

**The Determinants of Post-immigration  
Investment  
in Education in Canada**

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## **Abstract**

This paper presents an empirical analysis of the determinants of post-immigration investment in education using data from the 2003 Adult Education and Training Survey (AETS). Probit analysis is employed to compare the post-immigration educational achievement of immigrant men and women in Canada. The research shows that post-immigration educational attainment, defined as “educational participation in Canada” or “university educational attainment in Canada”, varies negatively with age and household income, as well as positively with respect to year of immigration and family size. Furthermore, immigrants from Asian countries are less likely to participate in additional schooling, but more likely to obtain a university education than those from European countries. Having a university degree prior to arrival has a similar effect. In addition, post-immigration educational investment is greater among immigrants who worked in the most skilled occupation. Finally, gender differences in investment in education for immigrants in Canada, which are directly measured in this paper, suggest that women’s propensity to invest education is more sensitive to birthplace and the spouse’s situation than men’s, but men’s investment decisions are more sensitive to health status and family size.

# **The Determinants of Post-immigration Investment in Education in Canada**

## **1 . Introduction**

As it is a net receiver of immigrants, immigration has played an important part in shaping Canada's population. The 2006 Census shows that 6,186,950 individuals were born outside of Canada. They represented one in five (19.8%) of the total population (Chui, Tran and Maheux 2007). However, many studies have shown that the foreign-born population is at an economic disadvantage compared to native-born Canadians in the Canadian labour market (Bloom, Grenier and Gunderson 1995; Baker and Benjamin 1994; Hum and Simpson 2000; Abbott and Beach 1993; Grant 1999). Many empirical studies have argued that this economic disadvantage immigrants face is partly explained by their human capital in the host country (Chiswick 1978); in particular, educational diplomas obtained in the home country are not equally valued in the host country (Friedberg 2000). Furthermore, research indicates that this disadvantage can be reduced through post-immigration investment in skills (Borjas 1994, Friedberg 2000). Therefore, analyzing the determinants and process of investment in education by immigrants has become a topic of interest to economists and policy makers.

In previous studies, a number of relevant factors have been considered as possible determinants of post-immigration investment in education, including duration of residence, age at the time of immigration, immigration motive, pre-immigration education, origin country, cost and quality of schooling and so on. Several important hypotheses have been tested using data for the United States (Borjas 1982; Hashmi 1987), Australia (Chiswick and

Miller 1994; Cobb-Clark, Connolly and Worswick 2005) and the Netherlands (van Tubergen and Werfhorst 2006). However, to date, no studies have been carried out for Canada.<sup>1</sup>

In my paper, I aim to explore the determinants of post-immigration investment in education and to examine schooling differentials between immigrant men and women using Canadian data. The data used in estimating my model are from the 2003 Adult Education and Training Survey (AETS), which provides a unique set of questions related to pre-immigration schooling. In addition, it includes a direct description of post-immigration education. Using probit analysis, I focus on educational participation and university educational attainment for immigrants in Canada.

This paper proceeds as follows. Section II reviews the relevant literature on post-immigration educational investment. The theoretical hypotheses are discussed in Section III. Using them as a basis, an empirical model of post-immigration investment in schooling is developed in the same section. Section IV describes the 2003 Adult Education and Training Survey (AETS) and the data set used for this study, as well as the estimating equations and econometric methods employed. The estimation results are described in Section V. Finally, the conclusions are summarized in the last section.

## **II. Literature Review**

While interest in the relationship between education and the labour market outcomes of immigrants has grown over the years, there are few studies that focus on the determinants of investment in post-immigration formal education. Since the early 1980s, two studies on

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<sup>1</sup> Hum and Simpson (2002) examine training undertaken by immigrants, but not formal education.

immigrants to the United States (Borjas 1982; Hashmi 1987), two studies on Australia (Chiswick and Miller 1994; Cobb-Clark, Connolly and Worswick 2005) and one study for the Netherlands (van Tubergen and Werfhorst 2006) have been published. Unfortunately, none of this literature uses Canadian data. The relevant existing empirical studies are discussed below and summarized in table 1.

### *Description of existing empirical studies*

#### *(1) Studies on immigrants to the United States*

Among the studies referred to, the earliest on the post-immigration investment in education by immigrants was carried out by Borjas (1982). He used a data set from the 1976 Survey of Income and Education (SIE) in the United States, restricting his sample to Hispanic male immigrants 16 to 64 years of age who reported positive annual earnings in that year, with positive working hours per week. Based on his empirical analysis of earnings differentials among male Hispanic immigrants in the United States, Borjas stated that Cuban immigrants have invested more heavily in U.S. schooling than other Hispanic immigrants. He constructed the first estimating equation for post-immigration education. Based on his regression results, he reported that age, marital status, health status, SMSA status, whether enrolled in an educational program, and pre-migration education have an important impact on the number of years of U.S. schooling obtained by immigrants. His finding that pre-migration education has a strong and statistically significant negative effect on post-migration education raised considerable interest, and led more and more economists to carry out further research on the issue.

The study of Hashmi (1987) employed a broader sample to study post-immigration investment in schooling by immigrants in the U.S. Her analysis is based on two micro-data sets: the 1976 Survey of Income and Education (SIE), and the 1980 U.S. Census of Population. In addition to years of U.S. schooling, Hashmi chose current enrollment status as a dependent variable, and considered the effect of school costs and school quality. Compared to the limited analysis of Borjas, Hashmi did a more exhaustive study, and enhanced the conclusions drawn by Borjas.

There are at least two limitations to Borjas and Hashmi's studies, both of which are inherent in the data sets used. First, there are no data which can be used directly to separate immigrants by motive for immigration. As a result, it is impossible to distinguish foreign students from immigrants, which leads to an estimation bias. Second, both studies estimated years of schooling in the U.S. using total years of schooling and age at migration, assuming continuous school attendance from age six. Therefore, there are random errors of measurement in the variables used to calculate post-immigration years of education. The following studies extended their work in an effort to overcome these estimation problems.

## *(2) Studies on immigrants to Australia*

Two recent studies rely on Australian data. Chiswick and Miller (1994) extended the studies of Borjas and Hashmi to Australian data. They used the 1987 Australian Survey of Labour Force Status and Other Characteristics of Migrants, and identified the determinants of the education obtained by adults after immigration. They employed similar regression models to the prior studies. However, since data on immigration motives and years of

post-immigration education are available for Australia, Chiswick and Miller (1994) were able to obtain some different results that avoid some of the measurement errors of previous studies.

More recently, Cobb-Clark, Connolly and Worswick (2005) used the Longitudinal Survey of Immigrants to Australia (LSIA) and examined post-migration investment in schooling from the perspective of a family. From this point of view, they report that the visa category and gender play an important role in decisions on investment in schooling.

### *(3) Study on immigrants to the Netherlands*

van Tubergen and Werfhorst (2006) conducted a study of post-immigration investment in education by immigrants to the Netherlands. They improved on earlier work by relying on more precise measures of the main concepts, such as direct measures of education obtained before and after immigration. In addition, they had access to age at migration and length of stay measured in years, rather than simply intervals. In their study, they employed a unique data source: the Social Position and Use of Services of the Allochtonous Population surveys of 1988, 1991, 1994, 1998 and 2002 (SPVA) to examine the determinants of educational investment. By adding a variable – the unemployment rate at the time of arrival – van Tubergen and Werfhorst obtained very similar conclusions to those of Cobb-Clark, Connolly and Worswick.

### *Summary of principal results*

Although the studies discussed above chose different countries' data, they still reported

very similar results for several independent variables. First of all, it is no surprise that age at migration has a negative effect on post-migration investment in education. The studies of Hashmi (1987), Chiswick and Miller (1994), van Tubergen and Werfhorst (2006) strongly supported this conclusion. Borjas (1982) considered the individual's age and included it with other variables such as health status, marital status, SMSA status and so on, in a vector of control variables  $z$ . However, he does not report the coefficient of age in his paper.

Second, it appears that the length of stay in the host country has a positive effect on post-migration investment in education, which means that the longer the duration of stay, the greater the investment in post-migration schooling. All the studies (Chiswick and Miller 1994; Hashmi 1987; van Tubergen and Werfhorst 2006; Cobb-Clack, Connolly and Worswick 2005) reported this positive relationship except that of Borjas (1982). Furthermore, these studies show this regression is non-linear and both years since migration (YSM) and the square of YSM are used as independent variables in the regression equation.

At the same time, these studies report contradictory conclusions with respect to other variables. One is the country of origin. In the studies of Hashmi (1987) and Cobb-Clack, Connolly and Worswick (2005), immigrants who come from non-English speaking countries tend to invest more in education after migration than the group from English speaking countries. But Chiswick and Miller (1994) do not find significant differences related to the original language. In their recent study, van Tubergen and Werfhorst (2006) reported that that immigrants from former Dutch colonies make greater investments in education in the Netherlands, which contradicts the results of Hashmi (1987) and Cobb-Clack, Connolly and Worswick (2005).

Similarly, the results with respect to immigration motive also differ. The earliest study using this variable separated refugees from other immigrants. In the studies of Borjas (1982) and Hashmi (1987), refugees with little or no expectation of returning are more likely to invest in schooling. However, Chiswick and Miller (1994) suggested refugees have a low probability of making such an investment. Recently, studies have focused on the purpose of immigration and categorize immigrants on this basis. Cobb-Clack, Connolly and Worswick (2005) considered three categories of immigrants in Australia: skilled-based, family-based and humanitarian. Among the three kinds of immigrants, family-based and humanitarian immigrants are expected to have more difficulty in transferring their human capital compared to skilled-based immigrants. Thus, these two kinds of immigrants are more likely to be enrolled in school than the skilled-based immigrants. van Tubergen and Werfhorst (2006) employed a different categorization, sorting immigrants in the Netherlands into three streams: “labour migrants”, “education migrants” and “family migrants”. Not surprisingly, they found that “education migrants” invest the most in education after immigration, followed by family migrants.

The most highly controversial issue related to investment in post-immigration education is the relationship between post- and pre-migration investment in education. Borjas (1982) and Hashmi (1987) found a negative correlation between pre- and post-immigration education using indirect data on post-migration schooling. In other words, they measure post-migration schooling as total education minus pre-education, because they lack direct information on this variable. As a result, they implicitly assume a “substitutive” relation between educational qualifications before migration and the qualifications obtained after

arrival in the U.S. In contrast, Chiswick and Miller (1994) reported a completely opposite conclusion. Using direct data on post-migration schooling, they found that the more education obtained before immigration, the greater the probability of investing in education after arrival in Australia. This kind of relationship is described as a “complementary” relation. After 10 years, Cobb-Clack, Connolly and Worswick (2005) confirmed the finding of a complementary relation using a new data source for Australia.

