excellent health, 2 = very good health, 3 = good health, 4 = fair health, and 5 = poor health. Since there are no observations in the 5th category for the Asian group, the 4th and 5th categories have been combined. The values have been recoded for the purpose of estimation and ease of interpretations.

[67] This variable has the following categories in the NLSCY data: 1 = near the top of the class, 2= above the middle of the class, 3 = in the middle of the class, 4 = below the middle of the class, and 5 = near the bottom of the class. No observation was found in the 5th category for the American group. For this reason, the 4th and 5th categories have been merged. This variable is also recoded.

[68] See Agresti (1996)

[69] The discussion here follows Greene (1993).

(4.3b) $Y^* = \beta'X + \varepsilon$

where Y^* denotes health or school performance. However, Y^* is unobserved. What is observed is Y:

$$
\begin{aligned}
Y &= 1 \text{ if } Y^* \leq 1, \\
&= 2 \text{ if } 1 \leq Y^* \leq \mu_1, \\
&= 3 \text{ if } \mu_1 \leq Y^* \leq \mu_2, \\
&= 4 \text{ if } \mu_2 \leq Y^* \leq \mu_3, \\
&\quad \vdots \\
&= J \text{ if } \mu_{J-1} \leq Y^*
\end{aligned}
$$

where Y denotes the observed values of health or school performances in J number of ordered categories. The μ's are unknown parameters to be estimated with βs. In the health and school performance questions, the respondents have their own intensity of feelings, which depends on certain measurable factors and certain unobservable factors, ε. Given four possible answers for the health and educational outcomes, they choose the cell that most closely represents their own feelings on the question. Assuming ε to be normally distributed across observations, and normalizing the mean and variance to zero and 1, the probabilities of the J categories are:

$$
\begin{aligned}
&\text{Prob } (Y=1) = \Phi(-\beta'X), \\
&\text{Prob } (Y=2) = \Phi(\mu_1 - \beta'X) - \Phi(-\beta'X), \\
&\text{Prob } (Y=3) = \Phi(\mu_2 - \beta'X) - \Phi(\mu_1 - \beta'X), \\
&\quad \vdots \\
&\text{Prob } (Y=J) = 1 - \Phi(\mu_{J-1} - \beta'X).
\end{aligned}
$$

In order for all of the probabilities to be positive, one must have

$0 < \mu_1 < \mu_2 < \ldots < \mu_{J-1}$.

The log likelihood function and its derivative can be obtained readily, and optimization can be done by the usual means.

Ordered Logit models for the health and educational outcomes of children of NBC and immigrant families

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. For a vector of predictors, X_k, the log of the *j*th cumulative odds for the health outcomes of native-born Canadian (NBC) and immigrant families can be written as:[70]

$$(4.3c) \qquad \text{Logit}\left[P(Y_{yfk} \leq j)\right] = \text{Log}\left(\frac{P(Y_{yfk} \leq j)}{1 - P(Y_{yfk} \leq j)}\right)$$

$$= \text{Log}\left(\frac{\pi_1 + \pi_2 + \ldots + \pi_j}{\pi_{j+1} + \pi_{j+2} + \ldots + \pi_J}\right), j = 1, \ldots \text{J-1}.$$

$$= \mu_j + \alpha \mathrm{I} + \mathbf{x}_y\boldsymbol{\beta}_N + \mathbf{x}_{yD}\boldsymbol{\beta}_D + \varepsilon_1$$

$$= \mu_j + \mathbf{x}_y\boldsymbol{\beta} + \gamma \mathrm{T} + \varepsilon_2$$

where

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

Subscript, y = (h, s) references health and education outcomes,

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

$\mathbf{x}_y = (\mathbf{x}_h, \mathbf{x}_s)$ references a vector of explanatory variables that affect health and educational outcomes,[71]

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

μ_j are the parameters to be estimated for the intercept terms of the ordered logit model;

α is the parameter to be estimated that will capture any differences in the intercept terms of the NBC and immigrant families;

$\boldsymbol{\beta}_N$, is the vector of slope coefficients to be estimated describing the effect of **x** on the log odds of response in category *j* or above for the NBC group, and $\boldsymbol{\beta}_D$'s is the vector of slope coefficients to be estimated to capture the differential values in the slope coefficients for the immigrant groups;

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70 See Agresti (1996).

71 Each vector includes individual characteristics of the child, family characteristics and resources that affect health and educational outcomes of children. Note that the vector of variables that affect child's school performances ($\mathbf{x}_s$) includes a few more variables in addition to the variables that affect health outcomes of children ($\mathbf{x}_h$)

T = *Years since immigration and* γ is the parameter to be estimated to denote the intergenerational impact of immigrants' assimilation;

ε_1 and ε_2 are the effect of unobserved characteristics and are assumed to be independent, identically, and normally distributed random variables with mean zero and variance $\sigma_{\varepsilon 1}^2$ and $\sigma_{\varepsilon 2}^2$ respectively.

Note that $\mu_j + \alpha I + \mathbf{x_y \beta_N} + \mathbf{x_{yD} \beta_D} + \varepsilon_1$ is the selection model for the pooled sample of NBC and immigrant families; and

$\mu_j + \mathbf{x_y \beta} + \gamma T + \varepsilon_2$ is the assimilation model for the sample of immigrants[72]

The response rate for the teacher's assessment of child's overall performance is 74 percent, which is not as low compared to that of the mathematics scores. Because the permission was given by the PMK of the child to release the teacher's assessment, it is likely that the child for whom the response is missing is non-random. However, this is not the only reason for the non-response. In many cases, the teacher's were also responsible for not sending the assessment. In many cases, the teachers did not send the assessment for all the children in the school. Hence, it is less likely that all the children for whom the responses are missing are non-random observations. Therefore, it is more likely that the ordered logit estimates[73] of school performance will not be affected largely because of the lower level of response rate.

Tests for the equality of two non-linear regressions: log-likelihood ratio test[74]

Ordered logit models are non-linear.[75]To test the hypothesis that the non-linear regressions are same for two groups, the log-likelihood ratio tests are performed. This test is described below:

Let $\hat{\theta}_U$ be the maximum likelihood estimate of θ obtained without regard to the constraints,

[72] Note that the variable, T, is not included in the selection model where the full sample of NBC and immigrant families is used in estimation. The reason behind this is that the variable T, *Years since immigration*, does not exist for native-born Canadian parents.

[73] While selection bias may arise if OLS methodology is applied; it is not clear how the logit estimates will be affected.

[74] See Greene (1993).

[75] Tobit models that are employed for HUI are also non-linear (See Appendix 4).

and let $\hat{\theta}_R$ be the constrained maximum likelihood estimator of θ. If $\hat{L}_U$ and $\hat{L}_R$ are the likelihood functions evaluated at these two estimates, then the likelihood ratio is:

(4.3d) $\lambda = \dfrac{\hat{L}_R}{\hat{L}_U}$ must lie between 0 and 1. If λ is too small, doubt is cast on the restriction.

Log-likelihood ratio test statistic

$-2 \ln \lambda = -2 (\ln \hat{L}_R - \ln \hat{L}_U)$ is distributed as chi-squared, with degrees of freedom equal to the number of restrictions imposed. The null hypothesis is rejected if the estimated value of $(-2 \ln \lambda)$ exceeds the critical value.

4.3.2 OLS and Heckman's (1979) two-stage 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:

$$
\begin{aligned}
(4.3e)\quad Y_{sfk} &= \mu_j + \alpha I + \mathbf{x}_s\boldsymbol{\beta}_N + \mathbf{x}_{sD}\boldsymbol{\beta}_D + \varepsilon_1 \\
&= \mu_j + \mathbf{x}_s\boldsymbol{\beta} + \gamma T + \varepsilon_2
\end{aligned}
$$

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

Note that $\mu_j + \alpha I + \mathbf{x}_s\boldsymbol{\beta}_N + \mathbf{x}_{sD}\boldsymbol{\beta}_D + \varepsilon_1$ is the selection model for the pooled sample of NBC and immigrant families, and $\mu_j + \mathbf{x}_s\boldsymbol{\beta} + \gamma T + \varepsilon_2$ is the assimilation model for the sample of immigrants.

However, mathematics computation scores are available only for the children who have responded (62%). 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. Suppose, the response status (responded or not), R, is determined by an unobserved latent variable $\hat{R}$ as in the following equation:

(4.3f) $$R = 1 \text{ if } \hat{R} > 0$$
$$= 0, \text{ if } \hat{R} < 0$$

Suppose that $\hat{R}$ is determined as:

(4.3g) $$\hat{R} = X_2\delta + \varepsilon_3$$

where X_2 is a vector of covariates, and ε_3 is an error term. Suppose ε_1 in equation 4.3e and ε_3 in equation 4.3g are correlated; then the regular OLS estimates of the educational outcome equation would not be consistent because the expected value of the error term is not zero as shown below:

(4.3h) $$E[\varepsilon_1 \mid \hat{R} \geq 0] = E[\varepsilon_1 \mid \geq - X_2\delta] = (\sigma_{13}/\sigma_3)\lambda$$

where σ_{13} is the correlation coefficient between ε_1 and ε_3, and σ_3 is the standard error of ε_3, and assuming a bi-variate normal distribution of ε_1 and ε_3,

(4.3i) $$\lambda = \varphi(Z)/\Phi(-Z), \text{ where } Z = X_2 (\delta/\sigma_3)$$

The Heckman (1979) two-stage procedure methodology is applied to test the presence of a sample selection bias in mathematics scores estimates. In the first stage, the response probability (a probit model) is estimated using equation 4.3g. The inverse of the Mill's ratio, λ, is estimated using this response probability and equation 4.3i. Then variable, λ, is included as a regressor in the math computation test score equation of the children who responded as shown in the following equation:

(4.3j) $$Y_{sfk} = \mu_j + \alpha I + x_s\beta_N + x_{sD}\beta_D + \varkappa\lambda + \varepsilon_4$$
$$= \mu_j + x_s\beta + \gamma T + \varkappa\lambda + \varepsilon_5$$

where Y_{sfk} denotes the mathematics score of the *k*th child of *f*th family

Note that $\mu_j + \alpha I + x_s\beta_N + x_{sD}\beta_D + \varkappa\lambda + \varepsilon_4$ is the selection model for the pooled sample of NBC and immigrant families; and $\mu_j + x_s\beta + \gamma T + \varkappa\lambda + \varepsilon_5$ is the assimilation model for the sample of children of immigrants.

A significant value of λ indicates that a sample selection bias is present. In this case, the Heckman model is the appropriate model to use, as the inclusion of λ makes the expected value or error term zero so that the estimated parameters are consistent. On the other hand, an insignificant value of λ shows no evidence of sample selection bias and the respondents are likely to be random draws from the population. Hence, OLS estimates are consistent.

Tests for the equality of two regressions: Chow test [76]

To compare the OLS models of two groups, the Chow test is used in this study. This test involves 4 steps:

Step1: Run OLS on a pooled sample. Suppose, the sample size is N. From this regression, obtain the residual sum of squares (RSS), say S_1, with df $=N_1+N_2-k$, where k is the number of parameters estimated, N_1 is the sample size of the first group and N_2 is that of the second group. Here, $N = N_1+N_2$

Step2: Run the two individual regressions and obtain their RSS, say S_2 and S_3, with df = $N_1 - k$ and $N_2 - k$, respectively. Add these two SS, say $S_4 = S_2 + S_3$, with df = $N_1 + N_2 - 2k$.

Step3: Obtain $S_5 = S_1 - S_4$.

Step4: Apply the F test as follows: $F = (S_5/k)/S_4/(N_1 + N_2 - 2k)$ with df = k, $N_1 + N_2 - 2k$. If the computed F exceeds the critical F, reject the hypothesis that the two regressions are the same.

4.4 Definitions of the study groups

Conceptually, it is not straightforward to define an immigrant family. An immigrant family has been defined in various ways in different studies. Some studies use the birthplace of the

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[76] See Gujarati (1988)

parents to define an immigrant family. For example, Worswick (2001) defines an immigrant family as one in which the PMK[77] of the child is foreign-born. This type of definition would represent an immigrant family accurately if the child lives with only one parent or with two parents from the same birthplace. The problem arises in applying this definition empirically if a child lives in a family with two parents from different birthplaces. If the two-parent families with different birthplaces were excluded from the analysis, the definition used by Worswick would represent an immigrant family accurately. However, when the sample size is small, the exclusion of these families may not produce a sample that is large enough to obtain reliable estimates. Also, the exclusion of these families may not represent the population if the percentage of these families is large. In this case, the researcher faces problems. Should the family be considered as an immigrant family when one parent is foreign-born and another is native-born? Can one consider this family as an immigrant family based on the role played by the foreign-born parent?

The answers of these questions are not straightforward. If these families are included in the immigrant group, then it is likely that they may not be representative of the immigrant group. Similarly, if these families are included in the immigrant group based on the role played by the foreign-born parent, then complications are created in deciding whose role is more important to the child. Usually, the mother plays the dominant role in a child's life at home and it would be reasonable to consider this family as an immigrant family when the mother is foreign-born.[78] On the other hand, the father is usually the primary income earner in a two-parent family. Studies show that the income of the family and the job status of parents are significant covariates of child outcomes.[79] If this is the case, then the father's role in the child's life is also important. Hence, the consideration of a family as an immigrant family based on the birthplace of the mother may not accurately measure an immigrant family when the father is native-born. Therefore, a researcher is required to choose between these alternatives. Also, a foreign-born parent may have lived in the host

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77 In 90% of the cases in this study, the PMK is the mother of the child.

78 It is generally the case that a woman has the major responsibility for the care of the children. See, for instance, Lundberg and Pollak (1997) and Carter and Katz (1997).

79 See Chapter 2.

country for a long period of time and assimilated enough to form a family with a native-born parent.[80] In this case, considering this family as an immigrant family may not represent a true immigrant family. The visible minority status of foreign-born may also be an important factor. For example, an African origin person is more likely to be different from an NBC person than is a European origin person. The birthplace of the child in the family with foreign born-parents may also matter. An immigrant family in which the child is native-born is likely to be different from the one in which the child is foreign-born.

Studies that define an immigrant family based on the time of residency of parents or the time of residency of children may also encounter weakness. For example, Beiser et al (1998) considered a child as an immigrant who has been living in Canada for less than 10 years. In other words, the children who have been living in Canada for more than 10 years were considered to be comparable to native-born children. Immigration literature suggests that not all foreign-born individuals assimilate in the host country in 10 years. Hence, the children in a family with all foreign-born parents may not be comparable to native-born children even if they have lived in the host country for more than 10 years.

Some studies[81] use the language spoken at home to identify the immigration status. If the language spoken at home is not the home language, the child's family is considered as an immigrant family. The problem with this definition is that it assumes that the children from English or French speaking countries are comparable to the native-born, which may not be correct. Other studies define an immigrant family based on the first language spoken by the mother of the child.[82] This definition may not accurately represent the children in the families in which the mothers' first language is not a home language, but they have been living in the host country for a long period of time. Neither will it represent accurately those families in which the father's spoken language is the home language.

The definition of an immigrant family is a critical issue for empirical investigations using

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[80] Marriage with a native-born partner may be an indication of assimilation.

[81] See, for example, Munnroe-Blum et al (1989)

survey data where the necessary information may not be present or where the number of observations for a particular group is small. Depending on the definition used, the findings could vary. This issue has received relatively little attention by other scholars working in the area.

As stated, this study uses data from the Cycle 2 of the NLSCY to study the health and 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. 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 (485 with exclusion vs. 1,074 without exclusion) and the findings would be less reliable. Also, one of the objectives of the thesis is to carry out analysis for three different immigrant sub-groups: the American immigrant group, the European immigrant group, and the Asian immigrant group. In this case, the exclusion of these two-parent families produces samples for the three sub-groups, which are not large enough to get reliable estimates. Considering this limitation, this study examines two alternative definitions of an immigrant family: a combined immigrant family; and an all parents immigrant family. The combined immigrant group includes two-parent families where each parent is from a different birthplace, while the all parents immigrant group excludes two-parent families with different birthplaces.

There is information in the NLSCY regarding the birthplace[83] (Canada, U.S., Europe, Asia, or Other place) of the PMK and her/his spouse /partner. Based on this birthplace information of parents, the various groups are defined. Since one of the objectives of the study is to examine the nature of association of time of residency of foreign-born parents and their children's outcome, time of residency issue is not considered in the definition of an immigrant family, as it is studied separately. Similarly, the language spoken by the parents

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82 See Worswick (2001).

are not considered in the definition, as the separate analyses are carried out for the sub-groups. For example, English was the first language spoken at home of all the PMK's in the American immigrant group. Hence, the outcome of this group may reflect the influence of language spoken at home of parents. Also, since only 5% of the children in the sample were born outside Canada, they were also included in the sample; but are not addressed separately. Finally, since the objective of the study is to examine the influence of birthplace of parents, the issue of visible minority status is also ignored in the definition of immigrant family. This issue could be a topic of future research. The formal definitions of various study groups are stated below.

An NBC family, a combined immigrant family and an all parents immigrant family

An NBC family is defined as one in which all the parents with whom the child lives are native-born Canadian (NBC). According to this definition, the birthplace of the PMK in an NBC family is Canada if the child lives with one parent (99% of the lone-parent families in the sample are headed by the mother); if the child lives with two parents, the birthplace of *both* the parents in an NBC family is Canada. A combined immigrant family is defined as one in which *at least one* of the parents with whom the child lives is foreign-born. An "all parents immigrant" family is defined as one in which all the parents with whom the child lives are foreign-born. According to this definition, the birthplace of the PMK in an "all parents immigrant family" is outside Canada if the child lives with one parent. If the child lives with two parents, the birthplace of *both* the parents in an "all parents immigrant family" is outside Canada. Note that the "all parents immigrant" family group is a subset of the combined immigrant family group and two parents in the "all parents immigrant" group need not have the same country of origin or resided in the host country for the same length of time since immigration.

Also note that the combined immigrant group consists of the families in which at least one of the parents are foreign-born, whereas, all parents immigrant group consists of those families in which one or two-parents with whom the child lives are foreign-born.

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[83] The NLSCY code for this variable is BSDPD04 in the primary file.

Thus, the combined immigrant group consists of two types of families: i) the families that have all foreign-born parents (the all parents immigrant group), and ii) the families that have two-parents, and one of them is native-born Canadian (NBC). The second type of families in the combined immigrant group are less representative of the true immigrant families in Canada for a number of reasons. First, the NBC parent is already established in Canada; and does not have to go through the resettlement process as the immigrants do. Second, since the NBC parent has chosen a foreign-born partner, it is likely that the foreign-born partner has already assimilated in Canada.[84] Third, even if the foreign born-partner did not assimilate, the NBC partner is likely to help him/her assimilate economically and culturally faster in Canada compared to the foreign-born parents in the all parents immigrant group. Thus, theoretically, for the presence of the second types of families the combined immigrant group is less representative of an immigrant group compared to the all parents immigrant group. However, empirically, the number of observations of the all parents immigrant group in this studied sample is markedly smaller compared to that of the combined immigrant group (1,073 for the combined immigrant group vs. 485 for the all parents immigrant group). Hence, the results of the all parents immigrant group may be less reliable empirically.

Sub-groups within the combined immigrant group

For comparisons within the immigrant population, the sample of children from the combined immigrant group is subdivided into four immigrant groups: the *American, the European, the Asian,* and the *other immigrants group*. If the PMK of a child is foreign born, a sub-group is identified according to the birthplace of the PMK.[85] For example, if the birthplace of PMK is the U.S., the family is labelled as an American immigrant family. If the PMK of a child is NBC, the family is identified according to the birthplace of the spouse/partner. All the American immigrant families belong to the American immigrant group. Other sub-groups are defined in the similar way.

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84 Choosing a foreign-born partner is an indication of cultural assimilation.

85 Since the PMK has the closest relationship with the child, it is a reasonable choice.

Years since immigration of parents

In the NLSCY, information about the "years since immigration" is provided for the PMK and his/her spouse. [86] If the child lives with a lone foreign-born parent, the "years since immigration" of that parent is considered as the "years since immigration of parents" in this study. On the other hand, if the child lives with two foreign-born parents, the "years since immigration" of the PMK is considered as the " years since immigration of parents." It is believed that the PMK has the most influence on the child, as she is the closest person to the child in the family.

4.5. The estimation sample

Although health measures are available for all the children in the NLSCY, school performances do not apply to all children. They are available only for children aged 6 to 13 years in the Cycle 2. To compare the health and educational outcomes of school-aged children, children aged 6 years and older are selected for the study of both outcomes. To select the initial sample for this study the following children were excluded:

I) The children aged less than 6 years (10,926 observations);

II) The children whose parents' (the PMK and the spouse of the PMK) birthplaces were unknown (323 observations);

III) The children who were living without a parent (16 observations);

Because of these exclusions, the initial sample size for this study is 8,760 observations. As explained above, sample sizes vary for different questions because of missing values. This is presented in Table 4.1. The sample sizes for different groups are shown in Table 4.2. Overall, only 439 children (5%) were born outside Canada and 95% of the children in the sample were born in Canada. Table 4.2 also shows the percentages of children in different groups who were born in Canada. For example, 99% of the children in the NBC group were born in Canada, while 80% of the children in the Asian immigrant group were born in Canada.

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[86] The NLSCY code for this variable is BSDPD04 in the primary file. The birthplace of the

Table 4.1: Number of observations for individual variables

	Total	Native-born Canadian group	Combined immigrant group
Birthplace	8,760	7,687	1,073
Age of child	8,760	7,687	1,073
Gender (= 1, if the child is a boy, = 0, if a girl)	8,760	7,687	1,073
Equivalent Income($)	8,760	7,687	1,073
House (= 1, if the family owns the house, = 0, if not)	8,760	7,687	1,073
Lone-parent (= 1, if child lives with a lone-parent, = 0, otherwise)	8,760	7,687	1,073
Age of mother (years) at birth of child	8,760	7,687	1,073
Years of education of PMK	8,760	7,687	1,073
Weekly working hours of PMK	8,617	7,556	1,061
Poor health condition of PMK(= 1, if PMK's health is fair or poor, = 0, otherwise)	8,661	7,599	1,062
Residential movement	7,557	6,614	943
Rural area (=1, if the child lives in a rural area, = 0, otherwise)	8,760	7,687	1,073
Provincial unemployment rate (1996)	8,760	7,687	1,073
Welfare (= 1, if the family's main source of income is public assistance, = 0, otherwise)	8,749	7,679	1,070
Job rank of parents (a lower value indicates a higher job status)	8,601	7,555	1,046
Family dysfunction	8,562	7,524	1,038
Negative parenting style	8,671	7,613	1,058
Private (= 0, if the child goes to public or Catholic school, =1, otherwise)	8,725	7,670	1,055
Missing days (= 0, if missing days of school are less than 3 days, = 1, if equal to or more than 3 days)	8,685	7,630	1,055
Instruction hours in mathematics (= 1, if per week instruction time is greater than or equal to 4 hours, = 0, if less than 4 hours)	6,642	5,820	822
Years since the family immigrated	1,070	Not applicable	1,070
PMK's assessment of child's health	8,742	7,672	1,070
Health Utility Index	8,712	7,645	1,067
Teacher's assessment of child's overall performance	6,576	5,757	819
PMK's assessment of child's overall performance	8,495	7,457	1,038
Mathematics test scores	5,444	4,741	703

PMK is recorded as Canada, U.S., Europe, Asia, or Other place.

Table 4.2: Sample size and the percentages of NBC children in different groups

Group	Sample size	Children who were born in Canada (%)
Native–born Canadian group	7,687	99
Combined immigrant group	1,073	86
All parents immigrant group	484	73
American immigrant group	148	96
European immigrant group	455	89
Asian immigrant group	128	80
Other immigrant group	342	72

4.6 Specification of the independent variables

The vector of inputs, **X**, includes child characteristics, family endowments and resources, school characteristics and resources, and public resources. In each category, a number of variables can be included. It is very difficult to identify all the variables that could be included in each category.

A valid empirical model needs correct specification. If some variables that are considered as important covariates of child outcomes are not included in a model, it could create specification bias in the estimated coefficients. The model of sources of variation in child outcomes that was developed in Chapter 3 presents the broad factors that could cause variation in child outcomes. Data for these broad factors are rarely available. As the diagram 3.0 in Chapter 3 shows, each broad factor could originate from several more specific factors for which data could be available. Consider the variation in parental preference for child outcomes, which could arise from some other more specific factors, such as, the age of parents, religious and/or cultural beliefs of parents, and educational experiences. Similarly, parental constraints could arise from wealth, local labour market condition, working status, and the nature of jobs. The literature review of the covariates of child outcomes in Chapter 2 gives a detailed list of such specific factors that could be associated with child outcomes. An alternate way of specifying an empirical model of child outcome is to include these specific factors. All the variables that are theoretically believed to be associated with child outcomes could be included in a model. However, there are some problems associated with including all these variables in an empirical model. For example, parental income and the neighbourhood environment could be highly correlated.

If both variables are included in a model, it could suffer from multicollinearity problems. Similarly, the mother's employment status/hours and child health could be simultaneously related. In that case, inclusion of the mother's employment in a child health model could cause an endogeneity problem. Hence, there a trade-off is involved. A reduction of one bias could increase the other bias.

The economic framework that is developed in Chapter 3 determines the specification methodology of this study. The final resource (covariate) vector for the empirical model is selected considering the objective of the study and availability of data. The main purpose of this study is to test the hypothesis that the children of immigrant families are a positively selected sample. However, the selectivity is related to the characteristics that a researcher does not observe. Hence, this hypothesis could be tested from the model coefficients of child outcomes of the NBC and immigrant groups. The strength of association of the observable resources and child outcomes reflects the nature of selection. A stronger association (positive or negative) would indicate a positive selection and a weaker association would indicate a negative selection.

A simple way of testing the selectivity hypothesis is to include the *birthplace* variable in the child outcome regression and interact it with other variables. The coefficient of an interaction variable gives the differential value of the slope coefficient of the non-interacted variable on child outcomes of the immigrant group. The same sign of the non-interacted variable and the interaction variable would indicate that the absolute slope is larger for the children of the immigrant group. This would be consistent with the hypothesis that the children of the immigrant group have a stronger association of observable resources and child outcomes, and hence, they are a positively selected sample.

To examine the association of time of residency of immigrants and children's outcome 'years since immigration' of parents in Canada is included in the health and educational outcome models. Hence, the main focus of the health and educational outcomes models are the coefficients of *birthplace* variable, interaction variables, and the "years since immigration of parents" variable. Note that "years since immigration of parents" variable does not exist for the NBC group. For that reason, this variable is included in the models[87] only when the outcomes are compared among the various immigrant sub-groups, but not when child outcomes are compared between the NBC group and an immigrant group. Besides the above-mentioned variables, some other variables are also included that are expected to have an association with child's health and educational outcomes.[88] Note that the variables were separated for child health and educational outcomes. Some variables that were relevant for educational outcomes were not relevant for health outcomes. For example, studying in a public school is likely to be associated with educational outcomes; it is unlikely that this variable will be associated with child health.

Initially, an economic model is specified for each outcome including fewer variables[89] and this is the *base model*. This *base* model could suffer from mis-specification bias, as it excludes four variables: "jobrank of parents," "welfare," " negative parenting style," and "family dysfunction score" that are expected to be associated with child outcomes. For that reason, a separate model for each outcome is also specified including the above four variables.[90] This model is termed the as an *extended model*. This *extended* model might suffer from multicollinearity and endogeneity problems.

The specification of the health outcome model in this study includes the working hours of the PMK (proxy of mother), as it is expected to be significantly associated with child health. However, as mentioned, this is likely to create an endogeneity problem in the health model. Theoretically, instrumental variable (IV) methodology[91] can reduce the problem of

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[87] These models are termed as assimilation models.

[88] See Table 4.3 for the complete specification.

[89] Job rank of parents, public assistance, parenting style, and family dysfunction score variables are not included. The first two variables have not been included in the base model because these two variables are highly correlated with household income. The other two variables are excluded because these variables are not observed in traditional economic models.

[90] These are often used in social science literature. Family structure is a variable that is considered a form of social capital in the family by the economists. This variable is considered as a significant factor in child development by sociologists and developmental psychologists.

[91] See Gujarati (1988) for a preliminary idea about IV method.

endogeneity. Unfortunately, from the available information in the NLSCY, it is difficult to find a proper instrument that is highly correlated with working hours of mothers but uncorrelated with the error terms. Hence, it was not possible to apply IV method to correct endogeneity bias in this study. Similarly, the inclusion of child health variable may cause some endogeneity bias in the educational outcome estimates.

Although the endogeneity problem was not corrected in the health and educational outcome models in this study, the extent of bias was examined by comparing the estimates of these models with those of the alternative models. These alternative models are expected to have less endogeneity problem. For example, an alternative model for health outcome model is specified using the ethnic working hours of the PMK variable[92] instead of the actual working hours of PMK. Similarly, for comparison, an alternative model of school performance is specified without child health[93] and compared with the models including child health. Also, two alternative models are specified with child health: one with HUI and another with the PMK's assessment of child's health. The model estimates that are more similar to those without child health are accepted. Table 4.3 lists the independent variables in the *base* models of the health and educational outcomes of children aged 6-13 years. Table 4.4 lists the independent variables in the *extended* models of the health and educational outcomes of children aged 6-13 years.

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[92] The idea of using ethnic working hours is taken from Borjas (1992, 1994), Card et.al (1998) and Chiswick and Miller (2000). Borjas uses the mean earnings of the ethnic group in the parents' generation as the ethnic capital, and argues that ethnic capital matters to the outcome (earnings) of the children when they are exposed frequently to other persons who share the same ethnic background. Borjas finds that the earnings of the children of immigrants are strongly affected by "ethnic capital." He further argues that if parental skills are measured with error, the ethnic mean then provides a very good instrument for parental skills. Card et.al includes mean education levels of father's ethnic group in the educational attainment of children of immigrants. They argue that ethnic capital averages out any individual -specific transitory fluctuations or measurement error and thus the estimates are most comparable to the estimates obtained from regressions that use instrumental variables methods. Chiswick and Miller include the average language efficiency of the ethnic group in the earnings function of immigrants and call it "ethnic goods effect." In the NLSCY, the birthplace of the PMK is recorded. Besides this, information on the country of origin of the PMKs is also provided (the NLSCY code for this variable is BSDPQ1 the secondary file). Using this information, the ethnic working hours of PMK variable is created. See Appendix 2 for more details.

[93] This model is expected to have less of an endogeneity problem.

Table 4.3 Explanatory variables in the base models of health and educational outcomes [94]

Health outcomes of children	Education outcomes of children	Expected sign
Birthplace (=1, for immigrant group, = 0, for NBC group)	Birthplace (= 1 for immigrant group, = 0, for NBC group)	Positive
Years since immigration of parents [1]	Years Since immigration of parents	Positive
Age of the child	Age of the child	Uncertain
Gender (=1, if the child is a boy, = 0, if a girl)	Gender (=1, if the child is a boy, = 0, if a girl)	Uncertain
Equivalent income ($) [2]	Equivalent Income($)	Positive
House (=1, if any family member owns the house, = 0, if not)	House (=1, if any family member owns the house, = 0, if not)	Positive
Lone-parent (= 1, if the child lives with a lone-parent, = 0, otherwise) [3]	Lone-parent (= 1, if the child lives with a lone-parent, = 0, otherwise)	Negative
Age of PMK (years) at child's birth	Age of PMK (years) at birth of child	Positive
Years of education of PMK	Years of education of PMK	Positive
Weekly working hours of PMK/Ethnic working hours of PMK	Weekly working hours of PMK	Negative
Poor health condition of PMK (=1, if health status of PMK is poor or fair, = 0, other wise)	Poor health condition of PMK (=1, if health status of PMK is poor or fair, = 0, other wise)	Negative
Number of residential movement	Number of residential movement	Negative
Rural area (= 1, if child lives in rural area, = 0, otherwise)	Rural area (= 1, if child lives in rural area, = 0, otherwise)	Negative
Provincial unemployment rate (1996)	Provincial unemployment rate (1996)	Negative
	Health Utility Index/PMK's assessment of child's health [4]	Positive
	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, if equal to 3 or more)	Negative
	Fewer instruction hours in mathematics (= 1, if instruction time per week is less than 4 hours, = 0, if equal to or above four hours) [5]	Negative

Continued on next page

[94] A detailed description of the explanatory variables and their expected association with the health and educational outcomes are presented in Appendix 2.

Table 4.3 continued

	Inverse of the Mills ratio [6]	Positive

Notes

[1] "Years since immigration of parents" does not exist for the NBC families. This variable is included only when outcomes are compared among different immigrant sub-groups within the immigrant population.
[2] Equivalent income is defined as household income divided by the equivalent scale = household income before taxes/square root of family size. Note that this income is a cross-sectional income (1996/97). Since 1994/95income information is available only for the longitudinal children (84%) of the 1996/97sample, longer-term income is not used.
[3] In the sample, only161 single parents are lone fathers. Curtis et al. (2001) argue that a lone-father has, on average, a higher income than does a lone mother, and hence, lone fathers should be excluded. In this study, they were not excluded because of sample size problems for the immigrant sub-groups. Also, since the percentage of lone father is approximately 1.8% of the full sample and an income variable is included, it is less likely that the impact of this inclusion will be substantial.
[4] Note that the health outcome is included in the educational outcome model but not vice versa. This is because it is expected that the health status of children aged 6-13 would affect school achievement of the school-aged children, but not vice versa.
[5] This variable is included only in the mathematics score model.
[6] This variable is included only in the Heckman model.

Table 4.4 Additional explanatory variables in the extended models

Health outcomes of children	Education outcomes of children	Expected sign
Welfare (= 1, if the main source of income of the family is public assistance, = 0, otherwise)	Welfare (= 1, if the main source of income of the family is public assistance, = 0, otherwise)	Negative
Job rank of parents [1] (a lower value indicates higher job status)	Job rank of parents (a lower value indicates higher job status)	Negative
Family dysfunction [2] (a higher value indicates lower value of family functioning)	Family dysfunction (a higher value indicates lower value of family functioning)	Negative
Negative parenting style [3] (a higher value indicates higher level of ineffective and hostile parenting style)	Negative parenting style (a higher value indicates higher level of ineffective and hostile parenting style)	Negative

Notes

[1] 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. See Appendix 2 for more details.

[2] This is a derived variable in the NLSCY with details presented in Appendix 2. The score of this variable is derived using the unweighted items of the following variables:

i) Planning family activities is difficult because we misunderstand each other;
ii) In times of crisis we can turn to each other for support;
iii) We cannot talk to each other about sadness we feel;
iv) Individuals (in the family) are accepted for what they are;
v) We avoid discussing our fears or concerns;
vi) We express feelings to each other;
vii) There are lots of bad feelings in our family;
viii) We feel accepted for what we are;
ix) Making decisions is a problem for our family;
x) We are able to make decisions about how to solve problems;
xi) We don't get along well together; and
xii) We confide in each other.

[3] 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. See Appendix 2 for more details.

Specification of explanatory variables for the Probit model of mathematics response rate

For identification of the mathematics score model that includes the *Inverse of the Mills Ratio*, λ, from the mathematics response model, 4.3f, it is necessary that there should be at least one variable in the first model that is not included in the second model. In the real field, it is very difficult to find a variable that influences the mathematics score but not the response rate. In my observation, per week instruction hours in mathematics is more likely to affect the mathematics scores of a child, but it is less likely to affect the presence in the mathematics test in the survey. Hence, this is the additional variable in the mathematics score model, which is not in the response model. Thus, the Heckman model in this study is identified.

4.7 Selectivity tests

As previously discussed, selectivity is related to the unobservable characteristics, or "differential cultural capital," which a researcher does not observe or measure. Hence, there is no scope to add a variable that could measure selectivity of parents in the health and educational outcome model of their children. However, a positive selection indicates that the association of observable resources with child outcome is stronger. The hypothesis that the children of immigrant families are a positively selected sample is tested in two steps.

First, a *birthplace*[95] variable is included in addition to the specified variables in the health and educational outcome model and interacted with the other specified variables. The coefficient of an interaction variable gives the differential value of the slope coefficient of this variable on the health outcomes and educational outcomes of children of the immigrant group compared to the NBC group. The coefficients of the interaction variables are compared with those of the non-interaction variables. The same signs of the coefficients of the non-interacted variables (consider income, for example) and the respective interaction

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[95] For the full sample, the birthplace takes value 1, if the child is from any immigrant family, value 0, if from a NBC family. For the pooled sample of children of American immigrant families and NBC families, birthplace takes value 1, if the child is from an American immigrant family, value 0, if from an NBC family. Similar definitions apply when the sample of children

variables (income*birthplace) indicate a larger absolute slope coefficient for the immigrant group.[96] Since a larger slope coefficient of a variable implies a stronger association of this variable with child outcome, this would be consistent with the hypothesis that the children of immigrant families are a positively selected sample. On the other hand, when the coefficient of the non-interacted variable and the respective interaction variable has opposite signs, it is consistent with the hypothesis that the children of immigrant families are negatively selected. However, by observing only one coefficient, it cannot be concluded that the children of a group are a positively selected sample. If it is observed that all the coefficients of the interaction variables have the same sign (opposite signs) as those of the original variables for a group, it is possible to conclude that the children of that group are a positively (negatively) selected sample. When the coefficients of some interaction variables have same signs and the others have opposite signs as those of the non-interacted variables, no precise conclusion can be drawn. For that reason, the hypothesis is tested in the second stage, which provides an accurate conclusion.

In the second stage, predicted outcomes for children of the two groups are simulated using the parameters for the two groups estimated in the first stage and giving each group the resource levels of the NBC group. In this stage, the conclusion about a positive (negative) selection is drawn observing a higher (lower) outcome of children of immigrant families for the same level of resources.

4.8 Constraints of the study

As mentioned earlier, the main constraint of this study is the missing values in the data. The initial sample size was 8,760 (7,687 for the NBC group, and 1,073 for the combined immigrant group). However, this sample size does not remain the same when more information is accommodated. While doing the t- tests for comparisons of the resources and opportunities of the NBC group and the immigrant groups, all observations with a response to the particular question were included. Thus sample sizes vary for many variables (see Table 4.1). For example, there were no missing observations for the age and

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of European or Asian immigrant families are pooled with those of NBC families.

gender of the child variable, and hence, the sample size for these variables was 8,760. On the other hand, for the working hours of PMK variable, the sample size was 8,617 (7,556 for the NBC group and 1,061 for the combined immigrant group). This variable sample size was used in the *t*-test to utilize the most available information for each variable.

The sample size problem becomes more acute while estimating the regressions because of more missing values in the dependent and in explanatory variables. There are different ways to handle missing values in the regression.[97] In this thesis, the *complete case studies methodology*, which studies only the cases for which all the information is available, is used. The regression process takes only those observations for which all the information is present. For the PMK's assessment of child's health, 8,742 observations are available. However, because of the missing values in the explanatory variables, the sample size for the base regression model is 7,464 and that of the extended model is 7,270. Similarly, for the teacher's assessment of child's overall performance, 6,576 observations are available; but for the extended regression model, the sample size is 5,645 because of the missing values in the explanatory variables.

In the case of math computation test scores, the scores are available only for 62% of the selected sample. Moreover, out of these observations, there were missing values for the independent variables. After excluding all the missing values, the final sample size (full sample) to estimate the extended model of math scores is 4,890. Thus, 8,760 can be considered as the full sample, while others are sub-samples. The possibility that non-respondents may have different characteristics from respondents could produce a sample selection bias in the results. However, as stated earlier, this is tested using Heckman's (1978) two-stage procedure for the math scores models. For the other outcome variables, the non-respondents are expected be similar to the respondents.

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[96] Assuming the coefficients are statistically significant.

[97] See Curran et al. (1998).

CHAPTER 5

Comparison of Average Resources and Child Outcomes of Native-born Canadian and Immigrant Families

5.0 Introduction

The health and educational outcomes of children, at least partly, depend on the resources available to them. It would be useful to study the resources of the families in Canada who have school-aged children to link them with the process of children's health and educational outcomes. Available information on the immigrant population, as presented in Chapter 2, suggests that the immigrant population have a higher level of resources than do the NBC population. This, however, does not necessarily imply that the subset of immigrant families who have children aged 6-13 would also have a higher level of resources compared to their counterpart. Information on the characteristics of the families who have school-aged children is available from the National Longitudinal Survey of Children and Youth (NLSCY) in Canada. In this study, data from the Cycle 2 of the NLSCY (1996-1997) are examined.

To get a preliminary picture of the process of children's outcomes, the mean values of characteristics (covariates of child outcomes), and health and educational outcomes of children in different groups are compared in this chapter. These groups are: the NBC group, the combined immigrant group (at least one of the parents of the child is foreign-born), the all parents immigrant group (all the parents with whom the child lives are foreign-born), the American immigrant group, the European immigrant group, the Asian immigrant group, and the other immigrant group. Note that the all parents immigrant group is a subset of the combined immigrant group. Similarly, the other four groups are also sub-groups of the combined immigrant group. However, the all parents immigrant group and these four sub-groups are not mutually exclusive. The mean values of characteristics of the combined immigrant group and the NBC group are compared in Section 5.1, and those of the sub-groups are compared in Section 5.2. The average health and educational outcomes of children are also similarly compared in Sections 5.3 and 5.4.

The results of the *t*-tests of differences in the average characteristics of the NBC group and different immigrant groups from the studied sample are presented in Tables 5.1 and 5.2; and in Graphs 5.1-5.6. The results of children's outcomes are provided in Tables 5.3 and 5.4 and in Graphs 5.7-5.9. The comparison group here is the NBC group. A positive *t*-ratio for a variable indicates that the mean value of that variable is higher for the NBC group compared to the other group; while a negative ratio indicates a lower mean value for the NBC group.

Table 5.1: Comparisons of average characteristics of immigrant and NBC families: *T*-tests

Characteristics	Mean			Pair-wise *t*-ratios	
	NBC group	Combined immigrant group	All parents immigrant group	Combined immigrant group & NBC group	All parents immigrant group & NBC group
Sample size	7,687	1,073	484		
Age of child (years)	9.46 (0.03)	9.49 (0.07)	9.54 (0.10)	-1.40	-0.79
Gender of child (= 1, if the child is a boy, = 0, if a girl)	0.51 (0.01)	0.52(0.02)	0.54(0.02)	-0.72	-1.52
Family size	4.29 (0.01)	4.60 (0.04)	4.51(0.06)	-7.99[a]	-5.14[a]
Equivalent income ($)	26286 (209.15)	27743 (651.6)	24996 (1031.1)	-2.13[b]	**1.23**
House (= 1, if the family own a house, = 0, otherwise)	0.78(0.005)	0.76(.013)	0.67(0.02)	1.77[c]	5.18[a]
Lone -parent family (= 1, if the child lives with a lone-parent, = 0, otherwise	0.19(0.05)	0.14(0.01)	0.23(0.02)	4.36[a]	**-2.21[b]**
Age of PMK	37.20(0.06)	39.60(0.18)	39.21(0.27)	-12.48[a]	-8.67[a]
Age of biological mother at child's birth	27.097 (0.06)	29.26(0.17)	29.49(0.27)	-11.80[a]	-8.68[a]
Years of education of PMK	12.53 (0.02)	13.02(0.07)	12.93(0.12)	-6.45[a]	-3.38[a]
Years of education of spouse	12.23 (0.03)	13.25(0.09)	13.38 (0.17)	-12.34[a]	-6.06[a]
Weekly working hours of PMK	20.01 (0.20)	20.04(0.55)	21.84(0.83)	-0.04	**-2.13[b]**
Ethnic weekly working hours of PMK	19.96(0.02)	20.87(0.14)	21.53(0.26)	-6.28[a]	-6.06[a]
Poor health condition of PMK (= 1, if health status of PMK is poor or fair, = 0, otherwise)	0.06(0.003)	0.06(0.008)	0.10(0.01)	-2.14[b]	-2.98[a]
Residential moves	1.95(0.03)	1.81(0.06)	1.93(0.09)	2.01[b]	**-0.16**
Rural area (= 1, if the child lives in a rural area, = 0, otherwise)	0.17(0.004)	0.04 (0.006)	0.02(0.01)	18.44[a]	21.53[a]
Provincial unemployment rate, 1996	9.86(0.03)	9.10(0.04)	9.08(0.06)	14.75[a]	11.66[a]
Welfare (= 1, if the main source of income is public assistance, = 0, otherwise)	0.10(0.004)	0.08(0.01)	0.13(0.02)	1.72[c]	**-1.68[c]**
Job rank of parents (a lower value indicates a higher rank)	9.82(0.05)	9.55(0.15)	10.27(0.22)	1.65[c]	**-1.98[b]**
Family dysfunction score	7.98(0.06)	9.00(0.16)	9.20(0.22)	-6.23[a]	-5.24[a]
Negative parenting style score	1.01(0.005)	0.97(0.013)	0.92(0.01)	3.00[a]	4.20[a]
Missing days of school (= 1, if missing days of school are equal to or more than 3 days, = 0, otherwise)	0.24(0.005)	0.23(0.01)	0.21(0.02)	0.25	1.36
Per week instruction hours in mathematics (= 1, if more than 4 hours, = 0, if equal to or less than four hours)	0.832(0.005)	0.829(0.013)	0.85(0.02)	0.20	-0.81
Private school (= 0, if public or catholic school, =1, otherwise)	0.04(0.002)	0.10(0.009)	0.09(0.01)	-5.93[a]	-3.45[a]
Years since the family immigrated	NA	21.68(0.31)	17.91(0.48)	NA	NA

Notes: 1. a b and c indicate significant at the 1%, 5% and, 10% level, respectively.
2. The *t*-ratios in boldface of the all parents immigrant group indicate that the particular sample is different from the combined immigrant sample regarding the corresponding mean value.
3. NBC denotes Native-born Canadian
4. The sample size mentioned is that of the *birthplace* variable. It varies for different variables depending on the missing values of each variable (see Table 4.1 in Chapter 4).

