

A STUDY OF IMMIGRATION PERFORMANCE IN
TERMS OF TASK SPECIALIZATION IN THE
CANADIAN LABOR MARKET

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Abstract

In this dissertation, I study the impact of immigration on the Canadian economy as well as the economic outcomes of immigrants to Canada. I focus on two key economic outcomes, which differ from most of the previous literature: task usage and labor market segmentation. My first chapter examines the effect of immigration on natives' task usage. My second chapter studies differences in the outcomes of immigrants who work in and out of ethnic enclaves. My third chapter explores differences in the outcomes of first, second and third generation immigrants.

In Chapter 1, I use Canadian confidential census data to undertake research on the effects of immigration on employees' performance in the Canadian labor market. By generating a new method to define communication and manual tasks, this chapter concentrates on changes in task supplies in the labor market resulting from changes in immigration to Canada. In this chapter, I also study the effects of a change in the foreign-born worker share on task compensations. I find the increase in the foreign born share will lead both the relative supply of communication versus manual tasks and the relative compensations of these tasks to go up in the highly-educated workers group. However, the Canadian immigration does not impact the less-educated group quite significantly because of the smaller size of this group in the labor market.

In Chapter 2, I study performance differences between immigrants working in the regular Canadian labor market and those in the ethnic enclave sector of the economy. First, by studying the effects of education and race on the weekly wage earnings, I find that the returns to education are greater and being a visible minority carries less of a wage penalty for immigrants working in the regular sector compared with those in the enclave sector. Moreover, taking the AME(Average Marginal Effect) studies, I document different effects of education and race on both earnings and job segment for these two types of immigrants and propose an explanation. After this, I compute task supply and wage gaps between different types of immigrants in three

census years to show differences in assimilation by immigration cohort. Finally, I use regression models to study immigrants' task supply and weekly wages so that we can have a fuller view of the differences in performance between immigrants working in the regular and enclave sectors.

In Chapter 3, I study the difference in task supplies and economic status between natives and two generations of immigrants. I estimate differences in task supply and earnings between natives and immigrants in 1970 and 2015, which are the beginning and end of the fifth (and current) wave of immigration to Canada. Furthermore, using a three-fold Blinder-Oaxaca decomposition, I link the average weekly wage of workers to their task productivity, and try to find the effects of the returns to tasks as well as different task supplies on the average wage gap between natives and immigrants. Finally, I use ordered probit and logit models to demonstrate and measure the significant effects of immigrant status on an employee's labor market segment.

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¹This Structure is from Peri & Sparber (2009)

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Chapter 1

Task Specialization, Wage, and Immigration in Canada

1.1 Introduction

In recent years, more and more people are immigrating to Canada. From Statistics Canada, we can find that:

- In 2011, Canada had a foreign-born population of about 6,775,800 people. They represented 20.6% of the total population, the highest proportion among the G8 countries.
- Between 2006 and 2011, around 1,162,900 foreign-born people immigrated to Canada. These recent immigrants made up 17.2% of the foreign-born population and 3.5% of the total population in Canada.
- Asia (including the Middle East) was Canada's largest source of immigrants during the past five years, although the share of immigration from Africa, Caribbean, Central and South America increased slightly.

The vast majority of the foreign-born population lived in five provinces: Ontario, British Columbia, Quebec and Alberta, and most lived in the nation's largest urban centers such as Toronto, Vancouver, Montreal, and so on.

In the 1990s, educational attainment among new immigrants increased significantly. For example, while about one-quarter of male immigrants who landed in 1988 had a university degree, this was the case for over one-half of those who landed in 1999. Among female immigrants who landed in 1988, 18% had a university degree. By 1999, that proportion had risen to 42%.

Some Canadians believe that current immigration level are too high. Inherent in this pessimism over perceived high immigration levels is the belief that it could potentially lead to loss of Canadian jobs, wage suppression or increased unemployment insurance and welfare rolls, thereby putting pressure on the public treasury (Baker and Benjamin: 1995).

Canada has a well known "points system" for independent immigration. In 1978, the Parliament of Canada enacted "Immigration Act, 1976" to refuse those independent immigrants who could become a burden on social welfare or health services. This act was replaced by "Immigration and Refugee Protection Act, 2001" in 2002. We may infer a different competition situation between highly-skilled immigrants and natives in Canada from that in the US.

