The effect of age at immigration on the earnings of immigrants:

Estimates from a two-stage model

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Abstract

Using microdata from the 2006 Canadian Census and the 2011 Canadian National Household Survey (NHS), this paper analyzes the relationship between age at immigration and immigrant wages with a two-stage regression model initially proposed by Schaafsma and Sweetman (2001). By estimating that model for males and females in three different specifications with different control variables, I find a general negative effect of age at immigration on both male and female immigrant wages. The older the immigrant arrived, the lower the wages. However, the ages at immigration between 25 and 34 for males are an exception. Male immigrants who landed in Canada in those prime working ages perform better than those who immigrated younger or older.

Contents

1. Introduction

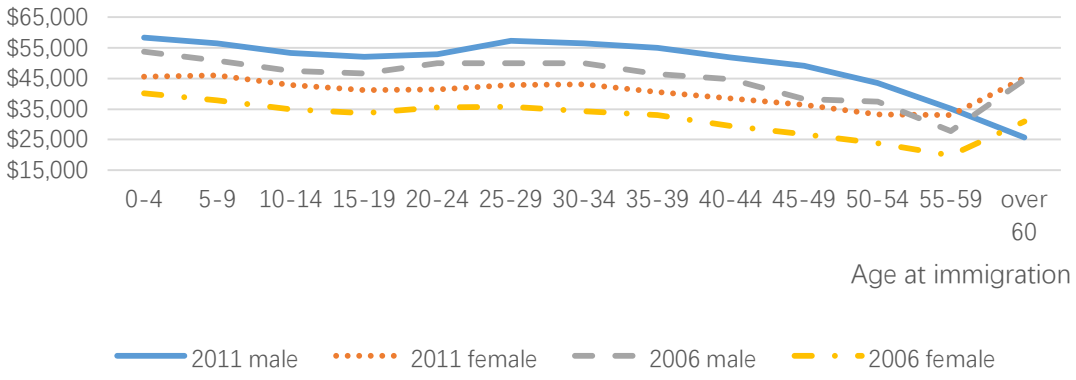
Canada attracts large numbers of immigrants from all over the world and these are now an important component of Canadian society. According to the 2011 Canadian National Household Survey (NHS), immigrants account for 21% of the total Canadian population. Unfortunately, the labour market outcomes of immigrants in Canada are not always very good.

The age at which an immigrant arrives matters. Take language skills as an example. If an immigrant from a non-English or a non-French speaking country landed in Canada at an early age, he/she will receive education in English or French during his/her school days. Mostly he/she can speak English or French, which means that he/she can use it to communicate without barriers. However, if an immigrant from a non-English or a non-French speaking country arrived in Canada at a relatively older age, like 40 years old for example, he/she needs to be accustomed to a new language. The process to learn an entire new language for older people is time-consuming. In this process, communicating across cultures and barriers will decrease the efficiency of production, directly affecting the wage of the immigrants.

Graph 1 gives an intuitive impression of the relationship between current wage and age at immigration. It is clear that annual wages and salaries for both male and female immigrants decrease up to the group of 20-24 years of age at immigration. The trend implies that before those ages, a larger age at immigration has negative effect on immigrants' labour income. The curves have slight fluctuations around the ages of 25

to 34. All the four groups of average annual wages present uptrends that could be related to the fact that those are the prime working ages to start a new career. During that period, most of the immigrants finish their education and start to work. For the ages over 35 years old, the downward trends reappear, and the slopes of the wage declines become steeper. That provides us with some evidence of the relationship between age at immigration and immigrants' earnings.

Graph 1
Average annual wages of immigrants, 2011 and 2006



Note: Average annual wages are in current Canadian dollars

Source: Public use files of the 2006 Canadian Census and of the 2011 Canadian National Household Survey(NHS) Microdata Files.

An important earlier study that focused on this issue was done by Schaafsma and Sweetman (2001). The authors estimated a two-stage regression model, which is different from the common OLS regression usually used in previous studies. That was done in order to avoid the perfect multicollinearity problem when the model includes at the same time age, age at immigration and year of immigration. However, Schaafsma and Sweetman provided information up to 1996 only, and they focused on males only. The purpose of my paper is to expand on that study by using more recent

2011 and 2006 data and by adding females to the males.

The structure of this paper is as follows. Section 2 summarizes the key findings of some earlier studies that have focused on immigrants' labour market performance and on age at immigration. In section 3, I describe the data sources and define the dependent and independent variables. In that section, I also provide summary statistics of the sample. Section 4 presents the two-stage econometric model that I use in this paper, which replicates the one of Schaafsma and Sweetman (2001). Section 5 shows the empirical results and provides an interpretation of them. A conclusion is presented in section 6. An appendix provides additional tables.

2. Literature review

In this section, I examine the literature on the performance of immigrants in the labour market, and in particular the social and economic effects of age at immigration. I analyze the data sets, the econometric methodologies and the main findings of the studies.

2.1 Studies on the earnings of immigrants

Many studies found that the average earnings of immigrants are lower than those of the native-born and most of them, such as Baker and Benjamin (1994) and Bloom, Grenier and Gunderson (1995), focus on the economic assimilation of immigrants. The above two studies use datasets from the Canadian censuses of 1971, 1981 and 1986. Baker and Benjamin (1994) analyze the performance of male immigrants and

find that for those who immigrated between 1976 and 1985, the assimilation rate, which is estimated as the difference between the estimated dummy variable coefficients for two adjacent cohorts, those of 1976-80 and 1981-85 is high at 20.2%. The average value of assimilation for all three datasets is about 6%. This means that, although assimilation is unstable during the periods of those three datasets, immigrants to Canada do show an increasing path in fitting in the Canadian labour market. Through their regression, which implies the effects of labour market experience and schooling in the relative earnings of immigrants, the authors find that immigrants who landed on Canada after 16 years old have lower returns on schooling than immigrants who landed in Canada at all other ages. In addition, their return on labour income is only half of that for all immigrants and two-thirds of that of the native born.

As a measurement of assimilation, Bloom, Grenier and Gunderson (1995) calculate the number of years immigrants will need to achieve an economic performance that is equal to that of the Canadian born. Their main finding is that the immigrants who immigrated between 1971 and 1986 take much longer than those who immigrated earlier. Specifically, for the most recent cohort in their dataset, those who immigrated between 1981 and 1986, male immigrants may take 137 years to get wage parity with Canadian born. As for females, the circumstance is similar, but the results show that they take less time than males to assimilate.

Coulombe, Grenier and Nadeau (2014) introduce GDP per capita in immigrants'

countries of birth as an indicator of the quality of the human capital. Using Mincerian regressions and 2006 Canadian census data, they find that the years of schooling and work experience have a positive effect on immigrants' wages. They also find that, when GDP per capita in the immigrants' country of birth is high, the returns to schooling and work experience are also high. Considering the wage gap between the immigrants and the Canadian born, they find that it is wider for immigrants who come from countries with low GDP per capita compared with Canada. This means that the earnings difference between low human capital quality immigrants' and the Canadian born is larger than the difference between immigrants with high human capital quality and the Canadian born. The other finding of that study is that the schooling and work experience of the immigrants play dominant roles in their performance in the Canadian labour market.

Unlike former studies that used regression approach to compare the earning difference between immigrants and native-born, Warman and Worswick (2004) use numeric comparisons by studying Census Metropolitan Areas (CMAs) for five Canadian censuses between 1981 and 2001. At the CMA level, both male and female immigrants received significantly lower earnings than the native-born. The difference becomes larger the more recently they immigrated. Only males who immigrated between 1966 and 1970 and females who immigrated between 1966 and 1975 can get equal or higher earnings levels than those of the Canadian-born. The earning gap between the immigrant cohorts who come to Canada after 1975 and the native-born has become wider.