Source: Author's calculation using the NLSCY (1996-97) Cycle 2 data

Table 5.2: Comparisons of characteristics of different immigrant sub-groups: *T*-tests

Characteristics	Mean values				Pair-wise *t*-ratios			
	American immigrant group	European immigrant group	Asian immigrant group	Other immigrant group	American & NBC	European & NBC	Asian & NBC	Other & NBC
Sample size	148	455	128	342				
Age of child (years)	9.62 (0.20)	9.60 (0.11)	9.62 (0.20)	9.50 (0.12)	-0.77	-1.23	-0.75	-0.32
Gender of child (=1, if the child is a boy, = 0, if a girl)	0.52 (0.04)	0.44 (0.02)	0.56 (0.04)	0.60 (0.03)	-0.15	**3.00**[a]	-1.06	**-3.43**[a]
Family size	4.58 (0.09)	4.53 (0.05)	*4.51 (0.10)*	4.66 (0.07)	-2.99[a]	-4.20[a]	-2.95[a]	-5.01[a]
Equivalent income ($)	27313 (1790.3)	*32548 (1162.8)*	26257 (1861.9)	23025 (822.12)	**-0.57**	--5.30[a]	**-0.02**	**3.84**[a]
House (=1, if the family own a house, = 0, otherwise)	0.85 (0.03)	0.80 (0.02)	*0.87 (0.03)*	0.64 (0.03)	**-2.23**	**-1.17**	**-2.82**[a]	5.29[a]
Lone-parent family	*0.08 (0.02)*	0.12 (0.02)	0.14 (0.03)	0.17 (0.02)	4.74[a]	4.26[a]	1.45	**0.89**
Age of PMK (years)	39.67 (0.50)	39.56 (0.25)	40.10 (0.48)	39.46 (0.33)	-4.10[a]	-6.58[a]	-6.18[a]	-6.43[a]
Age of biological mother at child's birth (years)	29.60 (0.52)	28.89 (0.27)	30.19 (0.43)	29.25 (0.29)	-4.81[a]	-6.58[a]	-7.13[a]	-6.73[a]
Years of education of PMK	*14.04 (0.17)*	13.03 (0.11)	13.20 (0.23)	12.71 (0.13)	-8.96[a]	-4.49[a]	-2.88[a]	-1.40
Years of education of spouse	*13.60 (0.25)*	13.29 (0.13)	13.28 (0.35)	13.04 (0.16)	-6.67[a]	-8.97[a]	-4.60[a]	-5.88[a]
Weekly working hours of the PMK	19.24 (1.56)	20.08 (0.83)	22.39 (1.74)	19.25 (0.96)	0.49	-0.09	-1.36	0.77
Ethnic weekly working hours of PMK	19.17 (0.09)	21.50 (0.20)	22.90 (0.73)	19.77 (0.18)	**8.58**[a]	-7.67[a]	-4.03[a]	**1.00**
Poor health condition of PMK (= 1, if health status of PMK is poor or fair)	*0.03 (0.01)*	0.05 (0.01)	0.04 (0.02)	0.14 (0.02)	**2.52**[a]	**0.90**	**1.46**	-4.14[a]
Residential moves	1.91 (0.20)	1.76 (0.10)	1.76 (0.17)	1.84 (0.11)	**0.16**	1.80[c]	1.08	0.86
Rural area (= 1, if the family is from rural area)	0.10 (0.02)	0.05 (0.01)	*0.01 (0.01)*	0.02 (0.01)	2.78[a]	11.26[a]	18.69[a]	16.24[a]
Provincial unemployment rate	9.36 (0.14)	9.19 (0.07)	*8.47 (0.10)*	9.19 (0.08)	3.60[a]	9.48[a]	13.58[a]	8.18[a]
Welfare (=1, if the main source of income is public assistance)	0.07 (0.02)	*0.03 (0.01)*	0.04 (0.02)	0.17 (0.02)	1.65[c]	8.10[a]	3.39[a]	**-3.28**[b]
Job rank (a lower value indicates a higher rank)	*7.82 (0.40)*	9.09 (0.22)	10.66 (0.45)	10.02 (0.26)	4.97[a]	3.22[a]	-1.86[c]	**-0.76**

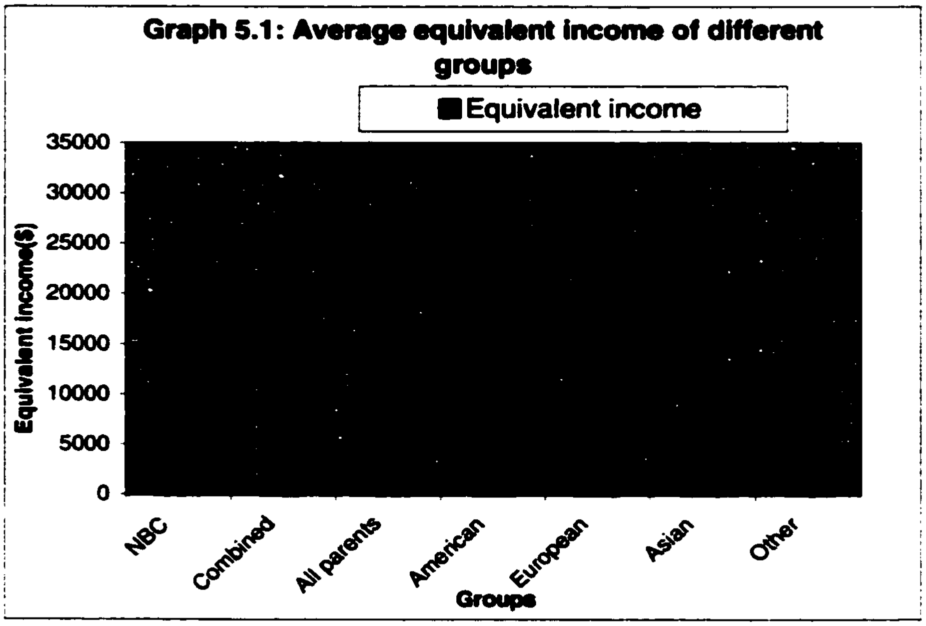
Continued on next page

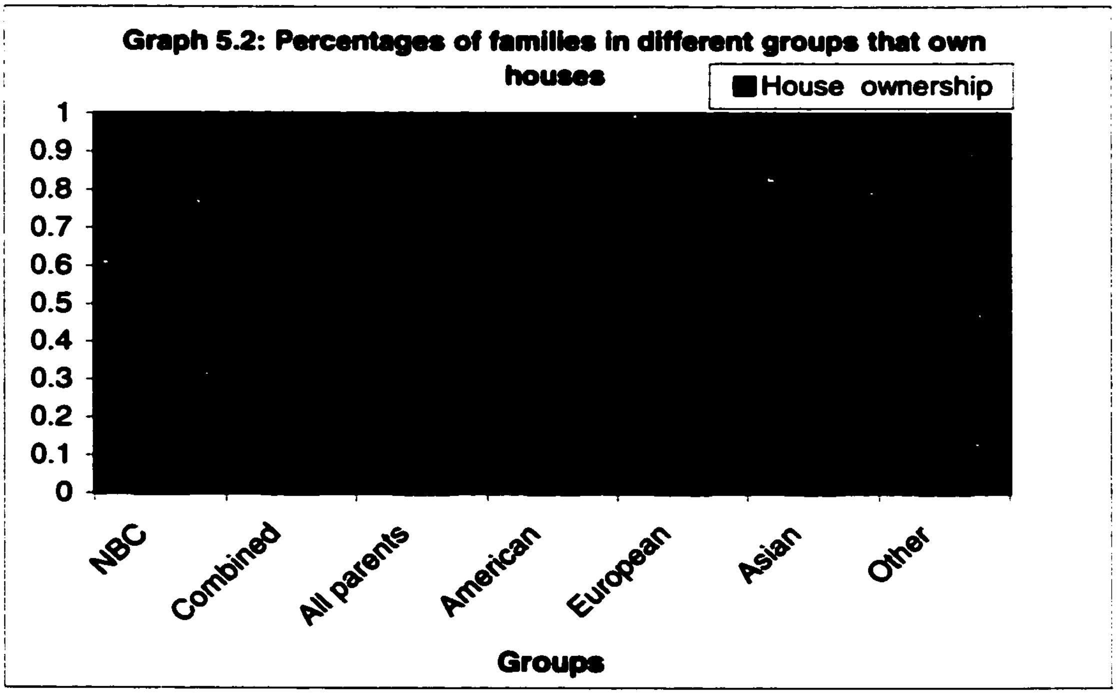
Table 5.2 continued

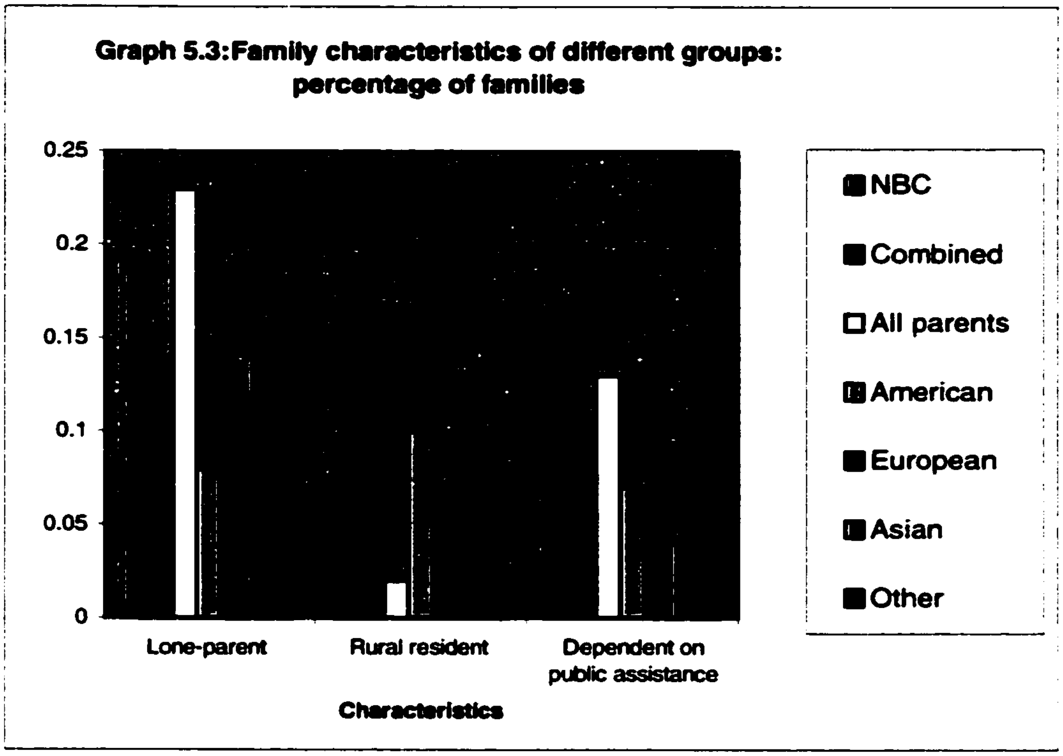
Characteristics	Mean values				Pair-wise *t*-ratios			
	American Immigrant group	European immigrant group	Asian immigrant group	Other immigrant group	American & NBC	Europea n & NBC	Asian & NBC	Other & NBC
Family dysfunction score	*7.50 (0.39)*	8.68 (0.24)	10.37 (0.44)	9.19 (0.27)	**1.22**	-2.82 [a]	-5.34 [a]	-4.52 [a]
Negative parenting style score (a higher value indicates a lower level)	*0.93 (0.03)*	1.02 (0.02)	0.931 (0.04)	0.94 (0.02)	2.41 [b]	**-0.24**	2.00[b]	2.98 [a]
Missing days of school (= 1, if equal to or more than three days, = 0, otherwise)	0.39 (0.04)	0.27 (0.02)	*0.11 (0.02)*	0.22 (0.02)	**-3.66 [a]**	-1.16	**4.68 [a]**	0.84
Per week instruction hours in mathematics (= 1, if more than four hours, = 0, if equal to or less than four hours)	0.79 (0.04)	*0.831 (0.02)*	0.81 (0.04)	0.83 (0.02)	1.24	0.05	0.47	-0.51
Private school (= 0, if public or catholic school, =1, otherwise)	0.27 (0.04)	0.12 (0.012)	0.08 (0.02)	0.05 (0.01)	-6.08 [a]	-4.73 [a]	-2.01 [b]	**-0.73**
Years since the family immigrated	20.33 (0.70)	*26.93 (0.49)*	17.03 (0.65)	17.55 (0.57)	NA	NA	NA	NA

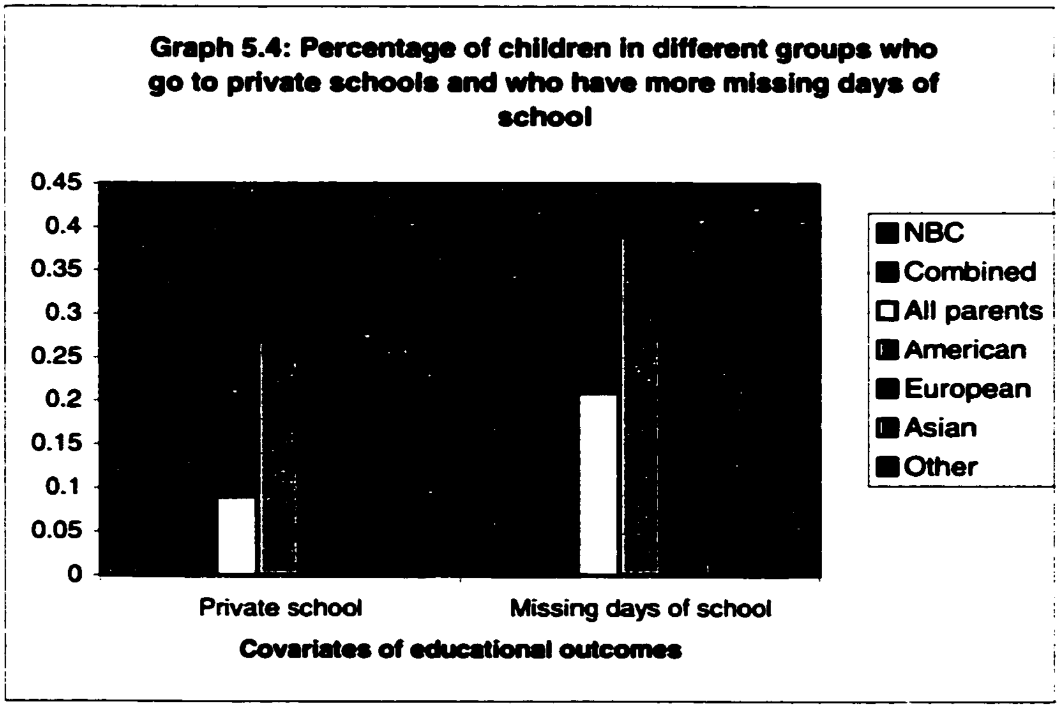
Notes: 1. a , b, c indicate significant at the 1% level, 5% level, and 10% level, respectively.
2. The t-ratios in boldface of an immigrant group indicate that the particular sample is different from the combined sample regarding the corresponding mean value.
3. The italicized mean values indicate the best (highest or lowest mean values among the four immigrant sub-groups. The variables that are expected to have mixed impacts are not italicized.
5. NBC denotes Native-born Canadian
6. The sample size mentioned is that of the *birthplace* variable. It varies for different variables depending on the missing values of each variable (see Table 4.1 in Chapter 4).

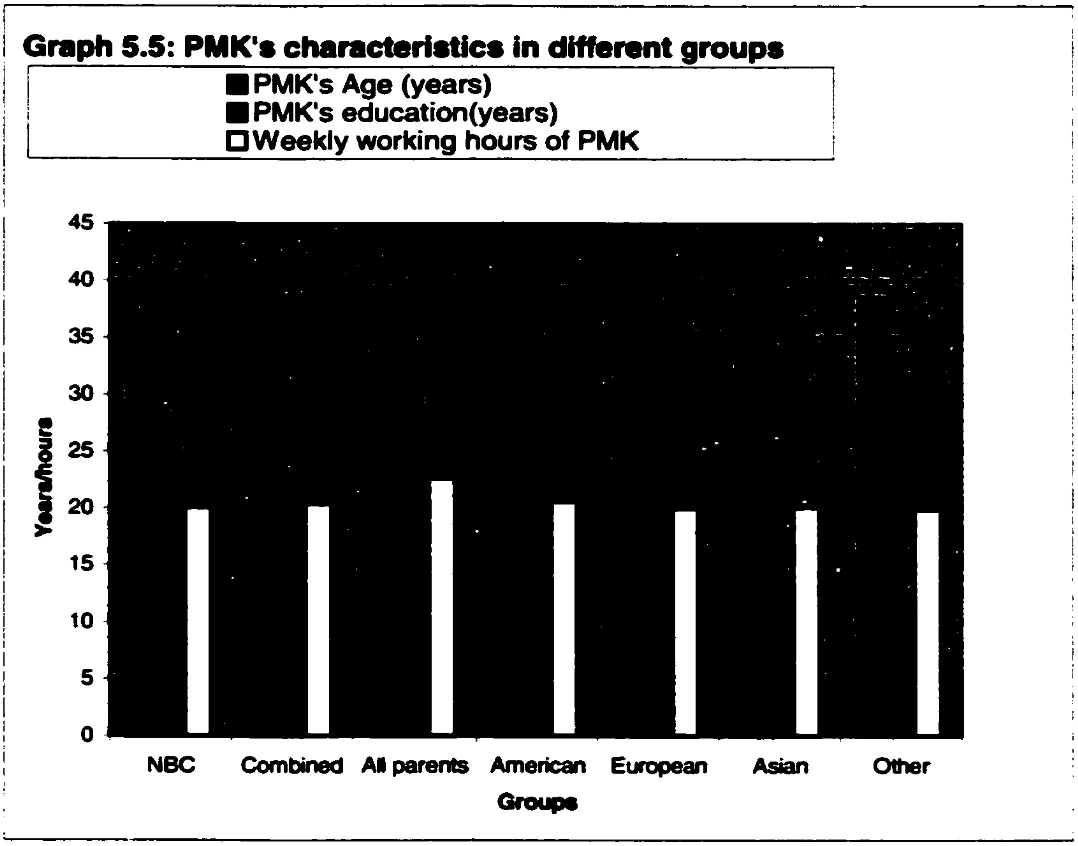
Source Author's calculation using the NLSCY (1996-97) Cycle 2 data

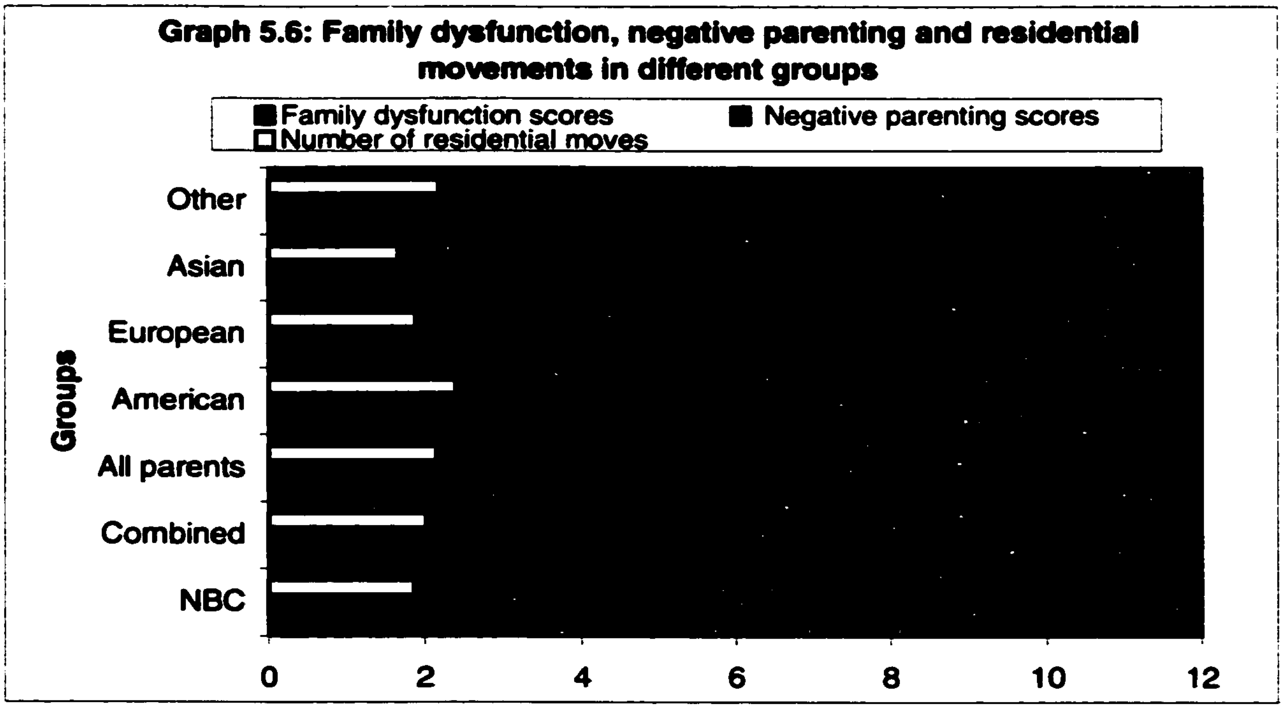

Graph 5.1: Average equivalent income of different groups
Equivalent income
Equivalent income($)
35000
30000
25000
20000
15000
10000
5000
0
NBC
Combined
All parents
American
European
Asian
Other
Groups


Graph 5.2: Percentages of families in different groups that own houses
House ownership
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
NBC
Combined
All parents
American
European
Asian
Other
Groups


Graph 5.3:Family characteristics of different groups: percentage of families
0.25
0.2
0.15
0.1
0.05
0
Lone-parent
Rural resident
Dependent on public assistance
Characteristics
NBC
Combined
All parents
American
European
Asian
Other


Graph 5.4: Percentage of children in different groups who go to private schools and who have more missing days of school
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
Private school
Missing days of school
Covariates of educational outcomes
NBC
Combined
All parents
American
European
Asian
Other


Graph 5.5: PMK's characteristics in different groups
PMK's Age (years)
PMK's education(years)
Weekly working hours of PMK
45
40
35
30
25
20
15
10
5
0
Years/hours
NBC
Combined
All parents
American
European
Asian
Other
Groups


Graph 5.6: Family dysfunction, negative parenting and residential movements in different groups
Family dysfunction scores
Negative parenting scores
Number of residential moves
Other
Asian
European
American
All parents
Combined
NBC
Groups
0
2
4
6
8
10
12

5.1 Comparison of average resources of the NBC group, the combined immigrant group, and the all parents immigrant group.

Columns 2-4 in Table 5.1 contain the mean values of the covariates of health and educational outcomes in the NBC group, the combined immigrant group and the all parents immigrant group, respectively. Note that both of these immigrant groups also contain the other four immigrant sub-groups: the American immigrant group, the European immigrant group, the Asian immigrant group, and the other immigrant group. Columns 5-6 give the pair-wise t-ratios of each immigrant group with the comparison group. The focus of the discussion here is on the mean values that are significantly different. Table 5.1 demonstrates that immigrants have more of some resources and less of others.

An examination of the family characteristics indicates that the children of the combined immigrant group are in an advantaged situation compared to those of the NBC group.
The average equivalent income is higher for the combined immigrant group than for the NBC group ($27,743 for the combined immigrant group vs. $26,286 for the NBC group). Job ranks are also significantly higher for the combined immigrant group. The mean value of job ranks is 9.82 for the NBC group, 9.55 for the combined immigrant group, and 10.27 for the all parents immigrant group.[98] The percentage of immigrants whose main source of income is public assistance (8% for the combined immigrant group vs. 10% for the NBC group), and who live in rural areas (4% for the immigrant group vs. 17% for the NBC group) is significantly lower for the combined immigrant group than for the NBC group. The percentage of children who live with a lone-parent (14% for the combined immigrant group vs. 19% for the NBC group) is also significantly lower for the combined immigrant group than for the NBC group. The immigrants also live in the areas where the unemployment rate is lower (9.9% for the NBC group and 9.1% for the combined immigrant group).

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[98] A lower mean value denotes a better job. For example, a mean value of 1 designates self-employed professional jobs, while 16 designates farm labourer. Similarly, 9 indicates skilled clerical/sales/service, while 11 indicates a farmer. A mean value of job ranks would be lower (higher) for a group when a higher (lower) percentage of people have better jobs.

However, an immigrant family does not seem to be in an advantaged situation in some of the above cases when the family characteristics of the all parents immigrant group are compared with those of the NBC group. Remember, an "all parents immigrant" family is more representative of a typical immigrant family. There is no statistically significant difference in the average value of equivalent income of the all parents immigrant group and that of the NBC group. The percentage of families in which the main source of income is public assistance (13% for the all parents immigrant group vs. 10% for the NBC group) and the PMKs have poor health (6% for the NBC group vs.10% for the all parents immigrant group) is higher for the all parents immigrant group. The percentage of children who live with lone-parent (23% for the all parents immigrant group vs. 19% for the NBC group) is markedly higher for the all parents immigrant group. Average weekly working hours of the PMK is higher (approximately, 20 hours for the NBC group vs. 22 hours for the all parents immigrant group) and the job rank of parents is lower for the all parents immigrant group than for the NBC group. The mean value of job ranks is 9.82 for the NBC group, while 10.27 for the all parents immigrant group. Finally, the all parents immigrant group has lived in Canada for shorter period of time compared to the combined immigrant group (21.68 years for the combined immigrant group vs. 17.91 for the all parents immigrant group.

Some parental characteristics suggest that the combined immigrant has a higher level of resources than does the NBC group. The mothers in the combined immigrant group are, on average, older than the mothers in the NBC group; the NBC mothers are, on average, 37.2 years old, whereas, the immigrant mothers are 39.6 years old. The average age of mothers at the birth of a child is also higher for the immigrant families (27 years for the NBC group vs. 29 years for the combined immigrant group). Immigrant parents are more educated than the NBC parents. A PMK and her/his spouse/partner in a typical immigrant family have 13.02 years and 13.35 years of education, respectively; whereas, those in a typical NBC family have 12.53 years, and 12.65 years of education, respectively. Immigrants, on average, are also less mobile and average negative parenting style (ineffective and hostile parenting strategy) scores are also lower for the immigrant families. The percentage of children who attend private schools is significantly higher for the combined immigrant group (10% for the combined immigrant group vs. 4% for the NBC group). Education is more expensive in a private school than in a public school. It indicates that the monetary investment for a child's education is higher in immigrant families compared to NBC families, as a higher percentage of children attend private schools. The conclusion is similar for the all parents immigrant family.

The combined immigrant group is in a lacking situation in some cases. Compared to the NBC group, the combined immigrant group has a larger family size (4.29 for the NBC group vs. 4.6 for the combined immigrant group). The percentage of families who own houses is smaller for the combined immigrant group than for the NBC group (78% for the NBC group and 76% for the combined immigrant group). The family dysfunction scores are higher for the combined immigrant group than for the NBC group (7.98 for the NBC group and 9.00 for the combined immigrant group).[99] This picture does not change with the change in the definition of the immigrant family.

The comparison of resources of the immigrant and NBC families raises a question: can one predict that the health and educational outcomes of children would be better for immigrant families? The answer is not straightforward. Since, in most of the cases, the combined immigrant group is in an advantaged situation compared to the NBC group, one may predict that the children's health and educational outcomes would be better for the combined immigrant group compared to the NBC group. However, the final outcomes would depend not only on the level of factors that are associated with the above outcomes, but also on the direction (positive or negative) and strength (magnitudes) of the association of these factors with the health and educational outcomes of children. Moreover, the unobservable characteristics -differential cultural capital- that is not considered by a researcher may also play an important role in determining the health and educational outcomes of children. The "differential cultural capital" could affect the strength of association of child outcomes and the observable resources. Differences in the strength of association could cause child outcomes to differ between two groups for the same level of observable resources.

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[99] A higher value of family dysfunction scores indicates a more dysfunctional family.

5.2 Comparisons of resources in the immigrant sub-groups within the immigrant population

As shown in the previous section, resources vary significantly between the NBC group and the combined immigrant group. The average resources may vary among the immigrant sub-groups within the combined immigrant group, as this group consists of a diverse population. Table 5.2 depicts a comparative picture of the average resources of different immigrant sub-groups: how they differ from the combined immigrant group, and how they are similar.

5.2.1 Differences in the mean values of resources of the combined immigrant group and the sub-groups

The differences in the American immigrant group and the combined immigrant group

The *t*-ratios in boldface in the 6th column of Table 5.2 reveal the cases where the American immigrant group differs from the combined immigrant group. Since all the immigrants in Canada are not from the U.S., it is likely that some mean characteristics of the American immigrant group would be different from those of the combined immigrant group. As mentioned before, America and Canada are similar in many ways. Hence, it is likely that an American immigrant family in Canada would be more similar to an NBC family than to a typical immigrant family. It could differ from the combined immigrant group mainly because of this similarity with the NBC group.

Table 5.2 shows that there are no significant differences in the average values of household income, residential movement, family dysfunction score, and parenting style variables of the American immigrant group and those of the NBC group; whereas, the average values of the above variables in the combined immigrant group are significantly different from those in the NBC group. The percentage of families that own houses is significantly higher for the American immigrant group than for the NBC group (85% for the American group vs. 78% for the NBC group). On the other hand, the percentage of families that own houses is significantly lower for the combined immigrant group (76%)

than for the NBC group. This attribute is likely to have a positive impact on child's health and educational outcomes of this group.

The average ethnic working hours of the PMK is significantly lower for the American group compared to the NBC group, whereas, it is significantly higher for the combined immigrant group (19.96 hours for the NBC immigrant group, 20.87 hours for the combined immigrant group, and 19.24 hours for the American group). This is a unique characteristic of the American immigrant group, and is likely to have a positive impact on children's outcome. The percentage of the PMKs who have poor health is also significantly lower for the American immigrant group than for the NBC group (3% for the American group vs. 6% for the NBC group), whereas, the percentage was similar for the combined immigrant group. The percentage of children who have more than three missing days of school is the largest for the American immigrant group (24% for the NBC group, 23% for the combined immigrant group, and 39% for the American immigrant group). This is likely to affect the school outcomes of children negatively.

Differences in the European immigrant group and the combined immigrant group

The *t*-ratios in boldface in the 7th column of Table 5.2 show the cases where the conclusions drawn for the combined immigrant group with respect to mean values of resources do not apply to the European immigrant group. Some of the cases are similar to those of the NBC group while the others are different.

The studied sample shows that the percentage of school-aged boys is significantly lower for the European immigrant group than for the NBC and combined immigrant group (51% for the NBC group, 52% for the combined immigrant group, while 44% for the European group). This characteristic is unique to the European immigrant group. The percentages of families who own houses in the European immigrant group is similar to that in the NBC group, while significantly different from the combined immigrant group. The percentage of children who have more than three missing days of school is significantly higher for the European immigrant group (24% for the NBC group, 23% for the combined immigrant group, and 27% for the European). Similarly, the negative parenting style score of the European group is similar to that of the NBC group, while it was lower for the combined immigrant group (1.01 for the NBC group, 0.97 for the combined immigrant group and 1.02 for the European immigrant group). These characteristics are likely to have a negative impact on the outcomes of children of this group.

Differences in the Asian immigrant group and the combined immigrant group

The *t*-ratios in boldface in the 8th column of Table 5.2 reveal that the Asian immigrant group is different from the combined immigrant population in Canada with respect to some factors. It is known that Canada and Asian countries are different in many aspects. For example, labour market institutions, level of economic development, income distribution, culture, language, ethnicity, and religion are different in the two places. Moreover, Asian immigrants also belong to a visible minority group. Despite this fact, the Asian immigrant group has some characteristics that are similar to those of the NBC group. The Asian immigrant group and the NBC group have the same mean values of household equivalent income, lone-parent status, and residential movement. The combined immigrant group, however, has significantly different mean values of the above factors, as already shown. These findings of the similarity of the mean characteristics with the NBC group seem unexpected, as the Asian countries are different from Canada in so many ways. However, the average value of household income is lower for the Asian immigrant group compared to the American and European immigrant groups ($26,257 for the Asian group, $26,286 for the NBC group and $27,743 for the combined immigrant group). This finding is not inconsistent, as the Asian immigrants come mostly from the Third World countries, whereas, the European and the American immigrants come mostly from the developed countries.

On the other hand, the finding that the Asian immigrant group has the highest percentage of families (87% for the Asian immigrant group, 78% for the NBC group and 76% for the combined immigrant group) that own houses seems unexpected from the above point of view. This variable is expected to have a positive influence on child outcomes. As expected, the Asian immigrant group has a significantly lower job rank of parents (the mean values of job ranks are: 9.82 for the NBC group, 9.55 for the combined immigrant group, and 10.66 for the Asian immigrant group) than does the NBC group. A noticeable characteristic of the Asian immigrant group is that, compared to the NBC group, this group has a significantly lower percentage of children who have missed more than three days of school (24% for the NBC group, 23% for the combined immigrant group, and 11% for the Asian immigrant group). This characteristic is expected to have a positive impact on the educational outcomes of children of this group compared to any other groups.

5.2.2 The similarities of various immigrant groups

A closer look at Tables 5.1 and 5.2 also indicates that, even though the immigrant population is a diverse group, there are many cases where the same conclusion applies to every immigrant group, irrespective of national origin. These mean characteristics are also different from those of the NBC group. Compared to the NBC group, any immigrant group has the following mean characteristics:

a larger family size;
a higher level of education of the PMK and her/his spouse;
a lower probability of residing in rural areas;
an older PMK;
a higher age of biological mother at birth of the child; and
a lower local unemployment rate.

5.2.3 Resources of the sub-groups: a relative representation

Within the immigrant population, available resources may differ. The italicized mean values in Table 5.2 display the relative position of the three immigrant sub-groups regarding the covariates of health and educational outcomes of children.[100] A comparative picture of these three sub-groups indicates that regarding the parental human capital and family capital, the American immigrant group has the highest level of observed resources. Only 8% of the children in the American immigrant group live with

[100] The covariates that are expected to have mixed impact on child outcomes are not compared among the sub-groups.

lone-parent, whereas, the percentage of the children who live with lone-parent is 12% for the European immigrant group, and 14% for the Asian immigrant group. On average, the PMKs in the American immigrant group have the highest level of education (14.04 years for the American immigrant group vs. 13.03 years and 13.2 years for the other two groups, respectively). The health status of the PMKs in the American immigrant group also seems to the best (only 3% of the PMKs have poor health in the American immigrant group vs. 5% and 4% of those have poor health in the European group and in the Asian group, respectively). The job status and the family dysfunction scores are also better for this group compared to the other two groups.

Regarding household income, public assistance, instruction hours in mathematics, and the time of residency in Canada, the European immigrant group seems to have the best mean values among the three immigrant sub-groups. Average equivalent income of this group is $32,548, whereas, those of the American immigrant group and the Asian immigrant group are $27,313 and $26,257, respectively. Among the three sub-groups, the European immigrant group has the lowest percentage of families in which the main source of income is public assistance (3% for the European immigrant group vs. 5% and 4% for the American immigrant group and the Asian immigrant group, respectively. The percentage of the children who have more than three hours instruction time in mathematics is the highest for the European immigrant group (83% for the European group vs. 79% and 81% for the American immigrant group and the Asian immigrant group, respectively. The average time of residency of parents in Canada is the longest for the European immigrant group (26.93 years for the European immigrant group vs. 20.33 years for the American immigrant group and 17.03 years for the Asian immigrant group).

The percentage of immigrants who are rural resident is the lowest for the Asian immigrant group (1% for the Asian immigrant group vs. 10% for the American immigrant group and 5% for the European group). The percentage of children who have missed more than three days of school is the lowest for this group (11% of the Asian immigrant group vs. 39% for the American immigrant group and 27% for the European immigrant group).

Given the differences in available resources, it is again not straightforward to predict which immigrant sub-groups will have children with the highest levels of health and success at school.

5.3 A comparison of the average health and educational outcomes of children in NBC and immigrant families

The main objective of the thesis is to compare the health and educational outcomes of children of immigrant families and NBC families. In this section, the average health and educational outcomes of different immigrant groups are compared with those of the NBC group. The *t*-tests tests are performed on the health and educational outcomes of children using the NLSCY, Cycle 2 (1996/97) data. Columns 2-4 in Table 5.3 contain the mean values of the health and educational outcomes of the NBC group, the combined immigrant group and the all parents immigrant group, and columns 5 and 6 provide the pair-wise *t*-ratios. The comparison group is the NBC group.

The mean values and the *t*-ratios in Table 5.3 reveal that the results differ depending on the measures of the health and educational outcomes. Consider the differences in the health outcomes as measured by the PMK's assessment.[101] When the percentages of children in the excellent health status category are compared, no significant difference is found between the combined immigrant group and the NBC group (60% for the NBC group vs. 58% for the combined immigrant group). However, the all parents immigrant group has a significantly lower percentage (53%) of children who have excellent health; while there are no significant differences among these three groups when the percentages of children in the poor or fair health category is considered (2% in each case). Note that, comparing the percentages of children in the middle categories between two groups does not give enough information to determine which group has better health outcomes. A comparison of cumulative probability, on the other hand, provides better information.
When the percentages of children in the excellent or very good health category of two groups are compared, the two immigrant groups have significantly lower health status

(88% for the NBC group vs. 85% for the combined immigrant group and 83% for the all parents immigrant group). When good health status is added with excellent or very good health status category in measuring health status, again, no significant difference is found among these three groups (98% in each case).

Table 5.3 also reveals that, on average, the educational outcomes of children of immigrant families are better in statistical sense when mathematics test scores are considered (standardized scale score is 1.2% higher). This is an objective measure and does not reflect any personal bias. The teacher's assessment of the child's over all performance also demonstrates a similar conclusion. The percentage of children in the immigrant groups is higher for the highest performance (excellent) category (22% for the NBC group vs. 24% for the immigrant group) and lower (23% for the NBC group and 18% for the two immigrant groups) for the lowest category (fair or poor). The teacher can evaluate the child among other children in the same class, and hence, this measure is likely to present a good evaluation of the child's cognitive outcome.[102]

5.4 A comparison of average health and educational outcomes of children in different immigrant sub-groups

Table 5.4 presents the statistically significant differences in the mean values of the health and educational outcomes of the American, the European, the Asian, and the *other immigrant group*. The *t*-ratios in boldface of any immigrant sub-group indicate that the conclusion drawn for the combined immigrant population in Canada does not apply to that particular group regarding that mean value of outcome.

5.4.1 Differences in the health and educational outcomes of children of American immigrant group and combined immigrant group

A comparison of the *t*-ratios in the 5th column of Table 5.3 and the 6th column of Table 5.4 gives the picture of how the American immigrant group differs from the combined

[101] When the health status of children is measured by the *Health Utility Index* (HUI), immigrant families have higher outcomes (0.967 for the NBC group vs. 0.973 for the combined and all parents immigrant group).
[102] However, this measure is subjective, and hence, may reflect any personal value judgment.

immigrant group. Consider the differences in the health outcomes of children as measured by the PMK's assessment. The outcome of the American immigrant group is not statistically different from that of the NBC group (and the combined immigrant group) only when the percentages of children in the excellent or very good or good health category of the two groups are compared (98% for each group). Any comparison of the PMK's assessment indicates that the children of the American immigrant group have a better health status than do the children of the NBC group. For example, 80% of the children in the American immigrant group have the excellent health, whereas, only 60% of the children in the NBC group have excellent health (and 58% in the combined immigrant group). Regarding the educational outcomes of children, the American immigrant group has a significant higher outcome than does the NBC group when the percentage of children in the excellent performance category of the two groups are compared (41% for the American immigrant group and 22% for the NBC group), whereas, for the combined immigrant group, no significant difference is found in this case.

5.4.2 Differences in the health and educational outcomes of children of the European immigrant group and the combined immigrant group

The t-ratios in the 5th column of Table 5.3 and the 7th column of Table 5.4 give a comparative picture of how the health and educational outcomes of children in the European immigrant group differ from those in the combined immigrant group. When the percentages of children in the excellent or very good health category of the two groups are compared, the European immigrant group has a significantly higher outcome than does the NBC group (92% for the European immigrant group vs. 88% for the NBC group). In the above case, the combined immigrant group has the same outcome as that of the NBC group.

5.4.3 Differences in the health and educational outcomes of children of the Asian immigrant group and the Combined immigrant group

The t-ratios in the 5th column of Table 5.3 and the 8th column of Table 5.4 compare the relative health and educational outcomes of the combined immigrant group and the Asian immigrant group. A comparison of the percentages of children in the excellent health category of the Asian immigrant group and the NBC group reveals that the health outcomes of children of the Asian immigrant group are significantly lower than those of the NBC group (60% for the NBC group vs. 47% for the Asian immigrant group). On the other hand, a comparison of the percentages of children in the excellent or very good or good health category of the two groups demonstrates that the Asian group has a statistically significant higher outcome (98% for the NBC group vs. 99% for the Asian group). In both cases, the combined immigrant group has the same outcomes, as does the NBC group. The educational outcomes of the children in the Asian immigrant group do not differ markedly from those of the combined immigrant group in any measure.

5.4.4 Ranking the health and educational outcomes of children of the sub-groups

The italicized mean values in Table 5.4 denote the best outcome[103] of children's outcomes among the three immigrant sub-groups. When health outcomes are considered, the American immigrant group seems to have the best outcome. 80% of the children have excellent health (the percentages for the European and the Asian group are 62% and 47%, respectively).[104] The Asian immigrant group seems to have the best outcomes of children among the three immigrant sub-groups if the mean values of the mathematics score are considered (1.03 for the Asian group vs. 1.02 for the American group and 0.99 for the European group). This finding for the Asian immigrant group is consistent with other findings (For example, see Caplan, Choy, and Whitmore 1991, Feigin 1995, Schneider and Lee 1990). However, if the teacher's assessment of child's performance is considered, again the American immigrant group seems to have the best outcome. 41% of the children in the American immigrant group perform excellent according to the teachers, whereas, the percentages are 22% and 24% for the European immigrant group and the Asian immigrant group, respectively.

[103] For example, the health outcome of a group is regarded as the best outcome if the percentage of children is the largest for the excellent health category, and the smallest for the very poor or poor category.

Table 5.3: A comparison of average health and educational outcomes of children in NBC and immigrant families: T-tests

Health and educational outcomes of children				Pair-wise *t*-ratios	
	NBC	Combined immigrant group	All parents immigrant Group	Combined immigrant group & NBC group	All parents immigrant group and & NBC group
Excellent health (= 1, if child's health is excellent, = 0, otherwise)	0.60(0.006)	0.58(0.015)	0.53(0.023)	1.11	**3.18**[a]
Very good health (=1, if child's health is very good, = 0, otherwise)	0.28(0.005)	0.27(0.014)	0.29(0.02)	1.18	-0.41
Good health (= 1, if child's health is good, = 0, otherwise)	0.10(0.003)	0.14(0.01)	0.16(0.02)	-3.64	-4.33
Fair or poor health (= 1, if child's health is fair or poor, = 0, otherwise)	0.02(0.002)	0.02(0.004)	0.02(0.01)	0.08	-0.70
Excellent or very good health (=1, if child's health is excellent or very good, = 0, otherwise)	0.88(0.0037)	0.85(0.011)	0.82(0.0176)	3.02[a]	4.21[a]
Excellent or very good or good health (= 1, if child's health is excellent or very good or good, = 0, otherwise)	0.98(0.0016)	0.981(0.0042)	0.977(0.007)	-0.20	0.48
Present in math test	0.73(0.006)	0.75(0.01)	0.76 (0.02)	-1.19	-1.13
Standardized scale score	0.998(0.002)	1.01(0.005)	1.01(0.008)	-1.76[c]	-1.83[c]
Excellent performance (= 1, if child's overall performance is near the top of the class = 0, otherwise)	0.22(0.0055)	0.24(0.0147)	0.23(0.021)	-0.49	-0.22
Very good performance (= 1, if child's overall performance is above the middle of the class, =0, otherwise)	0.22(0.005)	0.26(0.02)	0.27(0.02)	-3.51[a]	-2.60[a]
Good performance (= 1, if child's overall performance is in the middle of the class, = 0, otherwise	0.33(0.006)	0.32(0.02)	0.32(0.02)	0.83	0.51

Continued on next page

[104] Health Utility Index of children for the American immigrant group and the Asian immigrant

Table 5.3 continued

Health and educational outcomes of children				Pair-wise t-ratios	
	NBC	Combined immigrant group	All parents immigrant group	Combined immigrant group & NBC group	All parents immigrant group and & NBC group
Fair or poor performance (= 1, if the child's overall performance is below the middle of the class or near the bottom of the class, = 0, otherwise)	0.23(0.006)	0.18(0.01)	0.18(0.02)	5.19[a]	4.35[a]
Excellent or very good performance (= 1, if child's overall performance is near the top of the class or above the middle of the class, = 0, otherwise)	0.44(0.0065)	0.50(0.0175)	0.50(0.026)	-3.34[a]	-2.33[a]
Excellent or very good or good performance (=, if child's overall performance is near the top of the class or above the middle of the class or in the middle of the class, = 0, otherwise)	0.77(0.0056)	0.82(0.0136)	0.82(0.02)	-3.23[a]	-2.37[a]

Notes:
1. a, b and c indicate significant at the 1% level, 5% level, and 10% level, respectively.
2. T-ratios in boldface indicate that the conclusion is different for the combined immigrant group and the all parents immigrant group.

Source: Calculated by the author using the NLSCY (1996-97) Cycle 2 data.

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group is 0.98, whereas, the index is 0.97 for the European immigrant group.

Table 5.4: Comparisons of average health and educational outcomes of children in different immigrant sub-groups: T-tests

Health and educational outcomes	Mean outcomes				Pair- wise T-ratios			
	American Group	European Group	Asian Group	Other Group	American & NBC group	European & NBC group	Asian & NBC group	Other & NBC group
Excellent health 1(= 1, if child's health is excellent, = 0, otherwise)	*0.80 (0.032)*	0.62 (0.022)	0.47 (0.045)	0.53 (0.027)	**-5.90[a]**	-0.87	**2.81[a]**	**2.42[b]**
Very good health (= 1, if child's health is very good, = 0, otherwise)	0.12 (0.03)	0.21 (0.02)	0.29 (0.04)	0.35 (0.03)	5.46[a]	3.49[a]	-0.03	**-2.43[b]**
Good health (= 1, if child's health is good, = 0, otherwise)	0.06 (0.02)	0.16 (0.02)	0.23 (0.4)	0.08 (0.02)	**2.71[a]**	**-3.44[a]**	-3.62[a]	**0.83**
Fair or poor health (=1, if child's health is fair or poor, = 0, otherwise	0.02 (0.01)	*0.01 (0.003)*	*0.01 (0.04)*	0.04 (0.02)	**0.75**	**2.71[a]**	1.47	**-2.35**
Cumulative probability of health categories								
Excellent or very good health (= 1, if child's health is excellent or very good, = 0, otherwise)	*0.92 (0.022)*	0.83 (0.02)	0.76 (0.038)	0.88 (0.02)	**-2.05[b]**	**-2.74[a]**	3.25[a]	**0.16**
Excellent or very good or good health (= 1, if child's health is excellent or very good or good, = 0, otherwise)	0.98 (0.01)	*0.99 (0.004)*	*0.99 (0.007)*	0.96 (0.01)	-0.37	**-2.37[b]**	**-1.72[c]**	1.54
Present in math test	*0.82 (0.035)*	0.75 (0.022)	0.78 (0.04)	0.73 (0.026)	**-2.54[a]**	-0.79	-1.23	0.24
Standardized scale score	1.02 (0.012)	0.99 (0.008)	*1.03 (0.012)*	1.008 (0.008)	-2.06[b]	**0.38**	-2.41[b]	**-1.20**
Excellent performance (= 1, if child's overall performance is near the top of the class, = 0, otherwise)	0.41 (0.045)	0.22 (0.022)	0.24 (0.044)	0.20 (0.03)	**-4.24[a]**	0.26	-0.41	0.98
Very good performance (= 1, if child's overall performance is above the middle of the class, = 0, otherwise)	0.30 (0.04)	0.26 (0.24)	0.37 (0.05)	0.22 (0.03)	**-2.24[b]**	-2.29[b]	-3.04[a]	-0.45
Good performance (= 1, if child's overall performance is in the middle of the class, = 0, otherwise	0.13 (0.02)	0.34 (0.03)	0.23 (0.04)	0.37 (0.03)	**-2.01[b]**	-0.39	2.38[a]	-1.12

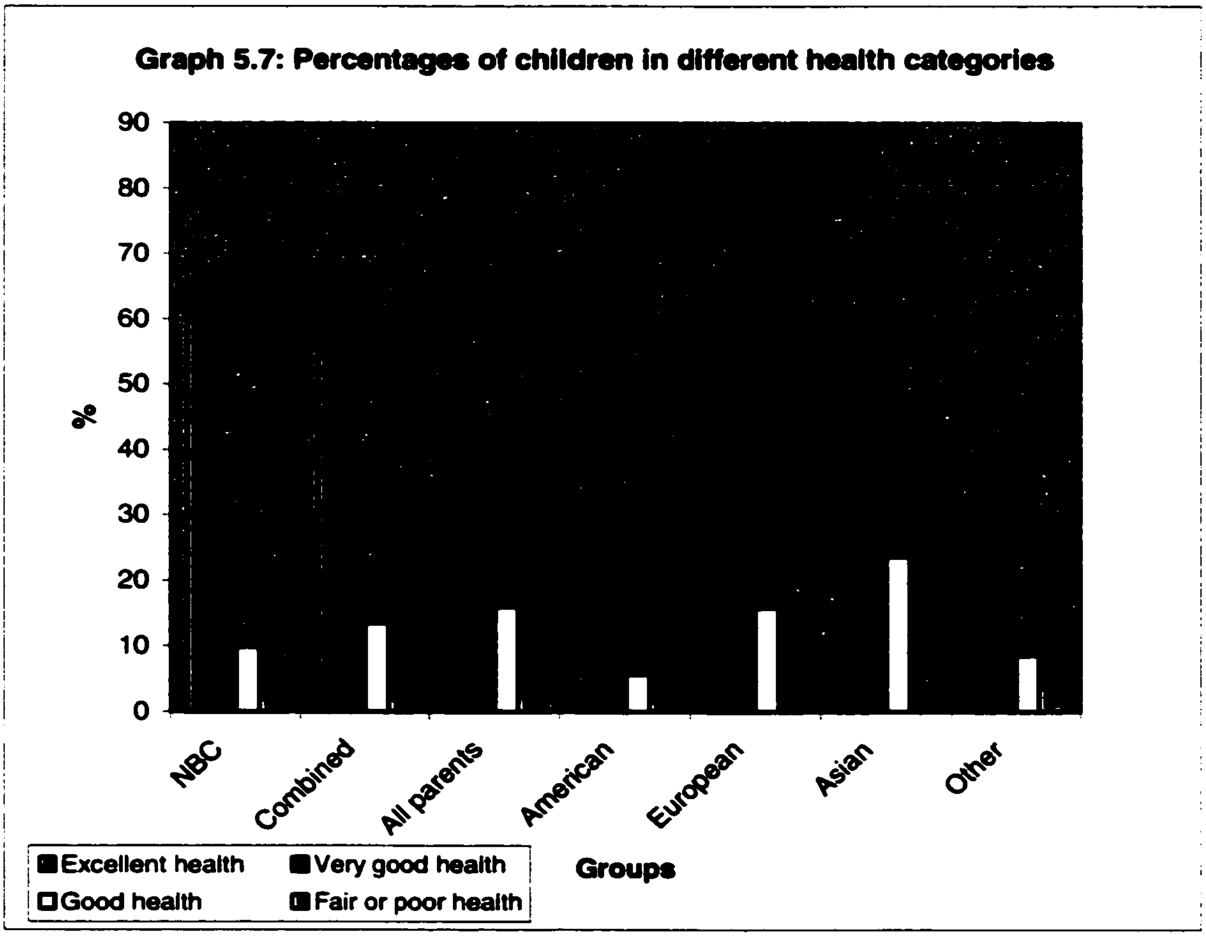
Continued on next page

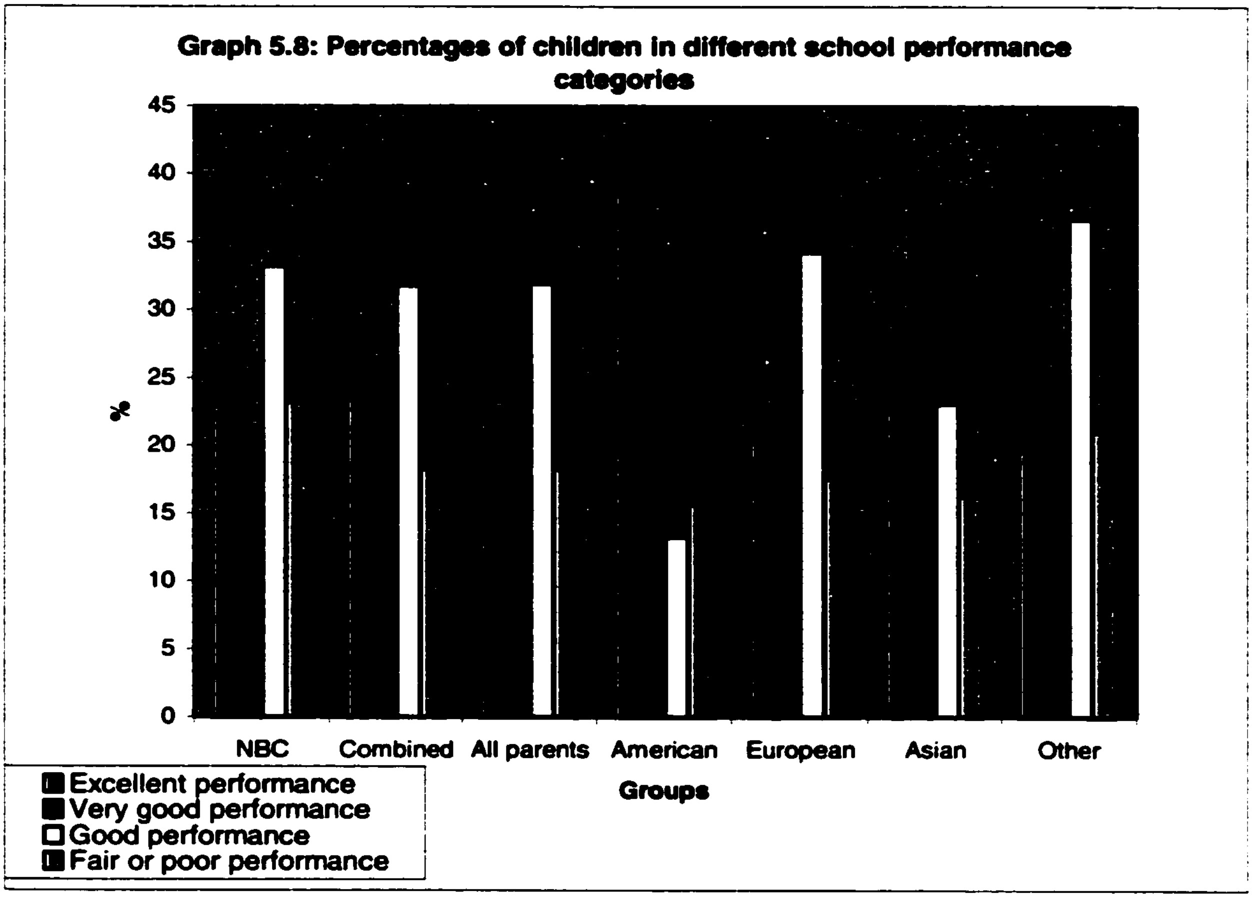
Table 5.4 continued

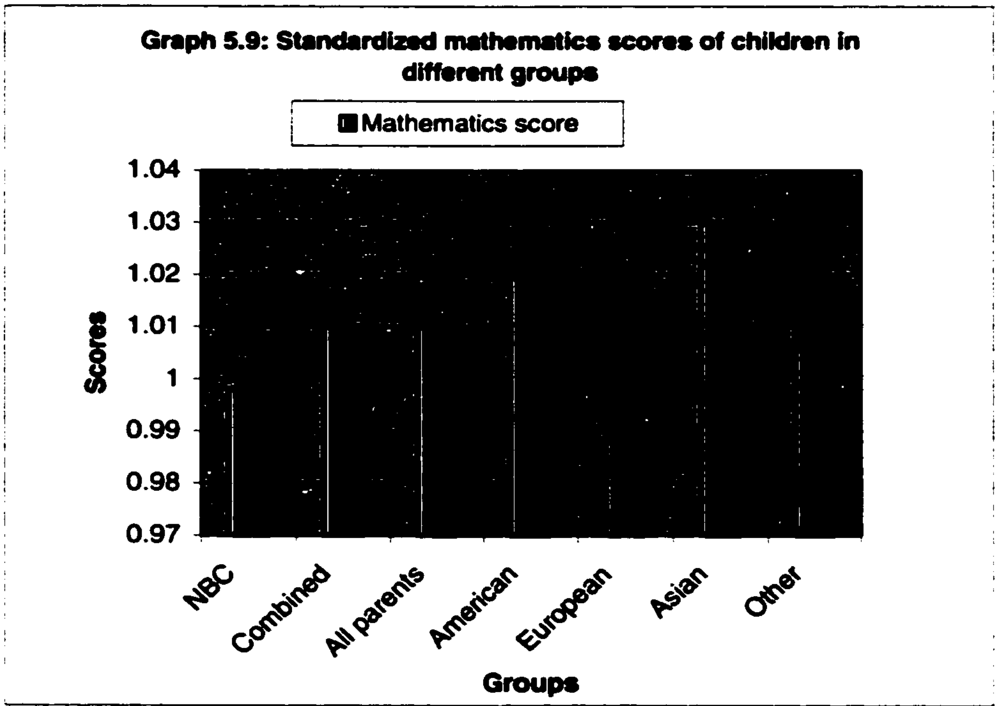
Health and educational outcomes	Mean outcomes				Pair- wise T-ratios			
	American Group	European Group	Asian Group	Other Group	American & NBC group	European & NBC group	Asian & NBC group	Other & NBC group
Fair or poor performance (=1, if the child's overall performance is below the middle of the class or near the bottom of the class, = 0, otherwise)	0.16 (0.02)	0.18 (0.03)	0.16 (0.04)	0.21 (0.03)	**7.39[a]**	6.61[a]	7.21[a]	1.13
Cumulative probability of school performance categories								
Excellent or very good performance (= 1, if child's overall performance is near the top of the class or above the middle of the class, = 0, otherwise)	*0.71 (0.041)*	0.48 (0.027)	0.61 (0.05)	0.42 (0.031)	-6.59[a]	-1.68[c]	-3.34[a]	**0.41**
Excellent or very good or good performance (= 1, if child's overall performance is near the top of the class or above the middle of the class or in the middle of the class, = 0, otherwise)	*0.84 (0.038)*	0.82 (0.02)	*0.84 (0.04)*	0.79 (0.026)	-2.25[b]	-2.66[a]	-1.79[c]	**-0.83**

Notes:
1. a, b and c indicate significant at the 1% level, 5% level, and 10% level, respectively.
2. The t-ratios in bold face indicate that the conclusions are different for the combined immigrant group and the sub-groups.
3. The italicized values indicate the best outcome among the three sub-groups

Source Prepared by the author using the NLSCY (1996-97) Cycle 2 data


Graph 5.7: Percentages of children in different health categories
90
80
70
60
50
40
30
20
10
0
%
NBC
Combined
All parents
American
European
Asian
Other
Excellent health
Very good health
Good health
Fair or poor health
Groups


Graph 5.8: Percentages of children in different school performance categories
45
40
35
30
25
%
20
15
10
5
0
NBC
Combined
All parents
American
European
Asian
Other
Groups
Excellent performance
Very good performance
Good performance
Fair or poor performance


Graph 5.9: Standardized mathematics scores of children in different groups
Mathematics score
1.04
1.03
1.02
1.01
1
0.99
0.98
0.97
Scores
NBC
Combined
All parents
American
European
Asian
Other
Groups

5.5 Summary of the findings

The NLSCY data demonstrates that compared to the NBC group, any immigrant group in Canada, on average, has a larger family size, more educated and older parents, and a higher percentage of urban residents. The average age of the biological mother at the birth of the child is higher for any immigrant group compared to the NBC group. Immigrants of any group, on average, also live in provinces where the unemployment rate is lower. As these factors are likely to be important covariates of child development outcomes, it is reasonable to predict that the average health and educational outcomes of children would be higher for immigrant families compared to NBC families. However, these are not the only factors that are associated with the health and educational outcomes of children. When some other important factors are considered, the pictures of resources and predicted outcomes vary for different groups in this study.