Some argue that, when more immigrants come, it becomes harder for natives to get a good job. On the other hand, with more immigrants, Canada will experience faster economic development. In order to study how immigration impacts natives and the overall working population in the Canadian labor market, this paper adopts the approach used in a paper written by Peri and Sparber (2009). Peri and Sparber (2009) introduce a way to decompose jobs into a combination of communication and manual task supplies. By generating these two task supplies per unit of time for each occupation, workers' task productivity can be derived in each occupation. Then,

by looking at the changes in the average task productivity in each city in different years, we could tell if the native workers and the total population are transferring to communication-intensive or manual-intensive jobs as a consequence of immigration to Canada.

This paper studies the effect of immigration on task specializations. This paper follows Peri and Sparber’s structure (2009), and tries to find evidence of immigration effects on Canada’s labor market. Instead of using the O*NET abilities survey from the US department of labor, I use a new dataset called the Canadian Career Handbook to define each occupation’s composition of specific aptitudes. This is appropriate because I assume employees with the same occupation may perform differently in Canada and the US. Then I create new definitions for task specializations.¹After that, I match occupations in the Canadian Career Handbook with those in the Canadian Census to generate a combined dataset which includes employees’ characteristics and their occupations’ detailed features.

In Canada, there is an existing literature about the effects of immigration on labor market. For instance, some papers (Laryea 1998a and Laryea 1998b) explore the substitutability or complementarity between natives and immigrants to determine whether immigrant inflows hampered the economics progress of native employees, or if job opportunities of the native-born worsen because of large inflows of foreign-born workers. Some other papers (Schaafsma and Sweetman 2001, Picot and Sweetman 2005, and Aydemir and Borjas 2006) examine the relationship between immigration and the unemployment rate as well as earnings in the Canadian labor market. In this paper, I will focus on understanding how native-born workers transfer to different types of occupations (communication or manual intensive occupations) because of the immigrant inflows. In other words, will native workers alter the composition of

¹The details for this part will be presented in Section 1.4.

their tasks supply when they are facing the large pool of immigrants in the labor market?

Intuitively, it is expected that natives would shift to more communication-intensive jobs in response to the increase of immigrants in one country. In the US, the majority of the immigrants come from Mexico and are believed to be weak at English language. This background would push these Mexicans' competitors to increase their communication task supply and decrease their manual task supply to avoid a huge loss from the manual task supply competition. In Canada, the composition of immigrants is quite different from that in the US. However, the same shifting in task supply may still occur. Immigrants to Canada are believed to have good language skills; however, most of them still cannot use Canada's official languages as well as natives because they come from non-English speaking source countries. Natives still have an advantage in communication-intensive tasks, so that they still could shift to a more communication-intensive job to avoid a further economic loss from the manual task supply competition. Moreover, immigrants to Canada are typically wealthy and have high job skills. Therefore, the increase of these kinds of immigrants would generate demand for high skilled and communication intensive jobs like the finance advisor, investment consultant, estate agent, and new immigration service job positions, which will have an incentive to the natives. This is why I expect that natives will also shift to more communication-intensive jobs in response to an increase in the foreign-born worker share in Canada.

In this paper, motivated by Peri and Sparber (2009), I study the impacts of the increasing number of the immigrants on changes in workers' task supplies in the Canadian labor market. In Section 1.3, I redo the theoretic procedures in Peri and Sparber's paper (2009) but allow high skilled occupations to be more or less communication intensive as well so that I generate a series of new regression models more suitable for my study. Moreover, I introduce my data sources and new methods

to generate communication and manual tasks as well as an instrumental variable for the 2SLS estimations in Section 1.4.

In the next section, I present my empirical results. First, in Section 1.5.1, I show the impacts of the increasing foreign born worker share on the change in the natives' supplies of communication and manual tasks. I find that, with the increase of the foreign born share, both highly-educated and lower-educated natives increase their relative supplies of communication tasks relative to manual tasks i.e. the natives transfer to communication-intensive occupations in general. However, highly-educated native workers increase their communication task productivity and decrease their manual task productivity, but lower-educated natives only increase their communication task productivity but do not change their manual task productivity significantly. This might be because less educated workers are less likely to hold technology-intensive jobs.

After this, in Section 1.5.2, I study the effect of immigration on the relative task supply changes of the total working population in the Canadian labor market. I find that, because of the dramatic increase in the demand for the communication intensive jobs in Canada, the increase in the foreign born share could lead the relative task supplies of the highly-educated workers to be more communication-intensive. Because there are few lower-educated immigrants, they are considered not to trigger a significant impact on the relative task supplies of the total lower-educated population.