The circumstances are similar in the U.S. as in Canada. Borjas (1994) used the 1970, 1980 and 1990 U.S. census data to find the changes in relative earnings between immigrants and native-born Americans. The data show that the immigrants who arrived before 1960 can get similar or even higher wages than the native-born. But for those who immigrated after 1960, the earning gap widens and is estimated to never vanish during their working time. For all immigrants, the wage gap is about 10% in 1980 and it is 16.5% in 1990.

2.2 Studies on age at immigration and education performance

Many of the studies that focused on age at immigration analyzed the particular issue of school performance of children. Considering the relationship between age at immigration and immigrants' school performance, Böhlmark (2008) uses data between 1972 and 1987 from Statistics Sweden. He uses a cross-sectional approach to study the influence of age at immigration on performance of immigrants in education. The results show that children who immigrated before nine years old have equality in acclimatization. However, when children landed after the critical age of nine, their performance in school shows a declining trend as the age at which they landed goes up. According to the pooled data, the grade point averages (GPA) show a significant drop when the age at immigration is larger than 12. Compared to the reference group of those who immigrated at 0-5 years old, children who landed in Sweden at 15 have a GPA which is about 25% lower. Another finding is that children who immigrated from Western countries, East European countries and Asian countries have better ability to adapt than those who came from the Middle East, Africa and South

America. This result is consistent with Coulombe, Grenier and Nadeau (2014) who find that immigrants from countries with similar degrees of development as Canada have a narrow gap in education and work performance compared to the native-born. The study also finds that girls take a shorter time than boys to assimilate in a new school or education system than boys.

A study based on U.S. data provides similar results. Beck, Corak and Tienda (2012) also focus on the relationship between the age at immigration and the school performance of children. They use 2000 U.S. Census data to do the regressions. When children's age at immigration is larger than eight, the probability of not finishing high school is high. The dropout rate increases with every year the children immigrated after eight. However, the effect is insignificant if children are from Canada, the United Kingdom, Australia or New Zealand. For those from the rest of Europe, Puerto Rico, Mexico and the rest of Latin America, the increase in the dropout rate is more obvious. This can be interpreted as an indication of the development level of the native country, or of a language effect since immigrants from those countries are less likely to speak English. The results also show that males between 35 and 55 years old in 2000 who arrived in the United States before age 18 have larger high school dropout rates than females in the same situation, regardless of their native countries.

Similar results are also found for Canada. Corak (2011) uses 2006 Canadian census data and finds that the critical age for Canadian immigrants' age at immigration is nine. When children immigrated before that age, there is a high

probability for them to get a high school diploma. However, the risk of dropout from high school for those who came to Canada after age nine increases with their age at immigration. Language is a dominant factor. For children from an English-speaking country such as the United Kingdom, the United States or Hong Kong, age at immigration has a weak influence on the high school dropout rate, the critical age being five, zero and five respectively for the above three countries. In contrast, for children whose mother tongue is not English, such as those who came from Italy, Portugal or India, age at immigration matters. The critical ages for children from the above countries are higher at nine, six and seven respectively.

Language is a big obstacle for immigrants to assimilate into a new country. Beck, Corak and Tienda (2012) report findings on the influence of age at immigrant on social performance. Non-English-speaking immigrants may prefer to marry persons who come from the same country, which may result in taking longer to fit in the new society. The higher the age a person immigrates, the harder for him/her to learn a new language. Enculturation plays an important role in immigrants' lives.

2.3 Studies on age at immigration and earnings of immigrants

Friedberg (1992) considers the U.S. Census of 1970 and 1980 and uses cross-sectional data to analyze the effect of age at immigrants on immigrant earnings. She studies the effect of age at immigration on immigrants who are from different countries of origin and finds that, except for immigrants from Western Europe, age at arrival in the U.S. has an obvious negative influence on immigrant's earnings.

In a recent study, Pendakur and Pendakur (2016) analyze the wage gap between Canadian born and immigrants, for female and male white and visible minorities. All the regression results for the four years that they study (1990, 1995, 2000 and 2005) show that male immigrants' wages have a highly negative relationship with age at immigration. However, for females, this pattern shows only for those who immigrated before the age of 18 years old. Their study divided immigrants into four categories: white, black, South Asian and Chinese. The results for the different visible minorities bring the similar conclusion that the negative relation between wage disparity and age at immigration for males is higher than the one for females.

Schaafsma and Sweetman (2001), the study that I partly replicate in this paper, focuses on the effect of age at immigration on the earnings differences between immigrants and Canadian born who are at the same age. Their study is based on the 1986, 1991 and 1996 Canadian censuses. They restrict the sample to males between 16 and 64 years old who worked more than 40 weeks in 1985, 1990 or 1995. To avoid the multicollinearity between age, age at immigration and year of arrival, and to keep the main independent variable of age at immigration in the model, they use a two step procedure. First, they use the Canadian born sample as the reference group and predict the earnings at various ages. Second, they use the difference between the actual wages of the immigrants and the wages predicted by the Canadian-born regression as the dependent variable, and they regress it on age at immigration with cohort controls. By doing so, they can isolate the effects of age at immigration from assimilation and cohort effects. Schaafsma and Sweetman (2001) find that, with age at

immigration 0-4 as the reference group, the wage gap becomes wider as age at immigration goes up. For those who immigrate after 35, the earnings are significant lower than for those immigrate at an early age. They also use a one stage approach that gets similar results. Education attainment and foreign labour market experience are the two dominant factors that explain why age at immigration matters. According their study, immigrants who immigrated at around middle school get a lower wage than both those who landed earlier and those who landed later. Foreign labour market experience has little effect on their labour performance in Canadian labour market.

According to the literature mentioned above, the earnings of immigrant are significant lower than those of the native-born. The educational level of the immigrants is a major factor that influences their earnings. Age at immigration, which largely determines the education performance of children, has a negative effect on the earnings of immigrants. In the rest part of the paper, I will use the approach of Schaafsma and Sweetman to analyze with recent data the effect of age at immigration on immigrant earnings.

3. Data and summary statistics

In this section, I discuss the data sources and the characteristics of the variables used in this paper. I also present the summary statistics of the samples.

3.1 Data

The datasets are the public use microdata files of the 2006 Canadian Census and of the 2011 Canadian National Household Survey (NHS). Those two datasets cover

people who usually lived in Canada in 2005 and 2010 respectively, including Canadian citizens (both Canadian-born and immigrants), permanent residents and nonpermanent residents. Both datasets represent 2.7% of the total population of Canada. The unit of observation is the individual and the sample sizes for 2006 and 2011 are 844,476 and 887,012 respectively.

The purpose of this paper is to study the effect of age at immigration on the immigrants' earnings by replicating the methodology of Schaafsma and Sweetman (2001) whose datasets are the 1986, 1991 and 1996 Canadian censuses. To make sure that my regression results are comparable to theirs, I select my samples as closely as possible to theirs, although some variables in the original dataset are different across these censuses.

Schaafsma and Sweetman (2001) restricted their sample to "males who were 16 to 64 years old on the relevant survey date and who worked more than 40 weeks in the year before the census was taken" (p. 1073). In the 2006 and 2011 public use data, the information is by age group, which is different from the previous censuses which provided the exact ages. In particular, the group corresponding to the lowest ages is 15-17. Therefore, I restrict my data to people aged between 15 and 64 (instead of between 16 and 64). I keep both males and females but treat them separately. As in Schaafsma and Sweetman's study, I also narrow down the sample to people who worked more than 40 weeks in 2005 and in 2010 respectively.