Because of the obvious disadvantage in the measurement of pre-immigration education in the studies of Borjas (1982) and Hashmi (1987), one can conclude that there is strong evidence supporting a positive correlation between the number of years of education obtained before migration and the number of years of schooling acquired after arrival in the host country. Furthermore, the research of van Tubergen and Werfhorst (2006) reported a similar “complementary” relationship, which strengthens the conclusion.

In addition to the variables which commonly interest economists, the researchers also added new independent variables available in their respective data sources. Hashmi (1987) extended Borjas’ (1982) study by introducing the cost (college expenses) and quality (student quality and instructional quality) of U.S. schooling, and found that post-migration schooling and school enrollment rates are higher with lower tuition and higher quality. In her empirical model, Hashmi employed tuition and fees for in-state students as the direct costs, as well as the tuition and fees for out-state students, which are less subsidized by the state, as a measure of the quality of education. Thereby, Hashmi regards the cost and quality of education as important variables for the analysis of the demand for schooling among immigrants in the U.S.

Chiswick and Miller (1994) considered not only pre-migration education, but also pre-migration occupation. They found strong evidence to support the hypothesis that pre-migration education and pre-migration occupation have separate effects on post-migration educational investment. Using data from Australia, the same country studied by Chi swick and Miller (1994), Cobb-Clack, Connolly and Worswick (2005) focused on the impact of the state-level unemployment rate on the demand for investment in education after arrival in Australia. Furthermore, they employed new dummy variables for the partner's education in the regression model. As a result, Cobb-Clack, Connolly and Worswick (2005) concluded that immigrants intend to invest in Australian schooling to maintain their occupational status if skills acquired abroad are not perfectly transferable to the Australian labour market. However, they found little relationship between one's own and one's partner's education level.

Finally, like Cobb-Clack, Connolly and Worswick (2005), van Tubergen and Werfhorst (2006) also introduced the unemployment rate at the time of arrival into their empirical model. Their study showed that immigrants who arrive in times of high unemployment are more likely to invest in schooling and to successfully obtain a diploma. Furthermore, they studied the effect of timing of marriage on post-migration education investment, and did not find strong evidence to support a correlation between them.

### **III. Theoretical Hypotheses and Model**

There is no doubt that post-immigration education is a form of human capital investment. Thus, I use the framework developed by Hum and Simpson (2002) to organize the

hypotheses proposed in this paper and distinguish between two kinds of factors which determine the decision to invest in post-immigration education.<sup>2</sup> One consists of core economic factors, such as age, the duration of residence in the host country, birthplace, pre-immigration education level and the country other than Canada where the immigrant attained the pre-immigration education. The other consists of personal and job characteristics, including gender, health status, household income, occupational status, family size, the spouse's situation and the presence of young children.

### *Core economic factors*

The core economic determinants of post-immigration schooling are based on the economic principles established by the human capital model. Becker (1964) developed human capital theory by explaining the relations between earnings, rates of return, and the amount invested in human capital. This is an important theoretical basis for my empirical testing. According to Becker (1964), the attributes of the costs and returns of the investment can help us understand the determinants of post-immigration investment in education.

I first of all focus on *age*, which is also a personal characteristic. However, in the context of human capital theory, this factor is always categorized as an economic factor, for several reasons. One assumption is that young immigrants are more efficient in assimilating knowledge than adults; that is, the cost of studying in the host country will be low for the young person. In addition, in the life cycle of a worker, the rate of return from investments in human capital such as schooling, training etc, decreases with age. Since young immigrants

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<sup>2</sup> Hum and Simpson (2002) employed the same data source but focus on the informal training of immigrants in Canada.

will spend a longer time in the host country than older ones, the benefits from the investment in post-immigration education will also be higher for the young ones. Hence, it is hypothesized that young immigrants are the most likely to invest in education in the destination country.

The *duration of residence* is also an important determinant of investment in post-immigration education. Almost all the relevant studies which I introduced in the literature review found a significant relationship between the duration of residence and education. (Borjas 1982; Hashmi 1987; Chiswick and Miller 1994; Cobb-Clark, Connolly and Worswick 2005; van Tubergen and Werfhorst 2006). According to the existing research results, the effect of duration of residence should be positive but non-linear. On the one hand, while the length of stay increases, the immigrants' studying capacity rises too, which makes the immigrants receive education more efficiently. On the other hand, the longer an immigrant lives in Canada, the more work experience is accumulated in the local labour market. Therefore, the opportunity cost of schooling increases too, which will reduce the immigrant's motive to invest in education. In summary, I expect that the probability of investing in education will increase with the duration of residence, but at a decreasing rate.

Education may also differ for immigrants from different *countries of origin*. The previous five empirical studies which focused on investment in post-immigration schooling (Borjas 1982; Hashmi 1987; Chiswick and Miller 1994; Cobb-Clark, Connolly and Worswick 2005; van Tubergen and Werfhorst 2006) observed this strong relationship, although these studies report contradictory conclusions. For my paper, due to the limitations of the data source, I cannot separate individuals who came from English-speaking countries from those

who came from non-English-speaking ones. However, another categorization is provided in the data source, which is also acceptable to my research goal. Therefore, employing the AETS data, I assume that immigrants from European countries (including only Germany, Italy, the Netherlands, Poland, Portugal, the United Kingdom, and France)<sup>3</sup> are more likely to invest in education, for several reasons. The first reason is that immigrants from the above countries have a language advantage, which means they can finish schooling in Canada more quickly and successfully than immigrants who came from Asian countries (specifically, China, Hong Kong, India, South Korea, the Philippines, Sri Lanka, Taiwan, and Vietnam).<sup>4</sup> Another reason comes from the similar school system and culture, which is obviously a strong point for the person from a European country. All of these advantages reduce the cost of investment in human capital. Hence, immigrants from European countries are expected to be more likely to obtain education in Canada.

The *pre-immigration education level* is another important determinant of post-arrival education. It is a factor discussed frequently, but there is much controversy regarding its effect. On the one hand, it is argued that those with a higher pre-immigration education level have more intelligence, and thus have the ability to finish the additional schooling more efficiently. As a result, immigrants with more pre-arrival education have a lower cost of education, which leads to a high probability of investing in education. On the other hand, from the point of view of the return to investment, those immigrants with a low level of education before immigration can get more benefits from the additional education and hence improve their competitive position in the labour market of the host country. In this paper, the

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<sup>3</sup> See Statistics Canada (2004b, p. 31) for the definitions of country categorization.

<sup>4</sup> See Statistics Canada (2004b, p. 31) for the definitions of country categorization.

relationship between pre- and post-immigration education will be examined using Canadian data.

The final economic factor I examine here is *the country other than Canada where the immigrant attained the pre-immigration education*. In the data source I employ in this paper, the country of schooling obtained prior to arriving in Canada is provided only for postsecondary education. Ferrer and Riddell (2004) argue that the pre-immigration education, especially for degrees and diplomas, of immigrants from Asian countries is valued much less than that from European countries in the Canadian labour market. Therefore, obtaining additional education can bring more benefits for immigrants from Asian countries. In addition, Cobb-Clark, Connolly and Worswick (2005) argued that “immigrants with poor skill transferability may have especially high returns to postmigration human capital acquisition since small human capital investments (such as language training) may lead to large improvements in their ability to transfer premigration skills to the host country labour market” (p. 671). This argument leads one to predict that immigrants who finished their post-secondary or a higher level of education in Asian countries are the most likely to invest in schooling.

### ***Personal characteristics***

Due to data limitations I can employ just a few of the traditional independent variables which have frequently been included in the relevant prior studies.<sup>5</sup> However, I introduce several explanatory variables related to individual and job characteristics. According to Hum

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<sup>5</sup> I will discuss the details of the data file in the section “Data and Econometric Methods.”

and Simpson (2002), these variables “may influence the training decision and, if excluded, would bias our estimates” (p. 10).

I will discuss each of the personal and job characteristics that possibly affect post-immigration investment in schooling in turn as follows:

(1) *Gender*. Many studies stated that behaviour with regard to investment in education is very different for males and females, especially with respect to adult education and training. (Green 1993; Hum and Simpson 2002; Miller 1994; Cobb-Clark, Connolly and Worswick 2005). To address the issue, I choose gender to be an important determinant of post-immigration education. Therefore, I hypothesize that there will be gender group differences in investment in education.

(2) *Health status*. Whether one is healthy or not is a potentially important factor which may influence the individual’s decision with regard to receiving education, although earlier studies seldom examined the effect of this variable. In fact, because of the barriers of language, income, culture and educational system for immigrants, obtaining education in the host country is hard work for immigrants. Without satisfactory health, one cannot imagine an immigrant would be able to finish his or her studies successfully in a strange country. As a result, I assume that good health should be positive related to investment in post-immigration education.

(3) *Household income*. Household income can influence post-immigration investment in education in a very complex way. From a general perspective, an increase in household income will provide the immigrant who intends to invest in schooling with a greater capacity to afford the tuition and living fees, namely, the conditions for investing in education will be

better. Nevertheless, another possibility is that when the individual has enough income to afford his ideal living condition, he will not need to invest in human capital anymore. The returns to additional investment in human capital will be less than the cost, especially the opportunity cost which is the foregone earnings due to time spent on schooling, once the individual's income has reached some amount. Hence, I expect that the possibility of investment in post-immigration education will increase with household income, but the increase will become slower after household income exceeds some level.

(4) *Occupational status.* A factor in which economists are interested is occupational status. Chiswick and Miller (1994) found that “those who worked in the most skilled occupation (Professional and Managerial) have a higher probability of acquiring a qualification after immigration than any other groups” (p. 173). Altonji and Spletzer (1991) examined the relationship between adult training and occupation and showed that the probability of taking training increases with the math, verbal and clerical skill requirements of an occupation, and decreases with manual skill requirements. Hum and Simpson (2002) also found a significant correlation between them. At the same time, a potential problem that should be considered here is that the immigrant, especially adult immigrants, may have already obtained the required skills. However, in Canada some analysts claim that the credentials of immigrants obtained in their country of origin are valued much less than the experience of comparable native-born workers (Ferrer and Riddell 2004; Reitz 2001). As a result, an immigrant who wish to work in the most skilled occupations has to invest more in education than those who choose other occupations. Therefore, it is hypothesized that the greater the skill requirements of an occupation, the greater the probability that the immigrant

invests in education.