In Section 1.5.3, I link changes in the relative compensation of communication versus manual tasks to the increasing foreign born share. I find that, in the highly-educated group, an increase in the number of immigrant workers causes the relative compensation of communication versus manual tasks to go up. This might result from the large proportion of the wealthy class among all the immigrants coming to Canada. The higher elasticity of the complementary relationship between the

foreign born share and the wages of lots of communication-intensive industries in Canada dominantly lead such an increase. Lastly, in Section 1.5.4, I divide the natives into some comparison groups based on different demographic characteristics and demonstrate differences in the impact of immigration on relative task supplies within each comparison group.

1.2 Literature Review

Peri and Sparber (2009) found that immigration to the US causes natives to supply more communication tasks to avoid potential wage loss. Peri and Sparber argued that since immigrants to the US have poor English language ability, they would cause a substitution effect for manual tasks instead of communication tasks.

This is quite different from the situation in Canada. Bonikowska, Hou, and Picot claim that even after accounting for compositional shifts, immigrants with high education experience different earnings outcomes in Canada and the US. Schaafsma and Sweetman (2001) showed that only the immigrants with a Canadian educational background could perform as well as the Canadian born, while those without a domestic educational background could not. In Canada, recent immigrants are believed to be quite different from older immigration cohorts. Picot and Sweetman (2005) argued that the increasing low-income rates resulted from the changing characteristics of immigrants, including country of origin; language; the decreasing returns to foreign work experience; and the decline in the labor-market outcomes of all new labor-force entrants including immigrants. Aydemir and Borjas (2006), we learn that a 10% labor-supply shift caused by immigration would result in a 3% to 4% reduction in wages in Canada.

A paper written by Goldin and Katz (2007) claims that “high school graduates and dropouts are close substitutes today.” Then, Ottaviano and Peri (2008) find that

there is a significant degree of imperfect substitutability between workers with a high school diploma or less and those with some college education or more. Therefore, in this paper, we will define two groups of workers based on educational attainment. One consists of workers with a high school degree or less, and the other consists of workers with more than high school degree. Therefore, to study the precise substitution effects from immigrants, I will study these two educational groups of workers separately. My analysis treats skilled and unskilled workers as belonging to separate labor markets, but this may not be entirely accurate since it is possible that high skilled immigrants compete with low-skilled natives. In future work I will treat unskilled natives and all immigrants as a single labour market to obtain some new findings.

There is mixed evidence about the effect of immigration on natives' wages. Immigration may not affect natives' employment or wages if immigrants and natives are imperfect substitutes in production. Peri and Sparber (2009) showed that immigration from Mexico induces native born workers to shift from manual to communication intensive tasks. These facts encourage us to make comparisons within substitutable groups. In this paper, workers are considered to be substitutable with each other only in their own educational groups.

When we study the immigration effects on the wages in the Canadian labor market, there are some other early relevant papers. Laryea (1998a) applies a random effects model to analyze the impact of foreign-born workers on wages in Canada. He studies the impacts by broad industry group and gender. Finally, the empirical results give the conclusion that there appears to be complementary relationship between Canadian wages and foreign-born wages, but the relationship has been masked by developments in specific industries.

After this, Laryea (1998b) employs a generalized Leontief production function to study whether there exists substitutability or complementarity between Canadian, old foreign-born and new foreign-born workers using data from the 1991 census.

The results show that Canadian and new foreign-born workers are substitutable in production with adverse impacts on Canadian-born wages. The earlier immigrants, on the other hand, were found to be complements to Canadian-born workers. Moreover, he proved that the foreign-born share in the Canadian labor market has a complementary relationship with Canadian wages in some communication-intensive industries while a substitutable relationship in other industries. Meanwhile, the complementary wage elasticity of the foreign-born share is higher than the substitutable part. Therefore, we could expect an increase in the relative compensation of the communication task versus the manual task caused by the increasing foreign-born worker share.

Some recent papers put views on the skill transition of women in Canada. Adserà and Ferrer (2014) find that, judging by the gradual convergence between the tasks required for educated immigrant women's jobs and those of natives, the job barriers seem to ease over time and lead to some wage assimilation (up to 80 percent of the wages of similar native-born women after 15 to 20 years in Canada). Moreover, they claim skill progression does not happen to less educated immigrant women, although wages still rise gradually over time. Adserà and Ferrer (2016) show that, on average, immigrant women participate significantly more in the labour market and experience wage gains over time, even though the skills required by their jobs do not converge to those of natives. They use recent evidence in Canada to show that married immigrant women make labor supply decisions similar to those recently observed for native married women.