3.1.1 Dependent variable

The dependent variable of my model is the natural logarithm of annual wages and salaries, which refers to gross wages and salaries before deductions for such items as income tax, pensions and Employment Insurance.

3.1.2 Independent variables

There are three categories of independent variables in the model: age at immigration, cohorts of years of immigration, and other, unrelated to immigration, control variables which influence earnings.

The central independent variable for this study is age at immigration, which is the age at which an immigrant first obtained permanent resident status. The ages at immigration are divided into nine groups: 0 to 4, 5 to 9, 10 to 14, 15 to 19, 20 to 24, 25 to 29, 30 to 34, 35 to 44 and 45 to 64. Another important independent variable is the year of immigration. The years of immigration are between “before 1955” and 2010. They are divided into twelve cohorts: “before 1955” and eleven cohorts defined by five year groups from 1955 to 2010.

The other variables that affect the wages and salaries are years of education, visible minority status, marital status, urbanization, language, whether the person worked full-time or not, whether the person worked full year or not, and the province where the person lived. The education level is measured as the highest certificate degree or diploma. I use the highest degree to estimate the years of schooling based

on the correspondence shown in Table 1.

Visible minority is defined by the Employment Equity Act and it includes South Asian, Chinese, Black, Filipino, Latin American, Arab, Southeast Asian, West Asian, Korean, Japanese, Non White and multiple visible minorities. If the person belongs to one of them, then the dummy variable of visible minority is equal to 1, otherwise it is equal to 0.

Table 1
Measurement of years of education

Highest certificate degree or diploma obtained	Assumed years of schoolings
No certificate, diploma or degree	8
High school diploma or equivalent	12
Trades certificate or diploma (other than apprenticeship); Registered Apprenticeship certificate; College, CEGEP or other non-university certificate or diploma from a program of 3 months to less than 1 year	13
College, CEGEP or other non-university certificate or diploma from a program of 1 year to 2 years	14
College, CEGEP or other non-university certificate or diploma from a program of more than 2 years; University certificate or diploma below bachelor level	15
Bachelor's degree	16
University certificate or diploma above bachelor level; Degree in medicine, dentistry, veterinary medicine or optometry	17
Master's degree	18
Earned doctorate degree	22

Regarding marital status, single is defined as including the people who were never legally married, those who are separated, those who are divorced and those who are widowed (and not living common law). Married is defined as a person who is either legally married (and not separated) or living common law.

Major CMAs identified in the 2011 NHS and in the 2006 census public use data define the urban dummy variable. Otherwise, the dummy variable of urban equals to 0. There are four language indicators according to knowledge of the Canadian official language: English only, French only, both English and French, and none of the official languages.

Another group of indicator variables is whether people worked full-year or not. I have already restricted the model to people who worked more than 40 weeks a year. There are two dummy variables: worked between 40 to 48 weeks a year, and worked between 49 and 52 weeks during the year before the censuses were taken (the reference category).

The last category is the province where people lived. I generate six groups of provincial dummy variables: Atlantic (including Newfoundland and Labrador, Prince Edward Island, Nova Scotia and New Brunswick), Quebec, Ontario, Prairies (including Manitoba and Saskatchewan), Alberta, and British Columbia. I exclude Northern Canada[1].

3.2 Summary Statistic

The descriptive statistics are summarized in Table 2 and Table 3 for males and females respectively. Table 2 also reproduces the information for the males from Schaafsma and Sweetman's study (for the years 1986, 1991 and 1996).

[1] The regional variables in Schaafsma and Sweetman (2001) are generated as "Quebec, Ontario, Prairies, Alberta, and British Columbia; the Atlantic provinces and the Territories are excluded from the sample, since their immigrant characteristics are severly grouped by Statistics Canada".

Table 2 Mean values of the variables – 2011, 2006, and comparison with the 1986, 1991 and 1996 data used by Schaafsma and Sweetman, males

	2011		2006		1996		1991		1986	
	Canadian born	Immigrants	Canadian born	Immigrants	Canadian born	Immigrants	Canadian born	Immigrants	Canadian born	Immigrants
Earnings	55466	54639	48926	48666	39534	39092	42150	44194	40440	42523
Age	40.5	44.0	39.8	43.7	38.8	43.0	37.8	42.7	37.4	42.6
Experience	21.3	23.8	20.9	23.8	20.3	24.2	19.7	24.2	19.8	24.7
Schooling	13.2	14.2	13.0	13.9	13.5	13.8	13.1	13.4	12.6	12.9
Married	0.641	0.773	0.656	0.790	0.705	0.790	0.712	0.803	0.723	0.819
Urban	0.641	0.949	0.636	0.935	0.509	0.807	0.511	0.796	0.513	0.784
Visible Minority	0.037	0.650	0.027	0.577	0.014	0.424	0.013	0.361	0.009	0.262
Bilingual	0.228	0.138	0.222	0.132	0.003	0.001	0.003	0.001	0.013	0.004
English	0.656	0.807	0.650	0.822	0.656	0.318	0.643	0.339	0.639	0.358
French	0.117	0.027	0.129	0.024	0.296	0.030	0.304	0.033	0.299	0.032
Full-time	0.918	0.938	0.923	0.946						
N	127046	33200	128993	28504	114922	29986	126187	32407	76128	20252

Source: 1996, 1991 and 1986 data are from Schaafsma and Sweetman (2001).
Note: 2011 and 2006 earnings are in current dollars. Schaafsma and Sweetman converted into $1995 using CPI. All the means are weighted.

Table 3 Mean values of the variables, 2011 and 2006 , females

	2011		2006	
	Canadian born	Immigrants	Canadian born	Immigrants
Earnings	42083.2	42009.3	35157.9	35041.7
Age	40.8	43.9	39.8	43.3
Experience	21.1	23.8	20.4	23.6
Schooling	13.7	14.1	13.4	13.7
Married	0.626	0.706	0.626	0.720
Urban	0.653	0.948	0.653	0.935
Visible Minority	0.037	0.654	0.029	0.584
Bilingual	0.234	0.126	0.227	0.128
English	0.633	0.811	0.631	0.817
French	0.133	0.032	0.141	0.028
Full-time	0.789	0.840	0.780	0.825
N	121688	30230	119210	25420

Note: 2011 and 2006 earnings are in current dollars. All the means are weighted.

The 2011 and 2006 earnings are in current dollars. However, Schaafsma and Sweetman converted into 1995 dollars using the CPI. Comparisons of earnings between immigrant and Canadian-born during the same year can provide useful information. For males, the earning gap between the Canadian-born and immigrants increased in the more recent years. In 1986 and 1991, immigrant males received higher mean wages than the Canadian-born, but starting in 1996, the advantage of immigrants vanished. In 2011, the difference is 827 dollars per year in favour of the Canadian-born. However, for females, the earning difference is not apparent. In 2011 and 2006, the gaps are only 70 and 110 dollars respectively.

An interesting phenomenon is that immigrants' mean ages are always larger than those of the native-born for both males and females. Also some immigrants immigrated to Canada after their undergraduate of graduate study; a relatively fast and simple way to immigrate is to get a diploma in Canada, which lead to them to go back to school to brush up. Both of these situations may postpone the age at which immigrants enter the workplace. However, the age gap shows a downward trend during the period from 1986 to 2011. The average age of immigrants is still larger than that of the Canadian-born by 3.5 years for males and 3.1 years for females in 2011, and by 3.9 years for males and 3.5 years for females in 2006.