(5) *Family size.* Although family size has never been employed as a determinant of the investment in post-immigration schooling, there are good reasons to believe that it will play a certain role. Especially for woman, as family size increases the time spent on housework rises. Hence, I expect that the factor “family size” will have different effects on male and female immigrants. It is expected that family size has a negative effect on investment in education for females.

(6) *Spouse's situation.* The spouse's situation includes two characteristics: the spouse's labour force status and the spouse's education level. Although it is reasonable to consider the spouse's situation as a potentially important determinant of investment in education, there are very few studies that have examined the effect of the spouse's labour force status. As for the spouse's education level, Cobb-Clack, Connolly, and Worswick (2005) included the partner's education in their regression model. However, they did not find a significant relationship between one's own and one's partner's education level. In my analysis, I try to estimate the correlation between the spouse's situation and investment in post-immigration schooling using Canadian data. I expect that when the spouse is employed, the possibility of education will increase. In addition, I also hypothesize a significant positive relation between one's own and one's spouse's education level.

(7) *The presence of young children.* Considerable differences have been found in the amount of investment in post-immigration education between the group with young children and the group without. In the AETS data file, a young child is defined as a pre-school child

aged 0 to 5 inclusive.<sup>6</sup> This factor has been shown to play an important role in adult schooling. Greenhalgh and Stewart (1987) state that the number of young children has a significant negative relationship with the probability of schooling for both men and women. Hum and Simpson (2002) introduced the same explanatory variable in their research, and found that the presence of young children reduces the chances of training. This negative effect is especially statistically significant for women (Miller 1994). It is hence hypothesized that immigrants with young children are less likely to invest in education.

### *The estimating equation*

Given the theoretical hypotheses discussed above, the empirical model takes into account both core economic factors and personal and job characteristics that are assumed to be related to post-immigration education investment. These factors compose the explanatory variables in the estimating equation. Furthermore, the dependent variable in these hypotheses is post-immigration education. In my regression model, I describe the accumulated education obtained in Canada in two ways: one dichotomous variable indicates whether an immigrant obtained any education in Canada; another dependent variable is based on the highest level of education attained in Canada. The details of these endogenous variables will be discussed in the next section.

Thus, the basic model of post-immigration educational attainment can be written in the form:

$$y_i^* = \alpha + \beta_1' E_i + \beta_2' P_i + \beta_3' H_i + \beta_4' F_i + \beta_5' J_i + \beta_6' S_i + \beta_7' I_i + \varepsilon_i \quad (1)$$

<sup>6</sup> See Statistics Canada (2004b, p. 80) for the definition of a young child. ([http://www.statcan.ca/english/sdds/document/3879\\_D7\\_T9\\_V1\\_E.pdf](http://www.statcan.ca/english/sdds/document/3879_D7_T9_V1_E.pdf))

where  $i$  indexes individuals. The exact interpretation of  $y_i^*$  will be discussed later in section IV.  $E_i$  is a vector of basic economic factors like age, birthplace, duration of residence of individual  $i$ .  $P_i$  is a vector of variables related to the pre-immigration education of individual  $i$ . This vector contains the pre-immigration education level and the country other than Canada where the immigrant attained the pre-immigration education.  $H_i$  is a vector of dummy variables reflecting the health status of individual  $i$ .  $F_i$  is a vector of variables consisting of two personal factors of individual  $i$ , namely, family size and the presence of young children.  $J_i$  is a vector of variables related to job characteristics which includes dummy variables for job permanence and the type of occupation.  $S_i$  is a vector of variables related to the situation of individual  $i$ 's spouse. This vector includes two dummy variables: the spouse's labour force status and the spouse's education level.  $I_i$  is a vector that contains dummy variables for the level of household income of individual  $i$ . In addition,  $\alpha$  and  $\beta_j', j = 1, \dots, 7$  contain the parameters to be estimated. Finally,  $\varepsilon_i$  is the error term. To test for gender differences, the model can be estimated separately for men and women.

Up to now, I have constructed the basic equation of post-immigration investment in education. In the next section, I will describe the data file employed in this paper. Using the detailed information in the data codebook, I can define the dependent and independent variables more accurately.

#### **IV. Data and Econometric Methods**

While there are several existing studies concerning investment in post-immigration education, reaching identical conclusions about this issue is difficult. In fact, in every

estimated model, the choice of variables and the use of econometric methods depends on the characteristics of the data. For my research purpose, I take advantage of a data source that provides unique data on immigrants' educational situation in Canada: the 2003 Adult Education and Training Survey (AETS).

### **A. Data**

The 2003 Adult Education and Training Survey is "Canada's most comprehensive source of data on individual participation in formal adult education and training. It is the only Canadian survey to collect detailed information about the skill development efforts of the entire adult Canadian population" (Statistics Canada 2004a, p. 7).

The AETS data are exceptionally rich for my research purpose. First of all, the 1998 AETS asks, for the first time, questions on immigration status. Thereby, this survey provides the most appropriate data source on immigrants' education and training in Canada.<sup>7</sup>

Employing the 2003 AETS provides me with up-to-date detailed information on post-immigration education for immigrants. For the AETS survey, the sample is restricted to individuals 25 years of age or older, including both males and females. In fact, considering the effect of the duration of residence, the sample will include individuals who immigrated at various ages, even those who immigrated as children. In addition, the AETS contains information about pre-immigration education, including education level and the country in which immigrants obtained the post-secondary education. Last but not least, the AETS separates the data on post-immigration and pre-immigration education efficiently, which

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<sup>7</sup> I considered using Cycle 4 (1989) of the GSS, which also contains data on immigrants' education. However, this survey fails to provide direct data on post-immigration educational attainment. For further details see <http://www.library.carleton.ca/ssdata/surveys/gss.html>.

gives me explicit data on post-immigration educational attainment. This information can help me to avoid the measurement error in the studies of Borjas (1982) and Hashmi (1987), who estimated years of schooling in the U.S. using total years of schooling and age at migration.

### *Dependent variables*

In the AETS file, two questions are designed to collect information about immigrants' educational achievement in Canada. Hence, the post-immigration education data are based on the following two questions (Statistics Canada 2004b, p. 32):

- (1) Has the respondent attained any level of education in Canada?

Here the coverage is respondents who were born in another country and who became a landed immigrant after the age of four who attained some high-school or less outside Canada or education which is not definable by a level.

- (2) What is the highest level of education the respondent has attained in Canada?

Here the coverage is respondents who were born in another country and who became a landed immigrant after the age of four who attained some education in Canada.

Therefore, the dependent variable can be specified in two ways. The first is whether immigrants invest in education in Canada, which has two outcomes: (1) schooling in Canada; and (2) no schooling in Canada. I call this variable "educational participation in Canada", which equals 1 when the immigrant has schooling in Canada, and 0 otherwise. In addition, I specify another dependent variable derived from the highest level of education obtained in Canada. In the original AETS data file, the highest level of education for immigrants is categorised into eight levels: from "Grade 8 or lower" to "University degree or certificate above bachelor's degree." In this paper, in focusing on the educational attainment of the adult immigrants, I prefer to group this variable into two categories: (1) University certificate or above; and (2) less than a university certificate (including "no education"). This dependent

variable is called “university educational attainment in Canada”, which equals 1 if the immigrant obtained a university certificate or above in Canada, and 0 otherwise.

In fact, neither of these two dependent variables can be dispensed with in discussing the determinants of post-immigration education. The variable “educational participation in Canada” provides an overall view of immigrants’ educational investment in Canada. However, limiting the analysis to this variable does not give us much detailed information on immigrants’ schooling after arriving in Canada. More specifically, the variable “educational participation in Canada” allows us only to distinguish between those who attained post-immigration schooling and those who didn’t. As to which kind of education immigrants have obtained after immigration, it provides no obvious information. Therefore, in addition to the variable “educational participation in Canada”, it is useful to examine “university educational attainment in Canada” as another dependent variable. Although the AETS provides eight categories of the highest level of education for immigrants, because previous research has shown that educational investments are qualitatively different for children and adults (Chiswick and DebBurman 2006), I focus on the formal educational attainment of the adult immigrants and look specifically at university education.

Since my goal is to analyse post-immigration investment in education, I limit my sample to respondents who were not born in Canada. As a result, there are 3,337 immigrants in the sample. After omitting the respondents who have answered “Don’t know”, “Refusal” or “Not stated” to the main questions, there are 2322 valid observations in the model where the dependent variable is “educational participation,” and 2316 observations in the model where the dependent variable is “university educational attainment”. The frequency distribution of

the sample by gender across these educational categories is presented in table 2.

The table indicates that over half of the immigrants in the sample participated in education after arrival in Canada. However, just 15.5% received a university certificate or above. When gender is considered, it appears that males participated in post-migration schooling at a higher rate than females. While 53.5% of immigrant men received education in Canada, only about 51% of immigrant women participated. Furthermore, this gap becomes greater at the university level of schooling. In the lower panel of table 2, it can be seen that 17.5% of immigrant men obtained a university certificate or above, but only 13.7% of women did so.

### *Independent variables*

In this paper, there are also limitations to the AETS, which restrict the definitions of the explanatory variables. For example, there are no data on age at immigration or visa categories. Besides, it is also difficult to distinguish whether the original country is an English or non-English speaking country. Therefore, I have to exclude these important explanatory variables from my estimating equations. Fortunately, the AETS includes many demographic and skill variables that can serve as explanatory variables for the analysis, which reduces the possible estimation bias in my model. As noted in the previous section, I categorised these variables as personal and job characteristics, following the framework developed by Hum and Simpson (2002).

In summary, the following independent variables are employed in the model. In the AETS, the immigrants' *age* is a categorical variable taking five values: 25-34, 35-44, 45-54,

55-64, and 65 or more. This variable is used to construct four dummy variables, one for each of the four oldest age categories. The *duration of residence* in the host country is represented by “Year of immigration or permanent resident status”, which includes four groups. For estimation purposes, dummy variables are created for three of these time intervals – 1993 to 1997, 1983 to 1992, and before 1983 – with the omitted category being 1998-2003.

*Birthplace* is classified into three groups: (1) European countries; (2) Asian countries; and (3) Other. Choosing “European countries” as reference group, I create two dummy variables for this factor. Similar categories are used to identify the *country other than Canada where the immigrant attained the pre-immigration education*.

The *pre-immigration education level* is another important explanatory variable in my empirical model. It is divided into twelve categories in the original AETS data file. In order to be consistent with the second dependent variable, I create a dummy variable with two categories: (1) University certificate or above; and (2) Non-university certificate or lower (including “no education”). In other words, I focus on the impact of having obtained university qualifications prior to arrival in Canada.