Compared to the NBC group, the combined immigrant group (in which at least one of the parents of the child is an immigrant) has a higher level of household income, higher job ranks, a lower percentage of children who live with a lone-parent and whose main source of incomes are public assistance, and a higher percentage of children who attend private schools. Immigrants in the combined immigrant group are less mobile and, on average, they have lower negative parenting style scores compared to the NBCs. Since these factors are likely to be positively associated with children's outcomes, the combined immigrant group is an advantaged position. On the other hand, compared to the NBC group, the combined immigrant group has a lower percentage of families that own houses and a higher percentage of PMKs who have poor health. These factors are likely to be negatively associated with health and educational outcomes of children.

On the other hand, compared to the NBC group, the all parents immigrant group (in which all the parents with whom the child lives are immigrants) has a higher percentage of children who live with a lone-parent and whose main source of income is public assistance. Also, the all parents immigrant group has lived a shorter period of time in Canada compared to the combined immigrant group. These factors may be associated with a lower level of health and educational outcomes of children in this group.

Compared to the NBC group, the American immigrant group also has a higher percentage of families that own houses; the PMKs in the American immigrant group, on average, have better health and they work fewer hours. These factors are likely to be positively associated with child outcomes. On the other hand, a higher percentage of children in the American immigrant group have missed more than three days of school compared to those of the NBC group that could lower their educational outcomes. Compared to the NBC group, the Asian immigrant group has a higher percentage of families that own houses and a lower percentage of children who have missed more than three days of school. These two factors are likely to be positively associated with the health and educational outcomes of children in this group. On the other hand, the job ranks of parents are lower for this group that may affect child outcomes negatively.

Among the different immigrant sub-groups, the American immigrant group has the best level of observable resources regarding parental human capital and family capital; the European immigrant group has the best mean values regarding labour market characteristics of parents, family income, job status, and the time of residency in Canada; and the Asian immigrant group has aged parents, a higher percentage of urban residents, and a lower percentage of children who missed school days more. The percentage of immigrants who own houses is also the highest for the Asian immigrant group. However, they have lived for shorter period of time in Canada compared to the two other sub-immigrant groups.

The European origin immigrants, on average, have been residing in Canada for the longest period of time (26.93 years for the European group vs. 20.33 years for the American origin immigrants and 17.12 years for the Asian origin immigrants). Hence, they are likely to assimilate more than the other two immigrant groups. According to Chiswick (1978), immigrants' incomes cross over those of the NBCs in 10-15 years, which seems to be true if the household incomes of the European and the American immigrant groups are compared. The average years since immigration and the comparison of the income of the Asian immigrant group and that of the NBC group shows that the Asian origin immigrants, on average, are still assimilating in the Canadian labour market and their incomes have not crossed those of the NBCs. This is not consistent with Chiswick's hypothesis since the average years since immigration is more than 15 years. If the *years since immigration of parents in Canada* variable is an indicator of child outcomes, it can be predicted that the European immigrant group is likely to have the highest outcome. However, this variable is not the only one predictor of child outcomes. Hence, this prediction may not be true.

An examination of the average health and educational outcomes of immigrant and NBC families postulates that the measures of health and educational outcomes determine which group has better outcomes. The PMK's assessment of child's health shows no difference in the health outcomes of two groups.[105] Immigrant families have better educational outcomes in any measure. Among the immigrant sub-groups, the American immigrant group has the best health outcomes of children in any measure, and also the best educational outcomes if the teacher's assessment of child's overall performance is considered. On the other hand, the Asian immigrant group has the best educational outcomes of children when the mathematics scores are considered. This outcome of the Asian immigrant group suggests that changing the immigration policies have positive effects on the educational outcomes of children in Canada.

This comparison of average resources and outcomes gives a preliminary picture of the process of child outcome: a higher level of resources could be linked with a higher level of outcome. However, this comparison of average resources and outcomes does not provide the nature of association of the individual resources and the health and educational outcomes of children, neither does it provide any indication whether child outcomes would be better for the immigrant families if they had the same level of resources as did the NBC families. A regression procedure provides a picture of how the above factors are associated with child outcomes. The results of the regression procedures are presented in Chapter 6.

[105] Immigrant families in any immigrant group are in a better position if the HUI is considered.

CHAPTER 6

Results and Discussion

6.0 Introduction

As stated previously, the purpose of this thesis is to compare the health and educational outcomes of children of native-born Canadian (NBC) and immigrant families; to test the hypothesis that the children of immigrant families are a positively selected sample (have a higher level of outcomes than do the children of NBC families for the same level of observable resources); and to examine the relationship of the time of residency of immigrants in Canada and the health and educational outcomes of their children. Any differences in parameter estimates of the health and educational outcome models of the children of NBC and immigrant families would indicate that child outcomes of the two families would be different for the same level of observable resources. The coefficient of "years since immigration of parents" variable in the health and educational outcomes models of children of different immigrant groups would show the strength of association of the time of residency of immigrants and their children's outcomes.

Cross sectional data from the Master File, Cycle 2 (1996/97) of the National Longitudinal Survey of Children and Youth (NLSCY) are used in this study. The health and educational outcomes of children are examined primarily for five different immigrant groups: the combined immigrant group (at least one parent is an immigrant), the all parents immigrant group (one or both parents with whom the child lives are immigrants), the American immigrant group, the European immigrant group, and the Asian immigrant group. Note that the last four immigrant groups are sub-groups of the combined immigrant group. Among them, the last three sub-groups are mutually exclusive, whereas, the all parents immigrant group and the last three immigrant groups are not. The NBC group is the comparison group. However, to study the relationship of the time of residency of immigrants and child outcomes within the immigrant sample, the *other immigrant group* is also examined as a base group. The health outcomes are measured by the PMK's (Person most knowledgeable about the child) assessment of child's health.[106]

[106] The Health Utility Index (HUI) is also used. See Appendix 4 for details.

The educational outcomes are measured by the teacher's assessments of child's overall performance[107] and mathematics test scores. The PMK's assessment of child's health takes the following values: 0 = fair or poor health, 1 = good health, 2 = very good health, and 3 = excellent health. Similarly, the teacher's rating of child's overall performances takes the values: 0 = near the bottom of the class or below the middle of the class, 1 = in the middle of the class, 2 = above the middle of the class, and 3 = near the top of the class.

Ordered logistic regression models are estimated for the PMK's assessment of child's health and teacher's assessment of child's overall performance.[108] OLS and Heckman's (1979) two-stage models are applied to the mathematics test scores. SAS software and standardised cross-sectional weights[109] are used in the estimation procedures. The coefficients of the explanatory variables (covariates of child outcome) for any two groups are compared using interaction variables. Each explanatory variable is interacted with the *birthplace* variable to determine whether there is any difference in the estimated parameters of the two groups.

In an ordered logit model,[110] 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 jth cumulative odds, which is the probability of having a response in category j (say, good health category) or lower as opposed to giving a response in category j+1 (say, very good health 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 variables- the PMK's assessment of child's health and the teacher's assessment of child's overall performances- are ordered in such a way that higher values are assumed to represent higher outcomes, a positive and significant coefficient of an explanatory

[107] The PMK's assessment of child's overall performance was also examined. The results are similar in nature but the magnitudes are different.
[108] Tobit models are employed for the HUI. See Appendix 4 for the results and discussion of the HUI models.
[109] The weight variable of each child is divided by the mean value of the weight variable of the group in which the child belongs.
[110] See Section 4.3 in Chapter 4.

variable[111] in an ordered logit model[112] 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.

Remember that because more than one child was interviewed from many households in the NLSCY survey, the selected sample is not an independent sample. To examine how the results are affected by the sibling status, models are also estimated from a sample where only one child from each household is selected randomly. In this chapter, the empirical findings of the health and educational outcomes of children are presented. In short, the main empirical findings of the study are:[113]

1. The health status of children as measured by the PMK's assessment is similar for the combined immigrant group (where at least one of the parents is immigrant) and the NBC group. However, that of the all parents immigrant group and the Asian immigrant group is slightly lower. The health status of children of the European immigrant group is slightly better and that of the American immigrant group is markedly better than that of the NBC group. For the same level of resources, the health status of the children of the combined immigrant group is similar to that of the

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

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

[113] Findings from the health outcomes of children as measured by the Health Utility Index (HUI) indicate that some children may have supra-normal functional ability. Remember that in the survey, the HUI value is assigned 1 for normal functional ability and this is the highest recorded value. 63% of the children have HUI index score of 1. The Tobit models are employed to consider this ceiling effect. The findings of the Tobit models demonstrate that the average predicted conditional HUI scores of the children of any immigrant group are significantly larger than those of the NBC group. However, the differences are not substantial in magnitude except for the children of both the American immigrant group and the Asian immigrant group. The selectivity tests (variation in outcomes for the same level of observable resources) indicate that the children of any immigrant group are positively selected (observable resources are strongly associated with outcome) in producing health outcomes. The HUI of children of the *other immigrant group* will improve with the time of residency of their parents in Canada. However, the association of time of residency of immigrants and the HUI (although positive) is weaker for the Asian immigrant group and for and the European immigrant group than for the *other immigrant group*.

NBC group; while that of the other four immigrant groups is significantly better. There is statistical evidence of significant association of time of residency of immigrants and the health outcomes of the children of the all parents immigrant group and the Asian immigrant group.

2. The average predicted conditional probabilities of different groups suggest that the educational outcomes of children, as measured by the teacher's assessment of child's overall performance, of any immigrant group are considerably higher than those of the NBC group. Among the immigrant sub-groups, the American immigrant group has the highest outcome and the European immigrant group has the lowest. The selectivity test suggests that the children of any immigrant group are positively selected. However, the evidence is stronger for the children of the American immigrant group than for the Asian and European group. There is no evidence that the educational outcomes of children of immigrant families improve with the time of residency of immigrant parents in Canada.
3. The findings from the mathematics scores models of children suggest that there is very little variation in the average predicted conditional mathematics scores of the NBC group, the combined immigrant group and the European immigrant group. The average predicted conditional mathematics score for these groups is very close to 1 which is equal to the simple mean value of each grade level. The average predicted score for the Asian and the American groups are markedly higher than the other groups. There is mixed evidence that the association of the observable resources and the mathematics scores are stronger for any immigrant group. There is no evidence that the mathematics performances of the children of immigrant families change significantly with the time of residency of their parents in Canada.

The results excluding the siblings show that the magnitudes of the average predicted conditional health outcomes and the coefficients of the time of residency variable are robust to the exclusion of siblings.

6.1 Ordered logit estimates of the PMK's assessment of child's health

The pooled sample of the NBC group and five different immigrant groups are used to estimate the ordered logit models of the PMK's assessment of child's health. The estimated coefficients for the NBC group, the combined immigrant group and the all parents immigrant group are presented in Tables 6.1-6.3. Table 6.1 reports the estimates from the base models.[114] Table 6.2 reports those from the extended models[115] with "actual weekly working hours of the PMK." Since the PMK's actual working hours may create endogeneity problems in the estimated coefficients of the child's health model, another model is estimated using the "ethnic weekly working hours of the PMK" variable to test the robustness of the estimated results.[116] The first column in each table lists the explanatory variables. Columns 2 and 3 present the estimated coefficients of different groups. As mentioned before, a larger (absolute value) and significant value of an interaction variable would indicate that this variable has a higher association with the health outcomes of children for the immigrant group than for the NBC group. In turn, this would be consistent with the hypothesis that the "differential cultural capital" is higher for the children of the immigrant group that could cause a higher association of this variable and the health outcomes (a positive selection). 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.

6.1.1 Ordered logit estimates of the NBC group, the combined immigrant group, and the all parents immigrant group

The second column of Table 6.1 compares the ordered logit estimates of the PMK's assessment of child's health of the combined immigrant group (where at least one of the

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[114] The base model does not include the following variables: "job rank of parents," "welfare," "family dysfunction," and "negative parenting style." See Section 4.6 of Chapter 4 for more details.

[115] This model includes all the variables that are included in the base model, and in addition, it includes the variables that are mentioned in the previous footnote.

[116] See Section 4.6 of Chapter 4 for more details. Table A3.1 in Appendix 3 presents the estimates from the model that uses "ethnic weekly working hours of the PMK."

parents of the child is foreign-born) with those of the NBC group. Note that the results of this column are estimated using the pooled sample of the children of the NBC group and the combined immigrant group. The results of this base model indicate that the estimated coefficients that are significant have the expected signs. As expected, the coefficients of "household equivalent income," "house," and "years of education of the PMK" are positive and significant. Similarly, the coefficients of "working hours of the PMK," "poor health status of the PMK," and "residential movement" have negative coefficients, as expected. It is unexpected that the coefficient of "provincial unemployment rate" is positive and significant. Since a higher unemployment rate in the region is likely to reduce the labour market opportunity for the parents, it was expected that the unemployment rate would have a negative impact on the outcomes of children.

An insignificant coefficient of the *birthplace* variable in the second column reflects the fact that there are no significant differences in the intercept terms of the health regression models of children in the NBC group and the combined immigrant group. This means that, if all other covariates were given zero values, the probability of the highest health category (excellent health), and that of the lowest health category (fair or poor health), would be the same for the children of the two groups. The slope coefficients of the interaction variables indicate that the slope coefficients of "age of the child," "lone-parent status," "biological mother's age at child's birth," and "working hours of the PMK" variables are significantly larger (in an absolute sense) for the children of the combined immigrant group compared to those of the NBC group. For example, the slope coefficient of "age of child" for the combined immigrant group is larger by 0.028 than for the NBC group (0.0076). This implies that, the "age of the child" has a stronger association with the probability of better health outcomes in the combined immigrant group than in the NBC group. The larger coefficients suggest that the children of the combined immigrant group have a higher level of "differential cultural capital." On the other hand, the slope coefficients of the "gender of child," "house ownership," and "years of education of the PMK" are significantly smaller for the children of combined immigrant group than for the children of the NBC group. For example, the slope coefficient of the "years of education of the PMK" for the NBC group is 0.056, larger by 0.025 than for the combined immigrant group. This implies that, an increase in a year of the PMK's education would increase the probability of the children being in the excellent health category by 6-percentage points in the NBC group, whereas, the increase in probability of the combined immigrant group would be 3-percentages point lower. The smaller coefficients of the explanatory variables (covariates) imply that, the children of the combined immigrant group would have a lower probability of having better health status for the same amount of these covariates. This could be because of a lower level of "differential cultural capital." In other words, a smaller coefficient for the immigrant group implies that the association of this variable and child health is weaker for the children of the immigrant group.

Consider the results of Column 3, which compares the estimates of the all parents immigrant group (where one or both parents with whom the child lives are foreign-born) with those of the NBC group. Note that the results of this column are estimated using the pooled sample of children of the NBC group and the all parents immigrant group. The association of the *birthplace* with the health outcomes of children are similar for the combined immigrant group and the all parents immigrant group. However, the magnitudes of the interaction variables are different (in most of the cases they are larger in an absolute sense) for the all parent immigrant group compared to those of the combined immigrant group. For example, the coefficient of the interaction variable "age of the child**birthplace*" for the all parents immigrant group is 0.06, whereas, it is 0.03 for the combined immigrant. The larger slope coefficients indicate a stronger association of the observable resources and the health outcomes of children (consistent with a positively selected sample hypothesis). Note that there are 55% families in the combined immigrant group where at least one of the parents is native-born. On the other hand, in the all parents immigrant group, none of the parents with whom the child lives are native-born. Hence, in this sense, the coefficients of the all parents immigrant group are likely to be more representative for the immigrant population in Canada.[117] The different (larger) coefficients of the interaction variables for the all parents immigrant group indicate that

[117] The estimates of the all parents immigrant group may be less reliable compared to those of the combined immigrant group because of the smaller sample size of the former group.

the health outcomes of children of this group are likely to be different from those of the NBC group for the same level of resources.

As explained in Chapter 4, the base model has been specified using the economic model developed in Chapter 3. Unlike the extended model, "welfare," "job rank of parents," "family dysfunction," and "negative parenting styles" variables have not been included in this model. Although the base model is expected to have fewer multi-collinearity problems than does the extended model, it could suffer from a mis-specification bias. As the literature review in Chapter 2 suggests, the above four variables could be significantly associated with the health and educational outcomes of children.

Now consider the results of the extended model in Table 6.2. The *birthplace* variable is insignificant and those of the added variables are significant in the extended model. Although "welfare" is positively associated with the health outcomes of children, it is not unexpected.[118] It is possible that parents whose main source of income is public assistance could give more home time to their children that could enhance child health. Also, their health insurance and drug plans are often covered by the government that could help them utilize health care services for children. All these facilities related to public assistance may improve the health status of children. The negative slope coefficients of "job rank," "negative parenting style," and "family dysfunction" variables are as expected. The slope coefficients of "welfare," "negative parenting style" and "family dysfunction" variables are larger for the combined immigrant group than for the NBC group. Within the two immigrant groups in this table, the slope coefficients are larger for the all parents immigrant group than for the combined immigrant group.

Even if the "ethnic working hours of the PMK" variable is used in the extended model instead of actual working hours of the PMK, the findings do not change.[119] The same

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[118] See Currie and Cole (1993), Levine and Zimmerman (2000), and Grubar (2000).

[119] See Table A3.1 in Appendix 3. Although "ethnic working hours of the PMK" variable is a poor proxy for actual "working hours of the PMK" variable, it reduces the individual variation and hence, is likely to reduce the endogeneity problem, if exists any. For that reason, the robustness of the model to the choice of working hours of mother variable, as presented in Table 6.2, is tested with this variable.

applies to the nature of the association of both *birthplace* and the interaction variables with the health outcomes. This suggests that the model in Table 6.2 is robust to the choice of "working hours of mother" variable, and hence, using "actual working hours of the PMK" in this model seems more appropriate for the purpose of this study.

The larger slope coefficients of "lone-parent status," "working hours of the PMK," "welfare," "negative parenting style, and "family dysfunction" for the combined immigrant group and the all parents immigrant group compared to the NBC group have some important implications. For example, the slope coefficient of "lone-parent status" is negative and it is larger for the above two-immigrant groups. This implies that the children in the lone-parent families are more vulnerable in the immigrant groups than in the NBC group. This may be caused by the less social support for immigrants in the host country to raise their children. Perhaps, for similar reasons, the working hours of mother, and their ineffective and hostile parenting styles have a stronger negative influence, and public assistance has a stronger positive influence on the health status of children in the immigrant families than in the NBC families.

The log likelihood ratio test

The t-tests for the coefficients of the *birthplace* and the interaction variables in Table 6.2 indicate that few of them are significant. The log-likelihood ratio test is performed to test the hypothesis that, jointly the coefficient of the *birthplace* and the interaction variables in Table 6.2 are different from zero. The log-likelihood ratio test statistic, which is distributed as $\chi^2(17)$, is significant at the 1% level. The test suggests 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 combined immigrant group and the all parents immigrant group are different from that of the NBC group, and as a result, the health outcomes are likely to be different for the same level of explanatory variables. Since the coefficients of some variables in Table 6.2 indicate that the children of the combined/all parents immigrant group could have a higher probability of being in better health status, and others indicate lower probability, it cannot be concluded from examining the regression coefficients whether or not the children of the combined/all parents immigrant group are positively selected.[120]

Results of logit models excluding siblings

In the NLSCY, more than one child was interviewed from the same household. Note that the sample size for the ordered logit models of the PMKs assessment of child's health is 7,270. These children come from 5,357 households. Since the error terms of the siblings in the regression are not independent, this could affect the variance of the estimates, and hence, the significance levels. To examine the robustness of the results of the previous model, ordered logit models are estimated using a sample, randomly selecting only one child from each household. Table 6.3 presents the results.

The second column that presents the results for the combined immigrant group suggests that some of the variables that were significant in Table 6.2 are not significant in Table 6.3. These are: "equivalent income" and "house" variables. Among the interaction variables, the "welfare*birthplace*" variable is not significant, which was significant in Table 6.2. On the other hand, the "gender*birthplace*" variable is significant in Table 6.3, but not in Table 6.2. An examination of the magnitudes indicates that they also vary considerably from the previous table for the interaction variables. Similar findings are revealed in the third column for the all parents immigrant group. In addition, the *birthplace* variable is significant in Table 6.3 for the all parents immigrant group.

Hence, the results in the two tables are not robust. The results of Table 6.3 do not suffer from sibling status effect. However, they may be less generalizable as the sample size is smaller. Since the main purpose of the thesis is to compare the health and educational outcomes of children of different groups, it is more important to examine how the simulated outcomes are affected when siblings are excluded from the sample. The simulated results excluding the siblings are presented in Section 6.1.3.

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[120] In Section 6.1.3, simulated probabilities for the children of each group in different hypothetical states are presented. A comparison of the simulated probabilities for the same level of resources

6.1.2 Ordered logit estimates of different immigrant sub-groups

The extended model with "actual working hours of the PMK" variable is considered to compare the estimates among the immigrant sub-groups. Note, the results in Columns 2-4 of Table 6.4 are estimated using the following three pooled samples: i) the NBC group and the American immigrant group (column 2), ii) the NBC group and the European immigrant group (column 3), iii) the NBC group and the Asian immigrant group (column 4), respectively. An examination of the estimates in Table 6.4 indicates that the conclusion for the combined immigrant group is not always applicable to each of the three immigrant sub-groups (as shown by the values in boldface). An examination of the birthplace coefficients indicates that the children of the European immigrant group are more likely to be healthier initially compared to those of the NBC group. However, the main focus of the model is on the coefficients of the interaction variables, which give the differential values of slope coefficients for the immigrant group. An examination of the magnitudes of the coefficients demonstrates that they are different for the immigrant sub-groups. In some cases, the signs of the coefficients are different for separate sub-groups. For example, the differential value of the slope coefficient of "equivalent income" is significantly positive for the European immigrant group, while significantly negative for the Asian group.

The three log-likelihood ratio test statistics in Table 6.4 suggest that the coefficients of the *birthplace* and the interaction variables in each model are jointly different from zero. This, in turn, implies that the regression models of each of the three immigrant sub-groups are different from that of the NBC group. Hence, the health outcomes of children of these sub-groups are likely to be different from those of the NBC group for the same level of resources.

Since some variables have larger slopes coefficients and some have smaller, it cannot be determined whether or not the children of any immigrant group are a positively selected sample (have a stronger association of the observable resources with the health outcomes of children). To determine this, one needs to observe a higher probability of the children

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enables one to examine the nature of selectivity of the children.

of an immigrant group having higher health status than the NBC group for the same level of resources. To determine the nature of the selectivity of the children of immigrants, the simulation results are presented for different immigrant groups in the next section.

Table 6.1: Ordered logit estimates of base health outcome model of children in NBC and immigrant families

Variables	Coefficients (standard errors)	
Groups	**NBC and Combined immigrant group**	**NBC and All parents immigrant group**
Intercept 1	-0.9175(0.1652) [a]	-0.9255(0.1626) [a]
Intercept 2	0.00846(0.165)	0.0156(0.1624)
Intercept 3	0.9683(0.1668) [a]	0.9689(0.1644) [a]
Age of the child	0.00757(0.0072)	0.00762(0.00707)
Gender (= 1, if the child is a boy, =0, if a girl)	-0.0178(0.0302)	-0.0178(0.0297)
Equivalent income ($)[121]	8.279E-6(1.201E-6) [a]	8.304E-6(1.182E-6) [a]
House (= 1, if any family members own the house, = 0, if not)	0.1037(0.043) [a]	0.1042(0.0423) [a]
Lone-parent (= 1, if the child lives with a lone parent, = 0, otherwise)	-0.0258(0.0436)	-0.0259(0.0429)
Age of mother (years) at birth of child	-0.00156(0.00316)	-0.00158(0.00311)
Years of education of the PMK	0.0560(0.00857) [a]	0.0562(0.00844) [a]
Weekly working hours of the PMK	-0.00098(0.00091)	-0.00098(0.000896)
Poor health of the PMK (= 1, if the health status of the PMK is poor or fair, = 0, other wise)	-0.4080(0.0583) [a]	-0.4092(0.0574) [a]
Residential movement (number of movements)	-0.0252(0.00730) [a]	-0.0253(0.00718) [a]
Rural area (= 1, if the child lives in a rural area, = 0, otherwise)	-0.0289(0.0420)	-0.0292(0.0413)
Provincial unemployment rate (1996)	0.0269(0.00645) [a]	0.0270(0.00635) [a]
Birthplace (= 1, if parents are foreign born, = 0, otherwise)	**0.4139(0.3513)**	**0.4246(0.4376)**
Age of the child* Birthplace	0.0281(0.0145) [b]	0.0633(0.0170) [a]
Gender * Birthplace	0.1039(0.0619) [c]	**0.0868(0.0740)**
Equivalent income* Birthplace	-1.49E-7(2.185E-6)	-9.67E-7(2.654E-6)
House * Birthplace	-0.1902(0.0816) [a]	-0.2368(0.0919) [a]
Lone-parent * Birthplace	-0.2377(0.0940) [a]	-0.1949(0.1002) [b]
Age of mother * Birthplace	-0.00841(0.00607)	**-0.0138(0.00709)** [b]
Years of education of the PMK* Birthplace	-0.0253(0.0155) [c]	-0.0395(0.0178) [b]
Working hours of the PMK* Birthplace	-0.00488(0.00179) [a]	-0.00744(0.00217) [a]
Poor health of the PMK* Birthplace	0.1745(0.1134)	**0.4011(0.1282)** [a]
Residential movement* Birthplace	-0.0195(0.0165)	-0.0225(0.0203)
Rural area* Birthplace	-0.1047(0.1508)	**0.5538(0.3141)** [c]
Provincial unemployment rate* Birthplace	0.00730(0.0210)	0.00742(0.0275)
-2LOGL	15595.25	14680.78
Chi-Square (score test) with 50 DF	270.33	247.42
Sample Size	7,454	6,952

Notes: 1. The dependent variable is the PMK's assessment of child's health.
2. a, b, and c denote significance levels at the 1%, 5% and 10%, respectively.
3. The coefficients in boldface suggest that the differential impacts of the corresponding variables are different for the all parents immigrant group and the combined immigrant group.

Source: Prepared by the author using the NLSCY (1996-97), Cycle 2 data

[121] Equivalent income = Household income/equivalent scale == household income before taxes/square root of family size.

Table 6.2:Ordered logit estimates of extended health outcome model of children in NBC and immigrant families

Variables	Coefficients (standard errors)	
Groups	**NBC & Combined immigrant group**	**NBC & All parents immigrant group**
Intercept 1	-0.2565(0.1942)	-0.2616(0.1912)
Intercept 2	0.7053(0.1944)[a]	0.7131(0.1914)[a]
Intercept 3	1.6550(0.1963)[a]	1.6627(0.1934)[a]
Age of the child	0.00820(0.00730)	0.00824(0.00718)
Gender (= 1, if the child is a boy, = 0, if a girl)	-0.0223(0.0307)	-0.0223(0.0302)
Equivalent income ($)	7.393E-6(1.255E-6)[a]	7.412E-6(1.235E-6)[a]
House (= 1, if any family members own the house, = 0, if not)	0.1135(0.0448)[a]	0.1140(0.0441)[a]
Lone-parent (= 1, child lives with a lone parent, = 0, otherwise)	-0.0134(0.0477)	-0.0134(0.0470)
Age of mother (years) at birth of child	-0.00313(0.0032)	-0.00315(0.0032)
Years of education of the PMK	0.0435(0.00890)[a]	0.0437(0.00876)[a]
Weekly working hours of the PMK	-0.00071(0.000946)	-0.00071(0.00093)
Poor health of PMK (= 1, if health status of PMK is poor or fair, = 0, other wise)	-0.3403(0.0599)[a]	-0.3417(0.0590)[a]
Residential movement (number of movements)	-0.0196(0.00752)[a]	-0.0197(0.00741)[a]
Rural area (= 1, if the child lives in a rural area, = 0, otherwise)	-0.0204(0.0426)	-0.0206(0.0419)
Provincial unemployment rate (1996)	0.0263(0.00656)[a]	0.0264(0.00646)[a]
Welfare (= 1, if the family's main source of income is public assistance, = 0, otherwise)	0.1164 (0.0622)[c]	0.1165(0.0612)[c]
Job rank of parents (a lower value indicates a higher job status)	-0.0135(0.00399)[a]	-0.0135(0.00392)[a]
Family dysfunction (a higher score indicates more dysfunctional)	-0.0246(0.00322)[a]	-0.0247(0.00317)[a]
Negative parenting style	-0.1486(0.0361)[a]	-0.1492(0.0356)[a]
Birthplace (= 1, if parents are foreign born, = 0, otherwise)	**0.1699(0.4037)**	**-0.1220(0.4984)**
Age of the child* Birthplace	0.0178(0.0150)	**0.0535(0.0178)[a]**
Gender * Birthplace	0.0683(0.0648)	0.0994(0.0796)
Equivalent income* Birthplace	1.217E-7(2.327E-6)	-3.12E-6(2.84E-6)
House * Birthplace	-0.0118(0.0904)	-0.0111(0.1039)
Lone-parent* Birthplace	-0.3886(0.1028)[a]	-0.3557(0.1121)[a]
Age of PMK * Birthplace	-0.00061(0.00635)	-0.00212(0.00748)
Years of education of PMK* Birthplace	-0.0181(0.0164)	-0.0287(0.0190)
Working hours of PMK* Birthplace	-0.00385(0.0019)[b]	-0.00371(0.00234)[a]
Poor health status of PMK* Birthplace	0.0654(0.1198)	0.3990(0.1401)
Residential movement* Birthplace	-0.0206(0.0172)	-0.0167(0.0218)
Rural area* Birthplace	-0.1798(0.1521)	0.4515(0.3200)
Provincial unemployment rate *Birthplace	0.0126(0.0220)	0.0329(0.0299)
Welfare* Birthplace	0.3073(0.1406)[b]	0.3198(0.1534)[b]
Job rank *Birthplace	0.0228(0.00785)[a]	0.0293(0.00907)[a]
Family dysfunction *Birthplace	-0.0270(0.00680)[a]	-0.0530(0.00858)[a]
Negative parenting style *Birthplace	-0.0704(0.0776)	-0.0285(0.0935)
-2LOGL(Intercept and covariates)	14815.09	13959.88
Chi-square (score test) with 66 DF	318.07	367.56
Log-likelihood ratio = $-2(L_R - L_u) \equiv \chi^2(17)$	60.97[a]	118.822[a]
Sample Size	7,270	6,783

Notes: 1. The dependent variable is the PMK's assessment of child's health.
2.a, b, and c denote significance levels at the 1%, 5% and 10%, respectively.
3.The coefficients in boldface suggest that the differential impacts of the corresponding variables are different for the all parents immigrant group and the combined immigrant group.
4. L_u denotes the log-likelihood of the unrestricted model (where the coefficients of *birthplace* and the interaction variables assumed to have non-zero values), and L_R denotes that of the restricted model.
Source: Prepared by the author using the NLSCY (1996-97) Cycle2 data

Table 6.3:Ordered logit estimates of extended health outcome model of children in NBC and immigrant families excluding siblings

Variables	**Coefficients Standard errors)**	
Groups	**NBC & Combined immigrant group**	**NBC & All parents immigrant group**
Intercept 1	-0.2984 (0.2259)	-0.3041(0.2223)
Intercept 2	0.6522(0.2261)[a]	0.6635(0.2225)[a]
Intercept 3	1.5797(0.2282)[a]	1.5804(0.2247)[a]
Age of the child	0.00367(0.00841)	0.00371(0.0083)
Gender (= 1, if the child is a boy, = 0, if a girl)	-0.0207 (0.0362)	-0.0208(0.0356)
Equivalent Income ($)	6.904E-6(1.475E-6)	6.925E-6(1.452E-6)
House (= 1, if any family members own the house, = 0, if not)	0.1096(0.0526)	0.1099(0.0517)
Lone-parent (=1, if child lives with a lone parent, = 0, otherwise)	-0.0480(0.0546)	-0.0479(0.0537)
Age of mother (years) at birth of child	0.000066(0.00375)	0.000051(0.00369)
Years of education of PMK	0.0487(0.0105)[a]	0.0489(0.0103)[a]
Weekly working hours of PMK	-0.00023(0.00112)	-0.00023(0.0011)
Poor health of PMK (= 1, if health status of PMK is poor or fair, = 0, other wise)	-0.3292(0.0697)[a]	-0.3298(0.0686)[a]
Residential movement	-0.0180(0.00897)[b]	-0.0181(0.00883)[b]
Rural area (= 1, if the child lives in a rural area, = 0, otherwise)	-0.0716 (0.0506)	-0.0720(0.0498)
Provincial unemployment rate (1996)	0.0216(0.00765)[a]	0.0216(0.00753)[a]
Welfare (= 1, if the family's main source of income is public assistance, = 0, otherwise)	0.1258(0.0721)[c]	0.1257(0.071)[c]
Job rank of parents (a lower value indicates a higher job status)	-0.0153(0.00469)[a]	-0.0153(0.00462)[a]
Family dysfunction	-0.0233(0.00377)[a]	-0.0234(0.00372)[a]
Negative parenting style	-0.1199(0.0421)[a]	-0.1201(0.0414)
Birthplace (= 1, if parents are foreign born, = 0, if native- born Canadian)	**-0.2978(0.4811)**	**-1.1597(0.5919)[b]**
Age of the child* Birthplace	0.0600(0.0174)[a]	0.1010(0.0207)[a]
Gender * Birthplace	0.1872(0.077)[a]	0.2528(0.0947)[a]
Equivalent income* Birthplace	2.173E-6(2.797E-6)	-8.72E-7(3.392E-6)
House * Birthplace	-0.1210 (0.1074)	-0.0253(0.1247)
Lone- parent * Birthplace	-0.2976(0.1198)[a]	-0.2551(0.1310)[b]
Age of PMK * Birthplace	-0.00231(0.0071)	-0.00313(0.00836)
Years of education of PMK* Birthplace	-0.00404(0.0193)	-0.00986(0.0218)
Working hours of PMK* Birthplace	-0.00932(0.0023)[a]	-0.00900(0.00279)[a]
Poor health status of PMK* Birthplace	-0.00901(0.1404)	**0.3125(0.1674)[c]**
Residential movement* Birthplace	-0.0227(0.0204)	**-0.0353(0.0256)[b]**
Rural area* Birthplace	0.0424(0.1840)	0.8233(0.3865)
Provincial unemployment rate *Birthplace	-0.0101(0.0265)	0.0285(0.0355)
Welfare* Birthplace	0.1856(0.1618)	0.2333(0.1777)
Job rank *Birthplace	0.0230(0.00939)[a]	0.0356(0.0109)[a]
Family dysfunction *Birthplace	-0.0207(0.00797)[a]	-0.0448(0.0101)[a]
Negative parenting style *Birthplace	-0.0159 (0.0910)	**0.1778(0.108)[c]**
-2LOGL(Intercept and covariates)	10700.028	10118.630
Chi-square (score test) with 66 DF	291.7690[a]	327.233[a]
Log-likelihood ratio = $-2(L_R - L_U) \equiv \chi^2(17)$	73.424[a]	134.973[a]
Sample Size	5,357	5,010

Notes: 1 The dependent variable is the PMK's assessment of child's health.
2.a, b, and c denote significance levels at the 1%, 5%, and 10%, respectively.
3.The coefficients in boldface suggest that the differential impacts of the corresponding variables are different for the all parents immigrant group and the combined immigrant group.
4. L_u denotes the log-likelihood of the unrestricted model (where the coefficients of *birthplace* and the interaction variables assumed to have non-zero values), and L_R denotes that of the restricted model.

Source: Prepared by the author using the NLSCY (1996-97) Cycle2 data

Table 6.4: Ordered logit estimates of extended health outcome models of the NBC group and different immigrant sub-groups

Variables	**Coefficients (standard error)**		
Groups	**NBC & American**	**NBC & European**	**NBC & Asian**
Intercept 1	-0.2614(0.1820)	-0.2595(0.1872)	-0.2781(0.1839)
Intercept 2	0.7231(0.1822)[a]	0.7062(0.1873)[a]	0.7052(0.1841)[a]
Intercept 3	1.6429(0.1845)[a]	1.6664(0.1896)[a]	1.6547(0.1865)[a]
Age of the child	0.00828(0.00684)	0.00820(0.00703)	0.00846(0.00691)
Gender (= 1, if the child is a boy, = 0, if a girl)	-0.0224(0.0288)	-0.0222(0.0296)	-0.0211(0.0291)
Equivalent Income ($)	7.419E-6(1.176E-6)[a]	7.401E-6(1.209E-6)[a]	7.406E-6(1.188E-6)[a]
House (= 1, if family members own house, = 0, if not)	0.1138(0.0420)[a]	0.1138(0.0432)[a]	0.1148(0.0424)[a]
Lone-parent (= 1, if the child lives with a lone parent, = 0, otherwise)	-0.0130(0.0447)	-0.0135(0.0460)	-0.0115(0.0452)
Age of mother (years) at birth of child	-0.00318(0.00304)	-0.00313(0.00313)	-0.00317(0.0031)
Years of education of PMK	0.0436(0.00834)[a]	0.0437(0.00857)[a]	0.0442(0.00842)[a]
Weekly working hours of PMK	-0.00072(0.0009)	-0.00071(0.0009)	-0.00082(0.0009)
Poor health condition of PMK (= 1, if the health status of PMK is poor or fair, = 0, other wise)	-0.3396(0.0562)[a]	-0.3418(0.0578)[a]	-0.3374(0.0567)[a]
Residential movement	-0.0196(0.00705)[a]	-0.0196(0.00725)[a]	-0.0194(0.00712)[a]
Rural area (= 1, if child lives in a rural area, = 0, otherwise)	-0.0205(0.0399)	-0.0205(0.0410)	-0.0206(0.0403)
Provincial unemployment rate (1996)	0.0263(0.00615)[a]	0.0264(0.00632)[a]	0.0266(0.00621)[a]
Welfare (= 1, if family's main source of income is from public assistance, = 0, otherwise)	0.1165(0.0583)[b]	0.1164(0.0599)[b]	0.1118(0.0588)[b]
Job rank of parents (a lower value indicates a higher job status)	-0.0135(0.00374)[a]	-0.0135(0.00384)[a]	-0.0134(0.00377)[a]
Family dysfunction	-0.0247(0.00302)[a]	-0.0247(0.00310)[a]	-0.0244(0.00305)[a]
Negative parenting style	-0.1490(0.0338)[a]	-0.1490(0.0348)[a]	-0.1484(0.0342)[a]
Birthplace (= 1, if parents are foreign born, = 0, if native born-Canadian)	-1.7667(1.9470)	**1.9826(0.6357)**[a]	1.1409(1.0296)
Age of the child* Birthplace	0.0799(0.0664)	**-0.0718(0.0228)**[a]	-0.0472(0.0359)
Gender * Birthplace	0.2653(0.3002)	0.0213(0.0937)	**0.5288(0.1685)**[a]
Equivalent income* Birthplace	-9.41E-6(9.846E-6)	**0.000013(3.729E-6)**[a]	**-0.00002(4.926E-6)**[a]
House * Birthplace	0.3562(0.4031)	0.1443(0.1306)	**-0.9004(0.3892)**[b]
Lone- parent * Birthplace	**0.9497(0.6442)**	**0.4610(0.1800)**[a]	**0.0454(0.3291)**
Age of PMK * Birthplace	0.0178(0.0287)	**-0.0179(0.0094)**[b]	-0.00776(0.0179)
Years of education of PMK* Birthplace	**0.1718(0.0978)**[c]	-0.0126(0.0246)	0.0114(0.0386)
Working hours of PMK* Birthplace	**-0.00468(0.0078)**	-0.00590(0.0031)[b]	**0.00731(0.0051)**
Poor health status of PMK* Birthplace	-0.2937(0.5911)	**-0.4937(0.1975)**[a]	**1.6056(0.6328)**[a]
Residential movement* Birthplace	**-0.1860(0.0686)**[a]	**0.0507(0.0258)**[b]	**-0.2043(0.0498)**[a]
Rural area* Birthplace	**-1.2639(0.4408)**[a]	-0.1250(0.2005)	0.3588(0.8738)
Provincial unemployment rate* Birthplace	-0.0164(0.1073)	**-0.0812(0.0322)**[a]	**0.1514(0.0788)**[b]
Welfare *Birthplace	1.0824(0.6556)[c]	**0.3317(0.3098)**	7.9593(1.3820)[a]
Job rank *Birthplace	**-0.0223(0.0397)**	0.0312 (0.0125)[a]	**-0.0249(0.0217)**
Family dysfunction *Birthplace	-0.0847(0.0352)[b]	-0.0216(0.00997)[b]	-0.0483(0.0178)[a]
Negative parenting style *Birthplace	0.1464(0.3393)	**-0.3609(0.1238)**[a]	-0.2615(0.1984)
-2LOGL(Intercept and covariates)	13680.60	13643.50	13238.81
Chi-square (score test) with 66 DF	168.28	243.65	261.17
Log-likelihood ratio = $-2(L_R - L_u) \equiv \chi^2(17)$	59.112[a]	66.727[a]	118.017[a]
Sample Size	6,494	6,764	6,480

Notes: 1. The dependent variable is the PMK's assessment of child's health

2 .a, b, and c denote significance levels at the 1%, 5% and 10%, respectively.

3. The coefficients in boldface suggest that the differential impacts of the corresponding variables are different for the immigrant sub-groups and the combined immigrant group.

4. L_u denotes the log-likelihood of the unrestricted model (where the coefficients of *birthplace* and the interaction variables assumed to have non-zero values), and L_R denotes that of the restricted model.