In my paper, I will study the immigration effects on these two areas similarly as Laryea did by introducing task specialization into the research.

1.3 Theoretical Model²

1.3.1 Regular Model

Now, I propose a general equilibrium model of task performance to demonstrate the effects of immigration on specialization and wages. First, consider an open economy that combines two nontradable intermediate services, Y_H and Y_L , we denote the a CES production function to produce a final tradable consumption good, Y .

$$Y = \left[\beta Y_L^{\frac{\sigma-1}{\sigma}} + (1 - \beta) Y_H^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} \quad (1.1)$$

Parameter $\sigma \in (0, \infty)$, and $\beta \in (0, 1)$. σ measures the elasticity of substitution between Y_H and Y_L , while β capture the relative productivity of these two intermediate services. In this paper, we will focus on the effects within both the highly-educated and less-educated workers which is different from Peri & Sparber's idea (2009). So, I assume that workers in both these two educational groups are heterogeneous and may differ in their relative task productivity. Now, we define relative supply of tasks as communication and manual tasks. This paper will focus on the less educated workers. Now, we define the intermediate service from low educated workers as:

$$Y_i = \left[\beta_i M_i^{\frac{\theta_i-1}{\theta_i}} + (1 - \beta_i) C_i^{\frac{\theta_i-1}{\theta_i}} \right]^{\frac{\theta_i}{\theta_i-1}} \quad (1.2)$$

Where β_i and $\theta_i \in (0, \infty)$. $i=H$ or L . Here, M and C mean the units of manual- and communication-tasks inputs in the aggregate.

Consider the case when labor markets here have perfect competition among producers of Y_H and Y_L respectively, which is a very strong assumption. Then, we have the equation (1.3), where w_C and w_M denote the compensation (price) paid for

²This Structure is from Peri & Sparber (2009)

one unit of manual and communication task, respectively.

$$\frac{C_i}{M_i} = \left(\frac{1 - \beta_i}{\beta_i} \right)^{\theta_i} \left(\frac{w_{Ci}}{w_{Mi}} \right)^{-\theta_i} \quad (1.3)$$

Labor incomes are given in equations (1.4) and (1.5) for the native and immigrant workers, respectively. Here, it is assumed that both of the highly and lower educated workers share the same income functions.

$$w_{Di} = (l_{Di})^\delta \mu_{Di} w_{Mi} + (1 - l_{Di})^\delta \varsigma_{Di} w_{Ci} \quad (1.4)$$

$$w_{Fi} = (1 - d) \left[(l_{Fi})^\delta \mu_{Fi} w_{Mi} + (1 - l_{Fi})^\delta \varsigma_{Fi} w_{Ci} \right] \quad (1.5)$$

$(1 - d) \in (0, 1)$.

Again, “i” is a worker’s education group. D and F denote native-born and foreign-born workers, respectively. Let l_j be the share of a worker’s labor endowment for manual tasks in his or her occupation with respect to a unit of time. Then, a worker’s supply of manual task units is $m_j = (l_j)^\delta \mu_j$, while the supply of communication task units is $c_j = (1 - l_j)^\delta \varsigma_j$. By maximum these two equations with respect to l_{ji} , we can get:

$$\frac{c_{ji}}{m_{ji}} = \left(\frac{w_{Ci}}{w_{Mi}} \right)^{\frac{\delta}{1-\delta}} \left(\frac{\varsigma_{ji}}{\mu_{ji}} \right)^{\frac{1}{1-\delta}} \quad (1.6)$$

and

$$\frac{l_{ji}}{1 - l_{ji}} = \left(\frac{\varsigma_{ji} w_{Ci}}{\mu_{ji} w_{Di}} \right)^{\frac{1}{1-\delta}} \quad (1.7)$$

Then, let L_j be the total labor supply of group j, we can denote the equation (1.8) as the aggregate relative supply of tasks in the economy.

$$\frac{C_i}{M_i} = \frac{C_{Fi} + C_{Di}}{M_{Fi} + M_{Di}} = \varphi_i(f_i) \frac{C_{Fi}}{M_{Fi}} + (1 - \varphi_i(f_i)) \frac{C_{Di}}{M_{Di}} \quad (1.8)$$

where $\varphi_i(f_i) = (M_{Fi} / (M_{Fi} + M_{Di})) \in (0, 1)$, and $f_i = L_{Fi} / (L_{Fi} + L_{Di})$.