Differences in labour market experience between the Canadian-born and immigrants follow a similar trend as age. In 1986, male immigrants have 5 years of

experience more than the Canadian-born. The number dropped a bit to 4.5 years and 3.8 years in 1991 and 1996 respectively. As the recent sample of 2006 shows, male immigrants only have two more years' experience than native. In 2011, the gap is 2.5 years. For females, the differences are around 3 years.

In 2011 and 2006, the years of education are estimated using the equivalences of Table1, but Schaafsma and Sweetman had direct information on years of education. Therefore, there is less comparability between my data and theirs. Immigrants have more years of education than Canadian-born in all the years. However, for males, the trend is different from the one of work experience. In 1986, 1991 and 1996, the gap is small at 0.3, 0.4 and 0.4 years respectively. In 2006 and 2011, immigrants have about one year of schooling more than the native-born. The years of schooling for female immigrants and Canadian-born are very close to each other, with a difference of 0.4 years.

Regarding marital status, immigrants have a higher proportion being married than the Canadian-born for all the years. However, the percentage being married goes down both for immigrants and Canadian-born through time. Also, males have a higher proportion than females being married.

The places where people live are very different between the two groups. Immigrants are much more like to live in large metropolitan areas than the native-born. The proportion of immigrants living in large census metropolitan areas

(CMAs) in 1986[2] was high at 78.4% for males. In contrast, the proportion for the Canadian–born male was only 51.3%. As time goes on, the difference between immigrants and native-born remains wide. In 2011, 94.9% of the male immigrants and 94.8% of the female immigrants lived in large CMAs, while for Canadian-born the numbers were only 64.1% and 65.3%. Schaafsma and Sweetman's data show a similar result. The proportion of immigrants living in large CMAs in 1986, 1991 and 1996 are around 80%. The percentage for the Canadian-born at the same time is only 51%. Although the CMAs are defined differently in each of the censuses, immigrants always tend to live in larger proportion in those CMAs.

It is apparent that the proportion of visible minorities among immigrants is higher than that among the Canadian-born. In 1986, the Canadian-born males who were visible minority were only 0.9% of the total sample. In 2006, 2.7% of the Canadian-born males and 2.9% of the females are visible minority. This rate for male immigrants increased from 26.2% to 65% from 1986 to 2011.

English is the dominant language of both immigrant and Canadian-born males and females. A higher percentage of the Canadian-born have a knowledge of French and also a higher percentage of the Canadian-born can use both Canadian official languages than that of the immigrants.

Immigrants are more likely to work full-time than the Canadian-born, the gap

[2] The variable urban in Schaafsma and Sweetman (2001) is defined as living in one of the major CMAs in 1986, 1991 and 1996. The lists of the large CMAs are not the same in all the censuses.

being around 2 percentage points for males. The ratio of females working full-time is much lower than that of males. Only 78% native-born females work more than 48 weeks a year. The number for female immigrants is a bit higher at 84% in 2011 and 82.5% in 2006.

4.Econometric model

To examine the impact of the age at immigration on the wage and salaries, I replicate the model proposed by Schaafsma and Sweetman (2001).

In the analysis of the labour performance of immigrants, age, age at immigration, and year of immigration are three important explanatory variables. However, those three explanatory variables are perfectly collinear since age is equal to age at immigration plus the number of years since immigration. To get around that collinearity, Schaafsma and Sweetman introduce a two-stage model that uses information on the native-born individuals. Other studies like Borjas (1995) simply dropped one of these three variables, and the datasets used in the majority of the other studies are pooled data which include more than one year of statistical information.

Stage one is an auxiliary regression which only uses information for the Canadian-born. In the earnings regression of the native-born, “age is modelled as a fourth-order polynomial to allow a high degree of flexibility” (Schaafsma and Sweetman, 2001, p. 1071):

$$lnw^{cb} = b_0^{cb} + \sum_{j=1}^{4} Age^j \, b_j^{cb} \;\; (+Xb_x^{cb}) + \epsilon^{cb}$$

where lnw^{cb} is the natural logarithm of annual wages and salaries of the Canadian-born, Age^j is the person's age raised to the power j, and X is a vector that contains socioeconomic characteristics; specifically, X includes years of education, visible minority status, marital status, whether the person lives in a large CMA, the language skills (bilingual, English only, and French only), whether the person worked full-time or part-time, whether the person worked full-year or not, and five regional dummy variables. The regressions coefficients for the Canadian-born are b_0^{cb}, b_j^{cb} and b_x^{cb}. The term with X is in parentheses to indicate that some regressions include those variables in stage one, while others do not. This is the procedure used by Schaffsma and Sweetman.

Stage two is the main regression for this analysis and it is based on the information on immigrants:

$$lnw^I - \left[b_0^{cb} + \sum_{j=1}^{4} Age^j \, b_j^{cb} \;\; (+Xb_x^{cb}) \right]$$
$$= b_0^I + AgeImmb_{AgeImm}^I + ImmCohortb_{AgeCohort}^I (+Xb_x^I) + \epsilon^I$$

The dependent variable is the difference between the natural logarithm of annual wages and salaries of the immigrants and the predicted value of the natural logarithm of annual wages and salaries of Canadian-born who are at the same age as the immigrants. Those predicted values are based on the coefficients estimated in the first

stage. $AgeImm$ refers to a group of dummy variables that indicates age at immigration and $ImmCohort$ refers to a group of dummy variables that indicates year of immigration. The regression coefficients are b_0^I, b_{AgeImm}^I and $b_{AgeCohort}^I$. The coefficients of interest are those of age at immigration, while those of the age cohorts capture both assimilation and cohort fixed effects. Again, the term with X is in parentheses to indicate that some regressions include those variables and others do not.

The regression results are divided into three groups: without controls, Canadian-born returns, and own returns. For the without controls model, the independent variables of the first stage include only age, the square of age, the third power of age and the fourth power of age. In the second stage of the without controls model, the only independent variables are the vector of ages at immigration and the cohorts of year of immigration. For Canadian-born returns model, the independent variables of stage one include the other socioeconomic characteristics variables in X, while the second stage is like the one of the without controls model. For the own returns model, both the first and the second stages contain explanatory variables in X that are unrelated to immigration. This is done in order to compare the differences in results when different labour related variables enter the model.

Since the predicted value of Canadian-born earnings used in stage two is based on ages which are defined by the midpoint of the age group, the predicted wage can

only have eleven groups. This method leads to a relatively small number of predicted values compared to OLS regression. However, the number of observations is still acceptable and the method provides a good interpretation of the results.

5. Empirical results

Table 4 and Table 6 provide the empirical results of the model's regression above for males and females respectively. They contain the coefficient estimates, with heteroscedasticity consistent standard errors for the first stage and bootstrap standard errors for the second stage. The tables in the text only include the main explanatory variable, age at immigration. The coefficients of the cohorts of year of immigration and of the other explanatory variables that are unrelated to immigration are presented in Appendix Tables A.1 and A.3. To facilitate comparisons, I also provide Schaafsma and Sweetman's two-stage approach regression results for age at immigration for the males in Table 5. The other results of their regression are listed in Appendix Table A.2.

5.1 Regression results of two-stage approach, males, 2011 and 2006, and comparison with Schaafsma and Sweetman, 1986, 1991 and 1996

The results of the without controls models for males in 2011 and 2006 are presented in Table 4, column (1) and column (4). Note that the reference category for age at immigration is 0-4 years old, that is, those who arrived at a very young age.