Source: Calculated by the author using the NLSCY (1996-97) Cycle 2 data

Table 6.5: Ordered logit estimates of extended health outcome models of the NBC group and different sub-groups excluding siblings

Variables	**Coefficients (standard error)**		
Groups	**NBC & American**	**NBC & European**	**NBC & Asian**
Intercept 1	-0.2988(0.2118)	-0.2955(0.2178)	-0.3058(0.2141)
Intercept 2	0.6668(0.2120)[a]	0.6423(0.2180)[a]	0.6723(0.2143)[a]
Intercept 3	1.5494(0.2145)[a]	1.5885(0.2205)[a]	1.5684(0.2169)[a]
Age of the child	0.00374(0.00788)	0.00362(0.00811)	0.00376(0.00797)
Gender (= 1, if the child is a boy, = 0, if a girl)	-0.0209(0.0339)	-0.0206(0.0349)	-0.0209(0.0343)
Equivalent Income ($)	6.914E-61.383E-6)	6.89E-6(1.422E-6)	6.935E-6(1.398E-6)
House (= 1, if family members own house, = 0, if not)	0.1092(0.0493)	0.1096(0.0507)	0.1098(0.0498)
Lone-parent (= 1, if the child lives with a lone parent, = 0, otherwise)	-0.0471(0.0511)	-0.0483(0.0526)	-0.0475(0.0517)
Age of mother (years) at birth of child	0.000021(0.00351)	0.000087(0.00361)	0.00003(0.00355)
Years of education of PMK	0.0487(0.00981)[a]	0.0487(0.0101)[a]	0.0489(0.00992)[a]
Weekly working hours of PMK	-0.00024(0.00105)	-0.00022(0.00108)	-0.000230.00106)
Poor health condition of PMK (= 1, if the health status of PMK is poor or fair, = 0, other wise)	-0.3260(0.0654)[a]	-0.3298(0.0672)[a]	-0.3288(0.0661)[a]
Residential movement	-0.0180(0.00840)[b]	-0.0179(0.00864)[b]	-0.0181(0.0085)[b]
Rural area (= 1, if child lives in a rural area, = 0, otherwise)	-0.0714(0.0475)	-0.0714(0.0488)	-0.0721(0.048)
Provincial unemployment rate (1996)	0.0215(0.00717)[a]	0.0216(0.00737)[a]	0.0216(0.00725)[a]
Welfare (= 1, if family's main source of income is public assistance, = 0, otherwise)	0.1255(0.0676)[c]	0.1259(0.0695)[c]	0.1256(0.0683)[c]
Job rank of parents (a lower value indicates a higher job status)	-0.0152(0.00440)[a]	-0.0152(0.00452)[a]	-0.0153(0.00445)[a]
Family dysfunction	-0.0233(0.00354)[a]	-0.0232(0.00364)[a]	-0.0234(0.00358)[a]
Negative parenting style	-0.1192(0.0395)[a]	-0.1200(0.0406)[a]	-0.1200(0.0399)[a]
Birthplace (= 1, if parents are foreign born, = 0, if native-born Canadian)	**0.9106(2.4819)**	**2.8521(0.7698)**	**-0.2149(1.2909)**
Age of the child* Birthplace	**-0.00592(0.0850)**	**-0.0182(0.0285)**	**-0.0600(0.0485)**
Gender * Birthplace	**0.2528(0.4391)**	**0.1315(0.1136)**	0.6947(0.2101)[a]
Equivalent income* Birthplace	-4.77E-6(0.000013)	**0.000013(4.548E-6)[a]**	**-0.00002(6.395E-6)[b]**
House * Birthplace	0.5876(0.5054)	-0.1849(0.1601)	**-0.8100(0.4358)[c]**
Lone- parent * Birthplace	**1.4868(0.7866)[b]**	**0.5787(0.2166)[a]**	**0.7825(0.4825)[c]**
Age of PMK * Birthplace	0.0200(0.0339)	**-0.0177(0.0104)[c]**	0.0104(0.0215)
Years of education of PMK* Birthplace	0.1723(0.1178)	-0.0409(0.0291)	0.0541(0.0470)
Working hours of PMK* Birthplace	-0.0224(0.0102)[b]	-0.00886(0.00368)[b]	**-0.00892(0.00664)**
Poor health of PMK* Birthplace	0.3967(0.7112)	**-0.2114(0.2325)[a]**	0.5897(0.9135)
Residential movement* Birthplace	**-0.2292(0.0900)[a]**	**0.0471(0.0314)[a]**	**-0.1633(0.0561)[a]**
Rural area* Birthplace	-0.3580(0.7526)	0.0385(0.2421)	0.3455(0.8827)
Provincial unemployment rate* Birthplace	-0.1330(0.1244)	-0.1420(0.0392)	0.1316(0.1033)
Welfare *Birthplace	0.8498(0.8258)	0.3842(0.3662)	3.9851(35.2805)
Job rank *Birthplace	**-0.00511(0.0473)**	**0.0107(0.0153)**	**0.0299(0.0264)**
Family dysfunction *Birthplace	-0.0774(0.0413)[c]	**-0.0294(0.0113)**	**-0.0323(0.0223)**
Negative parenting style *Birthplace	-0.9714(0.6459)	**-0.4292(0.1445)[a]**	-0.3552(0.2700)
-2LOGL (Intercept and covariates)	9430.346	9824.345	9431.057
Chi-square (score test) with 66 DF	149.0068	244.7200	188.5019
Log-likelihood ratio = $-2(L_R - L_u) \equiv \chi^2(17)$	38.154[a]	71.868[a]	74.530[a]
Sample Size	4,793	4,991	4,782

Notes: 1. The dependent variable is the PMK's assessment of child's health

2 .a, b, and c denote significance levels at the 1%, 5%, and 10%, respectively.

3. The coefficients in boldface suggest that the differential impacts of the corresponding boldface are different for the immigrant sub-groups and the combined immigrant group.

4. L_u denotes the log-likelihood of the unrestricted model (where the coefficients of *birthplace* and the interaction variables assumed to have non-zero values), and L_R denotes that of the restricted model.

Source: Calculated by the author using the NLSCY (1996-97) Cycle 2 data

6.1.3 Simulated probabilities of children being in different health categories: variation and the nature of selection in health outcomes measured by the PMK

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.[122] Equation (4.3a) in Chapter 4 indicates that 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:

$$\text{(6a)} \quad P_{Ni}\left(Y_{Ni} \le j\right) = \frac{\exp(\mu_{Nj} + \sum_{g=1}^{t} \beta_{Ng} X_{gNi})}{1 + \exp(\mu_{Nj} + \sum_{g=1}^{t} \beta_{Ng} X_{gNi})}$$

$$\text{(6b)} \quad P_{Ii}\left(Y_{Ii} \le j\right) = \frac{\exp(\mu_{Ij} + \sum_{g=1}^{t} \beta_{Ig} X_{gIi})}{1 + \exp(\mu_{Ij} + \sum_{g=1}^{t} \beta_{Ig} X_{gIi})}$$

where P_{Ni} and P_{Ii} are the probabilities of *i*th child in the NBC group and in the immigrant group, *I*, respectively;

I = (I, P, U, E, and A) refers to different immigrant groups, where I = the combined immigrant group, P = the all parents immigrant group, U = the American immigrant group, E = the European immigrant group, and A = the Asian immigrant group;

Y_{Ni} and Y_{Ii} are the health outcomes of *i*th child in the NBC group and in an 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 variables 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*.

The previous section presented the vector of estimated model coefficients for the children of each group, $\hat{\beta}_k$. Here the subscript, k = N for the NBC group, = *I*, for an immigrant

[122] Remember that the PMK's assessment of child's health variable has four response categories:

group. Suppose, the resource levels of *i*th child of different groups is denoted by the vector X_{ki}. Using the equations 6a or 6b, it is possible to simulate the predicted conditional probability for each child being in one response category, say excellent health, and the average predicted conditional probability for each group in the following four cases: Select the sample of the NBC group; give each child the vector of own group coefficients, $\hat{\beta}_N$; and using the equation 6a simulate the predicted conditional probability for each child with his/her own resource vector, X_{Ni}.. Take the mean value of these probabilities, $\hat{P}_i(X_N, \hat{\beta}_N)$. This simulated value, $\overline{\hat{P}(X_N, \hat{\beta}_N)}$, 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.

I) Select the sample of children of an immigrant group; give each child the own group coefficients, $\hat{\beta}_I$; and using equation 6b, simulate the predicted conditional probability for each child with his/her own resource vector, X_{Ii}. Take the mean value of these probabilities, $\hat{P}_i(X_I, \hat{\beta}_I)$. This simulated value, $\overline{\hat{P}(X_I, \hat{\beta}_I)}$ denotes the average predicted conditional probability for the immigrant group with its own group coefficients and with own resources of children.

II) Select the sample of the NBC group; give each child the vector of the immigrant group coefficients, $\hat{\beta}_I$; 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, $\hat{P}_i(X_N, \hat{\beta}_I)$. This simulated value, $\overline{\hat{P}(X_N, \hat{\beta}_I)}$ 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.

III) Select the children of the immigrant sample; give each child the vector of the coefficients of the NBC group, $\hat{\beta}_N$; and using one of the above equations,

poor or fair = 0, good = 1, very good = 2, and excellent = 3.

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, $\hat{P}_i(X_I, \hat{\beta}_N)$. This simulated value, $\overline{\hat{P}(X_I, \hat{\beta}_N)}$, 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.

For the purpose of this analysis, the probabilities of children being in different health categories are simulated for the above four hypothetical states. The coefficients of the health outcomes of children are taken from the regression models of Table 6.2 and Table 6.4. Note that each these five models are estimated from the pooled sample of the NBC group and an immigrant group. [123] The coefficients for the NBC group are those of the non-interacted variables in column 2 of Table 6.2; the coefficients for an immigrant group are derived by adding the coefficients of the non-interacted variables with those of the interacted variables. For example, the slope coefficient of "age of the child" (0.0082) in Column 2 of Table 6.2 is used to represent the slope coefficient of this variable for the NBC group. On the other hand, the slope coefficient of "age of the child" for the combined immigrant group is derived by adding the slope coefficient of "age of the child* birthplace" in Column 2 of Table 6.2- a value of 0.0178- with 0.0082. The reason behind this choice of using coefficients from pooled regression is that the sample sizes for different immigrant groups are smaller, and hence, the estimates of the regressions from separate samples of each immigrant group may be less reliable compared to those of the pooled regressions. However, the robustness of the results is tested for the health outcomes using the coefficients from the separate regression models of different groups.[124] The above exercise of simulation of probabilities at different hypothetical states will serve two purposes: the variation in probabilities of different groups for

[123] Oaxaca (1973) uses coefficients for a group from the separate sample of that group. However, his methodology is for linear models.
[124] See Table A3.4 in Appendix 3.

different health categories can be examined, and the selectivity hypotheses can be tested directly as the following discussion explains:

The differences in the average predicted conditional probability of the first case, $\overline{\hat{P}(X_N, \hat{\beta}_N)}$, and the second case, $\overline{\hat{P}(X_I, \hat{\beta}_I)}$ gives the average total variation in existing probabilities of the NBC group and the immigrant group.

Note that the first case, $\overline{\hat{P}(X_N, \hat{\beta}_N)}$, uses the coefficients of the NBC group and the third case, $\overline{\hat{P}(X_N, \hat{\beta}_I)}$, uses that of the immigrant group; but both use the resources of the children of the NBC group. Since the resources are constant in both cases, the nature of selectivity can be examined by comparing these two simulated probabilities. A higher value of the third case would indicate that if the children of the NBC group had the coefficients of the immigrant group, the probabilities would have been higher compared to the present probabilities of the NBC group with their own group coefficients. Alternatively, a higher value of the third case would also indicate that if the children of the immigrant group were given the resources of the children of the NBC group, the probabilities would be higher for the immigrant group compared with that of the NBC group. Both interpretations imply that the children of the immigrant group would be a positively selected sample in the above case. A lower probability of the third case would indicate a negative selection.

The second case, $\overline{\hat{P}(X_I, \hat{\beta}_I)}$, and the fourth case, $\overline{\hat{P}(X_I, \hat{\beta}_N)}$ use the resources of the children of the immigrant group but a different vector of coefficients. Hence, a comparison of the simulated probabilities of these two cases would also provide information about the nature of selectivity. A higher value of the second case compared with the fourth case would indicate that the children of the immigrant group are positively selected. Thus, selectivity can be tested in two ways: 1) select the sample of the children of the NBC group; estimate the predicted conditional probability using the NBC group coefficients; estimate also the predicted conditional probability using the immigrant group coefficients, and compare the two, or 2) select the sample of children of immigrant group; estimate the predicted conditional probability using the immigrant group coefficients; estimate also the predicted conditional probability using the NBC group coefficients, and compare the two. Note, the resource levels are different in the two methods. In this section, the probabilities of the NBC group and different immigrant groups are simulated for three different response categories of health: i) excellent health, ii) excellent health or very good health, and iii) excellent health or very good health or good health.

Tables 6.6-6.8 present the simulated probabilities of children in various health categories in different hypothetical states including and excluding siblings. Each box in these tables contains three entries which give the simulated probabilities of three categories of health in the children of a group. The first entry in each box denotes the probability of being in the excellent health category; the second entry denotes the probability of being in the excellent or very good health category, while the third entry is the probability of being in the excellent, or very good or good health category. Note that, if the fair or poor health category is added, the probability would be 1 in each box and there would be no variations in different boxes. For that reason, the probability of this category is excluded here. However, the probability of being in the poor or fair category can be calculated by subtracting the probability being in the excellent or very good or good health from 1.

The conditional expected probabilities and their differences

Consider Table 6.6. These values for each group are estimated with the existing individual resources of the children and the group coefficients of that group. The first column specifies different states. For example, the first case, $\overline{\hat{P}(X_N,\hat{\beta}_N)}$, denotes the average predicted conditional probabilities of the children of the NBC group with their own group coefficients and own resource levels. These values are the existing average predicted conditional probabilities of the children of the comparison group. Similarly, the second case, $\overline{\hat{P}(X_I,\hat{\beta}_I)}$, denotes the average predicted conditional probabilities of the children of the combined immigrant group with their own group coefficients and own resource levels. A comparison of the values of these two cases gives the total variations in average predicted conditional probabilities of the NBC group and the combined immigrant group. The second column gives the average predicted conditional probabilities and the fourth column gives their differences using the coefficients without any correction for sibling status. The third and the fifth columns give those after a correction is made for sibling status effects.

Now compare the probabilities of different immigrant groups with the base case before any correction has been done for sibling status. Consider the first entry, which gives the average predicted conditional probability of being in the excellent health category. The simulated probability for the NBC group is 0.565. This value is approximately equal to that of the combined immigrant group, which is 0.562. The difference is insignificant. When the other two categories are considered, the differences are statistically significant, although the magnitude is less than 1%. Hence, the magnitudes of the differences are robust (less than 1% in each case) to the health categories chosen. The comparison of these simulated probabilities suggest that the total variation in probabilities of the NBC group and the combined immigrant group is negligible. For both groups, the approximate probability of children's being in the excellent or very good health category is 77%; and that of being in the excellent or very good or good health category is 90%. Hence, it can be concluded that the health status of the children of these two groups are similar. However, for the all parents immigrant group, the difference in probabilities of the all parents immigrant group and the NBC group is about 3-percentage point for any health category.

Among the three immigrant sub-groups, the American immigrant group has the highest probabilities for any of these three health categories as shown in the 4th case. Compared to the NBC group, the probability is significantly higher for the American immigrant group. When the probability of being in the excellent health category is considered, the children of the American group have about 18-percentage point higher probability compared to those of the NBC group (0.57 for the NBC group vs. 0.75 for the American immigrant group). The probability is about 11-percentage point higher for the second health category, and 5-percentage points higher for the third category. Hence, it can be concluded that the health outcomes of the children of the American immigrant group are noticeably better than those of any group. However, because of the smaller sample size of this group, the results should be viewed in caution. Note that these predicted values are close to the raw mean values, as presented in Chapter 5, where the mean values for this sample were calculated from a larger sample.

The probabilities for the excellent health category are about 2-percentage point higher for the European immigrant group than for the NBC group (0.59 for the European immigrant group vs. 0.57 for the NBC group) and the difference decreases with other categories. In each case, the difference is statistically significant. A comparison of the Asian immigrant group and the NBC group reveals that the probability of the children of the former group is approximately 4-percentage points lower compared to that of the NBC group (0.53 for the Asian immigrant group vs. 0.57 for the NBC group) for any health category. Hence, the different immigrant sub-groups reveal a considerable amount of heterogeneity in health status of children.[125] The simulated results are robust to the choice of regression coefficients from either a pooled sample or separate samples.[126]

Now consider the results after a correction for sibling status is made. The numbers in each box vary slightly from those of the previous cases. Similar conclusions apply to each group, except to the European immigrant group. After the correction for sibling status, the differences in probabilities of the NBC group and those of the European group became insignificant. In most of the cases, the differences vary little. Hence, sibling status seems to have no substantive effects on the simulated health outcomes of children in the studied sample. This result reflects the fact that the estimation of models with maximum likelihood method, rather than OLS method, is a remedial measure when observations are non-independent.

[125] Table A3.4 in Appendix 3 demonstrates that the magnitudes of the average predicted values vary slightly if the regression coefficients from the separate sample of each group are used.

Note, the average predicted conditional probabilities presented in this section are close to the simple mean values for each group, presented in Chapter 5. This indicates that the predicted values are consistent with the simple mean values.

The nature of selectivity in health outcomes: a selectivity test using the resources of the children of the NBC group (selecting the sample of the NBC group)

As mentioned in the earlier chapters that when one group has a higher outcome compared to another group for the same level of resources, the former group could be considered as being a positively selected sample (has a stronger association of observable resources with the health outcomes). A positive selection is also consistent with the hypothesis of having a higher level of "differential cultural capital." The selectivity tests may provide useful information about the sources of variation in health outcomes. For remedial measures, it is important to know the causes of lower level of health outcomes. The previous section demonstrates that the health status of children of the all parents immigrant group and that of the Asian immigrant group are worse than that of the NBC group. This test may provide important information about the sources of lower health outcomes of these two groups.

In this section, the PMK's assessment of child's health variable is examined which has four levels, as shown in the previous section. The excellent health category is the highest level, and the fair or poor health category is the lowest level. Note that a higher probability for the higher levels would indicate higher health outcomes, and a higher probability for the lower levels would indicate lower health outcomes. Hence, to be positively selected, the probability has to be higher for the higher levels for the same level of resources. Consider the results of the selectivity test that uses the resource levels of the children of the NBC group.

The values in Table 6.7 are simulated selecting the sample of the NBC group. Six different vectors of group coefficients are used in six states but the resources of the

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[126] The health outcomes were also simulated using the coefficients of the base model with actual "working hours of the PMK," and those with the extended model with "ethnic working hours of

children of the NBC group are used in all of these states. The first column denotes these states. For example, the first case, $\overline{\hat{P}(X_N,\hat{\beta}_N)}$, denotes the average predicted conditional probabilities of different health categories of the children of the NBC group with the coefficients of the NBC group; while the second case, $\overline{\hat{P}(X_N,\hat{\beta}_I)}$, denotes those of the NBC group with the coefficients of the combined immigrant group. The numbers in the other five boxes can be interpreted in the same way. Thus, these values denote the average predicted conditional probabilities of the children of the NBC group if they had the coefficients of different immigrant groups. Alternatively, these numbers can be interpreted as the average predicted conditional probabilities of the children in different immigrant groups if they were given the resources of the children of the NBC group. Since the resources are constant in each case, the nature of the selectivity of the children of different immigrant groups can be examined.

Compare the values of the first case with those of the second case. These numbers provide information about the nature of selectivity of the children of the combined immigrant group. Consider the first number, which is the probability of being in the excellent health category. The probability is 0.565 for the NBC group with the NBC group coefficients, and also 0.565 with the combined immigrant group coefficients. Hence, there is no evidence that the children of the combined immigrant group are positively or negatively selected sample when the excellent health category is considered. When the other two health categories are examined, the probabilities are slightly lower (0.004) with the combined immigrant group coefficients but significant. Statistically, this implies that the children of the combined immigrant group are negatively selected. However, the small magnitude implies that the health status would be approximately the same for the same level of resources.

Now compare $\overline{\hat{P}(X_N,\hat{\beta}_N)}$, with $\overline{\hat{P}(X_N,\hat{\beta}_P)}$. These numbers provide information about the nature of selectivity of the children of the all parents immigrant group. For the excellent health category, and the for the excellent and very good health category, there is

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the PMK,"; the findings indicate simulated values are robust to the specification of the model.

statistical evidence that the children of the all parents immigrant group are positively selected. However, for the third response category there is no evidence. For example, if the all parents immigrant group were provided the resource levels of the NBC group, the probability for excellent health category would be 58% for this group, which is 1% higher than that for the NBC group. The difference is statistically significant. Note that with their own resources, the probability for the excellent health category was 53% (see Table 6.6). The policy implication of this finding is that the health status of children of this group could be improved by changing the resource levels. Remember, it was shown in Chapter 5 that compared to the NBC group and the combined immigrant group, this group was in disadvantaged condition in some cases. For example, the percentage of children who live with lone-parent was higher; and compared to the combined immigrant group, this group has lived for shorter period of time in Canada. In the previous section, it has also been shown that the lone-parent status has a stronger negative association with child health for this group. Hence, this factor may be largely responsible for this lower health outcome for this group. Hence, to improve the health outcomes of children of this group, the children in the lone-parent families may need special attention.

Similar comparisons with the other three cases indicate that the children of any of these three immigrant sub-groups are positively selected. For the resource level of the children of the NBC group, the probability of being in the excellent health category for the American group would be 65%, which is 8% higher than that for the NBC group. This indicates that even for the same level of resources, the American immigrant group would have a higher probability of being in the excellent health category. Remember that with their own resource levels, the probability is even higher (75%) for the American immigrant group (see Table 6.6). This finding indicates that the children of the American immigrant group have higher health outcomes because of higher level of observable and unobservable resources ("differential cultural capital"). Hence, policy makers need not be concerned for the health status of children of this group.

The magnitudes of the European immigrant group suggests that providing the resources of the NBC group would not change the health status of children of this group which is similar to that of the NBC group. On the other hand, the magnitudes of the Asian immigrant group suggests that the probability of being in the excellent health status could be increased by 11% by providing the resources of the children of the NBC group. Remember that the probability of being in the excellent health was 52% for the children of the Asian immigrant group, with their own resources (see Table 6.6); while with the NBC resources, the probability would be 63%. Hence, the situation of this group is more similar to that of the all parents immigrant group.

Now consider the cases after excluding the siblings from the sample. The differences in the fifth column and the *t*-ratios in the seventh column indicate that the results differ depending on the response category. When the probability of being in the excellent health category is considered, the results are different for the combined immigrant group and the all parents immigrant group. The *t*-values indicate that the children of the combined immigrant group are negatively selected; and there is no statistical evidence that the children of the all parents immigrant group are positively selected. However, the magnitudes are not markedly different from those with the inclusion of siblings.

For the immigrant sub-groups, the previous conclusion remains unaffected for excellent health category. When the other two categories are considered, the previous results vary significantly for the European and Asian immigrant groups. T-tests of the differences indicate that the children of the European immigrant group are negatively selected for both response categories; while the children of the Asian immigrant group are negatively selected only for the third category.

A selectivity test by using the resources of the children of the immigrant groups

As mentioned before, the nature of selectivity can be examined using two methods. The previous method uses the resources of the children of the NBC group. It can also be examined using the resources of the children of different immigrant groups. Two methods have two different policy implications. The first method provides information for the policy makers if they are interested to change the resources, say income levels, of the immigrant population or those of the sub-groups within the immigrant population.

The second method provides information if the interest of the policy makers is to change the efficiency of the use of the resources, say providing knowledge about the use of income that may improve the health outcomes of children.

Consider Table 6.8. The probabilities in this table are simulated selecting the samples of children of the five immigrant groups: the combined immigrant group; the all parents immigrant group; the American immigrant group, the European immigrant group, and the Asian immigrant group, respectively. For each group, the probabilities of the three health categories are estimated under two alternative states. One state shows the probabilities with the coefficients of the NBC group, while the other does with the coefficients of that immigrant group. A comparison of the probabilities of these two states for a group gives information about the nature of selectivity of that group. The tests are performed including and excluding siblings.

Compare the first case, $\overline{\hat{P}(X_I, \hat{\beta}_N)}$, and the second case, $\overline{\hat{P}(X_I, \hat{\beta}_I)}$. In both cases, the sample of the combined immigrant group is used to estimate the average predicted conditional probabilities for the three different health categories. Since the resource vector (X_I) is constant in these two states, a comparison of the numbers in these two boxes provides information about the nature of the selectivity of the children of the combined immigrant group. With the NBC group coefficients the probability would be 0.564 for the combined immigrant group, while with their own group coefficients, it is 0.562. The positive and significant *t*-values of the differences indicate that the probabilities would be higher with the NBC group coefficients, than with the coefficients of the combined immigrant group for any of these three health categories. Statistically, this indicates that the children of the combined immigrant group are negatively selected. However, the magnitude suggests that the difference is very negligible. The conclusion is robust to the exclusion of siblings.

A similar comparison of the third and the fourth cases indicate that the same applies to the children of the all parents immigrant group. This statistical finding has two different interpretations and hence, has two policy implications. It may indicate that if the children of the NBC group were provided the resources of the immigrant groups, their health outcomes would be higher than those of the above immigrant groups. On the other hand, it indicates that if the children of the two immigrant groups were provided the coefficients of the NBC group, their health outcomes would be higher than their present outcome. The second interpretation is more appropriate when the target group is the immigrant group. According to this interpretation, changing the coefficients[127] of these two groups could improve the health status of children of these two groups. However, it is less understood how the slope coefficients of the immigrant groups could be changed. Perhaps, they should be provided some programs that would increase their knowledge about the relationship of their resources and the health outcomes. Furthermore, the magnitude suggests that the improvement would be very negligible.

The fifth and the sixth cases provide information about the nature of the selectivity of the children of the American immigrant group. The magnitudes of the differences suggest that even if the resources were held constant the probabilities would be noticeably and significantly higher for the children of the American immigrant group than for those of the NBC group. For example, with the NBC group coefficients, the probability for the American immigrant group would be 0.601 (3-percentage point higher than that of the NBC group) for the excellent health category, while with their own coefficients the above probability is 0.754. The results are robust to the correction of sibling status. This finding indicates that this group is better off with their present slope coefficients. Similarly, the findings of the previous section demonstrated that they are also better off with their present resource levels.

A similar comparison of the seventh case and the eighth case indicates a mixed evidence of the nature of selectivity for the children of the European immigrant group. The results vary with the response categories and exclusion of siblings. Statistically, there is evidence of positive selection for the first response category including siblings. With the NBC group coefficients, the probability for the children of the European immigrant group would be 0.574, while with their own group coefficients the probability is 0.588. This 2% difference is statistically significant. For the other two categories, no evidence is

[127] The regression coefficients show the relationships of the resources and health outcomes.

revealed; while after the correction for sibling status the results change significantly for the other two categories. Positive and significant *t*-ratios indicate a negative selection for these two categories. However, the difference is approximately 1%. The policy implication is that changing the coefficients would not change the health status of children of this group markedly. As demonstrated, the present health status of children of this group is slightly better than that of the NBC group there is no need to change their resource levels or the coefficients, as these changes would not bring any marked improvement.

A comparison of the 9th and 10th cases indicate that with the NBC group coefficients the probability of children in the Asian immigrant group would be 0.562 for the excellent health which is 4% higher than their present probability. This difference is statistically significant. The positive and significant *t*-ratios in the rest of the two cases indicate that the children of the Asian immigrant group are negatively selected. The policy implication is that the health status of children of the Asian immigrant group could also be improved by changing their coefficients.

It is interesting to note that except for the American immigrant group, the two methods give opposite findings for different immigrant groups about the nature of the selectivity. The reason could be that the tests are performed on two samples with different sizes: the first test uses the NBC sample, while the second test uses the immigrant samples. The NBC sample is markedly larger than the immigrant samples. If this is the case, the results of the first method are more reliable.

Note that the results excluding the siblings are not robust in every case in a statistical sense. However, similar to the previous case, the magnitudes are not markedly different from the results with the inclusion of siblings. Since the results including siblings use a larger sample, they are more reliable. Moreover, the impacts of non-independent observations are likely to be less substantial in the ordered logit models than in the OLS models, as the ordered logit models use maximum likelihood method of estimation. Hence, the results of logit models including siblings may be used for policy purpose.

In sum, the strongest association of house ownership, mother's education, health status and parenting style with the health outcomes of children suggest the following: i) higher level of asset is more important for the improvement of health status of children than many other covariates; ii) the parents of children need more education to recognize and take care of the health of children; iii) they also need to take care of their own health and learn more about parenting to improve the health status of their children. .

The ordered logistic regression results show that the regression models of different immigrant groups are significantly different from that of the NBC group. The model coefficients suggest that the children of immigrant families are more vulnerable compared to those of the NBC group in the following cases: I) when they live in a lone-parent family, ii) when their mothers work for a longer period of time, iii) when the parenting styles are ineffective, hostile and inconsistent, and iv) when they come from dysfunctional families. To improve the health status of children of immigrant families, the children who are disadvantaged regarding these factors should be given more attention. For example, the percentage of children who live with a lone parent is higher for the all parents immigrant group; hence, the children in the all parents immigrant group who live with lone-parent may need more attention by the policy makers.

The average predicted conditional probabilities of different groups suggest that the health outcomes of children of immigrant families in which one or two parents with whom the child lives are foreign-born are slightly poorer than those of the NBC group in Canada (probability for the excellent health category is 0.57 for the NBC group; while 0.53 for the all parents immigrant group). Within the immigrant population, the health outcomes of children are the best for the American immigrant group. Compared to the children of the NBC group, the health outcomes of children of the American immigrant group are considerably better (19% higher probability for excellent health) those of the European immigrant group are slightly better (2% higher probability for excellent health) but those of the Asian immigrant group are significantly poorer (4% lower probability for excellent health). Thus, the children of the immigrant families in which one or both parents with

whom the child lives are foreign-born, and in which the parents are born in Asia need attention by the policy makers for the improvement of health status.
These findings of health status about the American immigrant group are consistent with the prediction of this study based on Borjas (1985, 1987, 1991). They are also consistent with Macdonald and Worswick (1999) and Worswick (2001).

The selectivity tests using the resources of the children of the NBC group suggest that there is no evidence that the children of an immigrant family where at least one of the parents of the child is an immigrant are positively selected in health outcomes. However, there is evidence that the children of the immigrant families in which one or both parents with whom the child lives are immigrants are positively selected. Within the immigrant population, the children of the American and the Asian immigrants are positively selected. The policy implication of this finding is that if the children of the immigrant families were provided the resources of the children of the NBC group their health outcomes would be better than those of the NBC group. Since the present health outcomes of the all parents immigrant group and those of the Asian immigrant group are slightly poorer than those of the NBC group, these outcomes could be improved providing the resources of the children of NBC group. No additional programs are needed for the children of the American and European immigrant groups.

Since the all parents immigrant group is more representative of the immigrant population, and the findings suggest that the children of the all parents immigrant group and any of these three sub-groups are positively selected in health outcomes, it can be concluded that these findings about selectivity are consistent with Chiswick (1978). However, more research is required to ascertain this claim, as this conclusion does not apply to the combined immigrant group, which has a larger sample.

Table 6.6: Average predicted conditional probabilities of different health categories of children

Predicted probabilities with group coefficients (β_G) and resources (X_G)	Estimated values including siblings	Estimated values excluding siblings	Differences (standard error[128]) including siblings	Differences (standard error) excluding siblings	T -values including siblings	T -values excluding siblings
1) $\overline{\hat{P}(X_N,\hat{\beta}_N)}$	0.565 0.769 0.895	0.570 0.771 0.893				
2) $\overline{\hat{P}(X_I,\hat{\beta}_I)}$	0.562 0.765 0.891	0.548 0.750 0.881	(1)-(2) 0.003 (0.003) 0.004 (0.002) 0.003 (0.001)	(1)-(2) 0.023(0.004) 0.020(0.003) 0.012(0.002)	0.97 1.94[c] 2.57[a]	6.23[a] 7.46[a] 8.22[a]
3 $\overline{\hat{P}(X_P,\hat{\beta}_P)}$	0.530 0.740 0.876	0.515 0.725 0.864	(1)-(3) 0.035(0.004) 0.030(0.003) 0.018(0.002)	(1)-(3) 0.055(0.005) 0.045(0.004) 0.029(0.002)	8.03[a] 9.04[a] 10.11[a]	10.61[a] 11.72[a] 13.52[a]
4) $\overline{\hat{P}(X_U,\hat{\beta}_U)}$	0.754 0.876 0.941	0.757 0.875 0.939	(1)-(4) -0.189(0.008) -0.107(0.006) -0.047(0.003)	(1)-(4) -0.187(0.01) -0.104(0.01) -0.046(0.004)	-23.23[a] -18.04[a] -14.39[a]	-19.41[a] -14.93[a] -11.75[a]
5) $\overline{\hat{P}(X_E,\hat{\beta}_E)}$	0.588 0.779 0.899	0.577 0.765 0.890	(1)-(5) -0.023(0.005) -0.010(0.003) -0.004(0.002)	(1)-(5) -0.006(0.01) 0.005(0.004) .0003(0.002)	-4.949[a] -2.968[a] -2.225[b]	-1.14 1.45 1.51
6) $\overline{\hat{P}(X_A,\hat{\beta}_A)}$	0.523 0.725 0.864	0.536 0.733 0.862	(1)-(6) 0.042(0.009) 0.045(0.006) 0.031(0.004)	(1)-(6) 0.035(0.01) 0.038(0.01) 0.031(0.004)	4.921[a] 7.060[a] 8.813[a]	3.44[a] 5.14[a] 7.53[a]

Note: 1. $\overline{\hat{P}(X_G,\hat{\beta}_G)}$ 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; *G* = *P* denotes all parents immigrant group; *G* = *U* denotes American immigrant group; immigrant group; *G* = *E* denotes European immigrant group; *G* = *A* denotes Asian immigrant group;
2. The first entry in each box denotes the probability of being in *excellent health* category; the second entry in each box denotes the probability of being in *excellent or very good* category; and the third entry in each box denotes the probability of being in *excellent or very good or good health* category.
3. The regression coefficients of this Table come from those of Tables 6.2-6.5
4. a, b, and c denote significant at the 1%, 5%, and 10% levels.
Source: Estimated by the author using the NLSCY (1996-97) Cycle 2 data

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128 The standard error (S.E) of the differences in the average predicted conditional probabilities of the NBC group and the immigrant group for each health category is calculated using the equation: S.E $=\sqrt{S^2(1/n_1+1/n_2)}$ Where S^2 is the pooled variance $S^2=[(n_1-1)s_1^2+(n_2-1)s_2^2]/(n_1+n_2-2)$ and where s_1^2 and s_2^2 are the sample variances of the predicted conditional probabilities of each child of the NBC group and the immigrant group, respectively; n_1 and n_2 are the sample sizes of the NBC group and the immigrant group, respectively.

Table 6.7 Average predicted conditional probabilities of different health categories of children with the resources of the children of the NBC group

Average predicted conditional probabilities with coefficients of different groups	Estimated values including siblings	Estimated values excluding siblings	Differences including siblings (standard error)	Differences excluding siblings (standard error)	T -values including siblings	T -values excluding siblings
1 $\overline{\hat{P}(X_N, \hat{\beta}_N)}$	0.5654 0.769 0.895	0.570 0.771 0.893				
2) $\overline{\hat{P}(X_N, \hat{\beta}_I)}$	0.565 1 0.765 0.891	0.547 0.750 0.880	(1)-(2) 0.0003(0.002) 0.004(0.0013) 0.004(0.001)	(1)-(2) 0.023(0.002) 0.021(0.002) 0.013 (0.001)	0.1460 2.869[a] 4.695[a]	11.36[a] 13.24[a] 14.25[a]
3) $\overline{\hat{P}(X_N, \hat{\beta}_P)}$	0.576 0.772 0.894	0.570 0.765 0.886	(1)-(3) -0.010(0.002) -0.003(0.001) 0.001(0.001)	(1)-(3) 1.82E-05(0.002) 0.006(0.001) 0.007(0.001)	-5.140[a] -1.923[c] 1.202	0.007 3.038[a] 6.814[a]
4) $\overline{\hat{P}(X_N, \hat{\beta}_U)}$	0.654 0.806 0.899	0.644 0.789 0.881	(1)-(4) -0.089(0.003) -0.037(0.002) -0.005(0.002)	(1)-(4) -0.073(0.004) -0.019(0.003) 0.012(0.001)	-29.362[a] -15.787[a] -2.971[a]	-19.05[a] -5.907[a] 5.22[a]
5) $\overline{\hat{P}(X_N, \hat{\beta}_E)}$	0.588 0.778 0.897	0.575 0.762 0.886	(1)-(5) -0.022(0.002) -0.009(0.002) -0.003(0.001)	(1)-(5) -0.004(0.003) 0.009(0.002) 0.007(0.001)	-10.89[a] -5.897[a] -3.212[a]	-1.74[c] 4.491[a] 6.166[a]
6) $\overline{\hat{P}(X_N, \hat{\beta}_A)}$	0.628 0.792 0.897	0.605 0.773 0.881	(1)-(6) -0.062(0.003) -0.023(0.002) -0.003(0.0013)	(1)-(6) -0.034(0.004) -0.002(0.003) 0.0125(0.001)	-20.59[a] -10.31[a] -2.015[b]	-9.481[a] -0.804 7.316[a]

Notes:

1. $\overline{\hat{P}(X_G, \hat{\beta}_G)}$ 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; $G = P$ denotes all parents immigrant group; $G = U$ denotes American immigrant group; immigrant group; $G = E$ denotes European immigrant group; $G = A$ denotes Asian immigrant group;
2. The first entry in each box denotes the probability of being in *excellent health* category; the second entry in each box denotes the probability of being in *excellent or very good* category; and the third entry in each box denotes the probability of being in *excellent or very good or good health* category.
3. The regression coefficients of this Table come from those of Tables 6.2-6.5
4. a, b, and c denote significant at the 1%, 5%, and 10% levels.

Source: Estimated by the author using the NLSCY (1996-97) Cycle 2 data

Table 6. 8 Average predicted conditional probabilities of different health categories of children with the resources of children of different immigrant groups

Average predicted conditional probabilities of different groups	Including siblings			Excluding siblings		
	Estimated values	Differences (standard error)	T - values	Estimated values	Differences (standard error)	T - values
1) $\overline{\hat{P}(X_I, \hat{\beta}_N)}$	0.564 0.768 0.894	(1)-(2) 0.002(0.004) 0.003(0.003) 0.00390.002)	 0.33 1.11 1.64	0.573 0.773 0.895	(1)-(2) 0.025(0.005) 0.023(0.004) 0.014(0.002)	 4.77 [a] 5.61 [a] 6.10 [a]
2) $\overline{\hat{P}(X_I, \hat{\beta}_I)}$	0.562 0.765 0.891			0.548 0.750 0.881		
3) $\overline{\hat{P}(X_P, \hat{\beta}_N)}$	0.553 0.760 0.890	(3)-(4) 0.023(0.007) 0.020(0.006) 0.014(0.003)	 3.139 [a] 3.717 [a] 4.322 [a]	0.563 0.766 0.891	(3)-(4) 0.048(0.009) 0.040(0.007) 0.027(0.004)	 5.37 [a] 5.78 [a] 6.49 [a]
4) $\overline{\hat{P}(X_P, \hat{\beta}_P)}$	0.530 0.740 0.876			0.515 0.726 0.864		
5) $\overline{\hat{P}(X_U, \hat{\beta}_N)}$	0.601 0.794 0.908	(5)-(6) -0.1530.02) -0.082(0.014) -0.034(0.01)	 -7.546 [a] -5.971 [a] -4.338 [a]	0.615 0.801 0.910	(5)-(6) -0.142(0.02) -0.073(0.016) -0.029(0.01)	 -5.95 [a] -4.59 [a] -3.25 [a]
6) $\overline{\hat{P}(X_U, \hat{\beta}_U)}$	0.754 0.876 0.941			0.757 0.875 0.939		
7) $\overline{\hat{P}(X_E, \hat{\beta}_N)}$	0.574 0.776 0.898	(7)-(8) -0.01413(0.008) -0.00333(0.006) -0.00032(0.003)	 -1.720 [c] -0.585 -0.105	0.583 0.780 0.899	(7)-(8) 0.006(0.01) 0.018(0.01) 0.010(0.004)	 0.645 2.210 [a] 2.528 [a]
8) $\overline{\hat{P}(X_E, \hat{\beta}_E)}$	0.588 0.779 0.899			0.577 0.764 0.889		
9) $\overline{\hat{P}(X_A, \hat{\beta}_N)}$	0.562 0.767 0.893	(9)-(10) 0.039(0.02) 0.042(0.015) 0.029(0.009)	 1.908 [c] 2.842 [a] 3.406 [a]	0.569 0.770 0.893	(9)-(10) 0.034(0.02) 0.038(0.02) 0.031(0.01)	 1.450 2.175 [b] 2.936 [a]
10) $\overline{\hat{P}(X_A, \hat{\beta}_A)}$	0.523 0.725 0.864			0.536 0.733 0.862		

Notes:

1. $\overline{\hat{P}(X_G, \hat{\beta}_G)}$ 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; $G = P$ denotes all parents immigrant group; $G = U$ denotes American immigrant group; immigrant group; $G = E$ denotes European immigrant group; $G = A$ denotes Asian immigrant group;
2. The first entry in each box denotes the probability of being in *excellent health* category; the second entry in each box denotes the probability of being in *excellent or very good* category; and the third entry in each box denotes the probability of being in *excellent or very good or good health* category.
3. The regression coefficients of this Table come from those of Tables 6.2-6.5
4. a, b, and c denote significant at the 1%, 5%, and 10% levels.

Source: Estimated by the author using the NLSCY (1996-97) Cycle 2 data

6.1.4 Association of time of residency of immigrants and the health outcomes of their children: the ordered logit estimates of the sample of immigrants

One of the objectives of this study is to examine how the health outcomes of children change with the time of residency of their parents in Canada. As the parents get the opportunity to assimilate economically and culturally with the time of residency, child outcomes are expected to improve. Immigration literature shows that, on average, immigrants assimilate economically with the time of residency; however, the assimilation rates may vary for different national origins, which could cause the marginal association of time of residency of parents and the outcomes of children to vary for different groups. *Years since immigration of parents in Canada* is used to measure the time of residency of immigrants in this study. The logit models of child's health outcomes in this section are estimated including *years since immigration of parents in Canada* variable to examine the association of time of residency of immigrant parents and the health outcomes of their children. Since the objective here is to examine the extent of association for different immigrant sub-groups, the three immigrant sub-groups are interacted with the *years since immigration of parents* variable to capture the variations in the marginal association for each sub-group compared to the comparison group. These sub-groups are the American immigrant group, the European immigrant group, and the Asian immigrant group. Note that the fourth immigrant sub-group, which is not interacted, is the *other immigrant group.*[129] Hence, this group is the comparison group within the immigrant sample. Since the explanatory variables are not interacted with the *birthplace* variable, differences in health outcomes would be captured by the intercept terms.[130]

In the case of a logistic regression, the slope coefficient of *years since immigration of parents in Canada* would give the rate of change of the probability of being in the response category j or lower as opposed to the response category j+1 or higher as a result

[129] This group is included to increase the sample size of the immigrants.

[130] Since there are four different immigrant groups in one pooled sample (unlike the previous cases where there was only one immigrant group in each pooled sample and the sample was markedly larger because of the inclusion of the NBC sample) and the sample is smaller because of the exclusion of the NBC sample, the explanatory variables, except *years since immigration*, are not interacted with the *birthplace*.

of a change in the time of residency. A positive and significant coefficient for "years since immigration" in this model[131] would indicate that the probability of being in the highest category of health would increase and that of the lowest category would decrease with an increase in the time of residency of immigrants. In turn, it would imply that the health outcomes of children in the immigrant family would improve with the time of residency of their parents in Canada. Table 6.9 presents the ordered logit estimates of the health outcomes of the children of different immigrant groups. The hypothesis is tested for the pooled sample of the combined immigrant group as well as that of the all parents immigrant group. Moreover, for each of the two samples, results are presented with and without a correction for sibling status.

Consider the 2nd column that presents the results from the sample of the combined immigrant group without any correction for sibling status. The coefficients of *American* and *European* variables are positive and significant. This suggests that if all other covariates were given zero values, the probability of being in the highest category as opposed to the lowest category is likely to be higher for these two groups than for the *other immigrant group*. On the other hand, an insignificant coefficient for the *Asian* variable indicates that the above probabilities are similar for the Asian immigrant group and the *other immigrant group*. The coefficient of *years since immigration* is positive and significant. This indicates that the probability of the children of the *other immigrant group* being in the highest health category would improve with the time of residency of immigrant parents in Canada. In other words, there is statistical evidence of a positive association of time of residency of immigrants and the health outcomes of children of the *other immigrant group*. The coefficient of *years since immigration* variable in this model suggests that one year of residency of immigrant parents would increase the probability of being in the excellent health category by 3-percentage point of the children of the *other immigrant group*.

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[131] Remember that the SAS software is used and descending option is used in the logistic procedure statement.

The coefficients of the interaction variables are significant and negative for the American and European immigrant sub-groups. Note that this does not indicate that the time of residency is negatively associative with the health outcomes of children for these two groups. Rather, this implies that the slope coefficient of *years since immigration* is significantly lower for these two groups than for *the other immigrant group,* which is the comparison group. In other words, the positive association is weaker for these two groups than for the *other immigrant group*. One reason could be that the initial health status of children of the American immigrant group and the European immigrant group are already significantly higher compared to that of the base group. On the other hand, the coefficient of the interaction variable is positive but insignificant for the children of the Asian group. This indicates that the association of the time of residency of immigrants and the health outcomes of children is similar for the Asian immigrant group and for the *other immigrant group*. An examination of the third column reveals that the conclusion remains the same even after a correction is made for sibling status effect.

Now consider column 4, which presents the results from the sample of the all parents immigrant group without a correction for sibling status. Note that the all parents immigrant group can also be subdivided into four immigrant sub-groups: the American immigrant group, the European immigrant group, the Asian immigrant group, and the *other immigrant group*. The coefficients of *American* and *European* variables are positive and significant and the coefficient of *Asian* is insignificant like the combined group, but the magnitudes are larger. The coefficient of *years since immigration* variable is significant and positive like the previous cases. However, the magnitude of the coefficient of *years since immigration* in this model suggests that one year of residency would increase the probability of being in the excellent health category compared to that in the other categories by 6-percentage point for the children of the *other immigrant group*. Hence, the positive association of time of residency of immigrants and the health outcomes of children is stronger for the all parents immigrant group than for the combined immigrant group.

The coefficients of the interaction variables in this column also indicate that the positive association of the time of residency of immigrants and health outcomes of children is significantly weaker for the children of the American and the European immigrant groups than for the *other immigrant group*. However, the Asian group has the similar association. The results of Column 5 suggest that the above conclusion remains unaffected after a correction is made for the sibling effect. An interesting finding is that the strength of association of the time of residency and the health outcomes of a group depends on how many years, on average, the group has resided in Canada. In Chapter 5, it is shown that the European and the American immigrant group have lived in Canada for more than 20 years and the Asian group less than 20 years. The lower association rate of the European and American immigrant groups compared to the Asian immigrant group may result from the fact that the immigrants may have already assimilated enough and they have less scope to do further. This is also true for the all parents immigrant group compared to the combined immigrant group.

Log-likelihood ratio test

To test the hypothesis that jointly the three variables for birthplaces-*American*, *European*, and the *Asian*- and the three interaction variables- are jointly different from zero, log-likelihood ratio tests are performed. Here, the likelihood ratio statistic which is distributed as $\chi^2(6)$, is significant at the 1% level. Hence, these variables are significantly jointly different from zero.

As mentioned before that *years since immigration in Canada* reflects the opportunity of the immigrants to assimilate in Canada. Immigration literature shows that, in general, immigrants assimilate economically although the rates of assimilation vary for different national origins. Hence, it is likely that because of intergenerational impact of immigrants' assimilation, the health outcomes of their children improve with the time of residency of parents. The improvement is faster for the all parents immigrant group than for the combined immigrant group. Among the three immigrant sub-groups the improvement is faster for the Asian immigrant group.

The results in this section suggest that the association of time of residency of immigrants and the health outcomes of children, denoted by the coefficient of "years since immigration", depends on the initial health outcome. The lower the initial outcome the higher the association. For example, initial health outcomes are lower for the all parents immigrant group than for the combined immigrant group, and the association is higher for the former group than for the later group. Similarly, among the three immigrant sub-groups, the Asian immigrant group has a lower initial health outcome of children than do the American immigrant group and the European immigrant group, and the association is stronger for this group than for the other two groups. These findings indicate that if the initial health outcome of children of an immigrant group is observed lower initially, this situation can be considered as a temporary phenomenon. With the time of residency of immigrants in Canada, the health outcomes of children would improve. Hence, the extra burden they may impose to Canadian society at present will disappear in time. Currently, the predicted probability of being in excellent health category is approximately 4-percenatge point lower for the all parents immigrant group and for the Asian immigrant group than for the NBC group. Since a year of residency would increase the probability of being in excellent health by 3-percentage point, it can be expected that the lower health outcomes of these two groups would disappear in about a year.

Table 6.9: Ordered logit estimates of the association of time of residency of immigrants in Canada and health outcomes of children: a comparison among immigrant sub-groups

Variables	Coefficients (standard error)'			
Group	Combined immigrant group		All parents immigrant group	
	Including siblings	Excluding siblings	Including siblings	Excluding siblings
Intercept 1	-0.0203(0.5198)	-0.5912(0.6297)	-0.4092(0.7996)	-1.6273[c] (0.9602)
Intercept 2	0.9212[b](0.5206)	0.3756(0.6297)	0.5838(0.8003)	-0.5688(0.9578)
Intercept 3	2.0791[a](0.5295)	1.5604[a](0.6376)	1.7957[b] (0.8105)	0.6363(0.9638)
American (=1, if the family is from the American group, =0 otherwise)	1.4866[a](0.4043)	1.5377[a](0.4849)	2.1589[b] (1.0308	2.3450[c] (1.3172)
European (=1, if the family is from the European group, =0, otherwise)	0.4727[b](0.2064)	0.3616[c](0.2433)	0.9173[a] (0.2922	0.8792[a] (0.3388)
Asian (=1, if the family is from the Asian group, =0, otherwise)	-0.0717(0.2978)	0.1184(0.3907)	0.4222(0.3722	0.6593(0.4885)
Years since immigration of parents	0.0316[a](0.00695)	0.0358[a](0.00803)	0.0576[a] (0.0122)	0.0610[a] (0.0135)
Years since immigration *American	-0.0387[b](0.0157)	-0.036[b] (0.0181)	-0.0574[c] (0.0308)	-0.0556[c](0.0378)
Years since immigration *European	-0.0229[a](0.00852)	-0.0169[c] (0.00995)	-0.0533[a] (0.0144)	-0.0493[a] (0.0161)
Years since immigration *Asian	-0.00622(0.0155)	-0.0099(0.0208)	-0.0393 (0.0210)	-0.0367 (0.0273)
Age of the child	0.00961(0.0195)	0.0381[c](0.0229)	0.0423(0.0289)	0.0675[a] (0.0346)
Gender (= 1, if a boy, =0, if not)	0.0889(0.0829)	0.2496[a] (0.0990)	0.1754 (0.1252)	0.3842[a] (0.1482)
Equivalent income ($)	6.616E-6[b](2.814E-6)	6.583E-6[b] (3.436E-6)	3.995E-6(4.255E-6)	4.329E-6(5.12E-6)
House (=1,if any family members own the house, = 0 if not)	0.0612(0.1138)	-0.0829(0.1361)	0.0426 (0.1593)	-0.0238(0.1901)
Lone-parent (= 0, if the child lives with both parents, = 1, otherwise)	-0.5309[a](0.1313)	-0.4665[a] (0.1527)	-0.7239[a] (0.1759)	-0.6355[a] (0.2042)
Age of mother (years) at the birth of a child	-0.00865(0.00796)	-0.00973(0.0088)	-0.0273[a] (0.0119)	-0.0241[c] (0.013)
Years of education of PMK	0.0209(0.0203)	0.0446[b] (0.0237)	0.0284(0.0295)	0.0547[c] (0.0334)
Working hours of PMK	-0.00572[a](0.0024)	-0.0112[a] (0.00288)	-0.00535(0.00366)	-0.0108[a] (0.00434)
Poor health of PMK (= 1, if health status of PMK is fair or poor, = 0 otherwise	-0.1743(0.1548)	-0.2609(0.1806)	-0.0132(0.2291)	-0.0944(0.2689)
Residential movement	-0.0198(0.0234)	-0.0098(0.0279)	-0.0165(0.0377)	-0.0208(0.0437)
Rural area (=1, if the child lives in a rural area, =0, otherwise)	-0.3781[c](0.2074)	-0.1867(0.2516)	0.1067(0.522)	0.4686(0.6222)
Local unemployment rate	-0.00087(0.0317)	-0.0153(0.038)	0.0309(0.0512)	0.0387(0.0599)
Welfare (= 1, if the family's main source of income is public assistance, =0, otherwise)	0.3388[b](0.1842)	0.2521(0.2094)	0.3414(0.2426)	0.2902(0.2771)
Job rank of parents (a lower value indicates better job status)	0.0157(0.00972)	0.0121(0.0117)	0.0310[b] (0.0141)	0.0371[b] (0.0168)
Family dysfunction	-0.0454[a](0.00863)	-0.0425[a] (0.0101)	-0.0778[a] (0.0136)	-0.0748[a] (0.0159)
Negative parenting style	-0.2927[b](0.0998)	-0.2298[b] (0.1176)	-0.2527[c] (0.1505)	-0.0276(0.1726)
-2LOGL (intercepts and covariates)	1673.38	1203.313	784.242	577.977
Log-likelihood ratio= $-2(L_R - L_u) \equiv \chi^2(6)$	131.249 [a]	102.705[a]	67.073[a]	52.991[a]
Sample size	841	610	390	291

Notes 1.The dependent variable is the PMK's assessment of child's health

2.*Other immigrant group* is the base group

3.a, b, and c denote significance levels at the 1%, 5% and 10%, respectively.