In addition, some new explanatory variables which have not been included in previous studies are employed in this paper. *Household income* is a categorical variable taking ten values in the AETS. Considering the frequency and the width of the income intervals, I group it into six categories in the model: less than \$20,000; \$20,000 to less than \$30,000; \$30,000 to less than \$40,000; \$40,000 to less than \$60,000; \$60,000 to less than \$80,000; and \$80,000 or more. Thus, I construct five dummy variables, one for each of the five highest income categories. *Occupational status* is classified into 4 groups: (1) Professional, managerial; (2)

Clerical, sales, service; (3) Blue collar worker; and (4) Not in the labor force. Similarly, dummy variables are created for three groups, while the “Professional, managerial” group is chosen as the reference group. *Spouse’s labour force status* and *spouse’s education level* are included in spouse’s situation. I create one dummy variable for *Spouse’s labour force status*, which equals 1 if the spouse is employed and 0 otherwise. For *spouse’s education level*, three dummy variables are created, which include 0-8 years of schooling, postsecondary, and university degree. Other variables used in the analysis are *health status*, *family size* and *the presence of young children*.

Table 3 explains the definitions of explanatory variables employed in my equation. In addition, I provide the sample characteristics of all the independent variables for men and women separately in Table 4. Table 4 indicates that over half the immigrants in the sample immigrated to Canada before 1983. This is true for both men and women in both samples. Considering the pre-immigration education level, less than one-third of immigrants obtained a university qualification prior to arrival in Canada. For women, only about one-fifth did so, which means that the average education level is lower for immigrant women than men when they came to Canada. Furthermore, Table 4 also illustrates that 56% of immigrant men have a permanent job, but only about 47% of immigrant women have a permanent job. Accordingly, females have a higher unemployment rate (30%) than males (14%) in the sample. Finally, it can be seen in Table 4 that most immigrants (87%) have no health problems which could limit the individual’s activity, and only 16% of immigrants have one or more young children.

Given the descriptive statistics of the independent variables, I can use econometric techniques to see what kind of relationship exists between post-immigration education and

the factors mentioned above.

## B. Econometric methods

Since the two alternative dependent variables are both defined as dichotomous variables, my econometric analysis starts with the most popular method of modelling such variables, namely, a *latent variable model*. According to Maddala (2001), a *standard latent variable model* has the following form:

$$y_i = \begin{cases} 1 & \text{if } y_i^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad (2)$$

In this paper,  $y_i$  represents the values of “educational participation” or “university educational attainment,” which as explained in the previous subsection are derived from the AETS. The variable  $y_i^*$  is an unobserved index of the net benefit to the individual of investing in education after arriving in Canada. Using equation (1), the following expression shows the relationship between  $y_i^*$  and the observed dummy dependent variable  $y_i$ :

$$\begin{aligned} p(y_i = 1) &= p(y_i^* > 0) = p\left(\alpha + \sum_{j=1}^7 \beta_j' X_{ij} + \varepsilon_i > 0\right) \\ &= 1 - F\left(\alpha + \sum_{j=1}^7 \beta_j' X_{ij}\right) \\ &= F\left(\alpha + \sum_{j=1}^7 \beta_j' X_{ij}\right). \end{aligned}$$

where  $X_{ij}, j = 1, \dots, 7$  represents the vectors of explanatory variables in equation (1), namely,  $E_i, P_i, H_i, F_i, J_i, S_i,$  and  $I_i$  respectively.  $F$  is the cumulative distribution function of  $\varepsilon$ .

This is the idea behind the *logit* and *probit* models. According to the statement of G.S. Maddala (2001), “the probit and logit models differ in the specification of the distribution of

the error term  $\varepsilon$ " (p. 322). More specifically, if  $\varepsilon$  is logistic the model is defined as the logit model; if the error term follow a normal distribution, the model is a probit model. The parameter  $\alpha$  and the parameter vectors  $\beta_j$ ,  $j = 1, \dots, 7$  can be estimated using either the logit or the probit model. In general, logit and probit models give similar results in terms of coefficient signs and significance tests. Greene (1997) concludes his discussion of the issue with the statement that "in most applications, it seems not to make much difference which model is used" (p. 875). Maddala (2001) stated that "we are not likely to get very different results using the logit or the probit method, unless the samples are large" (p. 323).

However, in the probit and logit models, the estimated coefficients do not have a direct economic interpretation. Instead, it is necessary to examine the marginal effects of the explanatory variables on the predicted probabilities. Here, the marginal effect of the  $k^{\text{th}}$  dummy explanatory variable in the vector  $j$ , where  $j = 1, \dots, 7$  is the change in the probability of a success ( $y = 1$ ) when  $x_{ijk}$  changes from zero to one, holding all other variables at some fixed values, denoted by  $X_*$ . The mathematical representation of a marginal effect of the  $k^{\text{th}}$  dummy explanatory variable in the vector  $j$  on the response probability is:

$$P(y = 1 | x_{ijk} = 1, X_*) - P(y = 1 | x_{ijk} = 0, X_*)$$

where  $X_*$  is set equal to the values of the explanatory variables for the reference individual.

With respect to the choice between the probit and logit models, Gordon, Lin, Osberg and Phipps (1994) stated that even if the probit and logit models yield identical coefficient estimates, "the probit model generates marginal effects which appear relatively more stable as sample size increases compared to the *logit* result" (p. 26). For this reason, I prefer to use the probit model.

Before estimating the probit model, in order to avoid potential data problems, I check for multicollinearity by regressing the explanatory variables on each other. The results show the values of all auxiliary  $R^2$ s are less than 0.8, which means that there are no strong linear relationships between the explanatory variables.<sup>8</sup> This result means that multicollinearity is unlikely to pose a serious problem.

## **V. Empirical Results and Analysis**

In this section, I will discuss the empirical results in two steps. First, I pool the male and female immigrants and introduce a gender dummy variable into the equation, which allows me to obtain an overview of the determinants of post-immigration education. In the second step, I estimate the post-immigration education models for males and females separately. By comparing the regression coefficients and marginal effects, I can analyse the gender differences in investment in education.

Using probit models, I can test the theoretical hypotheses mentioned in section III. But since the probit model is nonlinear, the coefficient estimates cannot be directly interpreted, as is the case in other models, such as the linear probability model. Therefore, I will give primary emphasis to the interpretation of the signs of the coefficients and the marginal effects of changes in the explanatory variables on the probability of obtaining post-immigration education, more specifically, on “educational participation” and “university educational attainment”.

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<sup>8</sup> I also test for heteroskedasticity using the test proposed by Davidson and MacKinnon (1984). Unfortunately, perhaps because there are too many independent variables entering into the variance, SHAZAM is unable to carry out the test.

### *Overview of post-immigration education*

The parameter estimates for the models of educational participation and university participation are given in table 5. Table 6 contains the marginal effects of changes in the explanatory variables on the probabilities. The dependent variables for the models are EDUPARTIC, educational participation in Canada, and UNIEDU, which represents university education in Canada. Table 5 tells us that both empirical models have some explanatory power since the Maddala  $R^2$ s are over 0.2, which is acceptable for microdata.<sup>9</sup> At the same time, table 6 shows the probability of the reference person is 0.55 in model 1 and 0.22 in model 2.

Considering the important factor *age*, there is a highly significant negative effect of *age* on both educational participation and university educational attainment in Canada. As immigrants 25 to 34 years old are the reference group, the negative signs on the coefficients of the age groups 35-44, 45-54, 55-64 and above 65 years imply that increases in age cause the probability of obtaining additional education to decrease. The coefficients of all the *age* variables are statistically significant at the 5 percent level of significance. Furthermore, among the four age variables, age 65 or more has the largest marginal effect: -0.45 in model 1, and -0.18 in model 2, which means that compared to the reference group, the probability of participating in education after arriving in Canada is lower by 45 percentage points for those 65 or older, holding all other specified regressors constant. Similarly, the probability of obtaining a university qualification is 18 percentage points lower for those 65 or older. These

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<sup>9</sup> The Maddala R-square is defined as  $R^2 = 1 - \left( \frac{L_R}{L_{UR}} \right)^{2/n}$ , where  $L_{UR}$  is the maximum of the likelihood function when maximized with respect to all the parameters and  $L_R$  is the maximum when maximized with the restriction that all the slope coefficients are zero.

results are consistent with my expectations.

The *year of immigration* is seen to have a significant positive relationship with both educational participation and the attainment of a university education in Canada. Tables 5 and 6 tell us that immigrants who arrived in Canada before 1983 are 75 percent more likely to invest in education than the most recent group, which is chosen as the benchmark.<sup>10</sup> Those who immigrated to Canada between 1983 and 1992 are 55 percent more likely, and the relatively recent arrivals who immigrated between 1993 and 1997 are 35 percent more likely to have invested in education after arriving in Canada. Similar results are observed when university educational attainment is the dependent variable. These results may partly reflect the fact that earlier immigrants have had more time to invest in post-immigration education. Therefore, in this paper, my finding confirms the positive effect of duration on post-immigration education, which is different from other previous empirical studies to some extent.

With respect to *birthplace*, an examination of Table 5 indicates that the coefficient of ASIA, which indicates the individual is from an Asian country, is statistically significant with a t statistic of -2.35 in Model 1 and 3.78 in Model 2. However, it is interesting to note that ASIA enters the two models with different signs.<sup>11</sup> On the one hand, compared with European immigrants (reference group), immigrants from Asian countries are less likely to participate in schooling after arrival in Canada.<sup>12</sup> Table 6 shows the probability of educational participation decreases by 9.8 percent points for Asian immigrants. On the other

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<sup>10</sup> I calculated the percentage change using following formula:

(Marginal effect of variable / probability of the reference person) \* 100%.

<sup>11</sup> According to the AETS codebook, Asian countries include China, Hong Kong, India, South Korea, the Philippines, Sri Lanka, Taiwan and Vietnam.

<sup>12</sup> European countries include only Germany, Italy, the Netherlands, Poland, Portugal, United Kingdom and France.

hand, the results for Model 2 in tables 5 and 6 imply that Asian immigrants are about 77 percent more likely to obtain a university education after immigrating, which is not consistent with my prior prediction. However, from an economic point of view, it is possible to explain why Asian immigrants have a higher probability of attending university after immigration than European group. The possible reason I can think of here is that those who immigrated from Asia can get more benefits from receiving university schooling. More specifically, for immigrants from Asia, larger cultural differences and lack of information render their human capital less valuable than that of European immigrants. Therefore, Ferrer and Riddell (2004) found that immigrants from Asian countries generally experience larger earnings gains associated with diplomas and degrees, especially postgraduate degrees.