In 2011, immigrants who came to Canada between the ages between 5 and 9 years old have 4% higher wages and salaries in the Canadian labour market than those

who immigrated at a very early age. Those who landed in Canada at the ages between 10 and 14 earned the same as those who landed before 4 years old. The results of the regression of 2006 show that the coefficients for both those who immigrated between ages 5 and 9 and between ages 10 and 14 groups are not significant, which means that the wage differences between these two groups and the reference group do not exist. A negative relationship between age at immigration and earnings is found for those who immigrated between ages 15 and 24, with the coefficients at -0.041 and -0.056 respectively for the 2011 data. The same pattern can be seen in the 2006 data. For those who immigrated between the age of 25 and 29, the earnings in 2011 are higher than for those who landed before 4 years old in without control model. The earning differences compared with immigrated between 0-4 group get dramatically wider for immigrants who immigrated at older ages. For instance, in the 2011 data, those who came to Canada between ages 45 and 64 receive 16% lower wages than those who immigrated before 4 years old. The results of 2006 show a 24% wage difference. The groups whose age at immigration is between 35 and 44 also have negative coefficients in both the 2006 and 2011 data.

The results of the Canadian-born return models for males in 2011 and 2006 are presented in column (2) and column (5) of Table 4. As already mentioned, for that regression, the first stage regression for the Canadian-born includes the unrelated to immigration control variables while the second stage includes only the age at immigration and cohort variables.

Table 4 Regression results of two-stage approach, males

	2011			2006		
	Without controls	Canadian-born returns	Own returns	Without controls	Canadian-born returns	Own returns
	(1)	(2)	(3)	(4)	(5)	(6)
Age at immigration:						
5-9	0.040**	0.040**	0.037**	0.001	0.000	0.006
	(0.021)	(0.020)	(0.019)	(0.020)	(0.021)	(0.019)
10-14	-0.006	-0.004	-0.013	0.016	0.014	0.021**
	(0.021)	(0.021)	(0.019)	(0.021)	(0.020)	(0.019)
15-19	-0.041**	-0.040**	-0.036**	-0.040**	-0.041**	-0.040***
	(0.023)	(0.022)	(0.020)	(0.021)	(0.022)	(0.019)
20-24	-0.056***	-0.055**	-0.089***	-0.027*	-0.028	-0.068***
	(0.020)	(0.021)	(0.019)	(0.020)	(0.021)	(0.018)
25-29	0.029*	0.031*	-0.080***	0.002	0.002	-0.104***
	(0.020)	(0.021)	(0.019)	(0.021)	(0.020)	(0.019)
30-34	-0.006	-0.006	-0.150***	0.011	0.009	-0.147***
	(0.020)	(0.022)	(0.020)	(0.022)	(0.022)	(0.019)
35-44	-0.056***	-0.057**	-0.200***	-0.079***	-0.082***	-0.242***
	(0.022)	(0.022)	(0.020)	(0.022)	(0.022)	(0.021)
45-64	-0.162***	-0.160**	-0.236***	-0.236***	-0.237***	-0.327***
	(0.029)	(0.027)	(0.026)	(0.031)	(0.032)	(0.031)

Notes: Standard errors are in parentheses. * statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. The dependent variable is the wage difference between immigrants and Canadian-born who are at the same age. First-stage standard errors are heteroscedasticity consistent, second-stage are bootstrapped. Complete results are in Appendix A.1.

Table 5 Schaafma and Sweetman's regression results of two-stage approach, males

	1996			1991			1986		
	Without controls	Canadian-born returns	Own returns	Without controls	Canadian-born returns	Own returns	Without controls	Canadian-born returns	Own returns
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Age at immigration:									
5-9	0.025	0.035	0.051	0.035	0.028	0.038	0.027	0.033	0.038
(5-12)	(0.022)	(0.018)	(0.019)	(0.0.21)	(0.021)	(0.020)	(0.023)	(0.022)	(0.023)
10-14	-	-	-	-0.005	0.018	0.030	-0.004	0.030	0.035
				(0.0.21)	(0.020)	(0.022)	(0.025)	(0.023)	(0.025)
15-19	-0.470**	-0.004	0.032	-0.057***	0.013	0.029	-0.050**	0.023	0.035
(13-19)	(0.022)	(0.021)	(0.021)	(0.020)	(0.020)	(0.020)	(0.022)	(0.022)	(0.021)
20-24	-0.009	-0.009	-0.040**	-0.005	-0.007	0.020	-0.045**	-0.032	-0.018
	(0.022)	(0.020)	(0.020)	(0.019)	(0.018)	(0.019)	(0.020)	(0.019)	(0.020)
25-29	-0.010	-0.056***	-0.001	0.012	-0.037**	-0.004	-0.014	-0.035	-0.020
	(0.023)	(0.021)	(0.022)	(0.020)	(0.019)	(0.020)	(0.021)	(0.020)	(0.021)
30-34	-0.019	-0.097***	-0.035***	-0.022	-0.093***	-0.058***	0.008	-0.043	-0.031
	(0.025)	(0.023)	(0.023)	(0.023)	(0.023)	(0.022)	(0.023)	(0.024)	(0.024)
35-44	-0.106***	-0.204***	-0.136***	-0.065***	-0.157***	-0.126***	-0.039	-0.113***	-0.103***
	(0.028)	(0.026)	(0.026)	(0.027)	(0.026)	(0.025)	(0.027)	(0.027)	(0.027)
45-64	-0.300***	-0.351***	-0.282***	-0.134***	-0.211***	-0.181***	-0.176***	-0.219***	-0.210***
	(0.045)	(0.043)	(0.045)	(0.039)	(0.037)	(0.036)	(0.044)	(0.044)	(0.043)

Notes: Standard errors are in parentheses. * statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. The dependent variable is the individual-specific deviation from the Canadian born age-earning profile; First-stage standard errors are heteroscedasticity consistent, second-stage are bootstrapped. Also included in the regressions are 7 indicators for hours worked, an indicator for 40-48 weeks worked in the year, and five regional indicators. Age at immigration in parentheses is for the 1996 census when the grouping does not correspond to that in 1986 and 1991. Complete results are in Appendix A.2.

The regression results with the Canadian-born return model for both 2011 and 2006 data are very similar to those of the without control model. This confirms that those who arrived at older ages earn significantly less than those who arrived as children.

Column (3) and column (6) of Table 4 provide the results of the own returns models for males in 2011 and 2006. Both the first and the second stage of that model introduce socioeconomic characteristics control variables. In 2011, the relationship between age at immigration and wages presents a nearly monotonic trend. A similar tendency can be found in own return regression of 2006 data. The groups 5-9 and 10-14 years have positive coefficients but they are small. The effect of age at immigration of those who immigrated after 20 present a clear monotonic trend and the results are all statistically significant at the 1% level. Those who arrived at ages between 45 and 64 years old earn 24% and 33% less than the reference group respectively in 2011 and 2006.

Considering the year of immigration in Appendix Table A.1, in general, recent immigrants have a wider wage gap compared with those who immigrated between 1955 and 1959. However, the result is not always significant in the own return models. Schaafma and Sweetman use the first group that have exact year information as the control group; to be consistent with their model, I use the year of immigration between 1955 and 1959 as the reference group.