4.L_u denotes the log-likelihood of the unrestricted model (where the coefficients of *birthplace* and the interaction variables assumed to have non-zero values), and L_R denotes that of the restricted model.

5. Source: Prepared by the author using the NLSCY (1996-97) data.

6.2 Ordered logit estimates of the teacher's assessment of child's overall performance

It has already been mentioned that educational outcomes are measured by the teacher's assessment of the child's overall performance and by mathematics test scores. Ordered logit models are estimated for the teacher's assessment of child's overall performance which has 4 response categories: 0 = near the bottom of the class or below the middle of the class, 1 = in the middle of the class, 2 = above the middle of the class, and 3 = near the top of the class. The specification for this outcome is an extended model. Among other explanatory variables, the actual "working hours of the PMK" is used, as it is found a more appropriate variable for the health outcomes of children in Section 6.1.1. Also, endogeneity problem seems less likely in this case, a priori. The additional variables for school performances that were not used in the health outcomes models are: "child's health," "attending private or public schools," and the "missing days of schools." Two different measures of child's health are used to test the robustness of the results regarding the choice of child health variable. The first model is estimated using the Health Utility Index (HUI), a comprehensive measure of child's health.[132] Since the HUI also includes child's cognition that could create an endogeneity problem, the second model is estimated excluding the child's health variable to ascertain the differences in results. However, child's health is an important covariate of child's school performance, as the literature suggests, a model of educational outcomes of children without child's health variable could be seriously mis-specified. Hence, the third model of school performance is estimated including the "the PMK's assessment of child's health."

The pooled samples of the NBC group and different immigrant groups are used to estimate the models.[133] Note that the following five pooled samples are used in this section for the comparison of the NBC group and five different immigrant groups:

[132] See Appendix 4 for details.

[133] The results are presented including the siblings. The reasons behind this are the following: First, it is shown in the previous section that the simulated results and the assimilation results were affected very little by the exclusion of siblings. Second, the sample sizes of different groups for the educational outcomes models are markedly smaller compared to those for the health outcomes models. Third, the main interest of this study is to observe the differences in child outcomes of the NBC group and different immigrant groups. The previous section shows that the

1) The pooled sample of the children of the NBC group and the combined immigrant group. The results of this sample are presented in Column 2 of Tables 6.10- 6.12;
2) The pooled sample of the children of the NBC group and the all parents immigrant group. The results of this sample are presented in Column 3 of the Tables 6.10- 6.12;
3) The pooled sample of the children of the NBC group and the American immigrant group. The results are presented in Column 2 of Table 6.13;
4) The pooled sample of the children of the NBC group and the European immigrant group. The results are presented in Column 3 of Table 6.13;
5) The pooled sample of the children of the NBC group and the Asian immigrant group. The results are presented in Column 4 of Table 6.13.

6.2.1 Ordered logit estimates of the children of the NBC group, the combined immigrant group, and the all parents immigrant group

Table 6.10 reports the estimates of school performance model when the HUI is used as a measure of child's health. The second column of Table 6.10 compares the ordered logit estimates of the teacher's assessment of child's overall performances in the combined immigrant group with those in the NBC group. The results indicate that "age of child," "household equivalent income," "house," "mother's age at birth of child," "years of education of the PMK," and "child's health" variables have a positive and significant association with the school performance of children. Similarly, the "working hours of the PMK," "poor health of the PMK," "residential movement," "job rank of parents," "negative parenting style," and "missing days of school" variables have negative slope coefficients, as expected. It is interesting that school performances in the public and

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differences were affected very little by excluding the siblings. Since there is no reason to believe that sibling status may have differential impacts on the estimates of different groups, it is less likely that the differences in educational outcomes will be affected significantly although the levels may be. Hence, the conclusion based on the differences is likely to be robust to the exclusion of siblings for the educational outcomes as well. Finally, the classical linear regression estimates are more likely to be largely affected by the non-independent observations. One of the remedial measures in that case could be the maximum likelihood estimation (see, Greene 1993). Since the ordered logit models use maximum likelihood method, the impact of non-independent catholic schools are higher than those in the private schools. This could indicate that even though parental investments in private schools are higher, there is no statistical evidence that the school performances of children in the private schools would be higher than that in the public and catholic schools. This could also indicate that the teachers' rating in these schools may be different. It is also noticeable that the probabilities for higher categories are lower for the boys than for the girls. Among all the coefficients, the child's health has the largest association with the school performance.

The slope coefficient of *birthplace* is insignificant. This indicates that, if all other covariates were given zero values, the probability of being in the highest performance category compared to the lowest would be the same for the two groups. The slope coefficients of "child's age," "house," "biological mother's age," and "poor health of the PMK" are significantly larger (in absolute sense) for the children of the combined immigrant group compared to those of the NBC group. For example, the slope coefficient of "house" variable for the children of the NBC group is 0.11, and that for the combined immigrant group is larger by 0.23. This value of "house" variable suggests that the association of house ownership and the probability of better school performance in children is stronger in the children of the combined immigrant group than in the children 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 combined immigrant group. In other words, these variables are more important for the combined immigrant group. Descriptive statistics in Chapter 5 demonstrates that regarding these variables this group is in an advantaged situation.

On the other hand, the slope coefficients of "equivalent income," "residential movement," "health status of child," "private," 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

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observations is likely to be less substantial. Given the smaller sample for educational outcomes, the results are reported including the siblings.

association of these resources with the educational outcomes is lower for the combined immigrant group.

Now consider the results of the third column, which are estimated using the pooled sample of the NBC group and the all parents immigrant group. The results vary slightly from the previous case. The coefficient of the *birthplace* is positive and larger, however, insignificant; and those of the interaction variables are slightly larger in most of the cases.

An examination of Table 6.11 demonstrates that if the Health Utility Index (HUI) variable is dropped, the results change significantly in some cases. The intercept terms are larger in the new model. The coefficient of "child's age" is insignificant. The coefficient of the *birthplace* is negative and significant and has a larger absolute value. The coefficients of the interaction variables also change, and in most of the cases they are larger. This may be an indication of endogeneity problem in the model with the HUI, as expected. Hence, the model with the HUI is less acceptable. Note that the HUI variable is dropped just to test the robustness of the results. As mentioned before, an educational outcome model without child's health variable is likely to be a mis-specified one. Hence, the PMK's assessment of child's health variable is included in the next model which is expected to create less endogeneity problem, as a PMK often distinguishes the health status from the school performances.

An examination of Table 6.12 demonstrates that if the PMK's assessment of child's health is used as a measure of health outcomes of children, the results do not change significantly compared to the previous model where no child's health variable is included. The intercept terms and the marginal association of the *birthplace* are similar. The slope coefficients change slightly and they are slightly smaller. The association of child's poor health and school performance is negative, as expected but insignificant. Here, child's poor health takes a value 1 if child's health status is good, or fair or poor according to the PMK, and takes a value 0 if child's health status is very good or excellent. The fact is that there were very few observations in the fair or poor categories. Hence, the impact of good health status compared to that of very good or excellent health status on school performance could be insignificant. If the all parents immigrant group is considered, the changes are similar.

Considering the above facts, the model with the PMK's assessment of child's health seems to be a more acceptable model of school performance compared to the previous two models, as it includes the child's health status variable; and the PMK's assessment of child's health status seems to create less endogeneity problem in the educational outcome than does the HUI.

Log-likelihood ratio test

Consider the model in Table 6.12. The main interest of this regression model is to determine whether or not the regression coefficients of the immigrant groups are different from those of the NBC group. The t tests on the *birthplace* variables and the interaction variables determine whether or not the intercept term and each of the slope coefficients are independently different for the two groups. The hypothesis that the *birthplace* variable and interaction variables are jointly different from zero is tested using the log-likelihood ratio test statistic which is distributed as $\chi^2(20)$. The test statistic is significant at the 1% level. It indicates that the regression models of the NBC group and the combined immigrant group are different. The same applies to the all parents immigrant group.

6.2.2 Ordered logit estimates of different immigrant sub-groups

To compare the estimates among the immigrant sub-groups, the extended model of school performance with the PMK's assessment of child's health is considered. An examination of the estimates in different columns of Table 6.13 indicates that the conclusion that is applicable for the combined immigrant group is not always applicable for each of the three immigrant sub-groups, as shown by the values in bold face. The estimated coefficients of the *birthplace* for immigrant sub-groups are different. An examination of this coefficient indicates that the children of the American immigrant group are more likely to have better school performances, and those of the Asian immigrant group are less likely to have better school performance compared to those of the NBC group if all other covariates were given zero values.

Consider the coefficients of the interaction variables in different columns. If the magnitudes are examined, all the coefficients are different for different immigrant sub-groups. In some cases, the sub-groups also differ from the combined immigrant group regarding the signs of the coefficients. For example, the "gender" variable is significant and positive for the European immigrant group, significant and negative for the Asian immigrant group, whereas, the differential marginal impact is insignificant for the combined immigrant group. On the other hand, the slope coefficient of "working hours*birthplace" is significant and negative for the American immigrant group; significant and positive for the Asian immigrant group; whereas, for the combined immigrant group, no significant difference was found. The log-likelihood ratio test also indicates that the regression model of each of these three sub-groups is different from that of the NBC group.

The results of these models indicate that immigrant population is a diverse population. The conclusion that applies to the combined immigrant group does not apply to each and every immigrant sub-groups. However, it should not be forgotten that the sample sizes for the immigrant sub-groups are smaller. Hence, the results may be less reliable for the immigrant sub-groups, particularly, for the American immigrant group and for the Asian immigrant group. In the next section, the results of the simulated probabilities are presented for different groups, which would lead one to ascertain the nature of selectivity in school performances of children of various groups.

Table 6.10: The ordered logit model of school performance of children of the NBC and immigrant families: estimation with Health Utility Index of children

Variables	Coefficients (standard error)	
Groups	NBC & Combined immigrant group	NBC & All parents immigrant group
Intercept 1	-4.2660(0.3463) [a]	-4.2468(0.3413) [a]
Intercept 2	-3.5627(0.3456) [a]	-3.5565(0.3405) [a]
Intercept 3	-2.5720(0.3447) [a]	-2.5655(0.3396) [a]
Age of the child	0.0163(0.00758) [b]	0.0162(0.00747) [b]
Gender (= 1, if the child is a boy, = 0, if a girl)	-0.3233(0.0318) [a]	-0.3222(0.0314) [a]
Equivalent Income ($)	2.558E-6(1.069E-6) [a]	2.548E-6(1.053E-6) [a]
House (= 1, if any family members own the house, = 0, if not)	0.1134(0.0492) [b]	0.1133(0.0485) [b]
Lone-parent (= 1, if child lives with a lone- parent, = 0, otherwise)	-0.1203(0.0508) [a]	-0.1198(0.0500) [a]
Age of mother (years) at birth of child	0.0116(0.00343) [a]	0.0115(0.00338) [a]
Years of education of PMK	0.0961(0.00910) [a]	0.0958(0.00896) [a]
Weekly working hours of PMK	-0.00406(0.00097) [a]	-0.00404(0.00096) [a]
Poor health condition of PMK (= 1, if the PMK's health is fair or poor, = 0, otherwise)	-0.00445(0.0680)	-0.00449(0.0670)
Residential movement	-0.0175(0.00828) [b]	-0.0175(0.00816) [b]
Rural area (= 1, if the child lives in a rural area, = 0, otherwise)	-0.0146(0.0443)	-0.0148(0.0436)
Provincial unemployment rate (1996)	0.0162(0.00658) [a]	0.0161(0.00649) [a]
Welfare (= 1, if the family's main source of income is public assistance, = 0, otherwise)	-0.0580(0.0687)	-0.0579(0.0677)
Job rank of parents (a lower value indicates a higher job status)	-0.0189(0.00406) [a]	-0.0188(0.0040) [a]
Family dysfunction	-0.00229(0.0033)	-0.00229(0.0033)
Negative parenting style	-0.0749(0.0377) [b]	-0.0746(0.0371) [b]
Health Utility Index	2.1219(0.2744) [a]	2.1154(0.2703) [a]
Private (= 0, if the child goes to public or catholic school, = 1, otherwise)	-0.2811(0.0846)	-0.2804(0.0834) [a]
Missing days (= 0, if missing days of school are less than 3, = 1, if equal to or more than 3 days	-0.2098(0.0380) [a]	-0.2092(0.0374) [a]
Birthplace (=1, if parents are foreign born, = 0, if native-born Canadian)	-0.5082(0.7124)	1.1499(0.8783)
Age of the child* Birthplace	0.0473(0.0161) [a]	0.0800(0.0197) [a]
Gender * Birthplace	0.0308(0.0676)	-0.0796(0.0870)
Equivalent income* Birthplace	-3.78E-6(2.246E-6) [c]	-6.97E-6(3.103E-6) [b]
House * Birthplace	0.2304(0.0974) [a]	0.2821(0.1142) [a]
Lone- parent * Birthplace	-0.0582(0.1151)	**-0.2178(0.1267)** [c]
Age of PMK * Birthplace	0.0194(0.00686) [a]	**0.00751(0.00849)**
Years of education of PMK* Birthplace	0.0245(0.0181)	**0.0372(0.0231)** [c]
Working hours of PMK* Birthplace	0.000927(0.0021)	0.000275(0.0028)
Poor health status of PMK* Birthplace	-0.4012(0.1345) [a]	**-0.1466(0.1590)**
Residential movement* Birthplace	0.0429(0.0194) [b]	**0.0312(0.0258)**
Rural area* Birthplace	-0.0126(0.1585)	-0.1812(0.3091)
Provincial unemployment rate *Birthplace	0.00547(0.0231)	**-0.0594(0.0338)** [c]
Welfare *Birthplace	-0.1383(0.1592)	-0.1457(0.1792)
Job rank *Birthplace	0.00831(0.00818)	0.0128(0.00983)
Family dysfunction *Birthplace	-0.00215(0.0074)	0.000372(0.0094)

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Table 6.10 Continued

Variables	**Coefficients (standard error)**	
Groups	**NBC & Combined immigrant group**	**NBC & All parents immigrant group**
Negative parenting style *Birthplace	-0.0261(0.0812)	0.0266(0.1010)
Health Utility Index *Birthplace	-1.1024 (0.5681) [b]	-2.2083(0.6569) [a]
Private *Birthplace	0.4278(0.1399) [a]	0.5009(0.1680) [a]
Missing days *Birthplace	0.2104(0.0846) [a]	**0.1376(0.1106)**
-2LOGL(Intercept and covariates)	15733.488	14673.044
Chi-square (score test) with 66 DF	329.2481	367.6304
Sample Size	5,645	5,256
Source: Prepared by the author using NLSCY (1996-97) Cycle 2 data		
Notes: 1.The dependent variable is teacher's assessment of child's overall performance. 2. a, b, and c denote significance levels at 1%, 5% and 10%, respectively. 3.The coefficients in bold face suggest that the differential impacts of the corresponding variables are different for the all parents immigrant group and the combined immigrant group.		

Table 6.11:The ordered logit model of school performance of children of NBC and immigrant families: estimation without child's health

Variables	Coefficients (standard error)	
Groups	NBC & Combined immigrant group	NBC & All parents immigrant group
Intercept 1	-2.0823(0.1988) [a]	-2.0697(0.1959) [a]
Intercept 2	-1.3828(0.1982) [a]	-1.3831(0.1953) [a]
Intercept 3	-0.3995(0.1978) [b]	-0.3996(0.1948) [b]
Age of the child	0.00910(0.0075)	0.00904(0.0074)
Gender (= 1, if the child is a boy, = 0, if a girl)	-0.3323(0.0318) [a]	-0.3311(0.0313) [a]
Equivalent Income ($)	2.793E-6(1.069E-6) [a]	2.782E-6(1.053E-6) [a]
House (= 1, if any family members own the house, = 0, if not)	0.1047(0.0490) [b]	0.1047(0.0483) [b]
Lone-parent (= 1, if child lives with a single parent, = 0, otherwise)	-0.1374(0.0506) [a]	-0.1369(0.0499) [a]
Age of mother (years) at birth of child	0.0117(0.0034) [a]	0.0116(0.00337) [a]
Years of education of PMK	0.0978(0.0091) [a]	0.0975(0.00895) [a]
Weekly working hours of PMK	-0.00406(0.001) [a]	-0.00404(0.001) [a]
Poor health condition of PMK (= 1, if the health status of PMK is poor or fair, = 0, other wise	-0.0311(0.0677)	-0.0311(0.0667)
Residential movement	-0.0251(0.0082) [a]	-0.0250(0.0081) [a]
Rural area (= 1, if the child lives in a rural area, = 0, otherwise)	-0.0157(0.0442)	-0.0159(0.0436)
Provincial unemployment rate (1996)	0.0152(0.00658) [b]	0.0152(0.00648) [b]
Welfare (= 1, if the family's main source of income is public assistance, = 0, otherwise)	-0.0691(0.0685)	-0.0689(0.0675)
Job rank of parents (a lower value indicates a higher job status)	-0.0202(0.00405) [a]	-0.0201(0.00399) [a]
Family dysfunction	-0.00313(0.0033)	-0.00313(0.0033)
Negative parenting style	-0.1004(0.0374) [a]	-0.1000(0.0369) [a]
Private (= 0, if the child goes to public or catholic school, = 1, otherwise)	-0.2946(0.0845) [a]	-0.2938(0.0833) [a]
Missing days (= 0, if missing days of school are less than 3, = 1, if equal to or more than 3 days	-0.2089(0.0379) [a]	-0.2083(0.0373) [a]
Birthplace (=1, if parents are foreign born, = 0 if native- born Canadian)	**-1.6838(0.4441)** [a]	**-1.1064(0.5851)** [b]
Age of the child* Birthplace	0.0537(0.0160) [a]	0.0867(0.0197) [a]
Gender * Birthplace	0.0421(0.0675)	-0.0707(0.0868)
Equivalent income* Birthplace	-3.87E-6(2.247E-6) [c]	-7.22E-6(3.1E-6) [b]
House * Birthplace	0.2465(0.0972) [a]	0.2877(0.1133) [a]
Lone- parent * Birthplace	-0.0690(0.1142)	-0.1961(0.1249)
Age of PMK * Birthplace	0.0194(0.0069) [a]	**0.00741(0.0085)**
Years of education of PMK* Birthplace	0.0228(0.0181)	0.0351(0.0231)
Working hours of PMK* Birthplace	0.000966(0.0021)	0.00033(0.0028)
Poor health status of PMK* Birthplace	-0.3809(0.1343) [a]	**-0.1185(0.1589)**
Residential movement* Birthplace	0.0508(0.0194) [a]	**0.0385(0.0258)**
Rural area* Birthplace	-0.0339(0.1581)	-0.1803(0.3091)
Provincial unemployment rate *Birthplace	0.00755(0.0230)	**-0.0583(0.0338)** [c]
Welfare *Birthplace	-0.1141(0.1589)	-0.1364(0.1779)
Job rank *Birthplace	0.00931(0.00818)	0.0142(0.00981)
Family dysfunction *Birthplace	-0.00225(0.0074)	0.00135(0.0093)
Negative parenting style *Birthplace	-0.0124(0.0809)	0.0529(0.1009)
Private *Birthplace	0.4246(0.1396) [a]	0.5144(0.1677) [a]
Missing days *Birthplace	0.2173(0.0845) [a]	**0.1361(0.1105)**
-2LOGL(Intercept and covariates)	15805.552	14742.496
Chi-square (score test) with 74 DF	327.5638	365.6219
Sample Size	5649	5260

Notes: 1. a, b, and c denote significance levels at 1%, 5% and 10%, respectively.
2.The coefficients in bold face suggest that the differential impacts of the corresponding variables are different for the all parents immigrant group and the combined immigrant group.
3.The dependent variable is the teacher's assessment of child's overall performance.
Source: Prepared by the author using the NLSCY (1996-97) Cycle 2 data

Table 6.12:Ordered logit model of school performance of children of NBC and immigrant families: estimation with the PMK's assessment of child's health

Variables	**Coefficients (standard error)**	
Groups	**NBC & Combined immigrant group**	**NBC & Pure immigrant group**
Intercept 1	-2.0771(0.1989)[a]	-2.0634(0.1960)[a]
Intercept 2	-1.3762(0.1982)[a]	-1.3760(0.1953)[a]
Intercept 3	-0.3916(0.1979)[b]	-0.3919(0.1949)[b]
Age of the child	0.00890(0.00751)	0.00884 (0.0074)
Gender (= 1, if the child is a boy, = 0, if a girl)	-0.3328(0.0318)[a]	-0.3314(0.0313)[a]
Equivalent Income ($)	2.751E-6(1.069E-6)[a]	2.74E-6(1.053E-6)[a]
House (= 1, if any family members own the house, = 0, if not)	0.1048(0.0490)[b]	0.1047(0.0483)[b]
Lone-parent (= 1, if child lives with a lone-parent, = 0, otherwise)	-0.1381(0.0506)[a]	-0.1375(0.0499)[a]
Age of mother (years) at birth of child	0.0118(0.00343)[a]	0.0118(0.00337)[a]
Years of education of PMK	0.0972(0.00910)[a]	0.0968(0.00897)[a]
Weekly working hours of PMK	-0.00408(0.00097)[a]	-0.00406(0.00096)[a]
Poor health of PMK (= 1, if health status of PMK is poor or fair, = 0, other wise)	-0.0257(0.0679)	-0.0257(0.0669)
Residential movement	-0.0244(0.00820)[a]	-0.0243(0.00807)[a]
Rural area (= 1, if the child lives in a rural area, = 0, otherwise)	-0.0136(0.0443)	-0.0138(0.0436)
Provincial unemployment rate (1996)	0.0151(0.00658)[b]	0.0151(0.00648)[b]
Welfare (= 1, if the family's main source of income is from welfare assistance, = 0, otherwise)	-0.0654(0.0686)	-0.0653(0.0675)
Job rank of parents (a lower value indicates a higher job status)	-0.0201(0.00405)[a]	-0.0200(0.00399)[a]
Family dysfunction	-0.00285(0.0033)	-0.00285(0.0033)
Negative parenting style	-0.0984(0.0375)[a]	-0.0979(0.0369)[a]
Poor health of child (= 1, if health status of child is poor/fair/good, = 0, otherwise)	-0.0703(0.0517)	-0.0702(0.0509)
Private (= 0, if the child goes to public or catholic school, = 1, otherwise)	-0.2963 (0.0845)[a]	-0.2955(0.0833)[a]
Missing days (= 0, if missing days of school are less than 3, = 1, if equal to or more than 3 days	-0.2026(0.0382)[a]	-0.2019(0.0376)[a]
Birthplace (= 1, if parents are foreign born, = 0, otherwise)	-1.6436(0.4445)[a]	-1.0658(0.5857)[c]
Age of the child* Birthplace	0.0501(0.0161)[a]	0.0820(0.0198)[a]
Gender * Birthplace	0.0310(0.0676)	-0.0779(0.0868)
Equivalent income* Birthplace	-4.45E-6(2.253E-6)[a]	-7.47E-6(3.105E-6)[a]
House * Birthplace	0.2393(0.09730)[a]	0.2871(0.1133)[a]
Lone- parent * Birthplace	-0.0358(0.1148)	-0.1753(0.1254)
Age of PMK * Birthplace	0.0192(0.00686)[a]	**0.00719(0.00849)**
Years of education of PMK* Birthplace	0.0232(0.0181)	0.0347(0.0231)
Working hours of PMK* Birthplace	0.00112(0.00212)	0.000077(0.00278)
Poor health status of PMK* Birthplace	-0.3795(0.1344)[a]	**-0.1497(0.1593)**
Residential movement* Birthplace	0.0542(0.0194)[a]	0.0414(0.0258)[c]
Rural area* Birthplace	-0.0553(0.1583)	-0.2033(0.3092)
Provincial unemployment rate *Birthplace	0.00953(0.0231)	-0.0544(0.0338)
Welfare *Birthplace	-0.2059(0.1611)	-0.2127(0.1813)
Job rank *Birthplace	0.00971(0.00819)	0.0142(0.00982)
Family dysfunction *Birthplace	-0.00085(0.00742)	0.00294(0.00939)
Negative parenting style *Birthplace	0.00674(0.0812)	0.0696(0.1013)
Poor health of child *Birthplace	-0.2160(0.1009)[b]	**-0.1469(0.1161)**

Continued on next page

Table 6.12 continued

Variables	Coefficients (standard error)	
Groups	**NBC & Combined immigrant group**	**NBC & Pure immigrant group**
Private *Birthplace	0.4469(0.1398) [a]	0.5272(0.1680) [a]
Missing days *Birthplace	0.2038(0.0847) [a]	**0.1299(0.1108)**
-2LOGL(Intercept and covariates)	15792.53	14736.13
Chi-square (score test) with 66 DF	346.82	390.61
Log-likelihood ratio = $-2(L_R - L_U) \equiv \chi^2(20)$	57.674 [a]	78.053 [a]
Sample Size	5649	5260

Notes: 1.The dependent variable is the teacher's assessment of child's over all performance.
2. a, b, and c denote significance levels at 1%, 5% and 10%, respectively.
3.The coefficients in bold face suggest that the differential impacts of the corresponding variables are different for the all parents immigrant group and the combined immigrant group.
4.L_u denotes the log-likelihood of the unrestricted model (where the coefficients of the *birthplace* and the interaction variables assumed to have non-zero values), and L_R denotes that of the restricted model.

Source: Prepared by the author using the NLSCY (1996-97) Cycle 2 data

Table 6.13: The ordered logit model of school performance of children of the NBC group and immigrant sub-groups

Variables	**Coefficients (standard error)**		
Groups	**NBC & American**	**NBC & European**	**NBC & Asian**
Intercept 1	-2.0313(0.1869)[a]	-2.0612(0.1919)[a]	-2.0431(0.1890)[a]
Intercept 2	-1.3709(0.1862)[a]	-1.3810(0.1912)[a]	-1.3721(0.1883)[a]
Intercept 3	-0.3940(0.1858)[b]	-0.3903(0.1908)[b]	-0.3934(0.1878)[b]
Age of the child	0.00869(0.0071)	0.00884(0.0072)	0.00874(0.0071)
Gender (= 1, if the child is a boy, = 0, if a girl)	-0.3281(0.0298)[a]	-0.3315(0.0306)[a]	-0.3293(0.0302)[a]
Equivalent Income ($)	2.712E-6(1.004E-6)[a]	2.738E-6(1.031E-6)[a]	2.722E-6(1.015E-6)[a]
House (= 1, if any family members own house, = 0, if not)	0.1044(0.0460)[b]	0.1050(0.0472)[b]	0.1045(0.0465)[b]
Lone-parent (= 1, if the child lives with a single parent, = 0, otherwise)	-0.1361(0.0475)[a]	-0.1376(0.0488)[a]	-0.1366(0.0480)[a]
Age of mother (years) at birth of child	0.0117(0.00322)[a]	0.0118(0.00330)[a]	0.0118(0.00325)[a]
Years of education of PMK	0.0958(0.00855)[a]	0.0968(0.00878)[a]	0.0962(0.00864)[a]
Weekly working hours of PMK	-0.00402(0.00091)[a]	-0.00406(0.00094)[a]	-0.00403(0.00092)[a]
Poor health condition of PMK (= 1, if health status of PMK is poor or fair, = 0, other wise)	-0.0254(0.0637)	-0.0258(0.0654)	-0.0255(0.0644)
Residential movement	-0.0241(0.00769)[a]	-0.0244 (0.0079)[a]	-0.0242(0.00778)[a]
Rural area (= 1, if child lives in a rural area, = 0, otherwise)	-0.0141(0.04160)	-0.0140(0.0427)	-0.0140(0.0420)
Provincial unemployment rate (1996)	0.0150(0.00617)[b]	0.0151(0.00634)[b]	0.0150(0.00624)[b]
Welfare (= 1, if family's main sources of income is from welfare assistance, = 0, otherwise)	-0.0648(0.0643)	-0.0653(0.0661)	-0.0649(0.0651)
Job rank of parents (a lower value indicates a higher job status)	-0.0198(0.0039)[a]	-0.0200(0.0039)[a]	-0.0198(0.0039)[a]
Family dysfunction	-0.00285(0.0031)	-0.00285(0.0032)	-0.00285(0.0032)
Negative parenting style	-0.0967(0.0352)[a]	-0.0980(0.0361)[a]	-0.0972(0.0356)[a]
Poor health of child (= 1, if health status of child is poor/fair/good, = 0, otherwise)	-0.0697(0.0485)	-0.0704(0.0499)	-0.0698(0.0491)
Private (= 0, if the child goes to public or catholic school, = 1, otherwise)	-0.2928(0.0794)[a]	-0.2959(0.0815)[a]	-0.2937(0.0802)[a]
Missing days (= 0, if missing days of school are less than 3, =1, if equal to or more than 3 days	-0.2002(0.0359)[a]	-0.2020(0.0368)[a]	-0.2008(0.0363)[a]
Birthplace (=1, if parents are foreign born, =0, if native born-Canadian)	**3.9506(1.8561)[a]**	**-0.6459(0.6758)**	-5.9493(1.3353)[a]
Age of the child* Birthplace	**0.0842(0.0636)**	**0.0215(0.0230)**	0.1506(0.0466)[a]
Gender * Birthplace	-0.1528(0.2549)	**0.2731(0.0950)[a]**	**-0.7473(0.2085)[a]**
Equivalent income* Birthplace	**4.666E-6(7.779E-6)**	**-9.98E-7(2.941E-6)**	-0.00002(8.425E-6)[b]
House * Birthplace	**-0.1863(0.4060)**	**0.0428(0.1375)**	2.1634(0.4247)[a]
Lone- parent * Birthplace	**-1.9588(0.5752)[a]**	0.1752(0.1730)	1.2173(0.4732)[a]
Age of PMK * Birthplace	**-0.0379(0.0271)**	0.0215(0.00963)[b]	0.0820(0.0219)[a]
Years of education of PMK* Birthplace	-0.0939(0.0696)	0.0171(0.0250)	0.0569(0.0498)
Working hours of PMK* Birthplace	**-0.0167(0.00878)[b]**	0.000382(0.0031)	**0.0142(0.00692)[b]**
Poor health status of PMK* Birthplace	**-0.4101(0.6661)**	-0.6696(0.2297)[a]	-2.0468(0.7789)[a]
Residential movement* Birthplace	**-0.0444(0.0733)**	**0.0390(0.0273)**	**0.00605(0.0750)**

Continued on next page

Table 6.13 Continued

Variables	Coefficients (standard error)		
Groups	NBC & American	NBC & European	NBC & Asian
Rural area* Birthplace	-0.3705(0.4417)	-0.0989(0.2082)	0.8408(0.9106)
Provincial unemployment rate* Birthplace	-0.1060(0.0966)	-0.0417(0.0352)	-0.0638(0.0949)
Welfare*Birthplace	0.2368(0.7011)	-0.1698(0.2998)	-0.1648(0.7476)
Job rank*Birthplace	-0.0105(0.0369)	0.0113(0.0117)	0.0361(0.0275)
Family dysfunction*Birthplace	-0.00580(0.0299)	-0.00489(0.011)	-0.00168(0.022)
Negative parenting style*Birthplace	-0.4679(0.3183)	**-0.2125(0.1188)** [c]	0.2173(0.2644)
Poor health of child*Birthplace	-1.2103(0.5862) [b]	**0.1861(0.1321)**	**-0.2939(0.2887)**
Private*Birthplace	**0.4883(0.4699)**	**-0.0745(0.1831)**	0.8975(0.4404) [b]
Missing days *Birthplace	0.9519(0.3176) [a]	**-0.0628(0.1206)**	0.7771(0.3861) [b]
-2LOGL(Intercept and covariates)	14206.47	14848.57	14109.33
Chi-square (score test) with 78 DF	212.87	352.20	248.95
Log-likelihood ratio = $-2(L_R - L_U) \equiv \chi^2(20)$	89.891 [a]	42.449 [a]	83.694 [a]
Sample Size	5,037	5,246	5,019

Notes: 1. The dependent variable is the teacher's assessment of child's overall performance.
2. a, b, and c denote significance levels at 1%, 5% and 10%, respectively.
3. The coefficients in bold face suggest that the differential impacts of the corresponding variables are different for the immigrant sub-groups and the combined immigrant group.
4. L_u denotes the log-likelihood of the unrestricted model (where the coefficients of the *birthplace* and the interaction variables assumed to have non-zero values), and L_R denotes that of the restricted model.

Source: Compiled by the author using the NLSCY (1996-97) Cycle 2 data

6.2.3 Simulated probabilities of different levels of school performances of children: variation in school performances and the nature of selection

It has been described in Section 6.1.3 how it is possible to simulate the probability of one group in four hypothetical situations given the information on resource levels of each child and the estimated coefficients of different groups. For the purposes of analysis in this section, the probabilities of different levels of school performances of children are simulated in four hypothetical states as described in Section 6.1.3. The results are presented in Tables 6.14-6.16. The coefficients of the children of different groups are taken from the regression models of Tables 6.12 and 6.13 which uses the "PMK's assessment of child's health" variable for child health.[134]

In this section, the probabilities are simulated for three performance categories: i) *near the top of the class*, ii) *near the top of the class or above the middle of class*, iii) *near the top of the class or above the middle of class or in the middle of the class*. The simulated probabilities of these three performance categories are shown in each box of the tables.

Differences in the conditional expected probabilities of the NBC group and the different immigrant groups

Consider Table 6.14. The first case, $\overline{\hat{P}(X_N, \hat{\beta}_N)}$, denotes the average predicted conditional probabilities of children in the NBC group with the own group coefficients and resource levels of children. These values are the existing average conditional expected probabilities in different performance categories of the children in the NBC group which is the comparison group.

Now, compare the second case, $\overline{\hat{P}(X_I, \hat{\beta}_I)}$, with the first case. Consider the first entry in each box which gives the probability of children being in the *near the top of the class* category. The average predicted conditional probability of the NBC group is 0.30, and that of the combined immigrant group is 0.34, a 4-percenatge point higher probability.

[134] The robustness of the results was tested using the coefficients of the following alternative models: i) with Health Utility Index variable; and ii) without any child's health. The results, which are not reported, suggest that they are robust with the choice of child's health variable.

The difference is almost the same even when the other two performance categories are chosen. In each case, the difference is significant. Hence, the simulated results of school performance for these two groups are robust to the response categories chosen. These values suggest that the school performance of the children of the combined immigrant group is better than that of the NBC group. A comparison of the third case, $\overline{\hat{P}(X_P, \hat{\beta}_P)}$, with the first case suggests that the same applies to the children of the all parents immigrant group.

Compare $\overline{\hat{P}(X_U, \hat{\beta}_U)}$ that denote the average predicted conditional probabilities of the children of the American immigrant group, with the base case. The probabilities for each of the above school performance categories are: 0.47, 0.60 and 0.76, respectively which are the highest values among all. Compared to the NBC group, these values are higher by 17-percentage point, 14-percentage point, and 8-percentage point for the above three categories, respectively. A similar comparison of the fifth case, $\overline{\hat{P}(X_E, \hat{\beta}_E)}$, with the base case indicates that compared to the NBC group, the probability is about 4-percenatge point higher for each of the three categories in the children of the European immigrant group. Similarly, $\overline{\hat{P}(X_A, \hat{\beta}_A)}$, demonstrates that compared to the NBC group, the Asian immigrant group has 9-percentage point, 7-percentage point, and 4-percentage point higher probabilities, respectively, for the three categories of school performance. Hence, the average predicted conditional probabilities of different groups suggest that the school performances of the children of any immigrant group are higher than those of the NBC group. Among the immigrant sub-groups, the American immigrant group has the highest outcome and the European immigrant group has the lowest. 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.

These findings are consistent with Chiswick's (1978) hypothesis. The finding of the highest outcome for the American immigrant group is also consistent with Worswick and McDonald (1999) and Worswick (2001). Thus, it is interesting that the educational outcome and health outcome results vary in some cases. In case of health outcomes, the all parents immigrant group and the Asian immigrant group had a lower outcome compared to the NBC group and the combined immigrant group. This is because the covariates of health outcomes and educational outcomes are not exactly the same. For example, "child's health," "missing days of school" and "private school" variables are added in this model. Remember that the children of the all parents immigrant group and the Asian immigrant group have a lower percentage of children who have missed more days of school. Even for the same covariates, the strength of association could be different for educational outcomes and health outcomes. For example, the house ownership has a stronger association with educational outcomes for the combined immigrant group than for the NBC group, whereas, this variable has a weaker association with health outcomes for the combined immigrant group than for the NBC group. The descriptive statistics show that the Asian immigrant group has a higher percentage of families who own houses. This characteristic may have increased the school performance of children in this group.

Nature of selection in school performances: a selectivity test by using the resources of the NBC group.

It has already been described in Section 6.1.3 how the nature of selectivity can be tested using two methods. In this section, selectivity in the teacher's assessment of child's overall performance is tested using the resources of the children of the NBC group. Consider Table 6.15, which presents the simulated probabilities of different performance categories of children of the NBC group under six alternative hypothetical states. It has also been described in Section 6.1.3 how these values are simulated selecting the sample of children of the NBC group with six different vectors of group coefficients. Since the resources are constant in each case, the nature of the selectivity of the children of different immigrant groups can be examined.

Compare the first case, $\overline{\hat{P}(X_N,\hat{\beta}_N)}$, with the second, $\overline{\hat{P}(X_N,\hat{\beta}_I)}$ which provides information about the nature of selectivity of children of the combined immigrant group. Consider the first number, which is the probability of children being in *near the top of the* *class* category. The probability is 0.303 for the NBC group with the NBC group coefficients, and 0.32 with the combined immigrant group coefficients. The difference appears to be the same for the other two performance categories. The *t*-ratio suggests that this 2% difference is significant. Hence, this test indicates that although the difference is very small in magnitude, there is statistical evidence that children of the combined immigrant group are positively selected; the educational outcomes of children of this group would be higher than those of the NBC group even for the same level of resources.

A comparison of the third case, $\overline{\hat{P}(X_N, \hat{\beta}_P)}$, with the base case suggests that the same applies to the children of the all parents immigrant group. This finding for these two groups suggest that not only the existing probabilities for excellent performance[135] are higher for the immigrant population, they 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 (34% with their own resources vs 32% with the NBC resources).

Now compare the base case, with the 4th case, $\overline{\hat{P}(X_N, \hat{\beta}_U)}$. The difference is 6-percentage point when the *near the top of the class* category is chosen. This indicates that even with the resources of the NBC group, the educational outcomes would be higher for the children of the American immigrant group than for the NBC group (0.30 for the NBC group vs 0.36 for the American immigrant group). However, this outcome is not higher than the existing outcome of the children of the American immigrant group (the probability of being in near the top of the class is 47% with their own resources vs. 36% with resources of the resources of the NBC group). Since this group has already a higher outcome with higher resources it is not recommended to change the resource levels of this group.

A similar comparison of the fifth case, $\overline{\hat{P}(X_N, \hat{\beta}_E)}$, with the base case, $\overline{\hat{P}(X_N, \hat{\beta}_N)}$, suggests that with resource levels of the children of the NBC group, the probability for the children of the European immigrant group would be .307, which is slightly higher than that of NBC group (0.30 for the NBC group). The same applies to the other categories. This difference is statistically significant. However, the difference is not substantial.

The findings of the Asian immigrant group are similar to those of the American immigrant group. This indicates that with the resources of the NBC group, the educational outcomes would be higher than those of the NBC group, but it would not be higher than their existing outcome. Hence, for this group it is also not recommended to change their resource levels even though they are positively selected.

It would be plausible to conclude from the selectivity tests using the resources of the children of the NBC group that there is statistical evidence that the children of any immigrant group are positively selected sample in school performance. In other words, every immigrant group would have higher educational outcomes compared to the NBC group even for the same level of resources. This indicates that they may have "differential cultural capital" which is favourable to educational outcomes of children. Their total outcomes, as presented in Table 6.14, and the hypothetical outcome as presented in Table 6.15 suggests 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.

A selectivity test by using the resources of the children of the immigrant groups

It has also been described in Section 6.1.3 how these probabilities are simulated under two states selecting the samples of children of five immigrant groups: the combined immigrant group, the all parents immigrant group, the American immigrant group, the European immigrant group, and the Asian immigrant group, respectively.

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[135] Near the top of the class category.

Consider Table 6.16. Compare the first case, $\overline{\hat{P}(X_I, \hat{\beta}_N)}$, with the second case, $\overline{\hat{P}(X_I, \hat{\beta}_N)}$. The first case denotes the average conditional probabilities with individual resources of the children of the combined immigrant group but with the group coefficients of the NBC group; while the second case denotes those with the individual resources of the children of the combined immigrant group and also with the coefficients of the same group. Since the resource vector (X_I) is constant in these two states, a comparison of the numbers in these two cases also provides information about the nature of the selectivity in the children of the combined immigrant group in school performances. The differences in the probabilities of these two cases (-3%) and the *t*-tests demonstrate that the children of the combined immigrant group are positively selected. A similar comparison of the third case and the fourth case suggests that the same applies to the children of the all parents immigrant group. Note that in this exercise the resource levels of the immigrant groups are unchanged. The probabilities with the NBC coefficients and resources of the children of the immigrant groups are always lower than those with immigrant group coefficients and resources (the existing probabilities of different immigrant groups are already described).

Within the immigrant population, there is evidence that the children of the American immigrant group are positively selected, as the comparison of the fifth case and the sixth case shows. For the other two groups, the evidence is stronger for the first performance category. As argued earlier that, since the probabilities are higher for the highest category, it can be concluded that the children of the American immigrant group would have higher educational outcomes compared to the NBC group even if both groups were provided the resources of the children of the American immigrant group (47% for the American group, 34% for the NBC group for the excellent health category). This also indicates that it is not suggested to change the resource levels of the American immigrant group. Similar conclusion applies to the European and Asian immigrant groups.

To conclude, the average predicted conditional probabilities of different groups suggest that the school performance of children of immigrant groups in general are better than those of the NBC group in Canada. It reflects the "skilled immigrant effect" in the educational outcomes of children. Within the immigrant population, school performances of children are best for the American immigrant group and worst for the European immigrant group.

The selectivity test suggests that the children of any immigrant group are positively selected. The findings of selectivity tests are consistent with Chiswick (1978). However, the evidence is stronger for the children of the American and Asian immigrant groups than for the European immigrant group. Remember, a positive selectivity implies that for the same level of resources, the immigrant group would have a higher outcome compared to the NBC group due to a higher level of "differential cultural capital." Since the outcomes of any immigrant group are higher with their own resources than with the resources of the children of the NBC group, it is not recommended to change their resource level to improve the educational outcomes even though they are positively selected.

Table 6.14: 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 (standard error)	T -values
1) $\overline{\hat{P}(X_N, \hat{\beta}_N)}$	0.303 0.460 0.687		
2) $\overline{\hat{P}(X_I, \hat{\beta}_I)}$	0.339 0.496 0.712	(1)-(2) -0.04(0.003) -0.04(0.004) -0.03(0.003)	-10.39 [a] -9.136 [a] -7.368 [a]
3) $\overline{\hat{P}(X_P, \hat{\beta}_P)}$	0.343 0.496 0.709	(1)-(3) -0.04(0.005) -0.04(0.006) -0.02(0.005)	-8.23 [a] -6.32 [a] -4.53 [a]
4) $\overline{\hat{P}(X_U, \hat{\beta}_U)}$	0.470 0.595 0.758	(1)-(4) -0.17(0.01) -0.14(0.01) -0.07(0.01)	-18.33 [a] -12.94 [a] -7.81 [a]
5) $\overline{\hat{P}(X_E, \hat{\beta}_E)}$	0.339 0.494 0.715	(1)-(5) -0.04(0.005) -0.03(0.006) -0.03(0.005)	-7.42 [a] -6.08 [a] -5.65 [a]
6) $\overline{\hat{P}(X_A, \hat{\beta}_A)}$	0.391 0.530 0.717	(1)-(6) -0.09(0.01) -0.07(0.01) -0.03(0.01)	-9.41 [a] -6.45 [a] -3.14 [a]

Notes: 1. $\overline{\hat{P}(X_G, \hat{\beta}_G)}$ 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; *G* = *P* denotes all parents immigrant group; *G* = *U* denotes American immigrant group; immigrant group; *G* = *E* denotes European immigrant group; *G* = *A* denotes Asian immigrant group;

2. The first entry in each box denotes the probability of being in *the near the top of the* class category; the second entry in each box denotes the probability of being in *the near the top of the* class or *above the middle of the class* category; and the third entry in each box denotes the probability of being in *the near the top of the* class or *above the middle of the class or in the middle of the class* category.

3. The regression coefficients of this Table come from those of Tables 6.12-6.13

4. a denotes significant at the 1% levels.

Source: Calculated by the author using the NLSCY (1996-97) Cycle 2 data

Table 6.15 Average predicted conditional probabilities of different school performance categories of children with the resources of the children of the NBC group

Average predicted conditional probabilities with coefficients of different groups	Estimated values	Differences (standard error)	T -values
1) $\overline{\hat{P}(X_N, \hat{\beta}_N)}$	0.303 0.460 0.687		
2) $\overline{\hat{P}(X_N, \hat{\beta}_I)}$	0.315 0.471 0.695	**(1)-(2)** -0.01(0.002) -0.01(0.002) -0.01(0.002	-6.59[a] -5.14[a] -2.68[a]
3) $\overline{\hat{P}(X_N, \hat{\beta}_P)}$	0.325 0.478 0.697	**(1)-(3)** -0.02(0.002) -0.02(0.002) -0.01(0.002)	-11.83[a] -8.41[a] -5.10[a]
4) $\overline{\hat{P}(X_N, \hat{\beta}_U)}$	0.360 0.488 0.669	**(1)-(4)** -0.06(0.003) -0.03(0.003) 0.02(0.003)	-19.46[a] -8.41[a] 5.54[a]
5) $\overline{\hat{P}(X_N, \hat{\beta}_E)}$	0.307 0.458 0.683	**(1)-(5)** -0.01(0.002) 0.002(0.002) 0.004(0.002)	-2.48[b] 1.024 2.088[b]
6) $\overline{\hat{P}(X_N, \hat{\beta}_A)}$	0.345 0.464 0.635	**(1)-(6)** -0.04(0.003) -0.01(0.004) 0.05(0.004)	-12.85[a] -1.11 14.21[a]

Notes: 1. $\overline{\hat{P}(X_G, \hat{\beta}_G)}$ 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; $G = P$ denotes all parents immigrant group; $G = U$ denotes American immigrant group; immigrant group; $G = E$ denotes European immigrant group; $G = A$ denotes Asian immigrant group;

2. The first entry in each box denotes the probability of being in *the near the top of the* class category; the second entry in each box denotes the probability of being in *the near the top of the* class or *above the middle of the class* category; and the third entry in each box denotes the probability of being in *the near the top of the* class or *above the middle of the class or in the middle of the class* category.

3. The regression coefficients of this Table come from those of Tables 6.12-6.13

4. a, b, and c denote significant at the 1%, 5%, and 10% levels.

Source: Calculated by the author using the NLSCY (1996-97) Cycle 2 data

Table 6.16 Average predicted conditional probabilities of different school performance categories of children with the resources of children of different immigrant groups

Average predicted conditional probabilities	Estimated values	Differences (Standard error)	T -values
1) $\overline{\hat{P}(X_I,\hat{\beta}_N)}$	0.314 0.473 0.698	(1)-(2) -0.03(0.005) -0.02(0.006) -0.01(0.005)	-4.87[a] -4.06[a] -2.863[a]
2) $\overline{\hat{P}(X_I,\hat{\beta}_I)}$	0.339 0.496 0.712		
3) $\overline{\hat{P}(X_P,\hat{\beta}_N)}$	0.301 0.459 0.686	(3)-(4) -0.04(0.008) -0.04(0.009) -0.02(0.008)	-5.14[a] -4.10[a] -3.03[a]
4) $\overline{\hat{P}(X_P,\hat{\beta}_P)}$	0.342 0.496 0.709		
5) $\overline{\hat{P}(X_U,\hat{\beta}_N)}$	0.343 0.507 0.724	(5)-(6) -0.13(0.003) -0.09(0.003) -0.04(0.002)	-4.85[a] -3.32[a] -1.97[b]
6) $\overline{\hat{P}(X_U,\hat{\beta}_U)}$	0.470 0.595 0.758		
7) $\overline{\hat{P}(X_E,\hat{\beta}_N)}$	0.322 0.483 0.707	(7)-(8) -0.02(0.007) -0.01(0.008) -0.01(0.007)	-2.42[b] -1.45 -1.10
8) $\overline{\hat{P}(X_E,\hat{\beta}_E)}$	0.339 0.494 0.715		
9) $\overline{\hat{P}(X_A,\hat{\beta}_N)}$	0.321 0.481 0.706	(9)-(10) -0.07(0.002) -0.05(0.002) -0.01(0.002)	-3.30153[a] -2.11644[b] -0.52897
10) $\overline{\hat{P}(X_A,\hat{\beta}_A)}$	0.391 0.530 0.717		

Notes: 1. $\overline{\hat{P}(X_G,\hat{\beta}_G)}$ denotes the average predicted conditional probability 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; *G* = *P* denotes all parents immigrant group; *G* = *U* denotes American immigrant group; immigrant group; *G* = *E* denotes European immigrant group; *G* = *A* denotes Asian immigrant group;

2. The first entry in each box denotes the probability of being in *the near the top of the* class category; the second entry in each box denotes the probability of being in *the near the top of the* class or *above the middle of the class* category; and the third entry in each box denotes the probability of being in *the near the top of the* class or *above the middle of the class or in the middle of the class* category.