Considering next the *pre-immigration education level*, given the large t statistic on the variable UNIVERSITY (-3.22 in model 1), the results imply that the probability of participating in education in Canada, all other factors held constant, is lower for an immigrant with a university education before immigration. Moreover, the value of the marginal effect in table 6 tells us that the probability of participating in education after arrival decreases by 11 percentage points for immigrants who already have a university education, compared to those with a lower pre-immigration education level. This is strong support for the hypothesis that prior education is a substitute for education in Canada. Immigrants who obtained higher levels of schooling prior to immigration have a lower probability of pursuing education in Canada. At the same time, Model 2 displays a completely different conclusion with respect to this variable; namely, a strong, highly significant positive coefficient implies complementarity between university education obtained outside and inside Canada. In short,

my results suggest that immigrants with a higher level of pre-arrival schooling are less likely to take additional schooling in Canada. However, among immigrants who participated in schooling in Canada, those with a high pre-migration education level have a higher probability of attending university in Canada.

With respect to the final economic factor, “*the country other than Canada where the immigrants attained the pre-immigration education,*” table 5 shows immigrants who obtained their postsecondary education in Asia are more likely to invest in additional schooling than immigrants from Europe (the reference group). Based on the value of the t-ratio (2.32), the coefficient of this variable is statistically significant at the 5 percent level of significance. This result supports my initial hypotheses that immigrants with credentials from Asian countries expect a high return to investment in schooling in Canada. However, the results for Model 2 show that immigrants who obtained some postsecondary education in Asia are 64 percentage points less likely to pursue a university education in Canada, as compared to immigrants who finished their prior postsecondary education in Europe. At first glance, this conclusion seems to contradict the result with respect to *birthplace*, which implied that Asian immigrants are about 77 percent more likely to obtain a university education after immigrating to Canada than European immigrants. However, I prefer to explain this result as follows: (1) the fact that immigrants have finished their postsecondary education in a country other than Canada implies that they have already obtained the skills or knowledge required in their home countries’ labour market; (2) the main barrier for Asian immigrants is that the market value of the skills and knowledge obtained in their home countries is likely to fall below that of the native-born (Bratsberg and Terrell 2002; Sweetman 2003). Therefore, for

Asian immigrants, choosing more job-specific training rather than university education can bring them more benefits, and be less costly.

Turning now to personal characteristics, *gender* is represented by the dummy variable FEMALE. As I choose males as the reference group, tables 5 and 6 suggest that immigrant women are less likely to invest in post-immigration education. However, statistically, the coefficient is significant only in model 2. This suggests that the gender differences are more considerable with respect to the level of educational attainment. I will discuss this issue in more detail in the next subsection.

*Occupation* is also an important factor in my econometric model. Occupational status is divided into four groups, with the professional and managerial group taken as the reference group. Tables 5 and 6 indicate that clerical and service workers, blue collar workers and individuals not in the labour force are less likely to participate in education and get a university qualification in Canada, with the effects being statistically significant at the 5 percent level in both models. Among these occupational groups, blue collar workers who have more manual skill requirements, are the least likely to obtain additional schooling. This result is consistent with empirical results from other studies.

*Family size* is also a statistically significant determinant of investment in post-immigration education. In model 2, the regression results reveal a highly significant negative effect of family size on post-immigration educational attainment at the university level. Furthermore, the values of the marginal effects show that compared to families with only one member (the reference group), the probability of obtaining a university qualification falls as family size increases. However, in the educational participation equation, at the 5

percent level of significance the coefficients of the two largest family size variables (FASIZE4 and FASIZE5) are statistically significant, but the coefficients of the first two are not. This implies that big families with four or more members affect the probability of investing in post-immigration education, but smaller families do not. All in all, these empirical results support my previous predictions, although not entirely.

Regarding *household income*, for model 1, tables 5 and 6 tell us that only the highest income class (\$80,000 or more) has a statistically significant coefficient at the 10 percent level of significance. Moreover, when household income reaches \$80,000 or more, the relevant group is 15 percent more likely to participate in schooling, compared to those with an income of less than \$20,000 (the reference group). This therefore suggests that household income has no strong effect on post-immigration educational participation. However, in model 2, the dummy variables for all income categories except \$30,000 to less than \$40,000 (INCOME 3) have significant coefficients at the 5 percent level of significance. Interestingly, for those immigrants whose household income is \$20,000 to less than \$30,000, the probability of investing in a university education decreases, compared to those with less than \$20,000 income (the reference group). In contrast, the other income classes have positive coefficients, implying a positive correlation between household income and post-immigration educational attainment. In general, this empirical result confirms my hypothesis. But table 6 also indicates that the probability of investing in post-immigration education at the university level keeps increasing as household income grows. This is a small deviation from my expectations.

Considering the *spouse's situation*, including the spouse's labour force and education

level, theoretically, this is an open issue. In fact, as no significant relationship between the *spouse's situation* and post-immigration education has been found in prior studies, I do not have any specific expectations regarding these variables. According to the empirical results, immigrants whose spouse is employed are less likely to invest in post-immigration schooling, compared to those whose spouse are unemployed or not in the labor force (the reference group). However, this negative effect is statistically significant at the 5 percent level of significance only in model 2. With respect to the spouse's education level, only the variable indicating that the spouse has a university degree (SEDUN) has a coefficient that is significant, at the 1% level for model 2 but at only the 10% level for model 1. This suggests that immigrants with a university degree are more likely to support and encourage their partner to invest in additional education than immigrants with a lower level of education.

Finally, I discuss the three remaining variables separately. First, tables 5 and 6 indicate that the coefficients of *presence of young children* (PRESCH) and *permanent job* (PERMJOB) are not statistically significant at the 10 percent level of significance for either model, which implies that these two variables have no significant impact on post-immigration educational investment. In addition, *health status* is expected to be positively related to investment in post-immigration education. This hypothesis is supported, although not entirely. The empirical results show that the variable HEALPROM, which represents the “not healthy” category, enters both regression models with a negative sign. However, only in model 2 is the negative coefficient of HEALPROM statistically significant at the 5 percent level of significance. This result suggests that health affects only the probability of obtaining university education after arriving in Canada, not the probability of obtaining a lower level of

education

### ***Gender differences in educational investment***

As mentioned previously, behaviour with regard to investment in education may be very different for males and females. Building on the analysis of the determinants for the full sample, I next examine gender differences in post-immigration educational investment. In this subsection, I divide the pooled sample into two subsamples by separating immigrant males from females. This allows me to explore men and women's post-immigration schooling decisions separately. The empirical estimates of model 1 and model 2 are presented separately by gender in tables 7 and 8.

The estimation results in tables 7 and 8 indicate that for both males and females, the effects of the main determinants of educational participation and university educational attainment are similar in terms of sign and statistical significance to those for the pooled sample of males and females in tables 5 and 6. For instance, the effects of *age* on post-immigration investment in education are still strong. The signs of the coefficients and the values of the marginal effects support the hypothesis that there should be a significant negative relationship between *age* and education. In addition, the *duration of residence*, reflected in the year of immigration, has a positive effect on schooling after immigration for both men and women. The values of the marginal effects further support the hypothesis that the probability of investing in education increases with the length of stay in Canada. Also consistent with the pooled results are the negative coefficients of the *occupation* dummy variables; in particular, the value of the marginal effect for the blue collar group is the highest

one, for both genders. Finally, the negative correlation between pre-immigration education and educational participation in Canada, as well as the complementarity between university education obtained outside and inside Canada is found in both the male and female subsamples. All the coefficients of these variables are statistically significant at the 5 percent level of significance, as for the full sample.

In this subsection, my major interest is in the differences in post-immigration educational investment between males and females. To this end, there are four variables which describe the discrepancy between men's and women's behaviour with respect to additional education. First, considering *birthplace*, table 7 tells us that immigrants from Asian countries are less likely to participate in schooling, but more likely to obtain a university education after arrival in Canada. This result is similar to that for the pooled sample. However, the effect of the variable ASIA on post-immigration schooling is statistically significant for females only. For males, the negative effect on educational participation (model 1) is now insignificant, but the positive effect on attending university (model 2) is still significant. Therefore, it would appear that birthplace plays a more important role in influencing females' investment in schooling than males'.

Second, *health status* also has a different effect on males and females. As can be seen in table 6, an immigrant with health problems is less likely to receive schooling and to finish a university education in Canada. This is consistent with my previous findings. However, this negative correlation between health problems and post-immigration education is statistically significant only for men, not women. A possible explanation is that as the head of a family, a man faces greater responsibilities for supporting his family. Thus, a man with a health

condition might prefer to find a suitable job that is not too demanding, rather than investing in further education.

Third, after I separated the immigrant sample into male and female subsamples, the apparently negative influence of *family size* on post-immigration education becomes statistically significant for men. In fact, for men, the probability of both educational participation and university educational attainment decrease as family size increases. For females, the increase in family size only has a significant impact on university educational attainment. Also, marginal effects seem to be much larger for men than for women, especially in model 1. These results are apparently contradictory to my earlier prediction that family size will have a negative effect on investment in education for females. Actually, the empirical results show that as family size increases, the probability of schooling is reduced for men, but not for women. A possible reason for this finding is that the economic burden will rise as family size increases, which forces men to spend more time on the job, which in turn reduces probabilities for education in Canada.

Fourth, with respect to the *spouse's situation*, two aspects of this factor are of interest. Firstly, the effect of the spouse's labour force status is not completely identical to that described above for the pooled sample. Actually, for women, those whose spouse is employed are less likely to invest in post-immigration schooling, compared to those whose spouse is unemployed or not in the labour force. This negative effect is statistically significant at the 5 percent level of significance only in model 2. In contrast, this variable has no strong effect for men in either model, and for women in model 1. Secondly, the results with respect to the spouse's education level in tables 7 and 8 show that women are more likely to obtain a

university education as the spouse's education level increases. The coefficients of the spouse's different education level variables are statistically significant at the 5 percent level of significance, except for that of the variable SEDUPO, which represents the group whose spouse's education level is some postsecondary, postsecondary certificate or diploma. However, this strong effect only exists for women in model 2. For men, only the variable indicating that the spouse has a university degree has a coefficient that is significant at the 5% level for both models 1 and 2, which is similar to the results for the pooled sample.