The effect of educational attainment is also significant in the immigrants' wage profile. When years of schooling increase by one year, the earnings of immigrants will increase around 5%. Visible minority is another important factor that affects immigrants' earnings. The wages of immigrations who are visible minority are 13.6% and 18.4% less than those of individuals who are not a visible minority. It also can be seen that immigrants who can speak at least one Canadian official language can get higher wages than those who can speak neither of the official languages. Both Canadian-born return models and own return models imply that individuals who worked full-year and full-time get higher wages and salaries than those who worked 40 to 48 weeks a year or who worked part-time. Using Ontario as the province reference group, only immigrants who lived in Alberta come out with wider a difference between their wage and Canadian-born wage. In 2011, the effect is even at 15.6%.

As a point of comparison, Schaafama and Sweetman's (2001) two-stage approach regression results are shown in Table 5. Their research is based on 1996, 1991 and 1986 data and they only take males into consideration. From the original census data, the ages at immigration in 1996 are defined slightly differently from this study and divided into eight groups, 1 to 4, 5 to 12, 13 to 19, 20 to 24, 25 to 29, 30 to 34, 35 to 44 and 45 to 64. In 1991 and 1986, the ages at immigration before 20 are also grouped differently and divided into four categories: 1 to 4, 5 to 9, 10 to 14 and 15 to 19.

Comparing Schaafama and Sweetman's results in Table 5 with my results in Table 4 for the without controls models and the Canadian-born returns models, we can see that the patterns of coefficients are very similar. Generally speaking, age at immigration has a negative influence on immigrants' earnings. When the person immigrated at a relative older age, the wages are lower than for those who immigrated at a relatively younger age. Specifically, their results also show that for those who immigrated after 45 years old, the negative effect is very large. From column (3) of Table 5, it can be seen that in the own returns model of 1996, when age at immigration is greater than 20 years old, the age at which most immigrants have finished the education, the negative effect of age at immigration on wage is becoming larger. In the without controls models in 1991, apart from group the group 25-29, all the coefficients are negative. This pattern is consistent with what I have found in my 2011 data. In the 1986 data, the positive sign of the coefficient of age at immigration is shown for the 30-34 years group, which matches my 2006 result. Among these five years' regression, the outliers always appear in the 25-29 and 30-34 group, which implies that they perform better than those who immigrated at younger or older age. When other control variables are included into the auxiliary equation and equation of interest (own return models), all five years' results are consistent. The recent data provide higher significance. From Appendix Table A.2, the effect of visible minority status on immigrants, earnings of my regression is also similar to that estimated by Schaafama and Sweetman. However, the degree of impact is higher in the 2011 and

2006 regressions, at more than 10%. This coefficient in the 1980s and 1990s is at an average of 8%.

Overall, the major finding is that the effect of age at immigration on immigrant's earning is negative in all the years examined.

5.2 Regression results of two-stage approach, females, 2011 and 2006 and comparison with males, 2011 and 2006

In these days, females play an equivalent role to males in the labour market and it is important to estimate the effects of age at immigration for them too. Table 6 and Appendix Table A.3 show the results of the two-stage model for female immigrants for the years 2011 and 2006.

In all six regressions with female data, the parameters after age 15 years (age 20 years in 2011 own returns model) have a negative sign. Specifically, in the own returns models, the coefficients show a nearly monotonic trend. This means that the negative effect is stronger for the females who immigrated at an older age.

The outlier coefficients with positive sign for the 25-29 years and the 30-34 years groups in the regressions for males cannot be found in female case. The main reason could be that the primary workers are the males. Compared to males' results, although some of the coefficients are smaller in absolute value compared to coefficients of the upper and lower groups, the negative influence still exists.

Table 6 Regression results of two-stage approach, females

	2011			2006		
	Without controls	Canadian-born returns	Own returns	Without controls	Canadian-born returns	Own returns
	(1)	(2)	(3)	(4)	(5)	(6)
Age at immigration						
5-9	0.073***	0.070***	0.068***	0.001	-0.019	0.001
	(0.021)	(0.022)	(0.019)	(0.023)	(0.021)	(0.019)
10-14	0.031*	0.030*	0.047**	0.008	-0.027	0.007
	(0.021)	(0.023)	(0.020)	(0.024)	(0.022)	(0.021)
15-19	-0.061***	-0.062***	0.005	-0.056***	-0.106***	-0.046***
	(0.022)	(0.021)	(0.020)	(0.023)	(0.022)	(0.020)
20-24	-0.068***	-0.070***	-0.027*	-0.039**	-0.093***	-0.061***
	(0.021)	(0.021)	(0.020)	(0.021)	(0.021)	(0.020)
25-29	-0.043**	-0.044**	-0.062***	-0.051**	-0.069***	-0.080***
	(0.021)	(0.022)	(0.019)	(0.023)	(0.022)	(0.019)
30-34	-0.043**	-0.041**	-0.067***	-0.075***	-0.091***	-0.117***
	(0.022)	(0.022)	(0.020)	(0.024)	(0.023)	(0.021)
35-44	-0.117***	-0.120***	-0.120***	-0.151***	-0.171***	-0.186***
	(0.023)	(0.023)	(0.021)	(0.025)	(0.023)	(0.021)
45-64	-0.152***	-0.153***	-0.067**	-0.225***	-0.319***	-0.219***
	(0.032)	(0.032)	(0.030)	(0.038)	(0.036)	(0.034)

Notes: Standard errors are in parentheses. * statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. The dependent variable is the wage difference between immigrants and Canadian-born who are at the same age. First-stage standard errors are heteroscedasticity consistent, second-stage are bootstrapped. Complete results are in Appendix A.3.

We also find that the influence of age at immigration on wages for females is weaker than that for males, as reflected in the absolute values of the parameters. Take 2011 the own returns models as an example: for female immigrants who landed in Canada at the age of 20 to 24, the coefficient is -0.027. This number means that the wage of female immigrants who landed in Canada between 20 and 24 years old is 2.7% lower than that of female immigrants who landed in Canada at between ages 0 and 4. The same coefficient in the males' model was -0.089. That shows an 8.9% difference in the males' case, which is larger than for females. For those who immigrated between 30 and 34, the difference is even larger between males and females.

6. Conclusion

In this paper, I replicated a two-stage econometric methodology used by Schaafama and Sweetman (2001) to analyze the impact of age at immigration on the wages of immigrants. The data used in the regressions are the public use microdata files of the 2006 Canadian Census and of the 2011 Canadian National Household Survey. I studied those effects in 2006 and 201 for both males and females and I also compared my results to those of Schaafama and Sweetman who did the estimations for the years 1996, 1991 and 1986 for males only. Although some of the variables are slightly changed in the data files and the statistical methods of the original censuses may vary a bit over time, the differences are still small enough to make comparisons and to get a relative general conclusion on this issue from 1986 to 2011.

For males, using immigrants who immigrated at the age of 0 to 4 years old as the reference group, those who landed Canada at 5 to 14 years old earned a bit more. This can be explained by the better cultural adaptation of children. The negative effect on wages begins to emerge for immigrants who arrived in Canada between 15 and 24 years old (between 13 to 19 in the 1996 dataset). The effects for 2011 and 2006 are larger than those of the previous years.

The ages of 25 to 34 are a very special period during which most people have finished their education and begin to work. One of the reasons is that people at those ages are more adaptable and can blend into a different environment more quickly than teenagers do. This explains why those immigrants can get equivalent or even higher earnings than those who immigrated at an early age. Another reason for the ages between 25 and 34 to be special is self-selection. Those immigrants tend to be better educated, younger and less risk-averse than non-immigrants. They are also more likely to have earned higher wages than non-immigrants even if they had not moved. Immigrants who arrive when they are between 25 and 34 may have unobservable qualities that make them more likely to succeed in Canada. In contrast to immigrants who arrived as children, they made a conscious decision to move to Canada, and are therefore perhaps more driven to succeed. This could perhaps explain why this age group stands out as being different.