From equation (1.3), (1.6) and (1.8), we can solve for the equilibrium relative compensation of tasks for the two educational groups respectively based on the different “i”:

$$\frac{w_{Ci}^*}{w_{Mi}^*} = \left(\frac{1 - \beta_i}{\beta_i} \right)^{\frac{(1-\delta)\theta_i}{(1-\delta)\theta_i + \delta}} \left[\frac{\varsigma}{\mu} \left(\begin{array}{c} f_i, \frac{\varsigma_{Fi}}{\mu_{Fi}} \\ - \quad + \end{array} \right) \right]^{\frac{-1}{(1-\delta)\theta_i + \delta}} \quad (1.9)$$

Substitute (1.9) into (1.6), we will solve for the equilibrium relative provision of tasks.

$$\frac{C_{Di}^*}{M_{Di}^*} = \frac{c_{Di}^*}{m_{Di}^*} = \left(\frac{1 - \beta_i}{\beta_i} \right)^{\frac{\delta\theta_i}{(1-\delta)\theta_i + \delta}} \left(\frac{\varsigma_{Di}}{\mu_{Di}} \right)^{\frac{1}{1-\delta}} \left[\frac{\varsigma}{\mu} \left(\begin{array}{c} f_i, \frac{\varsigma_{Fi}}{\mu_{Fi}} \\ - \quad + \end{array} \right) \right]^{\frac{-1}{(1-\delta)\theta_i + \delta} \frac{\delta}{1-\delta}} \quad (1.10)$$

Similarly, we can get the $\frac{C_F^*}{M_F^*}$, then, use (8), we will identify the equilibrium aggregate relative provision of tasks.

$$\frac{C_{Fi}^*}{M_{Fi}^*} = \frac{c_{Fi}^*}{m_{Fi}^*} = \left(\frac{1 - \beta_i}{\beta_i} \right)^{\frac{\delta\theta_i}{(1-\delta)\theta_i + \delta}} \left(\frac{\varsigma_{Fi}}{\mu_{Fi}} \right)^{\frac{1}{1-\delta}} \left[\frac{\varsigma}{\mu} \left(\begin{array}{c} f_i, \frac{\varsigma_{Fi}}{\mu_{Fi}} \\ - \quad + \end{array} \right) \right]^{\frac{-1}{(1-\delta)\theta_i + \delta} \frac{\delta}{1-\delta}} \quad (1.11)$$

$$\frac{C_i^*}{M_i^*} = \left(\frac{1 - \beta_i}{\beta_i} \right)^{\frac{\delta\theta_i}{(1-\delta)\theta_i + \delta}} \left[\frac{\varsigma}{\mu} \left(\begin{array}{c} f_i, \frac{\varsigma_{Fi}}{\mu_{Fi}} \\ - \quad + \end{array} \right) \right]^{\frac{\theta_i}{(1-\delta)\theta_i + \delta}} \quad (1.12)$$

$\frac{\varsigma}{\mu} \left(f, \frac{\varsigma_F}{\mu_F} \right)$ is a weighted average of the relative skill endowments among natives and immigrants.³

Equations (1.9)-(1.12) give us the equilibrium conditions. Consider other parameters as given, we could treat f (foreign-born share) as an exogenous variable which will influence the equilibrium conditions. Thus, we can generate the empirical specifications from these three equations.

³More specifically, $\frac{\varsigma}{\mu} \left(f_i, \frac{\varsigma_{Fi}}{\mu_{Fi}} \right) = \left[\varphi_i(f_i) (\varsigma_{Fi}/\mu_{Fi})^{1/(1-\delta)} + (1 - \varphi_i(f_i)) (\varsigma_{Di}/\mu_{Di})^{1/(1-\delta)} \right]^{1-\delta}$.