Finally, at end of this section, it should be noted that the estimation results regarding the *presence of young children* are inconsistent with my earlier hypothesis. In fact, not only in the pooled sample, but also in the male and female subsamples, the effect of the *presence of young children* on post-immigration education is not significant, a result which deviates from those of many prior studies (Greenhalgh and Stewart 1987; Hum and Simpson 2002; Miller 1994). A possible reason for not finding an effect may be the small number of observations ( $N_1 = 2322$ ,  $N_2 = 2316$  for the pooled sample;  $N_1^M = 1101$ ,  $N_1^F = 1221$ ,  $N_2^M = 1099$ ,  $N_2^F = 1217$  for the subsamples).<sup>13</sup> In addition, some important factors may be omitted in my model, such as the presence of a senior who can share the responsibility for looking after the young children. Limited by the AETS, I cannot incorporate variables to further investigate this issue. Finally, another reason may be the complexity of the model. Indeed, when I estimate separate equations by year of immigration, grouped in four cohorts, I find a significant negative interaction between the presence of young children and investment in

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<sup>13</sup>  $N_1$  = number of observations in model 1;  $N_2$  = number of observations in model 2;  $N^M$  = number of observations in male group;  $N^F$  = number of observations in female group

post-immigration education, for both males and females (results not shown).

## **VI. Conclusion**

In this study, I investigate the determinants of post-immigration investment in education. By employing the 2003 Adult Education and Training Survey (AETS), the impact of not only core economic factors that were previously used in other studies, but also personal and job characteristics, on immigrants' formal education after arriving in Canada are examined. From this point of view, my study enriches the existing literature by introducing several new explanatory variables, including health status, family size, household income and the presence of young children. Applying a probit model, I examine my empirical results first for the full sample, and then look at gender differences in post-immigration educational investment.

Several conclusions about the factors affecting post-immigration educational investment can be drawn from this study. First of all, my study provides a test of determinants that have been employed in other studies, using data for Canada for the first time. Similar to previous studies, my study confirms that age has a negative effect on post-immigration education, whereas duration of residence has a positive impact (Chiswick and Miller 1994; Hashmi 1987; van Tubergen and Werfhorst 2006; Cobb-Clack, Connolly and Worswick 2005). When a general assessment of the results is made according to the values of the marginal effects, increasing age leads to a lower probability of investing in education, whereas a longer duration of residence increases the propensity of immigrants to obtain schooling after immigration to Canada.

Also similar to prior studies are the effects of occupation. My empirical results suggest that blue collar workers with more manual skill requirements are less likely to obtain additional schooling than other occupational groups, which is highly consistent with the research of Chiswick and Miller (1994). At the same time, in contrast to the conclusions drawn by Cobb-Clack, Connolly, and Worswick (2005), I find that when the spouse has a university degree, the spouse's education level has a significant positive effect on the immigrant's own university educational attainment. However, immigrant men whose spouse has a university degree are more likely to invest in schooling than immigrant women whose spouse has a university degree, not only in schooling participation, but also in university educational attainment. For women, this effect becomes weaker, with a significant impact only on obtaining a university education.

In addition, my study examines the effect of birthplace by employing a different grouping of countries than in other studies, in which all immigrants are categorized into immigrants from Asian countries, European countries or other countries. The results show that immigrants from Asian countries are less likely to participate in schooling, but more likely to obtain a university education than those from European countries for the full sample. However, when males and females are disaggregated, this conclusion is supported only by the empirical results for the female subsample, rather than the male subsample. It therefore shows that birthplace plays a more important role in influencing females' investment in schooling than that of males.

In this paper, I also examined the relationship between pre- and post-immigration schooling. My regression results show that immigrants with a university education prior to

arrival are less likely to participate in additional schooling in Canada, which is a typical “substitution” relationship. At the same time, the results also indicate that immigrants who obtained a university degree prior to arrival are more likely to finish university in Canada. The first conclusion is consistent with the studies of Chiswick and Miller (1994), Cobb-Clack, Connolly and Worswick (2005) and van Tubergen and Werfhorst (2006), but the last one is similar to the studies of Borjas (1982) and Hashmi (1987). This is a very unexpected result. Furthermore, when I focus on the estimated results for the male and female subsamples, similar conclusions are obtained for men, whereas only the “substitution” relationship between pre-immigration education level and education participation after arrival in Canada is observed for women.

Secondly, considering the new explanatory variables which I introduced into the model of post-immigration investment in education, I do not find much support for the hypothesis that the presence of young children has a negative effect on post-immigration schooling, using both the full sample and the subsamples. Considering the positive effect of health status on post-immigration schooling, although this remains for immigrant men, whether one has a health condition or not has no significant impact on immigrant women. In addition, when a gender dummy variable enters the empirical equation, the empirical results with respect to household income and family size are consistent with expectations. The results reveal that household income has a significant positive effect on post-immigration education, while family size has a negative effect on schooling after arrival in Canada. However, the estimation results for the male and female subsamples show that household income has a positive impact on obtaining a university education in Canada for females only. In contrast,

deviating from prior expectations, the apparently negative influence of *family size* on post-immigration education becomes statistically significant for men, but not strong for women.

Thirdly, other important gender group differences in post-immigration investment in education are observed in my empirical results. Holding other variables constant, women are about 2.5 percentage points less likely to participate in post-immigration education, and about 4 percentage points less likely to obtain a university education. Furthermore, the empirical estimates for males and females indicate that women's propensity to invest in education is more sensitive to birthplace and spouse's situation than men's. For men, the investment decision is more sensitive to health status and family size, compared to women.

Finally, an important limitation of my study is that my data source has no detailed information on several important determinants for the model of post-immigration educational investment, including age at immigration, immigration motive, and ethnic group. As a result, I cannot employ these explanatory variables in my empirical model. Thus, the absence of these determinants might affect the model's explanatory power and influence the significance of the other explanatory variables to some extent.

As a continuation of this study, by employing a more complex econometric model such as the multinomial probit or ordered probit model, I could analyse the level of post-immigration educational attainment, thereby using all the information about educational attainment provided in the AETS. Thus I could explore the determinants of every level of education chosen by immigrants after arriving in Canada. In future work, using the available up-to-date AETS, I would like to investigate the factors which might affect the education

● decision for immigrants from a dynamic point of view.



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**Table 1. Summary of Empirical Studies of Post-immigration Education**

Authors	Data source	Dependent variables	Independent variables	Estimation method	Major finding
Borjas (1982)	1976 Survey of Income and Education (SIE)	Years of U.S. schooling	Age, marital status, health status, SMSA status, school enrollment, pre-migration schooling, birthplace, years since migration	OLS	<ul style="list-style-type: none"> <li>① Negative correlation between pre- and post-migration education .</li> <li>② Cuban immigrants invest more than other Hispanic immigrants.</li> </ul>
Hashmi (1987)	1976 Survey of Income and Education (SIE) & 1980 Census of U.S. Population	Total years of schooling completed & current enrollment status	Age, pre-migration education, marital status, health status, birthplace, duration of residence, cost and quality of U.S. schooling	OLS & Probit	<ul style="list-style-type: none"> <li>① Refugees and immigrants from non-English speaking countries intend to invest more in post-immigration education.</li> <li>② Negative effect of age on post-migration schooling.</li> <li>③ substitutionarity of pre- and post- investment in training.</li> <li>④ post-migration schooling declines with the schooling cost, rises with the quality</li> <li>⑤ Positive correlation between year of arrival and post-schooling.</li> </ul>

Chiswick and Miller (1994)	1987 Australian survey Labour Force Status and Other Characteristics of Migrants	Post-immigration educational attainment	Age on arrival, pre-immigration education, country of origin, pre-immigration occupation, gender, migration category, year of arrival	OLS & Logit	<ul style="list-style-type: none"> <li>① Negative effect of age on post-immigration schooling.</li> <li>② Refugees intend to invest less in post-immigration education.</li> <li>③ Complementarity of pre- and post- investment in education.</li> <li>④ Positive correlation between year of arrival and post-immigration schooling.</li> <li>⑤ the prior occupation is an important determinant of post-migration education</li> </ul>
Cobb-Clark, Connolly and Worswick (2005)	Longitudinal Survey of Immigrants to Australia (LSIA)	School enrollment	Visa category, region of origin, pre-migration education level, years since migration, the unemployment rate at the time of arrival, the partner's education	OLS	<ul style="list-style-type: none"> <li>① Immigrants from non-English speaking or less developed countries intend to invest more in post-migration education.</li> <li>② enrollment rates increase over the first years after immigration and then decline</li> <li>③ positive correlation between pre- and post-investment in training.</li> <li>④ humanitarian and independent household are likely to be enrolled in school</li> </ul>

<p>⑤ immigrants who arrive in times of high unemployment rate are more likely to invest in schooling</p>			
<p>① Immigrants from the former Dutch colonies are more likely to invest in post-migration education.</p>	<p>Country of origin, pre-migration education, age at immigration, years since migration, migration motive, timing of marriage, national unemployment rate</p>	<p>Logistic</p>	
<p>② age has a negative non-linear effect on the post-migration schooling, and the duration of stay has the same effect.</p>			
<p>③ complementarity of pre- and post- investment in education.</p>			
<p>④ weak relation between timing of marriage and post-migration education</p>			
<p>⑤ the rate of completed education rises with the unemployment rate at the year of migration</p>			

Tubergen and Werfhorst (2006)

the Social Position and Use of Services of the Allochtonous population surveys of 1988, 1991, 1994, 1998 and 2002 (SPVA) Netherlands

Educational participation & Level of completed schooling in the Netherlands

Country of origin, pre-migration education, age at immigration, years since migration, migration motive, timing of marriage, national unemployment rate

**Table 2. Post-immigration Education in Canada, by Gender**

	Gender		Total
	Male	Female	
Sample size	1101	1221	2322
Educational participation in Canada:			
Schooling (%)	53.5	51.0	52.2
No schooling (%)	46.5	49.0	47.8
Total	100	100	100
Sample size	1099	1217	2316
University educational attainment in Canada:			
University certificate or above (%)	17.5	13.7	15.5
Non-university certificate or lower (%)	82.5	86.3	84.5
<b>Total</b>	100	100	100