However, if a person immigrated to Canada after the age at 35 years old, the

ability to adapt to a new country and a new social system decreases due to language difficulties, differences in systems of education and in the various manners and customs. That is why age at immigration has greater influence on those who immigrated at a relatively old age.

To summarize, age at immigration has a negative effect on immigrants' annual wages and salaries for both males and females. Comparing males and females, the influence of age at immigration on male wages is much more important than that on female wages. Comparing my regression results for 2011 and 2006 males to those of Schaafama and Sweetman (2001) for males in 1986, 1991 and 1996, the influence of age at immigration in recent years appears to be higher than that in their earlier years.

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Appendix

Table A.1 Complete regression results of two-stage approach (coefficients other than age at immigration), males

	2011			2006		
	Without controls	Canadian-born returns	Own returns	Without controls	Canadian-born returns	Own returns
	(1)	(2)	(3)	(4)	(5)	(6)
Year of immigration:						
before 1955	0.035	0.030	0.056**	-0.010	-0.010	-0.002
	(0.062)	(0.066)	(0.058)	(0.041)	(0.040)	(0.036)
1960-1964	0.001	0.001	0.014**	-0.038	-0.040	0.008
	(0.050)	(0.050)	(0.046)	(0.037)	(0.036)	(0.032)
1965-1969	0.012	0.009	0.034**	-0.039*	-0.043*	0.016
	(0.044)	(0.043)	(0.040)	(0.031)	(0.030)	(0.028)
1970-1974	-0.015	-0.019	0.055*	-0.056**	-0.057**	0.057**
	(0.041)	(0.042)	(0.038)	(0.029)	(0.029)	(0.027)
1975-1979	-0.042	-0.045	0.035	-0.116***	-0.116***	0.036*
	(0.042)	(0.042)	(0.038)	(0.029)	(0.029)	(0.028)
1980-1984	-0.110***	-0.111***	0.014	-0.173***	-0.174***	0.027
	(0.042)	(0.043)	(0.039)	(0.031)	(0.029)	(0.030)
1985-1989	-0.168***	0.043***	-0.017	-0.207***	-0.208***	0.031
	(0.041)	(0.042)	(0.039)	(0.030)	(0.029)	(0.028)
1990-1994	-0.222***	-0.224***	-0.039	-0.296***	-0.298***	-0.027
	(0.041)	(0.042)	(0.038)	(0.031)	(0.029)	(0.029)
1995-1999	-0.184***	-0.186***	-0.022	-0.288***	-0.288***	-0.048*
	(0.041)	(0.042)	(0.039)	(0.031)	(0.030)	(0.030)

Table A.1 (Continued)
Complete regression results of two-stage approach (coefficients other than age at immigration), males

2000-2004	-0.206***	-0.208***	-0.049***	-0.407***	-0.407***	-0.156***
（2000-2006）	(0.042)	(0.042)	(0.039)	(0.031)	(0.030)	(0.030)
2005-2010	-0.314***	-0.315***	-0.121			
	(0.041)	(0.042)	(0.040)			
Year of education		0.058***	0.055***		0.053***	0.051***
		(0.001)	(0.001)		(0.001)	(0.002)
Visible minority		-0.069***	-0.136***		-0.061***	-0.184***
		(0.010)	(0.009)		(0.012)	(0.010)
Married		0.174***	0.023**		0.200***	0.040***
		(0.004)	(0.010)		(0.004)	(0.011)
Urban		0.053***	0.000		0.058***	0.018
		(0.004)	(0.019)		(0.004)	(0.018)
Bilingual		0.450***	0.171***		0.239	0.272***
		(0.133)	(0.029)		(0.149)	(0.034)
English		0.432***	0.141***		0.223	0.227***
		(0.133)	(0.024)		(0.149)	(0.028)
French		0.373***	0.138***		0.172	0.183***
		(0.133)	(0.036)		(0.149)	(0.183)
Full-time		0.958***	0.777***		0.943***	0.722***
		(0.010)	(0.020)		(0.010)	(0.024)
40-48 weeks a year		-0.108***	-0.149***		-0.135***	-0.164***
		(0.005)	(0.009)		(0.005)	(0.011)

Table A.1 (Continued)
Complete regression results of two-stage approach (coefficients other than age at immigration), males

Atlantic		-0.103***	-0.099***		-0.194***	-0.104**
		(0.007)	(0.045)		(0.007)	(0.057)
Quebec		-0.085***	-0.193***		-0.110***	-0.258***
		(0.008)	(0.018)		(0.008)	(0.019)
Prairie		-0.019**	-0.037**		-0.145***	-0.127***
		(0.008)	(0.021)		(0.008)	(0.024)
Alberta		0.183***	0.156***		0.078***	0.032**
		(0.007)	(0.156)		(0.006)	(0.016)
British Columbia		0.013**	-0.028***		-0.023***	-0.104***
		(0.006)	(0.012)		(0.006)	(0.011)
Constant	0.071**	0.071**	-1.528***	0.140***	0.142***	-1.450***
	(0.039)	(0.038)	(0.053)	(0.027)	(0.027)	(0.050)
N		33200			28504	

Notes: Standard errors are in parentheses. * statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. The dependent variable is the wage difference between immigrants' and Canadian-born's who are at the same age. First-stage standard errors are heteroscedasticity consistent, second-stage are bootstrapped. The number of observations are the number of observations in the second step.

Table A.2 Schaafama and Sweetman's regression results of two-stage approach, males

	1996			1991			1986		
	Without controls (1)	Canadian-born returns (2)	Own returns (3)	Without controls (4)	Canadian-born returns (5)	Own returns (6)	Without controls (7)	Canadian-born returns (8)	Own returns (9)
Year of immigration:									
before 1946	-0.028	-0.047	-0.065	-0.119	-0.109	-0.113	0.007	-0.001	-0.009
	(0.155)	(0.146)	(0.144)	(0.071)	(0.068)	(0.068)	(0.042)	(0.042)	(0.042)
1956-1960	-0.022	-0.001	-0.007	-0.033	-0.024	-0.021	-0.023	-0.009	-0.004
	(0.027)	(0.025)	(0.025)	(0.019)	(0.018)	(0.017)	(0.017)	(0.016)	(0.016)
1961-1965	-0.040	0.020	0.011	-0.075***	-0.050**	-0.043**	-0.075***	-0.035	-0.020
	(0.028)	(0.025)	(0.026)	(0.020)	(0.020)	(0.020)	(0.020)	(0.019)	(0.020)
1966-1970	-0.042	-0.012	-0.012	-0.040**	-0.042**	-0.025	-0.058***	-0.054***	-0.026
	(0.024)	(0.024)	(0.023)	(0.018)	(0.018)	(0.018)	(0.017)	(0.018)	(0.017)
1971-1975	-0.083***	-0.020	0.002	-0.130***	-0.096***	-0.062***	-0.136***	-0.101***	-0.049***
	(0.024)	(0.025)	(0.024)	(0.018)	(0.020)	(0.020)	(0.018)	(0.022)	(0.020)
1976-1980	-0.181***	-0.074**	-0.051**	-0.159***	-0.094***	-0.055***	-0.193***	-0.130***	-0.072***
	(0.026)	(0.027)	(0.025)	(0.020)	(0.022)	(0.021)	(0.021)	(0.024)	(0.023)
1981-1985	-0.213***	-0.089***	-0.068***	-0.223***	-0.135***	-0.095***	-0.374***	-0.307***	-0.251***
	(0.027)	(0.029)	(0.028)	(0.023)	(0.023)	(0.022)	(0.028)	(0.031)	(0.028)
1986-1990	-0.329***	-0.165***	-0.140***	-0.385***	-0.265***	-0.226***			
	(0.028)	(0.028)	(0.028)	(0.024)	(0.025)	(0.024)			
1991-1995	-0.486***	-0.298***	-0.270***						
	(0.030)	(0.031)	(0.032)						