3. The regression coefficients of this Table come from those of Tables 6.12-6.13

4. a, b, and c denote significant at the 1%, 5%, and 10% levels.

Source: Calculated by the author using the NLSCY (1996-97) Cycle 2 data

6.2.4 The association of time of residency of immigrants and the school performance of their children: ordered logit estimates of the sample of immigrants

Teacher's assessment of child's overall performance is used as a measure of educational outcomes in this section Logit models of teacher's assessment of child's overall performance are estimated including *years since immigration of parents in Canada* variable to ascertain the association of the time of residency of immigrant parents and the educational outcomes of their children. Table 6.17 presents the ordered logit estimates of the school performance models of children of immigrants. The results are examined from the pooled sample of the combined immigrant group as well as from that of the all parents immigrant group, a subset of the combined immigrant group. Columns 2-4 present the estimates from the pooled sample of combined immigrant group. Estimates from a model with the PMK's assessment of child's health is presented in the second column. The third and the fourth columns contain the estimates from a model with the Health Utility Index variable, and without any child's health variable. Columns 5-7 present those of the all parents immigrant group. *Other immigrant group* is the comparison group in each column. Similar to the health outcome model in section 6.1.4, a positive and significant coefficient of *years since immigration* in educational outcome model would indicate that the educational outcomes of children of the immigrant family would improve with the time of residency of their parents in Canada.

Consider column 2. All the *birthplace* variables-*American*, *European*, and *Asian*- are insignificant. This indicates that there are no significant differences in the initial school performances of the children of these three groups and those of the children of the *other immigrant group*. The coefficient of *years since immigration* is negative but insignificant. This indicates that the average probability in children of being in the highest performance category of the *other immigrant group* does not change with the time of residency of their parents in Canada. Moreover, all the interaction variables are insignificant, which suggests that the marginal association of the time of residency of immigrants and the school performances of children are similar for all the immigrant sub-groups. The log-likelihood ratio test, however, suggests that the *birthplace* variables and the interaction variables are jointly different from zero. This indicates that jointly the regression models of the all three sub-groups are different from that of the *other immigrant group.*

It can be concluded that there is no statistical evidence that educational outcomes of children would improve with the time of residency of their parents in Canada. This conclusion is robust to the model specification or the definition of immigrant families. This stagnant educational outcome may have caused by one or more of the following factors: i) the school system in Canada may be weaker that could prevent the progress of educational outcomes of immigrant families; ii) the preferences of the immigrants with the time of residency in Canada may change in such a way that is less beneficial to educational outcomes of their children; iii) the assimilation rate of immigrants in Canada may be very slow that prevents the progress of the educational outcomes of their children; and iv) parents' time of residency or assimilation may not be an important covariates of child's educational outcomes. As the existing educational outcomes are already higher than those of the NBC families, there is no need to be concerned for the immigrant population in general even if the educational outcomes of children of immigrant families do not improve with the time of residency of their parents.

This finding is different from that of the health outcomes, where the association of time of residency of immigrants and the health outcomes was significantly positive. The reason could be that the initial health outcomes of children of some immigrant groups were lower than those of the NBC group and hence, they are likely to improve with the time of residency of immigrants and converge to those of the NBC group. On the other hand, educational outcomes are already higher than those of the NBC group and there may be little scope to improve them further. Note also that the educational outcomes are estimated from a smaller sample compared to those of the health outcomes. Hence, they are less reliable. For the same reason, the findings of the sub-groups are less reliable compared to those of those of the combined immigrant group.

Table 6.17:Ordered logit estimates of the association of time of residency of immigrants and school performance of children

Variables	Coefficients (standard error)					
Group	Combined immigrant group			All parents immigrant group		
Model Specification	Using PMK's assessment of child's health	Using Health Utility Index	Using without child's health	Using PMK's assessment of child's health	Using Health Utility Index	Using without child's health
Intercept 1	-3.7711[a] (0.58970)	-4.8895[a] (0.9130)	-3.8039[a] (0.5890)	-3.6222[a] (0.9474)	-3.4441[a] (1.3948)	-3.6909[a] (0.9459)
Intercept 2	-2.8729[a] (0.5851)	-3.9980[a] (0.9092)	-2.9142[a] (0.5844)	-2.6985[a] (0.9409)	-2.5286[c] (1.3905)	-2.7754[a] (0.9394)
Intercept 3	-1.8706[a] (0.5819)	-2.9984[a] (0.9059)	-1.9174[a] (0.5811)	-0.6789[c] (0.9362)	-1.5113 (1.3879)	-1.7581[b] (0.9345)
American (= 1, if the family is from the American group, = 0, otherwise)	-0.1233 (0.3845)	-0.0455 (0.3830)	-0.0427 (0.3822)	-0.00056 (0.6925)	0.0716 (0.6893)	0.0740 (0.6892)
European (= 1, if the family is from the European group, = 0, otherwise)	0.00493 (0.2186)	0.0152 (0.2186)	0.0452 (0.2177)	0.1474 (0.3215)	0.2451 (0.317)	0.2376 (0.3155)
Asian ((= 1, if the family is from the Asian group , = 0, otherwise)	-0.2223 (0.3350)	-0.2420 (0.3365)	-0.2025 (0.3358)	-0.3118 (0.4292)	-0.238 (0.4293)	-0.2457 (0.4278)
Years since immigration in Canada	-0.00583 (0.007)	-0.00355 (0.0069)	-0.00319 (0.0069)	0.00612 (0.0117)	0.00936 (0.0115)	0.00927 (0.0115)
Years since immigration*American	0.0214 (0.0159)	0.0186 (0.0159)	0.0187 (0.0158)	0.00846 (0.0248)	0.0062 (0.0247)	0.00612 (0.0247)
Years since immigration*European	0.00193 (0.00865)	0.000188 (0.0086)	-0.00059 (0.00858)	-0.00067 (0.0151)	-0.00629 (0.0146)	-0.0061 (0.0146)
Years since immigration*Asian	0.0254 (0.0171)	0.0259 (0.0172)	0.0243 (0.0172)	0.0312 (0.0235)	0.0272 (0.0235)	0.0275 (0.0234)
Age of the child	0.0528[a] (0.0209)	0.0563[a] (0.0208)	0.0560[a] (0.0208)	0.0798[a] (0.0322)	0.0861[a] (0.0320)	0.0859[a] (0.0320)
Gender (= 1, if the child is a boy, =0, if not)	-0.2929[a] (0.0853)	-0.2854[a] (0.0852)	-0.2825[a] (0.0852)	-0.4035[a] (0.1356)	-0.3957[a] (0.1358)	-0.3978[a] (0.1355)
Equivalent income($)	-3.13E-7 (2.88E-6)	1.589E-7(2.871E-6)	3.612E-7 (2.87E-6)	-5.69E-6 (5.021E-6)	-5.17E-6 (5.014E-6)	-5.25E-6 (5.006E-6)
House (=1,if any family members own the house, = 0 if not)	0.3619[a] (0.1211)	0.3512[a] (0.1212)	0.3622[a] (0.1211)	0.4304[b] (0.1734)	0.4299[a] (0.1748)	0.4242[a] (0.1733)
Lone parent (=0, if the child lives with both parents, = 1, otherwise)	-0.1342 (0.1490)	-0.1428 (0.1495)	-0.1788 (0.1477)	-0.3696[c] (0.1972)	-0.4142[b] (0.1997)	-0.4043[b] (0.1953)
Age of mother (years) at the birth of a child	0.0325[a] (0.00867)	0.0318[a] (0.00866)	0.0316[a] (0.00865)	0.0176 (0.0136)	0.0157 (0.0136)	0.0160 (0.0135)
Years of education of PMK	0.1175[a] (0.0232)	0.1168[a] (0.0232)	0.1172[a] (0.0232)	0.1472[a] (0.0374)	0.1485[a] (0.0373)	0.1484[a] (0.0373)
Working hours of PMK	-0.0039[c] (0.00270)	-0.00413[c] (0.0027)	-0.00412[c] (0.0027)	-0.00471 (0.00447)	-0.00429 (0.00447)	-0.00419 (0.00445)

Continued on next page

Table 6.17 continued

Variables	**Coefficients (standard error)**					
Group	**Combined immigrant group**			**All parents immigrant group**		
Model Specification	**Using PMK's assessment of child's health**	**Using Health Utility Index**	**Using without child's health**	**Using PMK's assessment of child's health**	**Using Health Utility Index**	**Using without child's health**
Poor health of PMK(=1, if health status of PMK is fair or poor, =0 otherwise	-0.3736[b] (0.1685)	-0.3743[b] (0.1686)	-0.3678[b] (0.1686)	-0.1443 (0.2476)	-0.1069 (0.247)	-0.1094 (0.2468)
Residential movement	0.0401[c] (0.0259)	0.0367 (0.0259)	0.0368 (0.0259)	0.0538 (0.0446)	0.0472 (0.0444)	0.0473 (0.0444)
Rural area (=1, if the child lives in a rural area, =0, otherwise)	-0.0987 (0.2127)	-0.0573 (0.2133)	-0.0858 (0.2124)	-0.2559 (0.4981)	-0.2370 (0.4981)	-0.239 (0.4979)
Local unemployment rate	0.0201 (0.0329)	0.0149 (0.0328)	0.0162 (0.0328)	-0.0324 (0.0567)	-0.0357 (0.0566)	-0.0359 (0.0566)
Welfare (= 1, if the main source of income of the family is public assistance, = 0, otherwise)	-0.3344 (0.2170)	-0.2616 (0.2147)	-0.2404 (0.2141)	-0.2792 (0.2959)	-0.1816 (0.2929)	-0.1916 (0.290)
Job rank of parents (a lower value indicates better job status)	-0.0121 (0.0102)	-0.0121 (0.0102)	-0.0122 (0.0102)	-0.00719 (0.0155)	-0.0068 (0.0155)	-0.00664 (0.0155)
Family dysfunction	-0.00325 (0.00935)	-0.00384 (0.0093)	-0.00472 (0.0093)	-0.00152 (0.0146)	-0.00437 (0.0146)	-0.00391 (0.0145)
Negative parenting style	-0.0669 (0.1053)	-0.0796 (0.1053)	-0.0935 (0.1049)	-0.0425 (0.1665)	-0.0587 (0.1661)	-0.0585 (0.1660)
Poor health of child (= 1, if health status of child is poor/fair/good, = 0, otherwise)	-0.3267[a] (0.1236)			-0.2591 (0.1772)		
Health Utility Index		1.1248 (0.7274)			-0.2511 (1.0507)	
Private (= 0, if the child goes to public or catholic school, = 1, otherwise)	0.1466 (0.1618)	0.1490 (0.1625)	0.1244 (0.1615)	0.2976 (0.265)	0.2580 (0.2651)	0.2636 (0.2638)
Missing days (= 0, if missing days of school are less than 3, = 1, if equal to or more than 3 days	-0.00350 (0.1098)	-0.00620 (0.1098)	0.00446 (0.1096)	-0.0617 (0.1829)	-0.0605 (0.1831)	-0.0635 (0.1827)
-2LOGL (intercepts and covariates)	1746.26	1750.89	1753.36	753.095	755.222	755.281
Chi-Square (score test)	167.70	161.607	159.061	141.384	133.152	132.508
Log-likelihood ratio = $-2(L_R - L_U) \cong \chi^2(6)$	83.902			71.860		
Sample size	668	668	668	310	310	310

Notes: 1.The dependent variable is the teacher's assessment of child's over all performance.
2.*Other immigrant group* is the base group.
3.a, b, and c denote significance levels at the 1%, 5%, and 10%, respectively.
4. L_u denotes the log-likelihood of the unrestricted model (where the coefficients of *birthplace* and the interaction variables assumed to have non-zero values), and L_R denotes that of the restricted model.

Source: Prepared by the author using the NLSCY (1996-97) Cycle 2 data

6.3 The OLS estimates of mathematics scores of children

The mathematics scores of children in this study is a continuous variable. After an adjustment for each grade level,[136] the mean score of children in each grade level becomes 1. "Per week instruction hours in mathematics" variable is added in this model, which was not used in the ordered logit model of the overall performance in the children. As described in Section 4.3.2 of Chapter 4, since mathematics scores are available only for 62% of children in the sample, OLS estimates could be biased if the sample is not random. For that reason, the Heckman's two-stage procedure is applied to test the hypothesis that the sample is positively selected. The results are presented in Tables A5.1-A5.3 in Appendix 5. The results of the Probit model that are used to create the inverse of the Mills ratio (λ), as described in Chapter 4, are presented in Table A5.1. The results of the Heckman models that include λ as one of the regressors are presented in Tables A5.2 and A5.3. The pooled samples of the NBC group and the different immigrant groups are used to estimate the models. An insignificant value of λ, in each column of the two tables indicates that there is no evidence that the children in the sample are positively or negatively selected. Hence, OLS estimates are less likely to be biased. The results of the OLS estimates are presented in Tables 6.18 and 6.19.

The estimated coefficients for the NBC group and the two different immigrant groups are presented in Table 6.18. Column 2 compares the estimated coefficients of the NBC group and the combined immigrant group, while Column 3 compares those of the NBC group and the all parents immigrant group, where the all parents immigrant group is a subset of the combined immigrant group.

The coefficient of the *birthplace* variable in these tables captures differences in levels of mathematics performance of the children in the NBC group and the combined immigrant group. A higher value indicates a higher level of mathematics performance. 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 focus of these tables is on the coefficients of *birthplace* and the interaction variables.

6.3.1 A comparison of the estimates of the NBC group, the combined immigrant group and the all parents immigrant group

The second column of Table 6.18 compares the mathematics scores model of the children of the combined immigrant group with that of the NBC group. The slope coefficient of the *birthplace* is positive but insignificant. It indicates that average the mathematics performance in the children of the NBC group and the combined immigrant group would be similar if all other covariates were given zero value.

The other estimated coefficients that are significant have expected signs. As expected, "household equivalent income," "years of education of the PMK," "private school," and "instruction hours" have positive and significant association with mathematics scores of children. Similarly, the coefficients of "job rank of parents," "family dysfunction," and "missing days of schools" are negative and significant, as expected. It is interesting to note that in the case of overall performance, as presented in Section 6.2, the children of public and catholic schools showed a better performance, whereas, in the case of mathematics performance, the children of private schools display a better performance. Also, this variable has the strongest association with mathematics performance among all the explanatory variables. Mathematics performances are higher by 3% of the mean score for the children in the private schools than for those in public schools and publicly funded catholic schools.

The slope coefficients of "house," "years of education of the PMK," "job rank of parents," and "health status of child" are significantly larger (in absolute sense) for the

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

children of the combined immigrant group compared to those of the NBC group. For example, the slope coefficient of "house" variable is 3-percentage point higher and that of the "years of education of the PMK" is 1-percentage point higher for the children of the combined 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," "health status of the PMK," "family dysfunction," and "parenting style" are significantly smaller for the children of the combined 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 slightly if the all parents immigrant group is considered. The coefficient of the *birthplace* is insignificant like in the previous case. No significant differences are observed in the marginal associations of "equivalent incomes" and "house" variables with the mathematics performances of children of the NBC group and the immigrant group. In other cases, the results for the combined immigrant group and the all parents immigrant group are similar. The Chow test result shows that the regression models of the combined immigrant group and the all parents immigrant group are significantly different from that of the NBC group.

6.3.2 A comparison of the estimates of the children in NBC group and the different immigrant sub-groups

The estimates of mathematics score models for the three immigrant sub-groups are reported in Table 6.19. An examination of the estimates in different columns of the table indicates that, the conclusion that is applicable for the combined immigrant group is not always applicable for each of the three immigrant sub-groups, as shown by the values in bold face.

The estimated coefficients of the *birthplace* are different for different immigrant sub-groups. An examination of this coefficient indicates that initial mathematics scores would be the highest for the children of the European immigrant group and the lowest for those of the Asian immigrant group. If the magnitudes of the interaction variables are examined, it reveals that all the coefficients are different for different immigrant sub-groups. In some cases the sub-groups also differ from the combined immigrant group regarding the signs of the coefficients. For example, the slope coefficient of "missing days of school" is significantly smaller (opposite signs of the non-interacted variable and the interaction variable) for the children of the American immigrant group, but significantly larger (same signs of the non-interacted variable and the interaction variable) for those of the European immigrant group. In most of the cases, even though the signs of the coefficients are same, the significance levels are different for different sub-groups.

The American immigrant group differs from the combined immigrant in more cases than the European immigrant group and the Asian immigrant group, because of the similarity of the American immigrant group with the NBC group. The Asian immigrant group differs from the combined group only in fewer cases. It is interesting that the slope coefficient of "poor health status of the PMK" is insignificant for each of these three immigrant sub-groups, whereas, it is significant for the combined immigrant group. Perhaps, this is originated from a larger and significant slope coefficients of "poor health status of the PMK" of the *other immigrant group*, which is not reported in this table. The Chow test results show that the regression model of the European immigrant group is significantly different from that of the NBC group. Those of the American group and the Asian group are similar. However, Chow test results may not be reliable for smaller samples.

In the next section, the simulated mathematics scores of the different groups for the same level of resources are reported to test the nature of selectivity in mathematics performance.

Table 6.18:The OLS mathematics score model of children of NBC and immigrant families

Variables	**Coefficients (standard error)**	
Groups	**NBC & Combined immigrant group**	**NBC & All parents immigrant group**
Intercept	0.868771(0.02687264)[a]	0.868771(0.02664855)[a]
Age of child	-0.000117(0.00107245)	-0.000117(0.00106351)
Gender (= 1, if the child is a boy, = 0, if a girl)	0.006226(0.00421094)	0.006226(0.00417582)
Equivalent Income($)	0.0000003(0.00000014)[a]	0.0000003(0.00000014)[a]
House (= 1, if any family members own the house, = 0, if not)	0.002188(0.00654336)	0.002188(0.00648879)
Lone parent (= 1, if child lives with a lone parent, = 0, otherwise)	-0.002287(0.0067803)	-0.002287(0.00672376)
Age of mother (years) at birth of child	0.000693(0.00045757)	0.000693(0.00045375)
Years of education of PMK	0.004147(0.00116756)[a]	0.004147(0.00115782)[a]
Weekly working hours of PMK	-0.000158(0.00012827)	-0.000158(0.0001272)
Poor health of PMK (= 1, if PMK's health is fair or poor, = 0, otherwise)	-0.005104(0.00887037)	-0.005104(0.0087964)
Residential movement	-0.000381(0.00109479)	-0.000381(0.00108566)
Rural area (=1, if the child lives in a rural area, = 0, otherwise)	-0.001074(0.00586104)	-0.001074(0.00581217)
Provincial unemployment rate (1996)	0.006602(0.00086711)	0.006602(0.0008599)
Welfare (= 1, if the family's main source of income is from public assistance, = 0, otherwise)	-0.012000(0.00920308)	-0.012000(0.0091263)
Job rank of parents (a lower value indicates a higher job status)	-0.001398(0.0005378)[a]	-0.001398(0.0005333)[a]
Family dysfunction (a higher score indicates more dysfunctional)	-0.001531(0.00044602)[a]	-0.001531(0.0004423)[a]
Negative parenting style	0.001457(0.00498794)	0.001457(0.00494635)
Poor health condition of child (= 1, if health status of child is good or fair or poor, = 0, otherwise)	-0.008449(0.00700499)	-0.008449(0.00694657)
Private (= 0, if the child goes to public or catholic school, = 1, otherwise)	0.033569(0.01105607)[a]	0.033569(0.01096387)[a]
Missing days (= 0, if missing days of school are less than 3 days, = 1, if equal to or more than 3 days	-0.024937(0.0050566)[a]	-0.024937(0.00501445)[a]
Instruction hours in mathematics (= 1, if per week instruction hour is greater than or equal to 4 hours, = 0, if less than 4 hours)	0.022065(0.0057619)[a]	0.022065(0.00571385)[a]
Birthplace (= 1, if parents are foreign born, = 0, if native- born Canadian)	**0.011933(0.05724763)**	**0.092796(0.0808642)**
Age of the child* Birthplace	-0.002785(0.00225481)	-0.002994(0.00279962)
Gender * Birthplace	-0.000475(0.00896454)	-0.010303(0.01197344)
Equivalent income* Birthplace	-0.000000819(0.0000003)[a]	**-0.00000063(0.0000004)**
House * Birthplace	0.027572(0.01250237)[a]	**0.022306(0.0147156)**
Lone- parent * Birthplace	0.015844(0.01499163)	0.005164(0.0164893)
Age of PMK * Birthplace	-0.000316(0.00089682)	-0.001308(0.0011441)
Years of education of PMK* Birthplace	0.007382(0.00230055)[a]	0.010207(0.0028946)[a]
Working hours of PMK* Birthplace	0.000105(0.00028093)	-0.000424(0.000371)

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Table 6.18 Continued

Variables	**Coefficients (standard error)**	
Groups	**NBC & Combined immigrant group**	**NBC & All parents immigrant group**
Poor health status of PMK* Birthplace	0.079739(0.01812358)[a]	0.099388(0.02069503)[a]
Residential movement* Birthplace	-0.002769(0.00254808)	-0.002845(0.00333065)
Rural area* Birthplace	0.014679(0.02067828)	0.041834(0.03907811)
Provincial unemployment rate *Birthplace	-0.003721(0.00298386)	-0.007283(0.0049101)
Welfare *Birthplace	0.003712(0.02100710)	-0.004541(0.0236705)
Job rank *Birthplace	-0.003162(0.00103887)[a]	-0.003497(0.00122567)[a]
Family dysfunction *Birthplace	0.003507(0.00095645)[a]	0.005098(0.00122286)[a]
Negative parenting style *Birthplace	-0.027567(0.01060294)[a]	-0.046638(0.01315787)[a]
Poor health condition of child* Birthplace	-0.033812(0.0131955)[a]	**-0.046492(0.01519165)**
Private *Birthplace	0.009976(0.0176289)	0.022816(0.02087762)
Missing days *Birthplace	0.006427(0.01086790)	-0.009579(0.01377406)
Instruction hours *Birthplace	-0.008585(0.01211583)	**-0.037479(0.01608742)**[a]
R^2	0.0901	0.0958
Adjusted R^2	0.0825	0.0876
F value	11.718 [a]	11.650[a]
Root MSE	0.13271	0.13365
Chow test	F(20, 4,850)=1.67[b]	F(20, 4,509)=4.59[a]
Sample Size	4,890	4,549

Notes: 1.The dependent variable is scale score in mathematics test adjusted for grade levels.
2. a, b, and c denote significance levels at 1%, 5% and 10%, respectively.
3.The coefficients in boldface suggest that the differential impacts of the corresponding variable are different for the all parents immigrant group and the combined immigrant group.

Source: Estimated by the author using the NLSCY (1996-97) Cycle 2 data

Table 6.19: OLS mathematics score model of children of the NBC group and the immigrant sub-groups

Variables		Coefficients (standard error)	
Groups	NBC & American	NBC & European	NBC & Asian
Intercept	0.868771(0.02540984)[a]	0.868771(0.02631525)[a]	0.868771(0.02565722)[a]
Age of the child	-0.000117(0.00101407)	-0.000117(0.00105021)	-0.000117(0.00102395)
Gender (= 1, if the child is a boy, =0, if a girl)	0.006226(0.00398172)	0.006226(0.00412360)	0.006226(0.00402048)
Equivalent Income ($)	0.0000003(0.00000013)[a]	0.0000003(0.00000013)[a]	0.0000003(0.00000013)[a]
House (=1, if any family members own the house, = 0, if not)	0.002188(0.00618717)	0.002188(0.00640764)	0.002188(0.00624741)
Lone-parent (=1, if child lives with a single parent, = 0, otherwise)	-0.002287(0.00641122)	-0.002287(0.00663967)	-0.002287(0.00647364)
Age of mother (years) at birth of child	0.000693(0.00043266)	0.000693(0.00044808)	0.000693(0.00043687)
Years of education of PMK	0.004147(0.00110400)[a]	0.004147(0.00114334)	0.004147(0.00111475)
Weekly working hours of PMK	-0.000158(0.00012129)	-0.000158(0.0001256)	-0.000158(0.00012247)
Poor health of PMK (= 1, if PMK's health is fair or poor, = 0, otherwise)	-0.005104(0.00838751)	-0.005104(0.00868638)	-0.005104(0.00846917)
Residential movement	-0.000381(0.0010352)	-0.000381(0.0010721)	-0.000381(0.00104527)
Rural area (= 1, if the child lives in a rural area, = 0, otherwise)	-0.001074(0.005542)	-0.001074(0.00573947)	-0.001074(0.00559595)
Provincial unemployment rate (1996)	0.006602(0.00081991)[a]	0.006602(0.00084913)[a]	0.006602(0.00082789)[a]
Welfare (= 1, if the family's main source of income is public assistance, = 0, otherwise)	-0.012000(0.00870211)	-0.012000(0.00901219)	-0.012000(0.00878683)
Job rank of parents (a lower value indicates a higher job status)	-0.001398(0.00050853)[a]	-0.001398(0.00052665)[a]	-0.001398(0.00051348)[a]
Family dysfunction	-0.001531(0.00042174)[a]	-0.001531(0.00043677)[a]	-0.001531(0.00042585)[a]
Negative parenting style	0.001457(0.00471643)	0.001457(0.00488449)	0.001457(0.00476234)
Poor health condition of child (= 1, if health status of child is good or fair or poor, = 0, otherwise)	-0.008449(0.00662368)[a]	-0.008449(0.00685969)[a]	-0.008449(0.00668816)[a]
Private (= 0, if the child goes to public or catholic school, = 1, otherwise)	0.033569(0.01045424)[a]	0.033569(0.01082675)[a]	0.033569(0.01055602)[a]

Continued on next page

Table 6. 19 continued

Variables		Coefficients (standard error)	
Groups	**NBC & American**	**NBC & European**	**NBC & Asian**
Missing days (= 0, if missing days of school are less than 3 days, = 1, if equal to or more than 3 days	-0.024937(0.00478136)[a]	-0.024937(0.00495173)[a]	-0.024937(0.0048279)[a]
Instruction hours in mathematics (= 1, if per week instruction hour is greater than or equal to 4 hours, = 0, if less than 4 hours)	0.022065(0.00544825)[a]	0.022065(0.00564239)[a]	0.022065(0.00550129)[a]
Birthplace (= 1, if parents are foreign born, = 0, if native- born Canadian)	0.036088(0.22491278)	**0.208287(0.09252677)[b]**	0.019319(0.16956610)
Age of the child* Birthplace	0.000787(0.00874737)	0.002014(0.00335153)	-0.007872(0.00708072)
Gender * Birthplace	0.042815(0.03397535)	0.016143(0.01269453)	-0.091011(0.02689352)[a]
Equivalent income* Birthplace	-0.000001167(0.0000007)[c]	-0.00000091(0.0000004)[b]	0.000001145(0.0000014)
House * Birthplace	**0.013593(0.05881561)**	**0.014975(0.01813287)**	0.107771(0.04957854)[b]
Lone- parent * Birthplace	-0.199375(0.08528013)[a]	0.071297(0.02358709)[a]	0.076019(0.05922036)
Age of PMK * Birthplace	0.003235(0.00302512)	**-0.003609(0.00135447)[a]**	0.001294(0.00270913)
Years of education of PMK* Birthplace	**-0.000147(0.00851977)**	0.006495(0.00330573)[b]	-0.000395(0.00612453)
Working hours of PMK* Birthplace	0.000655(0.00109937)	-0.000850(0.00042417)[b]	0.001877(0.00094164)[b]
Poor health status of PMK* Birthplace	**-0.017828(0.09127198)**	**0.014093(0.03133441)**	**-0.132961(0.1189473)**
Residential movement* Birthplace	-0.010014(0.00904488)	-0.012435(0.00372719)[a]	0.004040(0.00849891)
Rural area* Birthplace	0.108111(0.05193017)[b]	0.014953(0.02827457)	0.019268(0.09214306)
Provincial unemployment rate *Birthplace	-0.003006(0.01183005)	**-0.013292(0.00484789)[a]**	-0.018183(0.01153122)
Welfare *Birthplace	**0.224753(0.10876824)[b]**	-0.025960(0.0389371)	-0.024310(0.09256587)
Job rank *Birthplace	**-0.001034(0.00461267)**	-0.004084(0.00156755)[a]	**0.001632(0.00325264)**
Family dysfunction *Birthplace	**-0.000470(0.00377779)**	**0.001458(0.00148352)**	0.008547(0.00259822)[a]
Negative parenting style *Birthplace	-0.075015(0.03810707)[b]	**-0.019709(0.01578823)**	**-0.008553(0.03739167)**
Poor health status of child* Birthplace	**-0.041674(0.06930603)**	**-0.006488(0.0176459)**	-0.123114(0.03552295)[a]
Private *Birthplace	0.034459(0.05471865)	-0.026944(0.02407502)	0.152651(0.05417069)[a]
Missing days *Birthplace	**0.066262(0.03651536)[c]**	**-0.026950(0.01626477)[c]**	0.042651(0.04748409)
Instruction hours *Birthplace	-0.048903(0.04451099)	0.001848(0.01732129)	-0.000549(0.03651638)
R^2	0.0720	0.0801	0.0752
Adjusted R^2	0.0632	0.0717	0.0664
F value	8.155[a]	9.544 [a]	8.51[a]
Root MSE	0.13385	0.13484	0.13363
Chow test	F(19,4259) = 0.89	F(19,4480) = 4.32 [a]	F(19,4277) = 0.81
Sample Size	4,352	4,537	4,334

Source: Estimated by the author using the NLSCY (1996-97) Cycle 2 data

Notes: 1.The dependent variable is scale score in mathematics test adjusted for grade levels.
2. a, b, and c denote significance levels at the 1%, 5% and 10%, respectively.
3.The coefficients in boldface suggest that the differential impacts of the corresponding inputs are different for immigrant sub-groups and the combined immigrant group.

6.3.3 Simulated mathematics scores of children: variation in scores and the nature of selection

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

(6c) $\hat{Y}_{Ni} = \mu_N + \sum_{g=1}^{t} \beta_{Ng} X_{gNi}$

(6d) $\hat{Y}_{Ii} = \mu_I + \sum_{g=1}^{t} \beta_{Ig} X_{gIi}$

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

I = (I, P, U, E, and A) refers to different immigrant groups, where I = the combined immigrant group; P = the all parents immigrant group; U = the American immigrant group; E = the European immigrant group; and A = the Asian immigrant group;

Y_{Ni} and Y_{Ii} are the health outcomes of *i*th child in the NBC group and an immigrant group, *I*, respectively;

μ_N and μ_I are the intercept parameters of the NBC group and the an immigrant group, *I* 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 an immigrant group, *I*;

The previous section reported the estimated OLS model coefficients for the children of each group, $\hat{\beta}_k$. Here the subscript, k = N for the NBC group, = *I*, for an immigrant group.

Suppose, the resource levels of *i*th child of different groups is denoted by the vector X_{ki}. Using the equations 6c or 6d, it is possible to simulate the predicted conditional mathematics scores for each child and the average predicted conditional mathematics scores 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, $\hat{\beta}_N$; and using the equation 6c simulate the predicted conditional mathematics scores for each child with his/her own resource vector, X_{Ni}. Take the mean value of these individual conditional mathematics scores, $\hat{Y}_i(X_N, \hat{\beta}_N)$. This simulated value, $\overline{\hat{Y}(X_N, \hat{\beta}_N)}$, denotes the average predicted conditional mathematics scores 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, $\hat{\beta}_I$; and using equation 6d, simulate the predicted conditional mathematics score for each child with his/her own resource vector, X_{Ii}. Take the mean value of these individual values, $\hat{Y}_i(X_N, \hat{\beta}_N)$. This simulated value, $\overline{\hat{Y}(X_I, \hat{\beta}_I)}$ denotes the average predicted conditional mathematics scores for an immigrant group with its own group coefficients and with the resources of the children of this group.

III) Select the sample of the NBC group; give each child the vector of the immigrant group coefficients, $\hat{\beta}_I$; and using one of the above the equations, simulate the predicted conditional scores for each child with his/her own resource vector X_{Ni}. Take the mean value of these individual values, $\hat{Y}_i(X_N, \hat{\beta}_I)$. This simulated value, $\overline{\hat{Y}(X_N, \hat{\beta}_I)}$, has two interpretations: it can be interpreted as the average predicted conditional scores of the NBC group with own resource levels but with the immigrant group coefficients; or it can be interpreted as the average predicted conditional scores for the children of the immigrant group with its group coefficients but with 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, $\hat{\beta}_N$; and using one of the above equations, simulate the predicted conditional scores for each child with his/her own resource vector, $X_{Ii,}$. Take the mean values of these individual expected conditional scores, $\hat{Y}_i(X_I, \hat{\beta}_N)$. This simulated value, $\overline{\hat{Y}(X_I, \hat{\beta}_N)}$, has two meanings: it may be interpreted as the average predicted conditional mathematics scores of the immigrant group with own resource levels but with the NBC group coefficients; or it can be interpreted as the average predicted conditional mathematics scores for the children of the NBC group with its group coefficients but with the resource levels of the children of the immigrant group.

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 Tables 6.20-6.22.

Average predicted conditional mathematics scores and their differences

Consider Table 6.20. It presents the average predicted conditional mathematics scores of six 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 combined immigrant group is 1% point higher than that of the NBC group (0.999 for the NBC group and 1.01 for the combined immigrant group) and the difference is statistically significant. The same applies to the children of the all parents immigrant group. The differences and the *t*-ratios in the other cases indicate that the average conditional mathematics scores of the children of the American and the Asian immigrant groups are significantly higher than that of the NBC group. The score is the highest for American immigrant group (1.04 for the American group, 1.00 for the European immigrant group and 1.03 for the Asian immigrant group). All the figures suggest, economically, the variations in mathematics performance are not noticeable among NBC group, the combined immigrant group, the all parents immigrant group and the European group.

Note that the average predicted conditional mathematics scores are close to the simple mean scores as presented in Chapter 5, which indicates that the OLS models are well-fitted model.[137]

Selectivity tests

Consider Table 6.21. These values are simulated selecting the sample of the NBC group and giving the coefficients of the six different groups. The differences and the t-ratios suggest that there is no evidence that the children of the immigrant group in general are positively or negatively selected; while the three immigrant sub-groups are negatively selected. This indicates that the "differential cultural capital" of the immigrant sub-groups is not favourable to the mathematics performance; their higher mathematics performance results from the observable resources. The magnitudes indicate that for the same level of resources the mathematics performances of the immigrant sub-groups are slightly lower.

Consider Table 6.22. These values are simulated selecting the five immigrant samples; and for each sample the values are simulated under two alternative states as the first column describes. The differences and the t-ratios suggest that the children of the immigrant family in general are positively selected. However, among the sub-groups, there is evidence that the children of the American immigrant group and those of the Asian immigrant group are positively selected. Thus, this test demonstrates a different conclusion from the previous case in this case. Remember that the results of each method have different policy implications, as described in the previous sections. However, both methods suggest that their present levels of resources are better than any other alternatives.

A comparison of the results of the teacher's assessment of child's overall performances with those of the mathematics scores raises a question: which results of the two educational outcomes are more representative of the children in Canada? Although the mathematics scores results do not give the same conclusion regarding the nature of the selectivity as those of the teacher's assessment of child's overall performances; they are

[137] The results are robust to the exclusion of siblings.

consistent with those in most cases. Since sample sizes are smaller for the mathematics scores models than for the teacher's assessment of child's performances, these results are less reliable than those of the teacher's assessment of child's overall performance. Furthermore, the mathematics scores may not accurately represent the educational outcomes of children, as these scores reflect partial educational outcomes.

Table 6.20 Average predicted conditional mathematics scores of children

Predicted conditional mathematics scores with group coefficients (β_G) and resources (X_G)	Estimated values	Differences (standard error)	T-values
1) $\overline{\hat{Y}(X_N, \hat{\beta}_N)}$	0.999		
2) $\overline{\hat{Y}(X_I, \hat{\beta}_I)}$	1.01	(1)-(2) -0.01(0.002)	-6.35[a]
3) $\overline{\hat{Y}(X_P, \hat{\beta}_P)}$	1.01	(1)-(3) -0.01(0.002)	-5.16[a]
4) $\overline{\hat{Y}(X_U, \hat{\beta}_U)}$	1.04	(1)-(4) -0.04(0.004)	-10.01[a]
5) $\overline{\hat{Y}(X_E, \hat{\beta}_E)}$	0.997	(1)-(5) 0.002(0.002)	0.798
6) $\overline{\hat{Y}(X_A, \hat{\beta}_A)}$	1.03	(1)-(6) -0.03(0.004)	-7.16[a]

Notes:

1. $\overline{\hat{Y}(X_G, \hat{\beta}_G)}$ 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 combined immigrant group; *G* = *P* denotes all parents immigrant group; *G* = *U* denotes American immigrant group; immigrant group; *G* = *E* denotes European immigrant group; *G* = *A* denotes Asian immigrant group;
2. The regression coefficients of this Table come from those of Tables 6.18 and 6.19
3. a, b, and c denote significant at the 1%, 5%, and 10% levels.

Source: Calculated by the author using the NLSCY (1996-97) Cycle 2 data

Table 6.21 Average predicted conditional mathematics scores of children with the resources of the children of the NBC group

Average predicted conditional mathematics scores with coefficients of different groups	Estimated values	Differences (standard error)	T -values
1) $\overline{\hat{Y}(X_N, \hat{\beta}_N)}$	0.999		
2) $\overline{\hat{Y}(X_N, \hat{\beta}_I)}$	0.998	(1)-(2) 0.001(0.001)	0.591
3) $\overline{\hat{Y}(X_N, \hat{\beta}_P)}$	1.00	(1)-(3) -0.001(0.001)	-0.81
4) $\overline{\hat{Y}(X_N, \hat{\beta}_U)}$	0.974	(1)-(4) 0.02(0.002)	14.07 [a]
5) $\overline{\hat{Y}(X_N, \hat{\beta}_E)}$	0.993	(1)-(5) 0.01(0.001)	5.17 [a]
6) $\overline{\hat{Y}(X_N, \hat{\beta}_A)}$	0.994	(1)-(6) 0.01(0.002)	2.69 [a]

Notes:

1. $\overline{\hat{Y}(X_G, \hat{\beta}_G)}$ 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 combined immigrant group; *G* = *P* denotes all parents immigrant group; *G* = *U* denotes American immigrant group; immigrant group; *G* = *E* denotes European immigrant group; *G* = *A* denotes Asian immigrant group;
2. The regression coefficients of this Table come from those of Table 6.18 and 6.19
3. a, b, and c denote significant at the 1%, 5%, and 10% levels.

Source: Calculated by the author using the NLSCY (1996-97) Cycle 2 data

Table 6.22 Average predicted conditional mathematics scores of children with the resources of children of different immigrant groups

Average predicted conditional scores with different group coefficients and resources of children	Predicted conditional scores	Differences	T-values
1) $\overline{\hat{Y}(X_I, \hat{\beta}_N)}$	1.00	**(1)-(2)** 0.01(0.002)	-3.02[a]
2) $\overline{\hat{Y}(X_I, \hat{\beta}_I)}$	1.01		
3) $\overline{\hat{Y}(X_P, \hat{\beta}_N)}$	1.00	**(3)-(4)** 0.01(0.004)	-2.62[a]
4) $\overline{\hat{Y}(X_P, \hat{\beta}_P)}$	1.01		
5) $\overline{\hat{Y}(X_U, \hat{\beta}_N)}$	1.02	**(5)-(6)** 0.02(0.01)	-1.88[c]
6) $\overline{\hat{Y}(X_U, \hat{\beta}_U)}$	1.04		
7) $\overline{\hat{Y}(X_E, \hat{\beta}_N)}$	0.997	**(7)-(8)** 0.003(0.01)	1.30
8) $\overline{\hat{Y}(X_E, \hat{\beta}_E)}$	1.00		
9) $\overline{\hat{Y}(X_A, \hat{\beta}_N)}$	0.995	**(9)-(10)** 0.03(0.01)	-2.95[a]
10) $\overline{\hat{Y}(X_A, \hat{\beta}_A)}$	1.03		

Notes: 1. $\overline{\hat{Y}(X_G, \hat{\beta}_G)}$ 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 combined immigrant group; *G* = *P* denotes all parents immigrant group; *G* = *U* denotes American immigrant group; immigrant group; *G* = *E* denotes European immigrant group; *G* = *A* denotes Asian immigrant group;

2. The regression coefficients of this Table come from those of Table 6.18 and 6.19

3. a, b, and c denote significant at the 1%, 5%, and 10% levels.

Source: Calculated by the author using the NLSCY (1996-97) Cycle 2 data

6.3.4 The association of time of residency of immigrants and mathematics scores of children: the OLS estimates of the sample of immigrants

In the case of an OLS model, the slope coefficient of *years since immigration of parents in Canada* would give the rate of change of mathematics scores as a result of a change in time of residency of immigrants in Canada. A positive and significant coefficient would indicate that mathematics score of children would improve with the time of residency of their parents in Canada. The model is estimated for the combined immigrant group and for the all parents immigrant group. Each of these two groups contains four sub-groups. Table 6.23 presents the estimates.

Consider the estimates in the second column. The positive and significant coefficient of *Asian* variable suggests that the level of mathematics score of children in the Asian immigrant group is significantly higher than that of the o*ther immigrant group.* In other words, if all other covariates were given zero values, mathematics scores of the children of the Asian immigrant group would be higher than those of the o*ther immigrant group.* On the other hand, there are no significant differences in the initial levels of mathematics scores of the children the American immigrant group, the European immigrant group, and the o*ther immigrant group.*

The coefficient of *years since immigration* is insignificant. This indicates that the mathematics scores of children in the o*ther immigrant group* do not change with the time of residency of their parents in Canada. Similar finding is observed for each of the sub-groups. This indicates that the same conclusion applies to each of the sub-groups.

The conclusion is robust to the definition of immigrant family. The mathematics performance results regarding the nature of association of time of residency and mathematics performance are similar to those of the teacher's assessment of child's overall performance. The results from both measures indicate that there is no evidence that the educational outcomes of children of immigrant families would improve with the time of residency of immigrants in Canada. This may be caused by one of several factors as described in section 6.2.4.

Table 6.23:OLS estimates of the association of time of residency of immigrants and mathematics scores of their children

Variables	**Groups**	
	Combined immigrant group	**All parents immigrant group**
Intercept	0.885165[a](0.07146378)	0.91881[a] (0.12509)
American(=1,if the family is from American group)	**-0.065310(0.04396495)**	**-0.08490 (0.08012)**
European(=1, if the family is from European group)	**0.028360(0.02699189)**	**0.01899 (0.04059)**
Asian ((=1, if the family is from Asian group)	**0.095209[a](0.04157045)**	**0.07933[c] (0.0505)**
Years since immigration in Canada	**-0.000179(0.00084634)**	**-0.000015 (0.00144)**
Years since immigration*American	**0.003168[b](0.001677)**	**0.00358 (0.00267)**
Years since immigration*European	**-0.000984(0.0010491)**	**-0.00096 (0.00185)**
Years since immigration*Asian	**-0.003977[b](0.0020658)**	**-0.00300(0.00287)**
Age of the child	-0.002021(0.00277762)	-0.00252(0.00439)
Gender (= 1, if the child is a boy, =0, if not)	0.003643(0.01072306)	-0.00711(0.01784)
Equivalent income ($)	-0.00000021(0.0000004)	-8.05165E-8 (6.529269E-7)
House (=1,if any family members own the house, = 0 if not)	0.023662[c](0.01471379)[c]	0.01834(0.02165)
Lone-parent (=0, if the child lives with two-parents, = 1, otherwise)	0.012485(0.01814020)	0.00908(0.02488)
Age of mother (years) at the birth of a child	-0.000471(0.00107698)	-0.00103 (0.00178)
Years of education of PMK	0.011611[a](0.00281132)	0.01606[a] (0.00445)
Working hours of PMK	-0.000154(0.00034322)	-0.000495(0.00058)
Poor health of PMK(=1, if health status of PMK is fair or poor, =0 otherwise	0.087213[a](0.02174704)	0.10611[a] (0.03107)
Residential movement	-0.006033[c](0.00323391)	-0.00675(0.00545)
Rural area (=1, if the child lives in a rural area, =0, otherwise)	0.012421(0.02656928)	0.04408(0.06112)
Local unemployment rate	0.003334(0.00410527)	0.00171(0.00789)
Welfare (= 1, if the family's main source of income is public assistance, = 0, otherwise)	0.001971(0.02687097)	-0.00126(0.03685)
Job rank of parents (a lower value indicates a better job status)	-0.004195[a](0.00122662)	-0.00433[b] (0.00187)
Family dysfunction	0.00228[b](0.00113847)	0.00343[c] (0.00182)
Negative parenting style	-0.019558(0.01318154)	-0.03858[c](0.02069)
Poor health of child (= 1, if health status of child is poor/fair/good, =0, otherwise)	-0.043801[a](0.01515849)	-0.05362[a] (0.02191)
Private (= 0, if the child goes to public or catholic school, = 1, otherwise)	0.026724(0.01965587)	0.02977(0.03236)
Missing days (= 0, if missing days in school are less than 3 days, = 1, if equal to or more than 3 days	-0.021718[c](0.01343424)	-0.03976[c] (0.0218)
Instruction hours in mathematics (= 1, if per week instruction hour is greater than or equal to 4 hours, = 0, if less than 4 hours)	0.011845(0.01448707)	-0.02244 (0.02446)
R^2	0.1988	0.2806
Adjusted R^2	0.1602	0.2014
F value	5.147[a]	3.54[a]
Root MSE	0.12684	0.12885
Sample size	587	272

Notes: 1.The dependent variable is scale score in mathematics test adjusted for grade levels.
2. a, b, and c denote significance levels at 1%, 5%, and 10%, respectively.
3.The coefficients in bold face suggest that the differential impacts of the corresponding variables are different for the all parents immigrant group and the combined immigrant group.

Source: Estimated by the author using the NLSCY (1996-97) Cycle 2 data

6.4 Summary of findings

The health status of children as measured by the PMK's assessment is similar for the combined immigrant group and the NBC group. However, that of the all parents immigrant group and the Asian immigrant group is slightly lower (the probability for excellent health is 57% for the NBC group, 53% for the all parents immigrant group and 52% for the Asian group). Compared to the NBC group, the probability of being in the higher health categories is significantly higher (19%) for the American immigrant group. The health status of any immigrant group is likely to be better than that of the NBC group if they were provided the resources of the children of the NBC group. This means that changing the available resources of the NBC group, the health outcomes of the all parents immigrant group and the Asian immigrant group could be improved (5% and 11% increase in probability for excellent health respectively). Also, there is statistical evidence that the health status of children would improve with the time of residency of immigrants (one year residency would increase the probability of excellent health by 3%-6%), if it were lower initially.

The educational outcomes as measured by the teacher's assessment of child's overall performance suggest that the educational outcomes of any immigrant group are significantly better than that of the NBC group; they are better even for the same level of resources. Among the sub-groups, the American immigrant group has the highest outcome. There is no evidence that they would improve with the time of residency of immigrants in Canada.

The findings from the mathematics scores models of children suggest that there is very little variation in the mathematics performances of children of immigrant families, in general, and those of the NBC group; while those of the American and the Asian immigrant groups are considerably better. There is mixed evidence for the children of any immigrant group that they are positively selected. There is no evidence that the mathematics performances of the children of immigrant families will change significantly with the time of residency of their parents in Canada.

Among the explanatory variables, the association of mother's education, health status and parenting style with health and educational outcomes are stronger. Mathematics performances are better in the private schools than in the public schools. Interesting finding is that both outcomes are better for the girls than for the boys.
The logistic model coefficients suggest that the children of immigrant families are more vulnerable compared to those of the NBC group in the following cases: I) when they live in a lone-parent family, ii) when their mothers work for a longer period of time, iii) when the parenting styles are ineffective, and hostile and inconsistent, and iv) when they come from dysfunctional families. To improve the health status of immigrant families, the children in these families should be given more attention.

The reader should note that because of the smaller sizes, the results for the immigrant sub-groups are less reliable compared to those of the combined immigrant group. Similarly, the findings of the educational outcomes are also less reliable compared to those of the health outcomes because of smaller sample size, and also because they are not corrected for sibling status effect. Moreover, most of the results differ in statistical sense. In economic sense, these variations are not substantive in magnitude. For the health outcomes, the results of the American immigrant group differ considerably in magnitude. For the educational outcomes, the results of the American immigrant group and those of the Asian immigrant group are noticeably better in magnitude.

CHAPTER 7

Summary and Conclusion

Canada is a country of immigrants. Available information on the immigrant population in Canada suggests that compared to the native-born Canadian (NBC) families, on average, immigrant families have a higher level of household income; they are more educated, less dependent on public assistance, and are more likely to be urban residents. The percentage of lone-parent families is lower in the immigrant population than in the NBC population. These are observable characteristics. Research on immigrant population (Chiswick 1978, for example) reveals that immigrants may a have higher level of unobservable characteristics: for the same level of observable resources, their average labour market outcome is higher than that of the NBCs (positively selected in terms of unobservable characteristics). During the early periods of their settlement in the host country, they experience a lower labour market outcome than their counterparts. However, within a few years of residency within the host country, their income catches up and then crosses over those of their counterparts. In other words, they assimilate in the host country. If these are the characteristics of the immigrants, then according to the intergenerational transmission theory, one can predict that the children of immigrant families are likely to have higher health and educational outcomes because of a higher level of observable and unobservable characteristics transmitted from their parents. In addition, the outcomes of these children are likely to improve with the time of residency of their parents, if lower initially. This study examines the above predictions.