**Source:** 2003 Adult Education and Training Survey Master File; calculations by the author.

**Table 3: Definitions of independent variables**

Variable	Description	
Age:		
Reference	=1 if immigrant is 25 to 34 years old	=0 otherwise
AGE35	=1 if immigrant is 35 to 44 years old	=0 otherwise
AGE45	=1 if immigrant is 45 to 54 years old	=0 otherwise
AGE55	=1 if immigrant is 55 to 64 years old	=0 otherwise
AGE65	=1 if immigrant is 65 or more years old	=0 otherwise
Gender:		
Reference	=1 if immigrant is male	=0 otherwise
FEMALE	=1 if immigrant is female	=0 otherwise
Birthplace:		
Reference	=1 if immigrant immigrated from European countries	=0 otherwise
AS IA	=1 if immigrant immigrated from Asian countries	=0 otherwise
OTHER	=1 if immigrant immigrated from country other than Asian and European countries	=0 otherwise
Year of immigration:		
Reference	=1 if immigrant immigrated between 1998 and 2003	=0 otherwise
YEARIM2	=1 if immigrant immigrated between 1993 and 1997	=0 otherwise
YEARIM3	=1 if immigrant immigrated between 1983 and 1992	=0 otherwise
YEARIM4	=1 if immigrant immigrated before 1983	=0 otherwise
Pre-immigration education level:		
Reference	=1 if the highest level of education that immigrants obtained outside Canada is non-university certificate or low	=0 otherwise
UNIVERSITY	=1 if the highest level of education that immigrants obtained outside Canada is university or more	=0 otherwise
Pre-migration education country:		
Reference	=1 if immigrant attained level of education in European countries	=0 otherwise
PREASIA	=1 if immigrant attained level of education in Asian countries	=0 otherwise
PREOTHER	=1 if immigrant attained level of education in country other than Asian and European countries	=0 otherwise
Health status:		
Reference	=1 if immigrant has no health problem	=0 otherwise
HEALPROM	=1 if immigrant has health problem	=0 otherwise

Household income:

Reference	=1 if household income is less than \$20,000	=0 otherwise
INCOME2	=1 if household income is \$20,000 to less than \$30,000	=0 otherwise
INCOME3	=1 if household income is \$30,000 to less than \$40,000	=0 otherwise
INCOME4	=1 if household income is \$40,000 to less than \$60,000	=0 otherwise
INCOME5	=1 if household income is \$60,000 to less than \$80,000	=0 otherwise
INCOME6	=1 if household income is \$80,000 or more	=0 otherwise

Permanent job:

Reference	=1 if immigrant has a temporary job	=0 otherwise
PERMJOB	=1 if immigrant has a permanent job	=0 otherwise

Family size:

Reference	=1 if one individual in family	=0 otherwise
FASIZE2	=1 if two individuals in family	=0 otherwise
FASIZE3	=1 if three individuals in family	=0 otherwise
FASIZE4	=1 if four individuals in family	=0 otherwise
FASIZE5	=1 if five or more individuals in family	=0 otherwise

Occupational status:

Reference	=1 if immigrant is a professional and managerial workers	=0 otherwise
CLER_SER	=1 if immigrant is a clerical and service workers	=0 otherwise
BLUECOLL	=1 if immigrant is a blue collar workers	=0 otherwise
NOLABOR	=1 if immigrant not in the labour force	=0 otherwise

Presence of young children:

Reference	=1 if no presence of pre-school child	=0 otherwise
PRESCH	=1 if presence of pre-school child	=0 otherwise

Spouse's labour force status:

Reference	=1 if the spouse is unemployed or not in the labour force	=0 otherwise
SPOUSLF	=1 if the spouse is employed	=0 otherwise

Spouse' education level:

Reference	=1 if the spouse's education level is less to 0-8 years	=0 otherwise
SEDUHS	=1 if the spouse's education level is 0-8 years	=0 otherwise
SEDUPO	=1 if the spouse's education level is postsecondary	=0 otherwise
SEDUUN	=1 if the spouse's education level is university degree	=0 otherwise

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**Table 4: Sample Characteristics by Gender**

		Sample 1			Sample 2		
		All	Males	Female	All	Males	Female
		%			%		
<b>Age:</b>							
25-34 years	(reference)	16.41	15.62	17.12	16.41	15.56	17.17
35-44 years	(AGE35)	28.90	29.52	28.34	28.89	29.48	28.35
45-54 years	(AGE45)	26.49	26.52	26.45	26.51	26.57	26.46
55-64 years	(AGE55)	24.29	23.89	24.65	24.27	23.93	24.57
65 or more	(AGE65)	3.92	4.45	3.44	3.93	4.46	3.45
<b>Year of immigration:</b>							
1998-2003	(reference)	14.04	13.90	14.17	14.03	13.92	14.13
1993-1997	(YEARIM2)	11.76	10.35	13.02	11.70	10.28	12.98
1983-1992	(YEARIM3)	20.03	19.89	20.15	19.99	19.84	20.13
Before 1983	(YEARIM4)	54.18	55.86	52.66	54.28	55.96	52.75
<b>Birthplace:</b>							
European countries	(reference)	35.36	35.70	35.05	35.41	35.76	35.09
Asian countries	(ASIA)	21.06	20.62	21.46	20.98	20.56	21.36
Other	(OTHER)	43.58	43.69	43.49	43.61	43.68	43.55
<b>Pre-immigration education level:</b>							
University certificate or above	(UNIVERSITY)	25.83	29.35	18.27	25.91	29.40	22.76
Non-university certificate or lower	(reference)	74.17	70.65	81.73	74.09	70.60	77.24
<b>Country of pre-immigration education:</b>							
European countries	(reference)	11.20	11.99	10.48	11.23	12.01	10.52
Asian countries	(PREASIA)	10.94	10.35	11.47	10.88	10.37	11.34
Other	(PREOTHER)	17.61	19.71	15.73	17.66	19.75	15.78
Health problem	(HEALPROM)	87.30	88.74	86.00	87.31	88.72	86.03
<b>Household income:</b>							
Less than \$20,000	(reference)	19.86	16.23	23.10	19.69	16.20	23.30
\$20,000 to less than \$30,000	(INCOME2)	14.00	13.35	14.58	13.99	13.29	14.63
\$30,000 to less than \$40,000	(INCOME3)	14.77	14.44	15.07	14.81	14.47	15.12
\$40,000 to less than \$60,000	(INCOME4)	21.88	22.25	21.54	21.94	22.29	21.61

\$60,000 to less than \$80,000	(INCOME5)	13.65	15.17	12.29	13.69	15.20	12.33
\$80,000 or more	(INCOME6)	15.85	18.53	13.43	15.89	18.56	13.48
Occupational status:							
Professional, managerial	(reference)	33.94	35.70	32.35	34.02	35.76	32.46
Clerical, sales, service	(CLER_SER)	23.60	18.44	28.26	23.49	18.29	28.18
Blue collar worker	(BLUECOLL)	19.98	31.79	9.34	20.04	31.85	9.37
Not in the labor force.	(NOLAABOR)	22.48	14.08	30.06	22.45	14.10	29.99
Permanent job	(PERMJOB)	51.46	56.13	47.26	51.43	56.05	47.25
Family size:							
One	(reference)	18.82	19.8	17.94	18.83	19.75	18.00
Two	(FASIZE2)	27.65	25.61	29.48	27.68	25.66	29.50
Three	(FASIZE3)	20.07	19.8	20.31	20.04	19.84	20.21
Four	(FASIZE4)	20.33	20.16	20.48	20.34	20.20	20.46
Five or more	(FASIZE5)	13.14	14.62	11.79	13.13	14.56	11.83
Presence of young children:	(PRESCH)	16.32	16.26	16.38	16.32	16.29	16.35
Spouse's labour force statuses:							
Employed	(SPOUSLF)	44.79	43.23	46.19	44.86	43.31	46.26
Unemployed or not in the labour force	(reference)	55.21	56.77	53.81	55.14	56.69	53.74
Spouse's education level							
Less to 0-8 year	(reference)	42.76	39.50	5.70	42.71	39.40	45.69
Graduate from high school	( SEDUHS)	13.14	15.90	10.65	13.13	15.92	10.6
postsecondary certificate or diploma	(SEDUPO)	25.32	25.89	24.81	25.39	25.93	24.9
University degree	(SEDUUN)	18.78	18.71	18.84	18.78	18.74	18.82
Sample size:		2322	1101	1221	2316	1099	1217

**Source:** 2003 Adult Education and Training Survey Master File; calculations by the author.

**Table 5: Probit Analysis of Post-immigration Education for Full Sample, Canada, 2003**

Variable	Model 1	Model 2
	Dependent variable:EDUPARTIC	Dependent variable:UNIEDU
	Coefficient (t-ratio)	Coefficient (t-ratio)
<b>Age:</b>		
AGE35	-0.44 (-4.66)	-0.46 (-3.95)
AGE45	-0.84 (-7.81)	-0.61 (-4.76)
AGE55	-1.18 (-10.06)	-0.82 (-5.80)
AGE65	-1.40 (-7.77)	-0.96 (-3.75)
<b>Gender:</b>		
FEMALE	-0.055 (-0.90)	-0.19 (-2.49)
<b>Birthplace:</b>		
ASIA	-0.25 (-2.35)	0.49 (3.78)
OTHER	0.11 (1.40)	0.046 (0.48)
<b>Year of immigration:</b>		
YEARIM2	0.51 (4.34)	0.41 (2.39)
YEARIM3	0.91 (8.26)	0.78 (5.00)
YEARIM4	1.60 (13.49)	1.08 (6.65)
<b>Pre-immigration education level:</b>		
UNIVERSITY	-0.27 (-3.22)	0.32 (2.91)
<b>Country of pre-migration education:</b>		
PREASIA	0.31 (2.32)	-0.63 (-3.53)
PREOTHER	-0.11 (-1.12)	-0.16 (-1.17)
<b>Health status:</b>		
HEALPROM	-0.14 (-1.57)	-0.27 (-1.99)
<b>Household income:</b>		
INCOME2	-0.017 (-0.17)	-0.37 (-2.21)
INCOME3	-0.12 (-1.17)	0.13 (0.89)
INCOME4	-0.044 (-0.46)	0.28 (2.14)
INCOME5	0.094 (0.83)	0.32 (2.20)
INCOME6	0.21 (1.77)	0.48 (3.22)
<b>Permanent job:</b>		
PERMJOB	0.089 (1.29)	-0.036 (-0.40)

Family size:

FASIZE2	-0.14 (-1.42)	-0.25 (-2.03)
FASIZE3	-0.074 (-0.70)	-0.43 (-3.13)
FASIZE4	-0.20 (-1.77)	-0.46 (-3.10)
FASIZE5	-0.35 (-2.81)	-0.60 (-3.53)

Occupational status:

CLER_SER	-0.29 (-3.57)	-0.79 (-7.50)
BLUECOLL	-0.51 (-5.93)	-1.28 (-9.20)
NOLABOR	-0.54 (-5.49)	-0.59 (-4.70)

Presence of young children:

PRESCH	-5.49 (-0.45)	-0.019 (-0.15)
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Spouse's labour force status:

SPOUSLF	-0.043 (-0.57)	-0.25 (-2.40)
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Spouse' education level:

SEDUHS	-0.074 (-0.72)	-0.26 (-1.59)
SEDUPO	0.090 (0.99)	-0.0051 (-0.039)
SEDUUN	0.18 (1.65)	0.59 (4.33)

Constant	0.12 (0.78)	-0.76 (-3.85)
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Sample size	2322	2316
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Maddala R <sup>2</sup>	0.21	0.23
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**Source:** 2003 Adult Education and Training Survey Master File; calculations by the author

**Notes:**

The reference group is defined as the healthy male immigrants from 25-34 years of age who immigrated from European countries to Canada between 1998 and 2003, obtained non-university certificate or low before immigration, have a permanent job and work in the managerial and professional occupational group, have no young child, who were single and got income less than \$20,000 in 2002.