Table A.2 (Continued) Schaafama and Sweetman's regression results of two-stage approach, males

Year of education		0.057***	-0.006***		0.055***	-0.007***		0.053***	-0.006***
		(0.001)	(0.002)		(0.001)	(0.001)		(0.001)	(0.002)
Visible minority		-0.093***	-0.085***		-0.087***	-0.070***		-0.080***	-0.087***
		(0.021)	(0.024)		(0.019)	(0.022)		(0.026)	(0.013)
Married		0.224***	-0.006***		0.227***	-0.061***		0.234***	-0.032**
		(0.006)	(0.014)		(0.005)	(0.014)		(0.007)	(0.016)
Urban		0.106***	-0.064***		0.020***	-0.035***		0.105***	-0.042***
		(0.005)	(0.013)		(0.004)	(0.012)		(0.005)	(0.014)
Bilingual		0.027	0.065		-0.064	0.067		0.032	-0.040
		(0.046)	(0.216)		(0.050)	(0.103)		(0.028)	(0.078)
English		0.066***	0.053***		0.066***	-0.017		0.073***	-0.013
		(0.012)	(0.016)		(0.010)	(0.014)		(0.013)	(0.017)
French		0.087***	0.007		0.078***	-0.012		0.084***	-0.086**
		(0.015)	(0.031)		(0.012)	(0.027)		(0.015)	(0.035)
Constant	0.087***	0.001	0.128***	0.093***	0.044***	0.136***	0.070***	0.030**	0.098***
	(0.023)	(0.021)	(0.040)	(0.017)	(0.017)	(0.032)	(0.018)	(0.017)	(0.038)

Notes: Standard errors are in parentheses. * statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. The dependent variable is the individual-specific deviation from the Canadian born age-earning profile; First-stage standard errors are heteroscedasticity consistent, second-stage are bootstrapped. Also included in the regressions are 7 indicators for hours worked, an indicator for 40-48 weeks worked in the year, and five regional indicators. Age at immigration in parentheses is for the 1996 census when the grouping does not correspond to that in 1986 and 1991.

Table A.3 Complete regression results of two-stage approach (coefficients other than age at immigration), females

	2011			2006		
	Without controls	Canadian-born returns	Own returns	Without controls	Canadian-born returns	Own returns
	(1)	(2)	(3)	(4)	(5)	(6)
Year of immigration:						
before 1955	-0.040	-0.048	-0.022	0.063*	0.062*	0.080**
	(0.063)	(0.060)	(0.054)	(0.044)	(0.044)	(0.038)
1960-1964	0.017	0.014	-0.020	-0.051	-0.012	-0.012
	(0.047)	(0.045)	(0.039)	(0.044)	(0.041)	(0.036)
1965-1969	-0.038	-0.044	-0.072**	-0.026	0.066**	0.043*
	(0.040)	(0.041)	(0.034)	0.035	(0.033)	(0.029)
1970-1974	0.011	0.007	-0.034	-0.007	0.062**	0.018
	(0.037)	(0.039)	(0.033)	(0.034)	(0.033)	(0.029)
1975-1979	-0.013	-0.014	-0.061**	-0.069**	-0.002	-0.046*
	(0.038)	(0.039)	(0.034)	(0.035)	(0.033)	(0.029)
1980-1984	-0.066**	-0.069**	-0.091***	-0.119***	-0.036	-0.060**
	(0.039)	(0.040)	(0.034)	(0.037)	(0.036)	(0.030)
1985-1989	-0.096***	-0.101***	-0.128***	-0.141***	-0.060**	-0.080***
	(0.038)	(0.040)	(0.034)	(0.035)	(0.035)	(0.030)
1990-1994	-0.143***	-0.147***	-0.151***	-0.218***	-0.131***	-0.139***
	(0.037)	(0.038)	(0.033)	(0.035)	(0.033)	(0.030)
1995-1999	-0.142***	-0.145***	-0.163***	-0.214***	-0.135***	-0.177***
	0.038	(0.040)	(0.034)	(0.035)	(0.034)	(0.030)

Table A.3 (Continued)
Complete regression results of two-stage approach (coefficients other than age at immigration), females

2000-2004	-0.171***	-0.172***	-0.218***	-0.340***	-0.266***	-0.309***
（2000-2006）	(0.038)	(0.039)	(0.034)	(0.036)	(0.034)	(0.030)
2005-2010	-0.293***	-0.296***	-0.313***			
	(0.038)	(0.040)	(0.035)			
Year of education		0.089***	0.072***		0.089***	0.067***
		(0.001)	(0.002)		(0.001)	(0.002)
Visible minority		-0.035***	-0.085***		-0.005***	-0.072***
		(0.010)	(0.009)		(0.011)	(0.009)
Married		0.038***	-0.063***		0.043***	-0.073***
		(0.004)	(0.009)		(0.004)	(0.009)
Urban		0.098***	0.076***		0.117***	0.115***
		(0.004)	(0.021)		(0.004)	(0.020)
Bilingual		0.358	0.228***		0.296**	0.212***
		(0.262)	(0.228)		(0.133)	(0.033)
English		0.310	0.118***		0.256*	0.124***
		(0.262)	(0.023)		(0.133)	(0.027)
French		0.277	0.137***		0.202	0.077**
		(0.262)	(0.037)		(0.134)	(0.042)
Full-time		0.756***	0.678***		0.717***	0.638***
		(0.006)	(0.013)		(0.006)	(0.013)
40-48 weeks a year		-0.142***	-0.136***		-0.188***	-0.162***
		(0.005)	(0.010)		(0.005)	(0.010)
Atlantic		-0.104***	-0.081*		-0.184***	-0.216***
		(0.007)	(0.055)		(0.007)	(0.063)

Table A.3 (Continued)
Complete regression results of two-stage approach (coefficients other than age at immigration), females

Quebec		-0.101***	-0.210		-0.100***	-0.228***
		(0.008)	(0.019) ***		(0.008)	(0.018)
Prairie		-0.011	0.006		-0.108***	-0.116***
		(0.008)	(0.023)		(0.008)	(0.027)
Alberta		0.120	0.103***		0.017***	-0.008
		(0.007)	(0.014)		(0.007)	(0.016)
British Columbia		-0.006	-0.062***		-0.025***	0.016***
		(0.007)	(0.011)		(0.006)	(0.012)
Constant	0.086***	0.090***	-1.519***	0.085***	0.099***	-1.392***
	(0.033)	(0.037)	(0.047)	(0.031)	(0.030)	(0.046)
N		30230			25420	

Notes: Standard errors are in parentheses. * statistically significant at 10% level; ** statistically significant at 5% level; *** statistically significant at 1% level. The dependent variable is the wage difference between immigrants' and Canadian-born's who are at the same age. First-stage standard errors are heteroscedasticity consistent, second-stage are bootstrapped. The number of observations are the number of observations in the second step.