The study develops a theoretical model of the sources of variation in child outcomes of two families. Differences in the productivity coefficients of children (the relationship of observable resources and child outcomes) and differences in the inputs (resources) available to the children of the two families are the broad sources of variation. However, the sources of variation in inputs could result from many factors, such as variation in parental preferences and constraints, and the choices of the children.

Empirically, this study undertakes three comparisons. First, the study compares the health and educational outcomes of the children of the NBC group with those of the immigrant group in general. Differences are also investigated within the three immigrant sub-groups: the American immigrant group, the European immigrant group and Asian immigrant group. Second, this study tests the hypothesis that the children of any immigrant group would have a higher level of health and educational outcomes for the same level of resources (a positively selected sample) assuming that Chiswick's hypothesis is applicable to all immigrants. Third, the study examines the association of time of residency of immigrants and the health and educational outcomes of their children. A rejection of Chiswick's hypothesis implies an acceptance of the alternative hypotheses: Borjas (1985, 1987, 1991) and/or Green (1999). According to Borjas (1985, 1987, 1991), immigrants from developed countries are likely to be positively selected, and those from Third World countries are likely to be negatively selected; while Green (1999) asserts that immigrants from English speaking countries assimilate faster than other immigrants; a fluency in English may be a signal of a higher ability.

The hypotheses of the study are tested using the Cycle 2 (1996-97), Master File data from the National Longitudinal Survey of Children and Youth (NLSCY). The children in the sample are 6 to 13 years of age. There are 8,760 children in the sample, 1,073 of them are from immigrant families. Two alternative definitions of an immigrant family are examined. A combined immigrant family is defined as one in which at least one of the parents is foreign-born; while an all parent immigrant family is defined as one in which one or both parents with whom the child lives are foreign-born. Health outcomes are measured by the PMK's assessment of child's health. Educational outcomes are measured by the teacher's assessment of the child's overall performance and by mathematics test scores. Ordered logit models are employed for the PMK's assessment of the child's health and the teacher's assessment of the child's overall performance. OLS models are used for the math scores. The findings are summarised according to the objective of the study.

Summary of the findings and discussion

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 lower level of unemployment rate in the region, a higher percentage of urban residency, a higher percentage of children who attend private schools, and a larger family size. However, the immigrant population is a diverse group. Resources vary with the country of origin. Every immigrant group differs in some way from the immigrant population in general. Compared to the NBC group, the combined immigrant group has a higher income and higher job ranks, a lower percentage of lone-parent families, and who depend on public assistance. On the other hand, compared to the NBC group, the all parents immigrant group (where the parent(s) with whom the child lives are foreign-born) has a higher percentage of children who live with lone-parent and whose main source of income is public assistance. Also, the all parents immigrant group has lived for a shorter period of time in Canada compared to the combined immigrant group.

Among the immigrant sub-groups, the European immigrant group is more similar to the combined immigrant group. The American immigrant group has a higher percentage of families who own a house; the PMKs in the American immigrant group have better health condition and they work, on average, fewer hours. On the other hand, a higher percentage of children in the American immigrant group have missed more days of school. Compared to the NBC group, the Asian immigrant group also has a higher percentage of families who own a house but a lower percentage of children who have missed days of school. On the other hand, the job ranks of parents are lower for this group and the immigrants in this group have lived a shorter time in Canada, which may lower the child outcomes of children in this group.

The average health and educational outcomes of children of immigrant families indicate that these outcomes are at least as good as those of the NBC families. The American immigrant group has the highest health outcomes of children, and the American and the Asian groups have the highest educational outcomes of children. The results of the health and educational outcomes from the ordered logistic and OLS estimates are summarised and discussed below:

1.PMK's assessment of child's health: Ordered logistic results and policy implications

The strongest association of house ownership, mother's education and health status, and parenting style with the health outcomes of children suggest the following: i) a higher level of assets is more important for the improvement of health status of children than many other covariates of children; ii) the parents of children need more education to be aware and take care of the health of children; iii) they also need to take care of their own health and learn more about parenting strategy to improve the health status of their children.

The ordered logistic regression results show that the various immigrant groups are significantly different from that of the NBC group. The model coefficients suggest that the children of immigrant families are more vulnerable compared to those of the NBC group in the following cases: i) when they live in a lone-parent family, ii) when their mothers work for a longer period of time, iii) when the parenting styles are ineffective, hostile and inconsistent, and iv) when they come from dysfunctional families. Hence, the children of immigrants in the above situations need more attention.

The comparison of the predicted probabilities suggests that the total variation in probabilities of the NBC group and the combined immigrant group is negligible. For both groups, the approximate probability of children's being in the excellent health category is 56%; that of being in the excellent or very good health category is 77%; and that of being in the excellent or very good or good health category is 90%. Hence, it can be concluded that the health status of the children of these two groups are similar. However, for the all parents immigrant group, the difference in probabilities is about 3-percentage point lower for any of the three health categories. Among the three immigrant sub-groups, the American immigrant group has the highest probabilities for any of these three health categories. Compared to the NBC group, the probability is not only significantly different, but also considerably higher for the American immigrant group (for example, 18-percentage point higher for the excellent health category). The European immigrant group has about 2-percentage point higher probability for the excellent health category; and the difference decreases with the inclusion of lower categories. The Asian immigrant group has a 3-percenatge point lower probability for each of the three health categories.

These findings of total variation in health outcomes are consistent with the results of Borjas (1985, 1987, 1991), Macdonald and Worswick (1999), and Worswick (2001). The results of this study indicate that the children of immigrant families in general do not impose extra burden on Canadian society. However, those of the all parents immigrant group and the Asian immigrant group may impose some burden on health care utilization, as the health outcome of children in this group is lower than that of the NBC group. The all parents immigrant group are more representative of the immigrant population. Hence, the fear that the change in the Canadian immigration policy may have a negative impact on Canadian economy applies somewhat for the health outcomes of children. However, these findings for the all parents immigrant group and the Asian immigrant group come from smaller sample size. Thus, more research with larger samples is required to ascertain this claim.

The selectivity tests using the resources of the children of the NBC group provide no evidence that the children of an immigrant family where at least one of the parents of the child is an immigrant are negatively or positively selected sample in health outcomes; while the evidence indicates that where all the parents with whom the child lives are immigrant are a positively selected sample. Since the all parents immigrant group is more representative of the immigrant population, it can be concluded that the children of immigrants in general are a positively selected sample. Within the immigrant population, the children of the three sub-groups are also a positively selected sample. The policy implication of this finding is that the present health outcomes (with own resources and group coefficients) of the all parents immigrant group and those of the Asian immigrant group which are poorer than those of the NBC group could be improved by providing the resources of the children of NBC group; 4% increase in probability for the excellent health category of the children in the all parents immigrant group and 11% increase in that in the Asian immigrant group. The children of the European and American immigrant groups do not require any additional programs or services to improve their health status, as it is better than that of the NBC group. These findings of selectivity tests are consistent with Chiswick's (1978) hypothesis that all immigrants are positively selected. In other words, immigrants in Canada may have "differential cultural capital" that is beneficial to health outcomes. However, more research is required to ascertain this factor, as this does not apply to the combined immigrant group, which has a larger sample.

The results of the assimilation model[138] suggest that the initial level of health outcomes[139] of the children of the American and the European immigrant groups is higher than that of the Asian immigrant group. The results of these models also provide statistical evidence of significant association of the time of residency of immigrants and the health outcomes of their children. For example, one year of residency of Asian immigrant parents would increase the probability of being in the higher health categories of children of the Asian immigrant group by 3 to 6-percentage points. The association is weaker for the children of the American and European immigrant groups. Assimilation models, thus, demonstrate that there seems to be an inverse relationship between the level of health status and the rate of association of time of residency of immigrants and the health outcomes of children. If health status is lower initially, the association rate is higher. For example, the Asian immigrant group has a lower outcome compared to the other two groups, but has a stronger association rate. These findings indicate that the health outcomes of an immigrant group are likely to converge to a common level. It also indicates that the association of time of residency and the health outcomes of children is weaker for the group in which parents have lived in Canada for more than 20 years than for the group in which parents have lived less than 20 years. These findings suggest that the change in immigration policy does not have any detrimental impact on the health outcomes of children in the long run, as the present gap in health status of children is likely to disappear in approximately a year.

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[138] The model that estimates the relationship of time of residency of immigrants and the health/educational outcome of their children

[139] Health outcomes here refer to the probabilities of different health categories. A higher health outcome implies that the probability is higher for the highest category and lower for the lowest category

2.Teacher's assessment of child's overall performance: ordered logit results

The ordered logit estimates indicate that the educational outcomes of different immigrant groups are different from that of the NBC group. The "child's age," "house," "biological mother's age," and "health status of the PMK" variables have a stronger association with educational outcomes for the children of the combined immigrant group compared to those of the NBC group. However, descriptive statistics show that regarding these variables, the children of the immigrants in general are in an advantaged situation.

The simulated values suggest that the school performance of the children of the combined immigrant group is better than that of the NBC group. The same applies to the children of the all parents immigrant group as well as to any immigrant sub-groups. For the NBC group, the approximate probability of children being in *near the top of the class* category is 30%; that of being in *near the top of the class* or *above the middle of the class* is 46%; and that of being in *near the top of the class or above the middle of the class* or *in the middle of the class* is 69%. The children of the combined immigrant have approximately 4% higher probability for each school performance category. The children of the all parents immigrant group have about 5% higher probability than those of the NBC group for each category.

Among the three immigrant sub-groups, the American group has the highest probability. The probabilities for each of the above school performance categories for this group are: 0.47, 0.60 and 0.76, respectively. The probabilities of children in the European immigrant group for these three performance categories are: 0.34, 0.49, and 0.72; while those of the Asian immigrant group are: 0.39, 0.53, and 0.72. These findings are consistent with the raw mean score of the teacher's assessment of child's overall performance. The findings for the American immigrant group are consistent with the results of Macdonald and Worswick (1999), and Worswick (2001).

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. The highest health and educational outcomes of the children of American immigrant group may have two policy implications: the children of an advanced industrialised country are likely to generate better educational outcomes than those of a less developed country and/or the English language ability of parents may be an important factor in educational outcomes of children. Hence, immigration policy needs to give more attention on these factors for better educational outcomes in Canada.

The selectivity tests suggest that the children of any immigrant groups have better school performances than do the children of the NBC group even for the same level of resources. The findings are consistent with those of Chiswick (1978) that all immigrants are positively selected. Hence, it would be plausible to conclude that the children of any immigrant group are positively selected sample in school performance. This indicates that they may have "differential cultural capital" which is favourable to educational outcomes of children. This decomposition of the variation in total educational 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 outcomes with the resources of the NBC group would be lower than those with their own resources, it is not recommended to change resource levels of the immigrant groups which appear already higher.

The estimates of assimilation model provide no evidence that the educational outcomes of children would improve with the time of residency of immigrants. The reason could be that the school performance of children in every immigrant group is already better than those in the NBC group and there may not be further scope to improve it with the time of their parents. Hence, there is no need to be concerned about the change in the school performance of children in immigrant families. Or, there may be shortcomings in the Canadian school system that prevents the educational outcomes of children of immigrant families to progress with the time of residency of their parents.

3.Mathematics tests scores: OLS results and policy implications

An insignificant coefficient of the *Inverse of the Mills ratio* variable in the Heckman model variable indicates that there would not be any significant differences in the mathematics performances of the children who are present and those who are absent in the tests. An interesting finding is that the mathematics performances of the children are better in private schools than in public or publicly funded Catholic schools. Since the percentage of children who attend private schools is higher for immigrant families, they are also in advantaged situation regarding this outcome.

The simulation results from the OLS models show that the outcome of the combined immigrant group is higher than that of the NBC group. With the change in the definition of immigrant group, the conclusion does not change. The outcome for the all parents immigrant group is even better than that of the combined immigrant group. Further, the conditional mathematics score of any immigrant group is larger than that of the NBC group. This finding is consistent with that of Worswick (2001). It is interesting to note that despite the evidence of statistically significant differences, the magnitudes of the differences indicates that the mathematics performances of different groups, except the American and Asian groups, are almost similar. Among the three immigrant sub-groups, the American immigrant group has the highest outcome and the European immigrant group has the lowest. The performances of the Asian children are very close to those of the American children. Thus, it seems that mathematics performance does not depend on the language of the parents. It would be useful to mention that all the parents in the American immigrant group are recorded as knowing one of the official languages in Canada; whereas, this is not the case for the other two groups.

The selectivity tests using the resources of the NBC group suggest that there is no evidence that the children of the immigrant group in general are positively or negatively selected; while the three immigrant sub-groups are negatively selected. On the other hand, the same tests with the resources of the immigrant group indicate that the children of the immigrant family in general are positively selected. However, among the sub-groups, there is evidence that the children of the American group and those of the Asian immigrant group are positively selected. The findings of the children of the Asian immigrant group are not consistent with the prediction following Borjas.

The results of the assimilation models suggest that the mathematics scores of children do not improve with the time of residency of immigrants. This finding is similar to that of the teacher's assessment of child's overall performance. Since the mathematics performances of the children of immigrant families are at least as good as those of the NBC families, no program or policy changes are necessary. However, more research is required to discover the causes of the stagnant performance of children in immigrant families. While the mathematics scores results do not lead to exactly the same conclusion as those of the teacher's assessment of child's overall performances; they are consistent in most of the cases. Only the selectivity test results are different. Since sample sizes are larger for the model of teacher's assessment of child's performances than for the model of mathematics scores, the former results are more reliable than the latter. Also, the mathematics score may not fully represent the educational outcomes of children. Although they are objective, these scores reflect partial educational outcomes.

To conclude, the lower health outcome for the children of the all parents immigrant group and the Asian immigrant group suggests that changing immigration policy that shifted the country of origin from traditional sources toward less developed regions, may have a short-term negative impact on health outcomes of children in Canada. 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 outcomes. The higher health and educational outcomes of children of immigrant families for the same level of resources suggest that there is a "differential cultural capital effect" and "skilled immigrant effect" in child outcomes. These children are likely to add more in future economic growth and prosperity. The findings of this study demonstrate that the children of immigrant families are assimilating human capital and fitting into Canadian society quite well.

Some unresolved issues and scope for further research.

The findings of the health outcomes in this study reveal that the children of the all parents immigrant group have lower health outcomes than do the children of the NBC group. Since this group is more representative of the immigrant population in Canada than is the combined immigrant group, this finding may be a concern for the policy makers. Hence, more research is needed with larger samples to test the validity of the results. Similar research is needed for the sub-groups, specifically, for the Asian and American immigrant groups.

The finding that the educational outcomes of children of immigrants do not improve with the time of residency of immigrant parents call for some discussion. This is not a present concern as the educational outcomes of immigrant families are already higher than those of the native-born Canadian families, but it is necessary for longer run policies to determine the underlying causes of this finding. One or more of the following factors could be responsible for this outcome: i) the school system in Canada may be weaker that could prevent the progress of educational outcomes of immigrant families; ii) the preferences of the immigrants with the time of residency may change which could be less beneficial to educational outcomes of their children; iii) may be the immigrant parents are not assimilating in Canada that stops the progress of the educational outcomes of their children; and iv) parents' time of residency or assimilation may not be an important covariates of child's educational outcomes. Hence, more research is necessary to determine the causes of stagnant educational outcomes of children of immigrant families in Canada.

The results of the selectivity tests in this study show that they are not robust to the level of resources used. The reason may be that sample sizes are different. To determine whether or not this factor is responsible the same test with a larger sample of immigrants would be useful.

This study does not correct the endogeneity bias that may arise because of using working hours of mothers. A search for a proper instrument of working hours of mothers and applying instrumental variable methodology could be a topic for future research. Similarly, a future research may consider the simultaneity of the parenting strategy and health and educational outcomes.

Finally, the findings of health outcomes are not robust to measures.[140] Hence, further research on health outcomes is necessary to reach a better conclusion.

[140]The findings from the HUI estimates indicate the opposite situation for the Asian immigrant group.

APPENDIX 1

Income and Inequality

Table A1.1: GNP and Income Inequality

Countries	Income		Inequality			
	GNP (US$)	Year	Percentage share of household income			Year
			Lowest 20%	Highest 20%	Ratio of highest 20% and lowest 20%[a]	
Canada	9,590	1978	3.8	42.0	11.053	1977
U.S.	9, 976	1978	4.6	50.3	10.93	1978
Canada	10,130	1980	5.3	40	7.55	1981
Asian countries						
Bangladesh	130	1980	9.3	39.0	4.19	1981-82
Saudi Arabia	2,150	1980	6.9	40.0	5.8	1980-81
Singapore	4,430	1980	5.1	48.9	9.59	1982-83
Hongkong	4240	1980	5.4	47.0	8.7	1980
India	240	1980	8.1	41.4	5.11	1983
Srilanka	230	1980	5.8	34.7	5.98	1980-81
Indonesia	430	1980	6.6	49.4	7.49	1976
Korea	1,130	1979	5.7	45.3	7.95	1976
Japan	9,890	1980	8.7	37.5	4.31	1976
China	290	1980	5.8	50.4	8.69	
Canada	6,930	1970-75	5.0	41.0	8.2	1969
European countries						
Germany	2,550	1970-75	6.5	46.2	7.11	1973
UK	3,780	1970-75	6.3	38.8	6.16	1973
France	5,950	1970-75	4.3	46.9	10.91	1970
Turkey	900	1970-75	3.4	56.5	16.62	1973
Netherlands	5,750	1970-75	6.5	42.9	6.6	1967
Norway	4,660	1973	6.3	37.3	5.92	1970
Sweden	5,910	1973	6.6	37.0	5.61	1972
Ireland	2,150	1973	7.0	39.4	5.63	1973

Note: a denotes author's calculation

Source: World Development Report, various issues, The World Bank, Oxford University Press; World Bank Atlas: Population, per Capita Product and Growth Rates, various issues.

APPENDIX 2

Explanatory variables and their expected association with child outcomes

Birthplace of parents

From the National Longitudinal Survey of Children and Youth (NLSCY), it can be known whether the parents (PMK and the spouse of the PMK) of the child were born in one of the following five places: Canada, the U.S., Europe, Asia, or other places.[141] As described in Section 4.4 of Chapter 4, an immigrant family is defined according to the birthplace of parents. In the health and educational outcome regression models, *birthplace* is a dummy variable = 1, if parents are foreign-born, = 0, if native-born Canadian (NBC). The objective of the study is to compare the health and educational outcomes of NBC and immigrant families. This variable is included in the model to assess the differences in the health and educational outcomes of the children in immigrant and NBC families. This variable is expected to influence the preferences of parents and children, and the productivity or efficiency of children. According to the selectivity hypothesis, this variable is expected to have a positive association with child health and educational outcomes of children.

Years since immigration of parents

There is information in the NLSCY about the years since the PMK/Spouse immigrated in Canada.[142] From this information, the "years since immigration of parents in Canada" is derived (see Section 4.4 of Chapter 4 for more). This variable is taken to represent the time of residency of parents in Canada. The time of residency could have a mixed impact on the health and educational outcomes of children through a change in the preference function of parents, and a positive impact through a change in their constraints. It is more likely that the impact of change in constraints would be higher than that of change in the preference function. Hence, the net association is expected to be positive.

Age of the child (years)

The health and educational outcomes of children are likely to change with child's age. With the age of the child, the preferences and constraints of the child and the preferences

[141] The NLSCY code for the variables are BSDPD04 and BSDSD04.
[142] The NLSCY code for the variables are BSDPD02 and BSDSD02.

of the parents change. It is not clearly understood whether or not the health and educational outcomes of children aged 6-13 will improve with their age.

Gender

It is a dummy variable takes value 1, if the child is a boy, value 0, if the child is a girl. Biologically, there are some differences between a boy and a girl. Their productivities and preferences could be different. Furthermore, parental preferences for investment in a child could also vary with gender. Hence, the outcomes of girls and boys are likely to be different. However, it is not clear whether the health and educational outcomes of girls would be higher or lower compared to those of the boys.

Equivalent Income

Equivalent income of household is constructed using LIS (Luxembourg Income Study) equivalent scale.

Equivalent income = Household income/equivalent scale

=household income before taxes/square root of family size

This income variable affects the constraints and hence, expected to be positively associated with health and educational outcomes of children. However, this variable sometimes reflects the temporary economic condition, which may not capture the impact of permanent income.

House

A dummy variable takes value 1, if any family members own a house, value 0, if not. This variable is used as a proxy for assets and wealth, and is expected to influence the constraints of parents, and hence its expected relationship with children's outcome is positive.

Lone-parent status

Lone-parent status is a binary variable takes value 1, if the child lives with a lone-parent, value 0, otherwise. Family structure or two-parent family could be viewed as social capital in the family. This variable changes the constraints of parents, other than income change, in many ways. For example, a lone-parent family is likely to have less parental time available for a child compared to a two-parents family. Hence, this variable is expected to have a negative association with child's health and educational outcomes.

Residential movement (number of movements)

Children move from one residential area to another with their parents. The NLSCY provides information about how many times the child moved with his/her parents.[143] From an economist's point of view, mobility is one kind of capital. Usually, parents move from one place to another if they feel that the new place would be better for them. From an economist's point of view, a residential movement is likely to give better home environment for children in the long run. Sociologists and development psychologists, on the other hand, believe that a residential movement causes a psychological stress on children and hence, has a negative impact. However, if everything remains the same, residential movement is expected to have a negative association with child outcomes.

Age of biological mother (years) at birth of child

Age of mother could be a proxy for labour market experience which affects the constraints of parents. On the other hand, preferences change with age. Patience and child caring knowledge increase with the age of mother. Thus, mother's age is expected to be positively associated with the health and educational outcomes of children. Since the age of the PMK and household income are expected to be highly correlated, age of biological mother at the birth of child, provided in the NLSCY data set, is used for a proxy of actual age at the time of the survey. This variable is not highly correlated with labour market experience, but it is highly correlated with mother's age.

Years of education of the PMK

This is a form of human capital that has a significant positive impact on the labour market outcome and hence, on the constraints of the family. Besides, educated mothers are also efficient users of inputs of health and educational outcomes of children. This variable is likely to have a positive influence on parental preferences for investment in children. Hence, the predicted association is positive.

Weekly working hours of PMK

This variable[144] 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. With an increase in weekly working hours of PMK, the home time available for the children decreases. Holding income

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[143] The NLSCY code for the variable is BEDCb11A

[144] The NLSCY code for the variable is BLFPb14A;

constant, this variable is expected to be negatively associated with the health and educational outcomes of children.

Ethnic weekly working hours of PMK

This variable is a proxy for actual working hours of the PMK. In the NLSCY, the information on birth countries of the PMK[145] is provided besides the information on five broader groups (birthplace). Using this information, average weekly working hours of the PMKs who are from a particular country has been estimated. This average working hours variable is termed as "ethnic weekly working hours." Note that there is no variation in the ethnic working hours of PMKs who are born in Canada, and hence, no separate regression can be estimated for the NBC group. To bring variations, the provinces in Canada are considered as the birth countries of the PMKs of the NBC group. The average weekly working hours of PMKs of different provinces are considered as the "ethnic weekly working hours of the PMK" of the NBC group. Since the "ethnic working weekly hours" variable is a proxy for the "actual weekly working hours," it is expected to be negatively associated with health and educational outcomes of children.

Poor health status of PMK

In the NLSCY, the PMK's health status is an ordered variable with the following 5 response categories (with values): excellent (1); very good (2); good (3); Fair (4); or poor (5).

In this study, poor health condition of the PMK is constructed as a binary variable, which takes value 1, if the PMK's health status is fair or poor, the value 0, otherwise. The PMK's health status is a form of human capital which affects the constraints of parents. A healthy mother is able to take more care of her children than a mother with poor health condition. Also, a healthy mother is more likely to give birth to a healthy child compared to a mother who has poor health status. Hence, poor health status of the PMK is expected to be negatively associated with the health and educational outcomes of children.

Rural area

This variable is used to capture the impact of urbanization on outcomes of children. In the NLSCY, Urban-Rural code variable takes 5 values as follows:

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[145] The NLSCY code for the variables is BSDPQ1. This variable is in the Secondary file.

(01) Rural area
(02) Urban, population<30,000;
(03) Urban, population 30,000 and 99,999;
(04) Urban, population 100,000 and 499,999;
(05) Urban population 500,000 or over;

In this study, the rural area is a binary variable. It takes the value 1, if NLSCY Urban-Rural code is equal to 1, the value 0, otherwise. This variable is included in the outcomes models as a proxy for public resources. An urban location has more public resources available for the children than does a rural location. Similarly, it can also work as a proxy for cost of inputs (covariates) of child outcome. Cost of inputs could be lower in the urban areas compared to the rural areas. Hence, rural area is expected to be negatively associated with the health and educational outcomes of children.

Provincial unemployment rate (1996)

This variable is used as proxy for the state of the economy. The higher the unemployment rate in the region, the lower would be the opportunity for parents. This variable is expected to have a negative influence on constraints, and hence, on the health and educational outcomes of children. Since the second cycle of the NLSCY was undertaken in 1996-1997, average provincial unemployment rates of 1996 are used.

Welfare

A dummy variable takes the value 1, if the main source of income of the household is unemployment insurance, worker's compensation or welfare, and takes the value 0, otherwise. According to development psychologist, sources of income may have independent negative impacts on child psychology. Dependency on public assistance may decrease the self–esteem of parents. Further, children could also suffer from inferiority complex, which is likely to affect child outcomes negatively.

Job rank (of the parents)

If the PMK is the only working person in the household, 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 of the spouse/partner. If none of them work, the value is set to 17, the lowest category. In the studied sample there are 781 (8%) children whose parents do not work.

Job rank takes the values as follows:

Self employed professional (01)

Employed professional (02)

High level Management (03)

Semi-professional (04)

Technician (05)

Middle manager (06)

Supervisor (07)

Foreman/forewoman (08)

Skilled clerical/sales/service (09)

Skilled crafts and trade (10)

Farmer (11)

Semi -skilled clerical/sales (12)

Semi-skilled manual (13)

Unskilled clerical/sales/service (14)

Unskilled manual (15)

Farm labourer (16)

According to development psychologists, occupational prestige has independent impact from the impact of income on child development outcomes.[146] A higher job rank inspires parents to motivate their children to have better development outcomes. The occupational status gives parents self-esteem and controlling power over children. As a result, this variable is expected to have a positive association with child outcomes (negative coefficient).

Family dysfunction (family functioning score in the NLSCY)

This is a derived variable in the NLSCY. The score of it was derived using the unweighted items of the following variables:

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

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[146] See Chapter 2.

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

L. We confide in each other.

where each of the above variables takes the following values: strongly agree (1); agree (2); disagree (3); or strongly agree (4).

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. A child from a dysfunctional family is likely to get less parental care compared to a child who comes from a less dysfunctional family. This variable is expected to a have negative coefficient. The magnitude of its coefficient does not have a usual interpretation.

Negative parenting style

For the children aged 6-11, ineffective parenting style[147] scores as derived in the NLSCY are used to denote negative parenting style. Ineffective parenting style is derived from the Parenting Practices Scale developed by Strayhorn and Weidman (1988), with additional questions developed by Dr. M. Boyle at Chedoke-McMaster Hospital (Statistics Canada 1996). Ineffective parenting style refers to ineffective interactions with the child, as reported by the PMK. It was assessed through the following seven questions:

1. How often do you get annoyed with the child for saying or doing something he/she is not supposed to?

[147] The NLSCY code for this variable is BPRCS03.

2. Of all the times that you talk to the child about his/her behaviour, what proportion is praise?
3. Of all the times that you talk to the child about his/her behaviour, what proportion is disapproval?
4. How often do you get angry when you punish the child?
5. How often do you think that the kind of punishment you give the child depends on your mood?
6. How often do you feel you are having problems managing the child in general?
7. How often do you have to discipline the child repeatedly for the same thing?

The response options of the first question were (with value):
never (1); about once a week or less (2); a few times a week (3); one or two times a day (4); or many times a day (5).

The response options of each of the other six questions were (with value):[148]
never (1); less than half the time (2); about half the time (3); more than half the time (4); or all the time (5). The derived total score varies between 0 and 25, with a mean score of 8.86 for the sample. In this study, the individual score is divided by the mean score and hence, the mean score is 1. A higher score indicates a higher level of ineffective/hostile parenting.

For the children who are 12 and 13 years old, parental rejection scores[149] are used to denote negative parenting style. This variable was constructed using the following seven questions:

1. How often do you soon forget a rule that you have made?
2. How often do you nag?
3. How often do you keep rules only when it suits you?
4. How often do you get angry and yell at?
5. How often do you threaten punishment more often than you use it?

[148] The values for the second question were reversed
[149] The NLSCY code is BPRCS04

6. How often do you enforce a rule or do not enforce a rule depending on your mood?
7. How often do you hit or threaten to do so?

The response options for each of the above questions were (with value): never (1); rarely (2); sometimes (3); often (4); or always (5). The total score ranges from 0 and 28 with the mean value of 8.94 in the studied sample. In this study, the individual score is divided by the mean score and hence, the mean score is 1. A higher score indicates a higher level of parental rejection. This variable is expected to have a negative association with the health and educational outcomes of children.

Private school

A binary variable takes the value 0, if the child attends to public or publicly funded catholic schools, the value 1, otherwise. Compared to the public schools, investment and resources per student are higher in the private schools. Hence, it is expected that educational outcomes would be higher in the private schools than in the public schools. Attending in a public/private school reflects the preferences of parents for educational outcomes of the child.

Missing days of school

It is a binary variable, takes the value 1, if the missing days of school since the child started school in the fall are equal to or above 3 days, 0, if it is less than 3 days. This variable is expected to be negatively associated with educational outcomes of children.

Instruction time in mathematics

It is a binary variable takes the value 0, if the per week instruction time in mathematics is less than 4 hours, 1, if the per week instruction time in mathematics is equal to or above 4 hours. With more instruction time in mathematics the child is likely to learn more and perform better. Hence, the mathematics performance of a child who receives more than or equal to 4 hours instruction time per week is expected to be higher than that of a child who receives less instruction time. Hence, the coefficient of that variable is expected to be positive.

APPENDIX 3

Findings of PMK's assessment of child's health

Table A3.1:Ordered logit estimates of health model with ethnic working hours of PMK

Variables	Coefficients (standard error)	
Groups	NBC & Combined immigrant group	NBC & All parents immigrant group
Intercept 1	-0.1710(0.2908)	-0.1757(0.28620)
Intercept 2	0.7933(0.2909)[a]	0.8028(0.2864)[a]
Intercept 3	1.7413(0.2923)[a]	1.7521(0.2878)[a]
Age of the child	0.00792(0.00729)	0.00796(0.00717)
Gender (= 1, if the child is a boy, =0, if a girl)	-0.0233(0.0306)	-0.0233(0.0301)
Equivalent Income ($)	7.072E-6(1.226E-6)[a]	7.093E-6(1.207E-6)[a]
House (= 1, if any family members own the house, = 0, if not)	0.1141(0.0447)[a]	0.1146(0.0440)[a]
Lone-parent (= 1, if child lives with a lone-parent, = 0, otherwise)	-0.0227(0.0467)	-0.0226(0.0459)
Age of mother (years) at birth of child	-0.00307(0.00323)	-0.00310(0.00318
Years of education of PMK	0.0420(0.00886)[a]	0.0422(0.00872)[a]
Ethnic weekly working hours of PMK	-0.00308(0.0104)	-0.00313(0.0102)
Poor health of PMK (= 1, if health status of PMK is poor/ fair.)	-0.3371(0.0598)[a]	-0.3388(0.0589)[a]
Residential movement	-0.0201(0.00750)[a]	-0.0202(0.00738)[a]
Rural area (= 1, if the child lives in a rural area, = 0, otherwise)	-0.0177(0.0424)	-0.0179(0.0417)
Provincial unemployment rate (1996)	0.0251(0.00678)[a]	0.0252(0.00667)[a]
Welfare (= 1, if family's main source of income is public assistance)	0.1244(0.0608)[b]	0.1244(0.0598)
Job rank of parents (a lower value indicates a higher job status)	-0.0136(0.00398)[a]	-0.0136(0.00392)[a]
Family dysfunction (a higher value indicates more dysfunctional)	-0.0246(0.00321)[a]	-0.0247(0.00316)[a]
Negative parenting style (a higher value indicates hostile parenting)	-0.1462(0.0360)[a]	-0.1469(0.0355)[a]
Birthplace (= 1, if parents are foreign born ,= 0 , if not)	0.0176(0.4707)	-0.6467(0.5460)
Age of the child* Birthplace	0.0166(0.0150)	**0.0525(0.0178)[a]**
Gender * Birthplace	0.0641(0.0644)	0.1103(0.0789)
Equivalent income* Birthplace	-4.71E-7(2.277E-6)	**-5.17E-6(2.773E-6)[c]**
House * Birthplace	-0.0212(0.0902)	-0.0130(0.1039)
Lone-parent* Birthplace	-0.4100(0.1013)[a]	-0.3513(0.1113)[a]
Age of PMK * Birthplace	0.000369(0.0063)	-0.00049(0.0074)
Years of education of PMK* Birthplace	-0.0139(0.0164)	-0.0140(0.0188)
Ethnic working hours of PMK* Birthplace	0.00176(0.0120)	0.0177(0.0122)
Poor health status of PMK* Birthplace	0.0627(0.1180)	**0.4060(0.1359)[a]**
Residential movement* Birthplace	-0.0184(0.0172)	-0.00711(0.0217)
Rural area* Birthplace	-0.1701(0.1523)	0.4945(0.3202)
Provincial unemployment rate *Birthplace	0.0162(0.0222)	0.0241(0.0307)
Welfare *Birthplace	0.3243(0.1388)[b]	0.3543 (0.1506)[b]
Job rank *Birthplace	0.0204(0.00787)[a]	0.0237(0.00917)[a]
Family dysfunction *Birthplace	-0.0272(0.00682)[a]	-0.0522(0.00860)[a]
Negative parenting style *Birthplace	-0.0900(0.0772)	-0.0542 (0.0933)
-2LOGL(Intercept and covariates)	14882.66	14022.07
Chi-square (score test) with 66 DF	346.6163	391.32
Sample Size	7,303	6,816

Notes: 1.The dependent variable is the PMK's assessment of the child's health.
2.a, b, and c denote significance levels at the 1%, 5% and 10%, respectively.
3.The coefficients in boldface suggest that the differential impacts of the corresponding variables are different for the all parents immigrant group and the combined immigrant group.
4. Prepared by the author using the NLSCY (1996-97) Cycle 2 data

Table A3.2:Ordered Logit model of health outcome of children of NBC and immigrant families: estimation from separate samples with actual working hours

Variables	**Coefficients (standard error)**		
Groups	**NBC group**	**Combined Immigrant group**	**All parents Immigrant group**
Intercept 1	-0.2613(0.1817)	-0.0745(0.4901)	-0.3785(0.7464)
Intercept 2	0.7249(0.1819)[a]	0.8093(0.4908)[c]	0.5384(0.7467)
Intercept 3	1.6394(0.1842)[a]	1.8696(0.4978)[a]	1.6404(0.7551)[b]
Age of the child	0.00828(0.00683)	0.0265(0.01820	0.0628(0.0265)[b]
Gender (= 1, if the child is a boy)	-0.0224(0.0287)	0.0472(0.0789)	0.0811(0.1193)
Equivalent income($)	7.421E-6(1.174E-6)[a]	7.462E-6(2.714E-6)[a]	4.442E-6(4.146E-6)
House (= 1, if any family members own the house, = 0, if not)	0.1138(0.0419)[a]	0.1011(0.1086)	0.1035(0.15240
Lone-parent (= 1, if the child lives with a lone-parent, = 0, otherwise)	-0.0129(0.0447)	-0.4070(0.1260)[a]	-0.3831(0.1650)[b]
Age of mother (years) at birth of child	-0.00318(0.00303)	-0.00361(0.00755)	-0.00534(0.0110)
Years of education of PMK	0.0436(0.00832)[a]	0.0246(0.0190)	0.0136(0.0273)
Weekly working hours of PMK	-0.00072(0.000885)	-0.00448(0.00229)[b]	-0.00442(0.00347)
Poor health condition of PMK (= 1, if the health status of PMK is poor or fair, = 0, other wise)	-0.3392(0.0561)[a]	-0.2726(0.1436)[b]	0.0570(0.2060)
Residential movement	-0.0196(0.00704)[a]	-0.0395(0.0215)[c]	-0.0359(0.0333)
Rural area (=1, if the child lives in a rural area, = 0, otherwise)	-0.0205(0.0398)	-0.1978(0.2021)	0.4304(0.5139)
Provincial unemployment rate (1996)	0.0263(0.00614)[a]	0.0387(0.0291)	0.0597(0.0473)
Welfare (= 1, if the family's main source of income is welfare assistance, = 0, otherwise)	0.1166(0.0582)[b]	0.4220(0.1746)[b]	0.4437(0.2280)[b]
Job rank of parents (a lower value indicates a higher job status)	-0.0136(0.00373)[a]	0.00929(0.00935)	0.0156(0.0132)
Family dysfunction (a higher value indicates more dysfunctional)	-0.0247(0.00301)[a]	-0.0507(0.00833)[a]	-0.0768(0.0130)[a]
Negative parenting style (a higher value indicates hostile parenting)	-0.1489(0.0338)[a]	-0.2188(0.0951)[b]	-0.1810(0.1401)
-2LOGL	12981.11	1804.53	852.23
Chi-Square (score test) with 32 DF	135.70[a]	100.25[a]	94.08[a]
Sample Size	6379	891	404

Notes: 1. The dependent variable is the PMK's assessment of the child's health
2. a, b, and c denote significance levels at the 1%, 5%, and 10%, respectively .

Source: Prepared by the author using the NLSCY (1996-97) Cycle 2 data

Table A3.3: The ordered logit extended model of health outcome of children of different immigrant sub-groups: the estimation from separate samples with actual working hours

Variables	Coefficients (standard errors)		
Immigrant sub-Groups	**American**	**European**	**Asian**
Intercept 1	-2.1962(2.1460)	1.7122(.8610)[b]	0.8250(1.6511)
Intercept 2	-1.3730(2.1408)	2.5081(0.8647)[a]	1.7529(1.6562)
Intercept 3	0.2760(2.1769)	3.8930(0.8881)[a]	3.5601(1.7051)[b]
Age of the child	0.0950(0.0729)	-0.0609(0.0307)[b]	-0.0428(0.0574)
Gender (= 1, if the child is a boy, = 0, if a girl)	0.2277(0.3285)	0.00795(0.1261)	0.5646(0.2729)[b]
Equivalent Income($)	-1.35E-6(0.00001)	0.00002(5E-6)[a]	-0.00001(7.877E-6)
House (= 1, if any family members own the house, = 0, if not)	0.5263(0.4445)	0.2516(0.1750)	-0.8742(0.6512)
Lone-parent (= 1, if the child lives with a lone-parent, = 0, otherwise)	1.0052(0.7158)	0.4543(0.2471)[a]	0.0245(0.5340)
Age of mother (years) at birth of child	0.0139(0.0314)	-0.0199(0.0126)	-0.0145(0.0287)
Years of education of PMK	0.2238(0.1087)[a]	0.0309(0.0328)	0.0696(0.0621)
Weekly working hours of PMK	-0.00451(0.0086)	-0.00614(0.00416)	0.00711(0.0082)
Poor health condition of PMK (= 1, if the health status of PMK is poor or fair, = 0, other wise)	-0.7618(0.6536)	-0.8479(0.2690)[a]	1.4000(1.0275)
Residential movement	-0.2071(0.0767)[a]	0.0276(0.0350)	-0.2447(0.0838)[a]
Rural area (=1, if the child lives in a rural area, =0 otherwise)	-1.2555(0.4892)[a]	-0.1530(0.2782)	0.3624(1.4547)
Provincial unemployment rate (1996)	0.00588(0.1183)	-0.0564(0.0448)	0.1957(0.1291)
Welfare (=1, if the family's main source of income is public assistance = 0, otherwise)	1.2456(0.7248)[c]	0.4413(0.4315)	9.1745(5.4683)[c]
Job rank of parents (a lower value indicates a higher job status)	-0.0330(0.0437)	0.0180(0.0169)	-0.0424(0.035)
Family dysfunction (a higher value indicates more dysfunctional)	-0.1140(0.0398)[a]	-0.0451(0.0135)[a]	-0.0737(0.0289)[a]
Negative parenting style (a higher value indicates hostile parenting)	-0.0106(0.3708)	-0.5086(0.1689)[a]	-0.4779(0.3193)
-2LOGL	116.42	697.12	189.23
Chi-Square (score test) with 32 DF	23.61	47.55[a]	40.63[a]
Sample Size	115	385	101

Notes: 1.The dependent variable is the PMK's assessment of the child's health
2.a, b, and c denote significance levels at the 1%, 5% and 10%, respectively.

Source: Prepared by the author using the NLSCY (1996-97) Cycle 2 data

Table A3.4: Simulated probabilities of being in different health categories of children using coefficients from the separate regression models

Probabilities with productivity coefficients	Probabilities with resource levels					
	NBC Group(X_n)	Combined immigrant group(X_{CI})	All parents immigrant group(X_{PI})	American group(X_U)	European group(X_E)	Asian group(X_A)
NBC group (β_N)	0.564 0.772 0.893	0.563 0.772 0.892	0.552 0.764 0.889	0.601 0.797 0.906	0.573 0.779 0.897	0.561 0.770 0.892
Combined immigrant group(β_{CI})	0.569 0.755 0.896	0.567 0.754 0.896				
All parents immigrant group(β_{PI})	0.577 0.763 0.903		0.532 0.730 0.887			
American group (β_U)	0.655 0.785 0.935			0.757 0.861 0.964		
European group(β_E)	0.595 0.755 0.920				0.596 0.757 0.922	
Asian group(β_A)	0.642 0.793 0.950					0.537 0.726 0.935

Notes:

1.The first number in each box denotes the probability of being in the excellent health category; the second number denotes the probability of being in the excellent or very good health category; and the third number in each box denotes the probability of being in the in the excellent, or very good or good health category.

2. The regression coefficients used in this table come from Tables A3. 2 and A3.3 in Appendix 3

Source: Calculated by the author using the NLSCY (1996-97) Cycle 2 data

APPENDIX 4
Health Utility Index and its Findings

Appendix 4.1 Health Utilities Index Mark III

Health is a multi-dimensional concept. The Health Utilities Index (HUI)[150] is a multi-attribute health status classification system to the measurement of health status and assessment of health related quality of life (HRQL). This is a two-step generic approach to the assessment of health related quality of life (HRQL). The first step is to assess health status (defined by capacity), independently (at least conceptually) of the value that the respondent attaches to that health status. In the second step, a multi-attribute preference function is used to translate categorical health status, as defined in the first step, into cardinal scores on the scale of no impairments equal to 1.00 and dead equals to 0.00. In the National Longitudinal Survey of Children and Youth, health status of a child is measured by Health Utilities Index Mark III (HUI3) system.[151]

HUI3 system[152], that is in current use, consist of 8 attributes: vision hearing, speech, ambulation, dexterity, emotion, cognition, and pain as shown in Table A4.1. This system specifies 5 or 6 levels per attribute and a combination of levels across the attributes constitutes a health state. The health status of person at a particular point in time is described by the HUI3 system as a 8-element vector ($x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8$), in which x_i describes the level (1 to 5, or 1 to 6) for each of the 8 attributes. Level 5 or 6 denotes severely disabled while level 1 denotes normal. Note "the HUI system will not distinguish between a person who is very physically fit (supranormal ambulation) and a person with normal capacity for ambulation. The importance of this omission when health status is defined in capacity terms is not obvious. When a concept of performance to define health status is used instead, the omission does imply a loss of descriptive

[150] See Furlong et al. (1989, 1998), Torrance et al. (1992,1995, 1996), and Feeny et al. (1993, 1994, 1995, 1996), for details. Information on Health Utilities Index (HUI) is also available at http:www.fhs.mcmaster.ca/hug/index.htm and http://www.healthutilities.com

[151] HUI3 system has also been implemented in every other major Canadian general population health survey since 1990, for example, the Ontario Health Survey (Ontario Ministry of Health 1993); the 1991 Canadian General Social Survey (Roberge et.al 1995); the National Population Health Survey (Statistics Canada 1998a; 1998b).

[152] The classification system has been described in details in Feeny et al (1993, 1994, 1995, 1996) and the derivation of the scoring formula has been described in details in Furlong et.al (1998).

completeness. There is some evidence indicating that supranormal ambulation or emotion has prognostic value. Thus, in the context of predictive uses (as opposed to discriminative or evaluative uses), the omission of supranormal may have important implications (Feeny et. al. 1995, p.497)."

Mathematically, there are 972000 unique health states. Multi-attribute HUI3 system is complement to multi-attribute utility theory, which provides the foundation for estimating a scoring function that is used to value 972,000 health states. Individuals have preferences for alternative health outcomes and they can express them, which may be cardinal or ordinal. There are two types of cardinal preferences: values and utilities. Values are cardinal preferences measured under certainty and utilities are preferences measured under uncertainty. Von Neumann- Morgenstern utility theory (1944), which measures outcome in an uncertain condition, is the basis for scoring the utilities of HUI3 classification system (Furlong et.al 1998). The three most widely used instruments to measure preferences for health status are: visual analog scale (VAS), the time-trade off, and standard gamble (SG).[153]

Visual analog scale

A typical rating scale consists of a line drawn on a page with clearly defined end points such as 'death/least desirable' at one end and ' perfect health/most desirable' at the other. The remaining health states are then located on the line between these two in order of their preferences, such that the intervals between them correspond to the differences in preference between the health states, as perceived by the respondent. The scale is measured from 0 assigned to the worst health state of the group and 1 assigned to the best. The person is asked to select the best and the worst health from the group and then locate the other states on the scale relative to each other, according to interval-scale principle.

Time trade-off method

Within this method, the technique is to vary the length of time in each health state with treatment choice. For example, the respondent is presented with two alternatives and asked to select the more preferred: health state B for a normal life expectancy (age-

[153] See Feeny et al. (1996) for details.

specific) of t years, or health state A (perfect health) for a shorter life expectancy of x years. Time x would be varied systematically to find that value of x at which the subject is just indifferent between the two possibilities. Then the time trade-off score for health state B is x/t.

The standard gamble (SG)

With this technique, people are asked to choose between a gamble with a desirable outcome, with risk, p, and a less desirable outcome, with a risk, 1-p, and a certain option of intermediate desirability. The person is asked what probability of getting the desirable or less desirable outcome will make him/her indifferent between the gamble and the certainty. An example of the standard gamble is to take a person faced with the choice of remaining in a poor state of health versus taking a gamble on treatment that could fully restore health or result in death (e.g. surgery for angina). If the probability of restoring full health is varied there will be a point where the person is indifferent between her current poor state of health and taking the gamble of surgery. The probability, p, at the indifference point is the vNM utility of the current health state. If the person is perceives her poor health state as particularly undesirable, she will be more likely to accept a greater probability of death in order to escape it.

The first two instruments give values, and the SG method produces von Neumann-Morgenstern utilities, which is more appropriate since future health is uncertain; and utility scores based on this theory have interval scale properties, which permit the construction of indices of health related quality of life.

HUI3 scoring system is based on Multi-attribute utility theory (MAUT) (Keeney and Raiffa 1976 and 1993), an extension of expected utility theory (von Neumann and Morgenstern 1994 and 1947). This system provides an efficient method to determine the 972000 utility scores for the 972000 health states under HUI3 (Furlong et.al 1998). The basic approach is to measure the eight single-attribute utility functions u_j, $j=1,2, \ldots, 8$, and to determine an equation that expresses the overall utility as a function of these single attribute utilities. The theory specifies alternative functional forms[154] to be considered depending on the assumption of additive independence of utility, or mutually utility independence or first-order utility independence[155]:

1. Additive: $u(x) = \sum_{j-1}^{8} k_j u_j(x_j)$ where $\sum_{j=1}^{8} k_i = 1$;

2. Multiplicative: $u(x) = (1/k)[\prod_{j=1}^{8}(1 + kk_j u_j(x_j)) - 1]$ where $(1+k) = \prod_{j=1}^{8}(1 + kk_j)$

3. Multilinear: $u(x) = k_1u_1(x1) + k_2u_2(x_2) + \ldots + k_{12}u_1(x_1)u_2(x_2) + k_{13}u_1(x_1)u_3(x_3) + \ldots + k_{123}u_1(x_1)u_2(x_2)u_3(x_3) + \ldots + \ldots$ where Σ all k's =1

The three types of models are closely related; the additive model is a special case of multiplicative model, which in turn is a special case of the multilinear model. In addition, to these three basic models, various hybrid models are possible. In the HUI mark III system the attributes are structurally independent which allows estimating a multilinear function. However, scoring formula using multi-linear function has not been developed yet. The additive formula is appropriate only if the interactions in preferences among attributes are not considered important. This constraint is rejected by the data collected to construct utility function for HUI3. The multiplicative formula is used in calculating utility scores for HUI 3 system as shown in Table A4.1, which is called the multiplicative muti-attribute utility function (MAUF). Hence HUI3 and MAUF are complement to each other.

Applications of HUI system require collection of sufficient information to classify the health status of study subjects within the HUI framework but do not require the collection of HRQL preference measures; utility scores for HUI health status data are calculated

[154] See Feeny et al. (1996).