**Table 6: Marginal Effects of Explanatory Variables on Probabilities of Post-immigration Education for Full Sample, Canada, 2003**

Variable	Model 1	Model 2
	Dependent variable: EDUPARTIC	Dependent variable: UNIEDU
	Marginal effect	Marginal effect
Age:		
AGE35	-0.17	-0.11
AGE45	-0.31	-0.14
AGE55	-0.40	-0.17
AGE65	-0.45	-0.18
Gender:		
FEMALE	-0.022	-0.053
Birthplace:		
ASIA	-0.098	0.17
OTHER	0.041	0.014
Year of immigration:		
YEARIM2	0.19	0.14
YEARIM3	0.30	0.29
YEARIM4	0.41	0.40
Pre-immigration education		
UNIVERSITY	-0.11	0.11
Country of Pre-migration education:		
PREASIA	0.12	-0.14
PREOTHER	-0.044	-0.044
Health status:		
HEALPROM	-0.056	-0.073
Household income:		
INCOME2	-0.0067	-0.094
INCOME3	-0.047	0.039
INCOME4	-0.017	0.092
INCOME5	0.037	0.11
INCOME6	0.080	0.17
Permanent job:		
PERMJOB	0.035	-0.011

Family size:

FASIZE2	-0.054	-0.068
FASIZE3	-0.030	-0.11
FASIZE4	-0.079	-0.11
FASIZE5	-0.14	-0.14

Occupational status:

CLER_SER	-0.12	-0.16
BLUECOLL	-0.20	-0.20
NOLABOR	-0.21	-0.14

Presence of young children:

PRESCH	-0.017	-0.0056
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Spouse's labour force status:

SPOUSLF	-0.017	-0.067
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Spouse' education level:

SEDUHS	-0.030	-0.070
SEDUPO	0.036	-0.0015
SEDUUN	0.068	0.21

Probability of the refence	0.55	0.22
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Source: 2003 Adult Education and Training Survey Master File; calculations by the author

**Table 7: Probit Analysis of Post-immigration Education by Gender, Canada, 2003**

Variable	Model 1		Model 2	
	Dependent variable:EDUPARTIC		Dependent variable:UNIEDU	
	Male	Female	Male	Female
	Coefficient	Coefficient	Coefficient	Coefficient
	(t-ratio)	(t-ratio)	(t-ratio)	(t-ratio)
<b>Age:</b>				
AGE35	-0.54 (-3.82)	-0.36 (-2.71)	-0.39 (-2.30)	-0.58 (-3.42)
AGE45	-0.82 (-5.18)	-0.91 (-5.91)	-0.43 (-2.38)	-0.90 (-4.68)
AGE55	-1.22 (-7.04)	-1.21 (-7.21)	-0.53 (-2.60)	-1.23 (-5.79)
AGE65	-1.23 (-4.66)	-1.59 (-6.03)	-0.61 (-1.77)	-1.78 (-3.55)
<b>Birthplace:</b>				
ASIA	-0.14 (-0.94)	-0.36 (-2.43)	0.61 (3.28)	0.37 (1.92)
OTHER	0.084 (0.75)	0.11 (1.11)	0.0211 (0.15)	0.025 (0.18)
<b>Year of immigration:</b>				
YEARIM2	0.49 (2.79)	0.45 (2.85)	0.58 (2.41)	0.14 (0.53)
YEARIM3	0.97 (6.01)	0.81 (5.23)	0.93 (4.21)	0.57 (2.47)
YEARIM4	1.65 (9.44)	1.54 (9.29)	1.08 (4.76)	1.06 (4.41)
<b>Pre-immigration education level:</b>				
UNIVERSITY	-0.29 (-2.40)	-0.26 (-2.15)	0.29 (1.92)	0.26 (1.54)
<b>Country of Pre-migration education:</b>				
PREASIA	0.099 (0.50)	0.50 (2.72)	-0.64 (-2.56)	-0.57 (-2.16)
PREOTHER	-0.10 (-0.74)	-0.12 (-0.83)	-0.16 (-0.87)	-0.10 (-0.51)
<b>Health status:</b>				
HEALPROM	-0.31 (-2.22)	-0.013 (-0.11)	-0.52 (-2.43)	-0.026 (-0.13)
<b>Household income:</b>				
INCOME2	-0.14 (-0.87)	0.091 (0.69)	-0.27 (-1.17)	-0.43 (-1.63)
INCOME3	-0.21 (-1.34)	-0.027 (-0.20)	0.013 (0.062)	0.31 (1.53)
INCOME4	-0.084	0.012	0.036	0.64

	(-0.57)	(0.088)	(0.18)	(3.33)
INCOME5	-0.029	0.26	0.16	0.66
	(-0.17)	(1.58)	(0.74)	(2.98)
INCOME6	0.14	0.28	0.27	0.8
	(0.82)	(1.70)	(1.26)	(3.68)
Permanent job:				
PERMJOB	-0.015	0.21	0.026	-0.091
	(-0.15)	(2.03)	(0.21)	(-0.67)
Family size:				
FASIZE2	-0.34	-0.039	-0.46	-0.26
	(-2.24)	(-0.30)	(-2.33)	(-1.54)
FASIZE3	-0.25	0.017	-0.67	-0.44
	(-1.54)	(0.12)	(-3.06)	(-2.29)
FASIZE4	-0.32	-0.16	-0.60	-0.55
	(-1.92)	(-1.02)	(-2.69)	(-2.53)
FASIZE5	-0.49	-0.22	-0.77	-0.69
	(-2.75)	(-1.20)	(-3.18)	(-2.63)
Occupational status:				
CLER_SER	-0.31	-0.28	-0.92	-0.68
	(-2.44)	(-2.58)	(-5.53)	(-4.75)
BLUECOLL	-0.39	-0.79	-1.28	-1.25
	(-3.44)	(-5.11)	(-7.96)	(-3.83)
NOLABOR	-0.53	-0.50	-0.36	-0.68
	(-3.15)	(-3.91)	(-1.77)	(-3.91)
Presence of young children:				
PRESCH	0.026	-0.060	0.19	-0.21
	(0.19)	(-0.45)	(1.06)	(-1.07)
Spouse's labour force status:				
SPOUSLF	0.11	-0.21	-0.12	-0.37
	(1.04)	(-1.77)	(-0.90)	(-2.19)
Spouse' education level:				
SEDUHS	-0.13	0.028	-0.073	-0.49
	(-0.93)	(0.18)	(-0.32)	(-1.81)
SEDUPO	0.23	0.013	0.26	-0.29
	(1.73)	(0.10)	(1.33)	(-1.44)
SEDUUN	0.34	0.065	0.73	0.53
	(2.11)	(0.45)	(3.55)	(2.74)
Constant	0.22	0.030	-0.90	-0.66
	(1.01)	(0.14)	(-3.20)	(-2.36)
Sample size	1101	1221	1099	1217
Maddala R <sup>2</sup>	0.22	0.21	0.21	0.20

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Source: 2003 Adult Education and Training Survey Master File; calculations by the author

**Notes:**

The reference group is defined as the healthy immigrants from 25-34 years of age who immigrated from European countries to Canada between 1998 and 2003, obtained non-university certificate or low before immigration, have a permanent job and work in the managerial and professional occupational group, have no young child, who were single and got income less than \$20.000 in 2002.

**Table 8: Marginal Effects of Explanatory Variables on Probabilities of Post-immigration Education by Gender, Canada, 2003**

Variable	Model 1		Model 2	
	Dependent variable: EDUPARTIC		Dependent variable: UNIEDU	
	Male	Female	Male	Female
<b>Age:</b>				
AGE35	-0.21	-0.14	-0.085	-0.15
AGE45	-0.31	-0.32	-0.093	-0.19
AGE55	-0.43	-0.39	-0.11	-0.23
AGE65	-0.43	-0.45	-0.12	-0.25
<b>Country of birth:</b>				
ASIA	-0.057	-0.14	0.20	0.13
OTHER	0.033	0.045	0.0057	0.0080
<b>Year of immigration:</b>				
YEARIM2	0.18	0.17	0.19	0.046
YEARIM3	0.29	0.29	0.33	0.21
YEARIM4	0.38	0.43	0.39	0.409
<b>Pre-immigration education level:</b>				
UNIVERSITY	-0.12	-0.10	0.088	0.089
<b>Country of Pre-migration education:</b>				
PREASIA	0.038	0.19	-0.12	-0.15
PREOTHER	-0.041	-0.047	-0.039	-0.032
<b>Health status:</b>				
HEALPROM	-0.12	-0.0053	-0.11	-0.0081
<b>Household income:</b>				
INCOME2	-0.053	0.036	-0.063	-0.12
INCOME3	-0.082	-0.011	0.0035	0.11
INCOME4	-0.033	0.0046	0.0097	0.24
INCOME5	-0.0111	0.10	0.045	0.25
INCOME6	0.054	0.11	0.079	0.31
<b>Permanent job:</b>				
PERMJOB	-0.0057	0.082	0.0071	-0.028
<b>Family size:</b>				

FASIZE2	-0.13	-0.016	-0.097	-0.076
FASIZE3	-0.0980	0.00690	-0.13	-0.12
FASIZE4	-0.13	-0.064	-0.12	-0.14
FASIZE5	-0.19	-0.087	-0.14	-0.17
Occupational status:				
CLER_SER	-0.12	-0.11	-0.15	-0.16
BLUECOLL	-0.15	-0.29	-0.17	-0.23
NOLABOR	-0.21	-0.19	-0.080	-0.16
Presence of young children:				
PRESCH	0.0099	-0.024	0.054	-0.061
Spouse's labour force status:				
SPOUSLF	0.042	-0.082	-0.031	-0.10
Spouse' education level:				
SEDUHS	-0.053	0.011	-0.019	-0.13
SEDUPO	0.087	0.0053	0.076	-0.083
SEDUUN	0.13	0.026	0.25	0.19
Probability of the refence person	0.59	0.51	0.18	0.25

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Source: 2003 Adult Education and Training Survey Master File; calculations by the author