[155] Additive utility independence means that there are no interactions in preferences among attributes. For example, the level on vision would not depend on the level on hearing. Mutual utility independence allows for simple interactions among preferences for attributes. However, the basic structure of this dependency must be the same across all attributes. For example, the marginal utility associated with better outcomes on each attribute increases as the levels on the other attributes rise. In this case, gaining back a single attribute does not contribute much utility, but gaining back multiple attributes does. Order-one utility independence allows for more complex interactions: some attributes can be substitutes (for example, vision and hearing), while other pairs of attributes are complements.

using published utility functions (Torrance et al., 1995, 1996). The scoring algorithm for HUI3 system has been developed by collecting a random sample of 504 adults from Hamilton Ontario, using a combination of VAS and SG instruments. Visual analog values (v) have been converted to utilities (u) from the estimated relationship using a power curve ($u=v^{\alpha}$). SG method gives direct utility from the estimated relationship, which provides a measure of desirability of each health state under uncertainty. This method is a "gold standard" method for measuring preferences under conditions of uncertainty (Furlong et al.1998).

The HUI system may be subject to ceiling effects, but unlikely to be vulnerable to floor effects (Feeny et.al 1995). That is, many children in the health survey may fall in the highest level of an attribute (normal or level 1), but very few, are likely to be worse than the lowest level (the most severely impaired). Evidence to date indicates that the HUI3 measurement system is responsive (Torrance et. al.1998), acceptable, reliable, valid, responsive and useful (Furlomg et al. 1998).

Table A4.1: Mark III health status classification system and multi-Attribute utility Function (Simplified format on Dead/Perfect Health scale)

Attribute (Xi)	Level	Level description	Coefficients (bi) for HUI3 score formula[1]
Vision(X_1)	1	Able to see well enough to read ordinary newsprint and recognize a friend on the other side of the street, without glasses or contact lenses	1.00
	2	Able to see well enough to read ordinary newsprint and recognize a friend on the other side of the street, but with glasses	0.98
	3	Able to read ordinary newsprint with or without glasses but unable to recognize a friend on the other side of the street, even with glasses	0.89
	4	Able to recognize a friend on the other side of the street, with or without glasses but unable to read ordinary newsprint, even with glasses	0.84
	5	Unable to read ordinary newsprint and unable to recognize a friend on the other side of the street, even with glasses	0.75
	6	Unable to see at all	0.61
Hearing (X_2)	1	Able to hear what is said in a group conversation with at least three other people, without a hearing aid	1.00
	2	Able to hear what is said in a group conversation with one other person in a quiet room without a hearing aid, but requires a hearing aid to hear what is said in a group conversation with at least three other people	0.95
	3	Able to hear what is said in a group conversation with one other person in a quiet room with a hearing aid, and able to hear what is said in a group conversation with at least three other people with a hearing aid	0.89
	4	Able to hear what is said in a group conversation with one other person in a quiet room without a hearing aid, but unable to hear what is said in a group conversation with at least three other people even with a hearing aid	0.80
	5	Able to hear what is said in a group conversation with one other person in a quiet room with a hearing aid, but unable to hear what is said in a group conversation with at least three other people even with a hearing aid	0.74
	6	Unable to hear at all	0.61

Continued on next page

Table A4.1 continued

Attribute (Xi)	Level	Level description	Coefficients (bi) for HUI3 score formula[1]
Speech (X_3)	1	Able to be understood completely when speaking with strangers or friends	1.00
	2	Able to be understood partially when speaking with strangers but able to understood completely when speaking with people who know the respondent well	0.94
	3	Able to be understood partially when speaking with strangers or people who know the respondent well	0.89
	4	Unable to be understood when speaking with strangers but able to be understood partially by people who know the respondent well	0.81
	5	Unable to be understood when speaking to other people (or unable to speak at all)	0.68
Ambulation (X_4)	1	Able to walk around the neighborhood without difficulty, and without walking equipment	1.00
	2	Able to walk around the neighborhood with difficulty, but does not require walking equipment or the help of another person	0.93
	3	Able to walk around the neighborhood with walking equipment, but without the help of another person	0.86
	4	Able to walk only short distances with walking equipment, and requires a wheelchair to get around the neighborhood	0.73
	5	Unable to walk alone, even with walking equipment; able to walk short distances with the help of another person, and requires a wheelchair to get around the neighborhood	0.65
	6	Cannot walk at all	0.58
Dexterity (X_5)	1	Full use of two hands and ten fingers	1.00
	2	Limitations in the use of hands or fingers, but does not require special tools or help of another person	0.95
	3	Limitations in the use of hands or fingers, is independent with use of special tools (does not require the help of another person	0.88
	4	Limitations in the use of hands or fingers, requires the help of another person for some tasks (not independent even with use of special tools)	0.76
	5	Limitations in the use of hands or fingers, requires the help of another person for most tasks (not independent even with use of special tools)	0.65
	6	Limitations in the use of hands or fingers, requires the help of another person for all tasks (not independent even with use of special tools)	0.56

Continued on next page

Table A4.1: continued

Attribute (Xi)	Level	Level description	Coefficients (bi) for HUI3 score formula[1]
Emotion (X_6)	1	Happy and interested in life	1.00
	2	Somewhat happy	0.95
	3	Somewhat unhappy	0.85
	4	Very happy	0.64
	5	So unhappy that life is not worthwhile	0.46
Cognition (X_7)	1	Able to remember most things, think clearly and solve day to day problems	1.00
	2	Able to remember most things, but have a little difficulty when trying to think and solve day to day problems	0.92
	3	Somewhat forgetful, but able to think clearly and solve day to day problems	0.95
	4	Somewhat forgetful, and have a little difficulty when trying to think or solve day to day problems	0.83
	5	Very forgetful, and have a great difficulty when trying to think or solve day to day problems	0.60
	6	Unable to remember anything at all, and unable to think or solve day to day problems	0.42
Pain (X_8)	1	Free of pain and discomfort	1.00
	2	Mild to moderate pain that prevents no activities	0.96
	3	Moderate pain that prevents a few activities	0.90
	4	Moderate to severe pain that prevents some activities	0.77
	5	Severe pain that prevents most activities	0.55

Notes:
b_i denotes the coefficient of attribute, Xi, where I==1,2….,8
1. Formula (Dead/Perfect Health Scale): $u^* = 1.37(b_1 \cdot b_2 \cdot b_3 \cdot b_4 \cdot b_5 \cdot b_6 \cdot b_7 \cdot b_8) - 0.371$
where u^* is the utility of a chronic health state[2] on the utility scale where dead[3] has a utility of 0.00 and healthy[1] has a utility of 1.00.
2. Chronic states, and healthy state, are here defined as lasting for a life time,
3. Dead is defined as immediate.

Source: Feeny et al. (1994, pp.10-11) and Furlong et al. (1998, p 76)

Appendix 4.2: Tobit estimates of Health Utility Index model of children

The Health Utility Index (HUI) is a continuous variable. However, HUI scores may suffer from a ceiling effect. The value of HUI was recorded as 1 for 63% of the children in the sample. To correct for the ceiling effect Tobit (Tobin 1958) model is applied as given in equation A4.1:[156]

(A4.1) $Y_{hfk} = \mu_j + \alpha I + x_h\beta_N + x_{hD}\beta_D + \varepsilon_1$ if RHS<1

= 1, otherwise (selection model for the sample of NBC and immigrant families)

$= \mu_j + x_h\beta + \gamma T + \kappa\lambda + \varepsilon_2$ if RHS<1

=1 otherwise (assimilation model for the sample of immigrants)

where Y_{hfk} denotes the Health Utility Index of the kth child of the fth group.

In this model, the sample for which the observation has value equal to 1, is said to be a censored sample, because for the observations $Y_{hfk} = 1$, we do not have exact values. All we know is that $Y_{hfk} \geq 1$. Hence, OLS estimates will be biased and inconsistent in this case. For that reason, this model is estimated by the maximum-likelihood method as suggested by Tobin (1958), which corrects the results for censoring the sample. For the purpose of the following discussion regarding Tobit model, let use y_i to denote the health outcome of the ith child. Assume that N_0 be the number of observations for which y_i=1, and N_1 the number of observations for which y_i<1; the N_1 observations for which y_i<1 occur first. Let

(A4.2) $$F_i = \int_{-\infty}^{\beta' x_i} \frac{1}{\sigma(2\pi)^{1/2}} e^{-t^2/2\sigma^2} dt$$

(A4.3) $$f_i = \frac{1}{\sigma(2\pi)^{1/2}} e^{-(1/2\sigma^2)(\beta' x_i)^2}$$

The likelihood function for the Tobit model is:

(A4.4) $$L = \prod_0 (1 - F_i) \prod_1 \frac{1}{(2\pi\sigma^2)^{1/2}} e^{-(1/2\sigma^2)(y - \beta' x_i)^2}$$

[156] Discussion here follows Maddala (1983).

where the first product is over the N_0 observations for which $y_i = 1$ and the second product is over the N_1observations for which $y_i<1$;

The log of the likelihood function of the Tobit model is:

(A4.5) $$\log L = \sum_0 \log(1-F_i) + \sum_1 \log(\frac{1}{(2\pi\sigma^2)^{1/2}}) - \sum_1 \frac{1}{2\sigma^2}(y_i - \beta' x_i)^2$$

Maximizing this log-likelihood function with respect to β and σ^2 gives the maximum likelihood estimates of the Tobit model.

Note that the predicted value of y_i from the Tobit model is :[157]

(A4.6) $$E(y_i/x_i) = F(\frac{\beta' x_i}{\sigma})(\beta' x_i + \sigma\lambda_i)$$

where $\lambda = \dfrac{-f(\beta' x_i / \sigma)}{F(\beta' x_i / \sigma)}$ since the censoring is from above;

β and σ (standard error) are the maximum likelihood estimates of the Tobit model.
The estimates of Tobit models are presented in Tables A4.2 and A4.3.

A4.2.1 The Tobit estimates of HUI of the children of different groups

Columns 2 in Table A4.2 compares the estimates of the combined immigrant group with that of the NBC group and Column 3 compares the estimates of the all parents immigrant group with those of the NBC group. The estimates indicate that the nature of the association of the explanatory variables and HUI is similar to that of the association of the explanatory variables and PMK's assessment of child's health, as shown in Section 6.1.1. The intercept term indicates that if the HUI of children were allowed to take a higher value than 1,[158] the mean value would be higher than the present mean value of HUI. It also indicates that some children may have supranormal functional ability.

[157] See Greene (1993)
[158] Remember that the HUI value was not allowed to exceed 1 in the survey.

The slope coefficient of *birthplace* is insignificant. This is also true if the definition of immigrant family is changed. The estimates of the interacted variables indicate that the "age of child," "PMK's health status," and "residential movement" variables have smaller slope coefficients for the children of the combined immigrant group and the all parents immigrant group than for those of the NBC group. Moreover, "house" variable has also a smaller slope coefficient for the all parents immigrant group than for the NBC group. However, "negative parenting style" variable has a larger slope coefficient for these two groups compared to the NBC group.

The Tobit estimates of the HUI models for the three immigrant sub-groups are reported in Table A3.3. The log likelihood ratio tests suggest that the Tobit regression models of the immigrant sub-groups are different from that of the NBC group. As mentioned before that since the sample sizes for the sub-groups are smaller compared to the combined group, the results for the sub-groups are less reliable.

A4.2.2 Simulated values of HUI of children from Tobit models

Using the equation A4.6, the HUI outcomes of children of different groups are simulated for different hypothetical states.

To examine whether or not the children of immigrant families have a stronger association of the covariates with the health outcomes compared to those of the NBC group, the average conditional expected HUI scores of different groups are simulated for the same level of resources. The HUI scores of children are simulated in four hypothetical states as described. The results are presented in Tables A4.4-4.6. The explanation of each of the simulated value in the tables is discussed in Section 6.1.3 in Chapter 6.

The conditional expected values of HUI of children of different groups and their variations

Consider Table A4.4. The values of this table denote the average predicted conditional HUI scores of each group with their own group coefficients and individual resources of the children of that group. The first case shows that the average predicted conditional HUI score of the NBC group is 1.05, and that of the combined immigrant group and the all parents immigrant group is 1.07, a higher value. The difference is approximately 0,02, which is significant. The finding does not change with the change in the definition of immigrant family. The differences and the *t*-ratios in other cases indicate that the children of any of these three immigrant sub-groups have significantly higher HUI than do the children of the NBC group. Among them, the children of the American immigrant group have the highest scores (1.13 for the American immigrant group, 1.08 for the European immigrant group and 1.09 for the Asian immigrant group). Note that these findings vary for the all parents immigrant group and for the Asian immigrant group compared to those from the PMK's assessment of child's health. Here, the health status of the children of these two groups is also better than that of the NBC group, whereas, it was worse in the case of the PMK's assessment of child's health. Remember from Chapter 5 that the raw mean values of HUI were higher for these two groups than for the NBC group. The only difference here is that the predicted values are greater than 1. This is not unpredicted for the Tobit model as it allows the value to be greater than 1, and 63% of the children in the survey had that value. This indicates that these children may have supranormal functional ability.

Selectivity tests

Consider Table A4.5 that presents the simulated values for the six groups using resources of the NBC group. The differences and their *t*-ratios suggest that if the children of any immigrant group were provided the resources of the children of the NBC group, HUI scores would be higher for the children of that immigrant group than for the children of the NBC group. With the resources of the NBC group, the HUI score of the children of the combined immigrant group would be 1.06 (1% higher than that of the NBC group) and those of the all parents immigrant would be 1.07 (2% higher than that of the NBC group). For the European and the American immigrant groups, this difference is 3%; and for the Asian immigrant group, it is 9%. A comparison of these values with those in Table A4.4 indicates that if the immigrant groups were provided the NBC resources, the health status of children of the Asian immigrant group would improve by 5% (their present HUI score is 1.09 vs it would be 1.14 with the NBC resources). For the all other groups, it is not recommended to change the resource levels. In this sense, this finding is similar to that of the PMK's assessment of child's health. A selectivity tests using the resources of the children of different immigrant groups, as presented in Table A4.6, also demonstrates that any immigrant group is positively selected.

Thus, the Tobit estimates of HUI models suggest the health status of children of any immigrant group is better than that of the NBC group. Not only that, the health status of the children of any immigrant group would be better even for the same level of resources. Immigrants have a higher level of observable and "differential cultural capital." These findings suggest that change in the immigration policy has a "healthy immigrant effect" on the outcomes of children in Canada.

A4.2.3 The association of time of residency of immigrants and health outcomes of children: the OLS and Tobit estimates of HUI from the pooled sample of immigrants

Table A4.7 in Appendix 4 presents the estimates of the HUI assimilation model of children of the different immigrant groups. Tobit models are estimated using the sample of the combined immigrant group as well as that of the all parents immigrant group. Like the other assimilation models, the comparison group in these models is the *other immigrant group*.

The positive and significant coefficients of *European* and *Asian* variables suggest that the initial level of health status of children of the European and the Asian immigrant groups are significantly higher than that of other *immigrant group*. The Asian immigrant group has a larger coefficient than the European immigrant group. On the other hand, there are no significant differences in the levels of HUI scores of the children the American immigrant group and the *other immigrant group*.

The coefficient of *years since immigration* is significant and positive. This indicates that the HUI of children of the *other immigrant group* will improve with the time of residency of their parents in Canada. Tobit model suggests that a year of residency of immigrant parents in Canada would increase the HUI score of children of the *other immigrant group* by 0.2-percentage point. The same applies to the children of the American immigrant group, as the interaction variable is insignificant for this group. The coefficients of the interaction variables are negative and significant for the European and the Asian immigrant groups. This implies that the association of time of residency of immigrants and the health outcomes of children is significantly weaker (although positive) for the children of the Asian and the European immigrant groups than for the *other immigrant group*. However, the Tobit model suggests that there are no statistically significant differences in the association of *years since immigration* variable and HUI scores for the European immigrant group and the *other immigrant group*.

It is also noticeable in this model, as was in previous assimilation models of health outcomes, that there exists an inverse relationship between the initial level of health outcomes and the association time of residency of immigrants. For example, the Asian immigrant group has the highest level of initial HUI scores and it has the lowest association rate. Similarly, the American immigrant group has a lower initial HUI score than does the Asian immigrant group, but a higher association rate. The findings from the sample of the all parents immigrant group are somewhat different. The Tobit model estimates suggest that the Asian immigrant group has a higher level of initial health status, and the association of *years since immigration* and HUI is significantly weaker for this group than for the *other immigrant group*. Compared to the *other immigrant group*, the American immigrant group and the European immigrant group have similar initial health status, and the same association of *years since immigration* and HUI.

This result indicates that the children of an immigrant group, who have lower health outcomes, will improve it with the time of residency of their parents in Canada. The present situation seems a temporary phenomenon for them. The HUI results in this model are similar to those of the PMK's assessment of child's health. Findings from both measures suggest that the health status of children of immigrants is likely to improve with the time of residency of immigrants in Canada.

Table A4.2: Tobit model of health outcome of children of NBC and immigrant families: the estimation from pooled samples

Variables	Coefficients (standard error)	
Groups	**NBC & Combined immigrant group**	**NBC & All parents immigrant group**
Intercept	1.15357607(0.02546) [a]	1.15310291(0.024996) [a]
Age of the child	-0.0117072(0.000964) [a]	-0.0116819(0.000947) [a]
Gender (= 1, if the child is a boy, =0, if a girl)	-0.0143552(0.00399) [a]	-0.0143238(0.003916) [a]
Equivalent Income($)	5.68399E-7(1.577E-7) [a]	5.67023E-7(1.548E-7) [a]
House (=1, if any family members own the house, = 0, if not)	-0.0088237(0.005839)	-0.0088035(0.00573)
Lone parent (=1, if child lives with a lone-parent, = 0, otherwise)	-0.0201396(0.006049) [a]	-0.0200974(0.00594) [a]
Age of mother (years) at birth of child	0.00131107(0.000422) [a]	0.00130779(0.00041) [a]
Years of education of PMK	0.00421894(0.001154) [a]	0.00420895(0.00113) [a]
Weekly working hours of PMK	-0.000076(0.000122)	-0.0000757(0.00012)
Poor health of PMK (=1, if health status of PMK is poor or fair, =0, other wise)	-0.0309503(0.007806) [a]	-0.0309116(0.007662) [a]
Residential movement	-0.0061629(0.000945) [a]	-0.0061539(0.000928) [a]
Rural area (=1, if the child lives in a rural area, = 0, otherwise)	0.00140926(0.005541)	0.00140671(0.005439)
Provincial unemployment rate (1996)	-0.0006143(0.000841)	-0.0006134(0.000826)
Welfare (=1 if the family's main source of income is public assistance, =0, otherwise)	-0.0071172(0.007914)	-0.0071079(0.007768)
Job rank of parents (a lower value indicates a higher job status)	-0.0008508(0.000521) [c]	-0.0008495(0.000511) [c]
Family dysfunction (a higher value indicates more dysfunctional)	-0.0013841(0.000414) [a]	-0.0013809(0.000407) [a]
Negative parenting style (a higher value indicates hostile parenting)	-0.0344803(0.004684) [a]	-0.0344096(0.004598) [a]
Birthplace (=1, if parents are foreign born, = 0 if native- born Canadian)	-0.029549(0.053135)	0.00305017(0.065063)
Age of the child* Birthplace	0.00500175(0.002079) [b]	0.00693957(0.002476) [a]
Gender * Birthplace	-0.0044609(0.008745)	0.00184219(0.010864)
Equivalent income* Birthplace	-5.2038E-8(3.051E-7)	-2.9979E-8(4.025E-7)
House * Birthplace	0.00774029(0.012237)	**0.02639844(0.01387)** [b]
Lone-parent * Birthplace	-0.0214967(0.013795)	-0.0189049(0.015124)
Age of PMK * Birthplace	0.00115835(0.000879)	0.00006134(0.001059)
Years of education of PMK* Birthplace	-0.0025883(0.002181)	-0.0011988(0.002565)
Working hours of PMK* Birthplace	0.00039508(0.000259)	0.00015859(0.000319)
Poor health status of PMK* Birthplace	0.04684108(0.016995) [a]	0.07683981(0.020642) [a]
Residential movement* Birthplace	0.00566042(0.002337) [a]	0.00619813(0.003039) [b]
Rural area* Birthplace	-0.0308391(0.019944)	0.07368357(0.04784)
Provincial unemployment rate *Birthplace	0.00007984(0.002893)	-0.0046033(0.003942)
Welfare* Birthplace	0.04687532(0.018932)	**0.07300884(0.02077)** [a]
Job rank *Birthplace	-0.0005111(0.001068)	-0.0010348(0.001263)
Family dysfunction *Birthplace	-0.0008747(0.000905)	-0.0017875(0.001149)
Negative parenting style *Birthplace	-0.0152808(0.010298)	**-0.0208116(0.012601)** [c]
Scale (σ)	0.1294744(0.001955)	0.12907117(0.00199)
Log Likelihood for Normal	-818.0446	-724.5855
Right censored values	4579	4253
Log-likelihood ratio = $-2\log(L_u - L_R) \cong \chi^2(17)$	65.38 [a]	68.72 [a]
Sample Size	7266	6779

Source: Prepared by the author using NLSCY(1996-97) Cycle2 data

Notes: 1.The dependent variable is Health Utility Index of child
2.a, b, and c denote significance levels at 1%, 5% and 10%, respectively.
3.The coefficients in bold face suggest that the differential impacts of the corresponding covariates are different for the all parents immigrant group and the combined immigrant group.
4. L_u denotes the log-likelihood of the unrestricted model (where the coefficients of *birthplace* and the interaction variables assumed to have non-zero values), and L_R denotes that of the restricted model.

Table A4.3:Tobit model of health outcomes: estimation from pooled samples of the NBC group and different immigrant sub-groups

Variables	Coefficients (standard error)		
	NBC & American group	NBC & European group	NBC & Asian group
Intercept	1.14952963(0.023228)[a]	1.15066432(0.024061)[a]	1.14889602(0.023387)[a]
Age of the child	-0.0114909(0.00088)[a]	-0.0115516(0.000911)[a]	-0.0114571(0.000886)[a]
Gender (= 1, if the child is a boy, = 0, if a girl)	-0.0140866(0.003638)	-0.0141619(0.003769)	-0.0140445(0.003663)
Equivalent Income($)	5.56632E-7(1.438E-7)[a]	5.59932E-7(1.49E-7)[a]	5.54789E-7(1.448E-7)[a]
House (=1, if family members own house, =0, if not)	-0.0086515(0.005324)	-0.0086998(0.005516)	-0.0086245(0.005361)
Lone-parent (=1, if the child lives with a lone-parent, = 0, otherwise)	-0.0197784(0.005516)[a]	-0.0198797(0.005715)[a]	-0.0197219(0.005554)[a]
Age of mother (years) at birth of child	0.00128301(0.000385)[a]	0.00129088(0.000399)[a]	0.00127861(0.000387)[a]
Years of education of PMK	0.00413352(0.001052)[a]	0.00415747(0.00109)[a]	0.00412014(0.001059)[a]
Weekly working hours of PMK	-0.0000739(0.000112)	-0.0000745(0.000116)	-0.0000736(0.000112)
Poor health condition of PMK (=1, if the health status of PMK is poor or fair, = 0, other wise)	-0.0306192(0.007117)[a]	-0.0307121(0.007374)[a]	-0.0305673(0.007166)[a]
Residential movement	-0.0060856(0.000862)[a]	-0.0061073(0.000893)[a]	-0.0060735(0.000868)[a]
Rural area(=1, if child lives in a rural area, = 0, otherwise)	0.00138738(0.005052)	0.00139354(0.005234)	0.00138394(0.005087)
Provincial unemployment rate (1996)	-0.0006064(0.000767)	-0.0006087(0.000795)	-0.0006052(0.000772)
Welfare (= 1, if family's main source of income is from welfare assistance, = 0, otherwise)	-0.0070382 (0.007216)	-0.0070603(0.007477)	-0.0070258(0.007266)
Job rank of parents (a lower value indicates a higher job status)	-0.0008392(0.000475)[a]	-0.0008425(0.000492)[a]	-0.0008374(0.000478)[a]
Family dysfunction (a higher value indicates more dysfunctional)	-0.0013569(0.000378)[a]	-0.0013645(0.000392)[a]	-0.0013527(0.00038)[a]
Negative parenting style (a higher value indicates hostile parenting)	-0.0338756(0.004272)[a]	-0.0340452(0.004426)[a]	-0.0337809(0.004302)[a]
Birthplace (=1, if parents are foreign born, =0 if native born-Canadian)	-0.0494697(0.207918)	0.03757013(0.080725)	-0.1497895(0.149835)
Age of the child* Birthplace	**-0.0096594(0.008424)**	**-0.0006128(0.003171)**	0.01596854(0.00558)[a]
Gender * Birthplace	**-0.1133754(0.034356)[a]**	0.01143066(0.012473)	**-0.07231(0.025725)[a]**
Equivalent income* Birthplace	1.37729E-6(1.269E-6)	**-7.5328E-7(4.061E-7)[c]**	**-1.9216E-6(7.375E-7)[a]**
House * Birthplace	-0.0092752(0.055354)	0.0147488(0.01711)	**0.1095981(0.039861)[a]**
Lone-parent * Birthplace	**-0.1465296(0.070212)[b]**	**0.14874467(0.024515)[a]**	-0.0296962(0.046434)
Age of PMK * Birthplace	0.00728512(0.003073)[a]	0.00447922(0.001374)[a]	0.00487734(0.002737)[c]
Years of education of PMK* Birthplace	**0.00191227(0.010028)**	**-0.0112128(0.00313)[a]**	**-0.0119024(0.006363)[c]**
Working hours of PMK* Birthplace	0.00071002(0.000898)	**0.00121782(0.000398)[a]**	0.00115537(0.000798)
Poor health status of PMK* Birthplace	**0.13342934(0.132389)**	-0.0490733(0.025584)[b]	**-0.0327806(0.08436)**
Residential movement* Birthplace	**0.00894212(0.007832)**	0.00789909(0.00335)[a]	0.01876255(0.007648)[a]
Rural area* Birthplace	0.02432496(0.054393)	**-0.0788541(0.025189)[a]**	0.34073501(1.163093)
Provincial unemployment rate* Birthplace	-0.0072262(0.010525)	0.00046075(0.004385)	0.01094559(0.01147)
Welfare *Birthplace	**0.11258468(0.090106)**	-0.086927(0.035217)[a]	**0.06875244(0.083529)**
Job rank *Birthplace	0.00225928(0.004188)	-0.0018083(0.001553)	-0.0082249(0.003306)[a]
Family dysfunction *Birthplace	0.00328871(0.003515)	**-0.0024186(0.001299)[c]**	0.00141087(0.002518)

Continued on next page

Table A4.3 continued

Variables	Coefficients (standard error)		
	NBC & American group	NBC & European group	NBC & Asian group
Negative parenting style *Birthplace	-0.0192145(0.037919)	0.00660831(0.015616)	-0.0440875(0.0306)
Scale (σ)	0.12602568(0.001964)	0.12699283(0.001965)	0.1254856(0.001962)
Log Likelihood for Normal	-589.5213	-666.3006	-580.8893
Right censored values	4047	4222	4042
Log-likelihood ratio $=-2\log(L_u - L_R) \equiv \chi^2(17)$	41.90[a]	102.16[a]	62.12[a]
Sample Size	6490	6760	2434

Notes:

1. The dependent variable is the Health Utility Index of child
2. a, b, and c denote significance levels at 1%, 5% and 10%, respectively.
3. The coefficients in bold face suggest that the differential impacts of the corresponding covariates are different for the immigrant sub-groups and the combined immigrant group.
4. L_u denotes the log-likelihood of the unrestricted model (where the coefficients of *birthplace* and the interaction variables assumed to have non-zero values), and L_R denotes that of the restricted model.

Source: Compiled by the author using the NLSCY (1996-97) Cycle 2 data

Table A4.4 Average predicted conditional HUI value of children

	Tobit		
Predicted conditional scores with group coefficients (β_G) and resources (X_G)	Estimated values	Differences (standard error)	T -value
1) $\overline{\hat{Y}(X_N, \hat{\beta}_N)}$	1.05		
2) $\overline{\hat{Y}(X_I, \hat{\beta}_I)}$	1.07	(1)-(2) -0.02(0.002)	-13.29[a]
3) $\overline{\hat{Y}(X_P, \hat{\beta}_P)}$	1.07	(1)-(3) -0.02(0.003)	-8.027[a]
4) $\overline{\hat{Y}(X_U, \hat{\beta}_U)}$	1.13	(1)-(4) -0.08(0.005)	-15.92[a]
5) $\overline{\hat{Y}(X_E, \hat{\beta}_E)}$	1.08	(1)-(5) -0.03(0.003)	-12.75[a]
6) $\overline{\hat{Y}(X_A, \hat{\beta}_A)}$	1.09	(1)-(6) -0.04(0.005)	-8.61[a]

Notes: 1. $\overline{\hat{Y}(X_G, \hat{\beta}_G)}$ denotes the average predicted conditional HUI 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 combined immigrant group; $G = P$ denotes all parents immigrant group; $G = U$ denotes American immigrant group; immigrant group; $G = E$ denotes European immigrant group; $G = A$ denotes Asian immigrant group;

2. The regression coefficients of this Table come from those of Tables A4.2 and A2.3

3. a, b, and c denote significant at the 1%, 5%, and 10% levels.

Source: Calculated by the author using the NLSCY (1996-97) Cycle 2 data

Table A4.5 Average predicted conditional HUI value of children with the resources of the children of the NBC group

Average predicted conditional HUI scores of different groups	Estimated values	Differences (standard error)	T -value
1) $\overline{\hat{Y}(X_N, \hat{\beta}_N)}$	1.05		
2) $\overline{\hat{Y}(X_N, \hat{\beta}_I)}$	1.06	(1)-(2) -0.01(0.001)	-13.18[a]
3) $\overline{\hat{Y}(X_N, \hat{\beta}_P)}$	1.07	(1)-(3) -0.02(0.001)	-24.24[a]
4) $\overline{\hat{Y}(X_N, \hat{\beta}_U)}$	1.08	(1)-(4) -0.003(0.002)	-17.92[a]
5) $\overline{\hat{Y}(X_N, \hat{\beta}_E)}$	1.08	(1)-(5) -0.03(0.001)	-20.55[a]
6) $\overline{\hat{Y}(X_N, \hat{\beta}_A)}$	1.14	(1)-(6) -0.09(0.002)	-43.15[a]

Notes: 1. $\overline{\hat{Y}(X_G, \hat{\beta}_G)}$ denotes the average predicted conditional HUI 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 combined immigrant group; $G = P$ denotes all parents immigrant group; $G = U$ denotes American immigrant group; immigrant group; $G = E$ denotes European immigrant group; $G = A$ denotes Asian immigrant group;
2. The regression coefficients of this Table come from those of Tables A4.2 and A2.3
3. a, b, and c denote significant at the 1%, 5%, and 10% levels.

Source: Calculated by the author using the NLSCY (1996-97) Cycle 2 data

Table A4.6 Average predicted conditional HUI value of children with the resources of children different immigrant groups

	Tobit		
Average predicted conditional HUI scores of different groups	Estimated values	Differences (standard error)	T -value
1) $\overline{\hat{Y}(X_I,\hat{\beta}_N)}$	1.05		
2) $\overline{\hat{Y}(X_I,\hat{\beta}_I)}$	1.07	(1)-(2) -0.02(0.002)	-7.73[a]
3) $\overline{\hat{Y}(X_P,\hat{\beta}_N)}$	1.05		
4) $\overline{\hat{Y}(X_P,\hat{\beta}_P)}$	1.07	(3)-(4) -0.02(0.004)	-4.86[a]
5) $\overline{\hat{Y}(X_U,\hat{\beta}_N)}$	1.06		
6) $\overline{\hat{Y}(X_U,\hat{\beta}_U)}$	1.12	(5)-(6) -0.06(0.01)	-4.79[a]
7) $\overline{\hat{Y}(X_E,\hat{\beta}_N)}$	1.06		
8) $\overline{\hat{Y}(X_E,\hat{\beta}_E)}$	1.08	(7)-(8) -0.02(0.004)	-5.45[a]
9) $\overline{\hat{Y}(X_A,\hat{\beta}_N)}$	1.05		
10) $\overline{\hat{Y}(X_A,\hat{\beta}_A)}$	1.09	(9)-(10) -0.04(0.02)	-2.12[b]

Notes: 1. $\overline{\hat{Y}(X_G,\hat{\beta}_G)}$ denotes the average predicted conditional HUI 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 combined immigrant group; $G = P$ denotes all parents immigrant group; $G = U$ denotes American immigrant group; immigrant group; $G = E$ denotes European immigrant group; $G = A$ denotes Asian immigrant group;
2. The regression coefficients of this Table come from those of Tables A4.2 and A2.3
3. a, b, and c denote significant at the 1%, 5%, and 10% levels.

Source: Calculated by the author using the NLSCY (1996-97) Cycle 2 data

Table A4.7: Tobit estimates of the association of time of residency of immigrants and the health outcomes of children

Variables	Coefficients (standard errors)	
	Combined Immigrant group	All parents immigrant
Intercept	1.1014204 [a] (0.07323)	1.15033 [a] (0.11003)
American(=1, if the family is from the American group,=0 otherwise)	0.02773187(0.054005)	-0.01772 (0.11044)
European(=1, if a family is from European group, =0, otherwise)	0.05709631 [b](0.030394)	0.06822 (0.04316)
Asian ((=1, if a family is from Asian group ,=0, otherwise)	0.12091139 [a](0.047216)	0.12612 [b] (0.05832)
Years since immigration in Canada	0.00169464 [c](0.000954)	0.0016014 (0.0016254)
Years since immigration*American	0.00006927(0.002324)	0.0019282 (0.0039503)
Years since immigration*European	-0.0015783(0.00121)	-0.0013097 (0.0020289)
Years since immigration*Asian	-0.0053706 [c](0.002318)	-0.0052746 [c] (0.0030701)
Age of the child	-0.0070866 [b](0.002939)	-0.0055919 (0.0043566)
Gender (= 1, if the child is a boy, =0, if not)	-0.016337(0.012091)	-0.01060 (0.0184)
Equivalent income($)	4.67607E-7(4.028E-7)	6.06998E-7 (6.81688E-7)
House (=1, if any family members own the house, = 0 if not)	-0.0026719(0.016537)	0.01112 (0.02269)
Lone-parent (= 1, if the child lives with a lone-parent, = 0, otherwise)	-0.0481028 [a](0.01929)	-0.05064 [b] (0.02548)
Age of mother (years) at the birth of a child	0.0023026 [b](0.0012)	0.0009376 (0.0018292)
Years of education of PMK	0.0027648(0.0029)	0.0041281 (0.0043204)
Working hours of PMK	0.0003835(0.000354)	0.00008372 (0.0005452)
Poor health of PMK (= 1, if health status of PMK is fair or poor, =0 otherwise	0.03831499(0.024415)	0.07386 [b] (0.03693)
Residential movement	-0.0009876(0.003401)	-0.001761 (0.005564)
Rural area (= 1, if the child lives in a rural area, =0, otherwise)	-0.0420603(0.028888)	0.05497 (0.08303)
Local unemployment rate	-0.0032476(0.004446)	-0.0093625 (0.0072063)
Welfare (= 1, if the family's main source of income is public assistance, = 0, otherwise)	0.0652802 [b](0.027592)	0.09397 [a] (0.0367)
Job rank of parents (a lower value indicates a higher job status)	-0.0007322(0.001438)	-0.0004398 (0.0021335)
Family dysfunction (a higher value indicates more dysfunctional)	-0.0017877(0.001226)	-0.0027554 (0.0019384)
Negative parenting style (a higher value indicates hostile parenting)	-0.0587122 [a](0.0144)	-0.05871 [a] (0.02216)
Scale parameter	0.13807768(0.006836)	0.13828 (0.009923)
Log Likelihood for Normal	-137.23	-58.29
Right censored values	586	284
Sample size	841	390

Source: Prepared by the author using the NLSCY (1996-97) Cycle 2 data

Notes: 1.The dependent variable is the Health Utility Index of child.
2. a, b, and c denote significance levels at the 1%, 5%, and 10%, respectively.

Appendix 5
Some findings of mathematics test scores
Table A5.1: The Probit model of presence in mathematics test: the estimation from the full sample

Variables	Coefficients	Standard error
Intercept	0.9460[a]	0.1961
Age of the child	-0.00944	0.00802
Gender (= 1, if the child is a boy, =0, if a girl)	-0.1394[a]	0.0318
Equivalent Income($)	-1.1E-6	1.038E-6
House (=1, if any family members own the house, = 0, if not)	-0.0181	0.0468
Lone-parent (=1, if child lives with a lone-parent, = 0, otherwise)	-0.0407	0.0498
Age of mother (years) at birth of child	0.00190	0.00329
Years of education of PMK	0.00238	0.00849
Weekly working hours of PMK	0.000701	0.000959
Poor health condition of PMK (=1, if PMK's health is fair or poor, = 0, otherwise)	-0.0869	0.0626
Residential movement	-0.00347	0.00810
Rural area (=1, if the child lives in a rural area, =0 otherwise)	-0.00453	0.0478
Provincial unemployment rate (1996)	-0.0108	0.00706
Welfare (=1, if the family's main source of income is public assistance, = 0, otherwise)	-0.2284[a]	0.0654
Job rank of parents (a lower value indicates a higher job status)	-0.00852[b]	0.00398
Family dysfunction (a higher value indicates more dysfunctional)	0.00600[c]	0.00334
Negative parenting style (a higher value indicates hostile parenting)	0.0389[c]	0.0379
Poor health condition of child (=1, if health status of child is good or fair or poor,=0, otherwise)	-0.1786[b]	0.0483
Private (=0, if the child goes to public or catholic school, =1, otherwise)	-0.1284[b]	0.0692
Missing days (=0, if missing days in school are less than 3 days, =1, if equal to or more than 3 days)	0.0604[b]	0.0387
-2LogL	8365.28	
Sample Size	6920	
Source: Prepared by the author using NLSCY (1996-97) Cycle 2 data		

Note:
1.The dependent variable is presence in mathematics test
2. a, b, and c denote significance levels at 1%, 5% and 10%, respectively.

Table A5.2: The Heckman's model math scores of children of NBC and immigrant group: the estimation from the pooled samples

Variables	Coefficients (standard error)	
Groups	NBC & Combined immigrant group	NBC & All parents immigrant group
Intercept	0.795297(0.15645562)[a]	0.793985(0.15976789)[a]
Age of child	-0.001199(0.00250884)	-0.001218(0.0025504)
Gender (= 1, if the child is a boy, =0, if a girl)	-0.009732(0.03373934)	-0.010017(0.0344677)
Equivalent Income($)	0.000000175(0.0000003)	0.000000172(0.0000003)
House (=1, if any family members own the house, = 0, if not)	0.000123(0.00784785)	0.000085633(0.0078559)
Lone-parent (=1, if child lives with a lone-parent, = 0, otherwise)	-0.006973(0.01194146)	-0.007057(0.012089)
Age of mother (years) at birth of child	0.000901(0.00063274)	0.000905(0.00063671)
Years of education of PMK	0.004410(0.00129168)[a]	0.004415(0.00128818)[a]
Weekly working hours of PMK	-0.000074562(0.0002164)	-0.000073078(0.0002189)
Poor health condition of PMK (=1, if PMK's health is fair or poor, = 0, otherwise)	-0.015493(0.02352874)	-0.015678(0.0239473)
Residential movement	-0.000820(0.00143046)	-0.000828(0.0014367)
Rural area (=1, if the child lives in a rural area, = 0, otherwise)	-0.001526(0.00593752)	-0.001534(0.0058927)
Provincial unemployment rate (1996)	0.005326(0.00281271)[c]	0.005304(0.00286673)[c]
Welfare (=1, if the family's main source of income is from public assistance, = 0, otherwise)	-0.040358(0.06019505)	-0.040864(0.06148048)
Job rank of parents (a lower value indicates a higher job status)	-0.002370(0.00210734)	-0.002387(0.0021497)
Family dysfunction (a higher value indicates more dysfunctional)	-0.000849(0.00149738)	-0.000837(0.00152642)
Negative parenting style (a higher value indicates hostile parenting)	0.006013(0.01078163)	0.006094(0.01095011)
Poor health condition of child (=1, if health status of child is good or fair or poor, = 0, otherwise)	-0.029857(0.04545075)	-0.030239(0.04642080)
Private (= 0, if the child goes to public or catholic school, = 1, otherwise)	0.018650(0.03319144)	0.018384(0.03381301)
Missing days (= 0, if missing days of school are less than 3 days, =1, if equal or more than 3 days	-0.017999(0.01540736)	-0.017875(0.01569739)
Instruction hours in mathematics (=1, if per week instruction time is greater than or equal to 4 hours, = 0, if less than 4 hours)	0.022136(0.00576428)[a]	0.022137(0.00571637)[a]
[illegible]	[illegible]	[illegible]
Birthplace (=1, if parents are foreign-born, = 0, if native- born Canadian)	0.011772(0.05725318)	0.093450(0.08088287)
Age of the child* Birthplace	-0.002788(0.00225501)	-0.003015(0.00280023)
Gender * Birthplace	-0.000228(0.00898018)	-0.010297(0.01197448)
Equivalent income* Birthplace	-0.000000821(0.00000029)[a]	-0.000000632(0.0000004)
House * Birthplace	0.027386(0.01250945)[a]	0.021979(0.01473286)
Lone-parent * Birthplace	0.015855(0.01499284)	0.005127(0.01649085)
Age of PMK * Birthplace	-0.000297(0.00089776)	-0.001291(0.00114468)
Years of education of PMK* Birthplace	0.007331(0.00230322)[a]	0.010146(0.00289765)[a]

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Table A5.2 continued

Variables	**Coefficients (standard error)**	
Groups	**NBC & Combined immigrant group**	**NBC & All parents immigrant group**
Working hours of PMK* Birthplace	0.000106(0.00028097)	-0.000422(0.0003711)
Poor health status of PMK* Birthplace	0.079995(0.01813299) [a]	0.099612(0.02070219) [a]
Residential movement* Birthplace	-0.002737(0.0025492)	-0.002825(0.00333121)
Rural area* Birthplace	0.014599(0.02068062)	0.041765(0.03908175)
Provincial unemployment rate *Birthplace	-0.003642(0.00298876)	-0.007232(0.00491171)
Welfare *Birthplace	0.004638(0.02109846)	-0.003506(0.02377269)
Job rank *Birthplace	-0.003181(0.00103971) [a]	-0.003525(0.00122719) [a]
Family dysfunction *Birthplace	0.003501(0.00095661) [a]	0.005099(0.00122296) [a]
Negative parenting style *Birthplace	-0.027732(0.01060943) [a]	-0.046800(0.01316345) [a]
Poor health status of child* Birthplace	-0.033107(0.01327923) [a]	-0.045846(0.01525369) [a]
Private *Birthplace	0.010168(0.01763491)	0.022849(0.02087953)
Missing days *Birthplace	0.006233(0.01087637)	-0.009520(0.01377581)
Instruction hours *Birthplace	-0.008684(0.01211856)	**-0.037556(0.01608961)** [b]
R^2	0.0902	0.0959
Adjusted R^2	0.0823	0.0874
F –value	11.443 [a]	11.37 [a]
Root MSE	0.13272	0.13366
Sample Size	4890	4549

Source: Estimated by the author using the NLSCY (1996-97) Cycle 2 data

Notes:
1.The dependent variable is scale score in mathematics adjusted for grade levels (see Chapter 4).
2. a, b, and c denote significance levels at 1%, 5% and 10%, respectively.
3.The coefficients in boldface suggest that the differential impacts of the corresponding covariates are different for the all parents immigrant group and the combined immigrant group.

Table A5. 3: The Heckman model of math score of children of the NBC and immigrant sub-groups: the estimation from pooled samples with PMK's assessment of child's health

Variables		Coefficients (standard error)	
Groups	NBC & American	NBC & European	NBC & Asian
Intercept	0.746411(0.15850082)[a]	0.731157(0.16051573)[a]	0.727956(0.15970597)[a]
Age of the child	-0.001918(0.00251564)	-0.002142(0.00255579)	-0.002189(0.00253552)
Gender (= 1, if boy)	-0.020350(0.03421198)	-0.023663(0.034637)	-0.024358(0.03447120)
Equivalent Income($)	9.0530415E-8(0.0000003)	6.4312452E-8(0.0000003)	5.8810045E-8(0.0000003)
House (=1, if any family members own the house)	-0.001251(0.00759080)	-0.001680(0.0078017)	-0.001770(0.00765902)
Lone-parent (=1, if child lives with a lone-parent, = 0, otherwise)	-0.010091(0.01185989)	-0.011063(0.01208557)	-0.011268(0.01195692)
Age of mother (years) at birth of child	0.001040(0.00061965)	0.001083(0.00063429)	0.001092(0.00062498)
Years of education of PMK	0.004585(0.00123823)[a]	0.004640(0.00127641)[a]	0.004651(0.00124971)[a]
Weekly working hours of PMK	-0.000019287(0.00021449)	-0.00000204(0.0002187)	0.000001579(0.0002163)
Poor health condition of PMK (=1, if PMK's health is fair or poor, = 0, otherwise)	-0.022405(0.02365734)	-0.024561(0.02401425)	-0.025014(0.02384234)
Residential movement	-0.001112(0.00139459)	-0.001203(0.00142963)	-0.001222(0.00140678)
Rural area (= 1, if the child lives in a rural area, = 0, otherwise)	-0.001826(0.00562499)	-0.001920(0.0058215)	-0.001940(0.00567928)
Provincial unemployment rate (1996)	0.004478(0.00283705)[c]	0.004213(0.00287701)[c]	0.004157(0.00285898)[c]
Welfare (=1, if the family's main source of income is public assistance)	-0.059225(0.06100674)	-0.065113(0.06177451)	-0.066348(0.06146989)
Job rank of parents (a lower value indicates a higher job status)	-0.003016(0.00212983)	-0.003218(0.00215849)	-0.003260(0.00214617)
Family dysfunction (a higher value indicates more dysfunctional)	-0.000396(0.00151097	-0.000254(0.00153205)	-0.000225(0.00152263)
Negative parenting style (a higher value indicates hostile parenting)	0.009045(0.01078788)	0.009991(0.01096736)	0.010189(0.01087377)
Poor health condition of child (=1, if health status of child is good or fair or poor,=0, otherwise)	-0.044100(0.04606245)	-0.048545(0.0466425)	-0.049477(0.04641219)
Private (= 0, if the child goes to public or catholic school, =1, otherwise)	0.008724(0.03344292)	0.005627(0.03392527)	0.004977(0.03370242)

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Table A5. 3 continued

Variables		Coefficients (standard error)	
Groups	**NBC & American**	**NBC & European**	**NBC & Asian**
Missing days (=1, if equal to or more than 3 days	-0.013383(0.01552748)	-0.011942(0.0157504)	-0.011640(0.01564787)
Instruction hours in mathematics (=1, if per week instruction time is greater than or equal to 4 hours)	0.022183(0.00545059) [a]	0.022198(0.0056446) [a]	0.022201(0.00550353) [a]
Inverse of the Mills ratio	**0.411854(0.52659727)**	**0.463196(0.53296968)**	**0.473972(0.53057186)**
Birthplace (=1, if parents are foreign born)	**0.034229(0.22493546)**	**0.207682(0.0925319)** [b]	**0.021085(0.1695816)**
Age of the child* Birthplace	0.000702(0.00874845)	0.002049(0.00335187)	-0.007804(0.00708129)
Gender * Birthplace	0.042495(0.03397934)	0.016855(0.01272131)	-0.090745(0.0268958) [a]
Equivalent income* Birthplace	-0.000001163(0.0000007) [c]	-0.0000009(0.0000004) [b]	**0.00000116(0.000002)**
House * Birthplace	**0.014103(0.05882188)**	**0.014686(0.01813642)**	0.107976(0.04958024) [b]
Lone-parent* Birthplace	**-0.197937(0.08530381)** [b]	**0.071254(0.02358778)** [a]	0.076304(0.05922262)
Age of PMK * Birthplace	0.003285(0.00302593)	-0.003580(0.0013549) [a]	0.001310(0.00270925)
Years of education of PMK* Birthplace	**-0.000173(0.00852022)**	0.006373(0.00330879) [b]	**-0.000577(0.00612805)**
Working hours of PMK* Birthplace	0.000650(0.00109944)	**-0.000855(0.00042423)** [b]	0.001877(0.00094166)
Poor health status of PMK* Birthplace	**-0.017061(0.09128136)**	0.014705(0.03134317) [c]	**-0.131929(0.11895571)** [b]
Residential movement* Birthplace	-0.009940(0.00904578)	**-0.012385(0.00372773)** [a]	0.004142(0.00849988)
Rural area* Birthplace	0.107813(0.0519339) [b]	0.014906(0.02827539)	0.019570(0.09214584)
Provincial unemployment rate *Birthplace	-0.002979(0.01183063)	-0.013127(0.00485175)	-0.018165(0.01153151)
Welfare *Birthplace	0.225946(0.10878384) [b]	-0.023240(0.03906373)	-0.021398(0.09262542)
Job rank *Birthplace	**-0.000988(0.00461325)**	-0.004137(0.00156876) [a]	**0.001603(0.00325288)**
Family dysfunction *Birthplace	**-0.000513(0.00377837)**	**0.001442(0.00148367)**	0.008511(0.00259858) [a]
Negative parenting style *Birthplace	-0.074233(0.03812189) [b]	**-0.019940(0.0157909)**	**-0.008774(0.03739337)**
Poor health status of child* Birthplace	**-0.040805(0.06931806)**	**-0.004393(0.01781038)**	-0.122558(0.03552922) [a]
Private *Birthplace	0.035613(0.05474099)	-0.026657(0.02407793)	0.151559(0.05418576) [a]
Missing days *Birthplace	0.065739(0.03652312) [c]	-0.027658(0.0162856) [c]	0.041711(0.04749686)
Instruction hours *Birthplace	-0.048786(0.04451325)	0.001935(0.01732205)	-0.001268(0.03652610)
Adjusted R^2	0.0631	0.0716	0.0664
F value	7.975 [a]	9.335	8.334
Sample Size	4352	4537	4334

Notes: 1.The dependent variable is scale score in mathematics test adjusted for grade levels (see Chapter 4).
2. a, b, and c denote significance levels at the 1%, 5% and 10%, respectively.
3.The coefficients in boldface suggest that the differential impacts of the corresponding covariates are different for the immigrant sub-groups and the combined immigrant group.
Source: Estimated by the author using the NLSCY (1996-97) Cycle 2 data

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