1.3.2 Empirical Specifications

Based on equations (1.10) and (1.12), we will define three linear regression models by taking log-linearization to those two in the empirical works, and all these equations apply separately to high or low education workers.

$$\ln \left(\frac{C_D}{M_D} \right)_{st} = \gamma f_{st} + \alpha_s^D + \tau_t^D + \varepsilon_{st}^D \quad (1.13)$$

$$\ln \left(\frac{C}{M} \right)_{st} = \gamma_{TOT} f_{st} + \alpha_s^{TOT} + \tau_t^{TOT} + \varepsilon_{st}^{TOT} \quad (1.14)$$

Then, by log-linearizing the equation (1.9), we obtain the a third linear relation given by:

$$\ln \left(\frac{w_C}{w_M} \right)_{st} = \gamma_w f_{st} + \alpha_s^w + \tau_t^w + \varepsilon_{st}^w \quad (1.15)$$

These three panel regressions are my main empirical specifications. Peri and Sparber's paper (2009) studied a similar case in the US; however, in this paper, I use confidential census data⁴ from Statistics Canada and a new approach to define the task variables. Then, I will study the results in Canada and make a comparison with those in the US to see the similarities and differences.

Since the immigrants moving to Canada are quite different from those to the US, we may consider a different equilibrium of the supply and demand of the C/M ratio under the relative compensation of communication versus manual tasks which is W_c/W_m . I find the equilibrium under different situations. Figure B.1 shows the original equilibrium of the supply and demand of the C/M ratio. Figure B.2 displays the situation in the US after a large influx of unskilled immigrants from Mexico. The supply of C/M would shift leftward since there is a higher poor-English labor share in the market. This will lead to a decrease to C/M but an increase to W_c/W_m .

⁴This will be introduced in Section 1.4.

The situation in Canada may be quite different from the US. Since the immigrants to Canada are overwhelmingly formed by the Economy Class (business people and skilled workers) from non-English speaking countries, we could naturally suppose that an increase in the number of immigrants will increase the demand for communication intensive jobs which means the demand curve will shift rightward. Figures B.3, B.4, and B.5 illustrate three different possible results of the leftward shift of the demand curve. First, if the increase in demand resulting from increased immigration is small, in equilibrium, relative compensation will still increase while the equilibrium C/M ratio will decline. The second case is a special case. Here, the increase of C/M from the rightward shift of the demand curve will be offset by the leftward shift of the supply curve. Therefore, in equilibrium, relative compensation will increase, while C/M will stay the same. Finally, in the last figure, if there is a large increasing effect on the demand for communication intensive jobs, the demand curve will shift rightward dramatically. Then, equilibrium relative compensation will increase, and equilibrium C/M ratio will increase, too.

1.4 Data

1.4.1 Data Source

The microdata used for my study is census data ⁵. from Statistics Canada. I use data for the period 1971-2011, which includes Canada-born and foreign-born (immigrant) workers who are between 18 and 65 years of age. The data include different types of demographic characteristics such as race, birth place, sex, wage, working hours, immigration status, and so on. And for my panel study, I will use metropolitan area to define location. Here might be a potential problem that treating different cities as distinct labor markets may be not fair if they are connected by transit. Therefore, in

⁵This set of data is the confidential version which is from the RDC department

future work, I will try some other fixed effects (e.g. group cities that are part of the same transit network).

To define the communication and manual tasks for each occupation, I will use another data set from Statistics Canada, which is called the Canadian Career Handbook published in 2003. This data set uses values to define the aptitudes requirement for each occupation: General Learning, Verbal, Numerical, Spatial Perception, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, and Manual Dexterity. Each aptitude is given five values (1-5) to describe its grade among the entire working population⁶. However, to undertake my empirical analysis, I will need to generate a new variable to describe the importance of each aptitude. Here, I will use the median of each aptitude's percentile range among all workers to represent that aptitude's importance. For example, the median of the highest 10 percent is 0.95. Then, I will replace the value 1 by 0.95. Using this method, I will get 0.75 for the value 2, 0.50 for 3, 0.25 for 4, and 0.05 for 5.

To define communication-intensive tasks, I will use the average importance value of Verbal and Clerical Perception aptitudes. When it comes to manual tasks, I have two types of definitions, the basic definition and the extended one. Under the basic definition, a manual task is considered to be a combination of Finger and Manual Dexterity aptitudes. A combination of these two basic aptitudes plus Spatial Perception and Form Perception constitute the extended definition.

Figure 1.1 plots the number of immigrants and non-permanent residents of Canada from different source countries in 2001. From this graph, we can see that majority of the foreign-born residents were from China, India, The US, and some European countries. This implies that the immigrants could have quite a different effect on the Canadian labor market than they have on the labor market in the US.

⁶The value 1 means the aptitude for this occupation is in the highest 10 percent among all workers. The value 2 means the upper third, exclusive of the highest 10 percent. The value 3 means the middle third. The value 4 means the lowest third, exclusive of the lowest 10 percent. The value 5 means the lowest 10 percent.

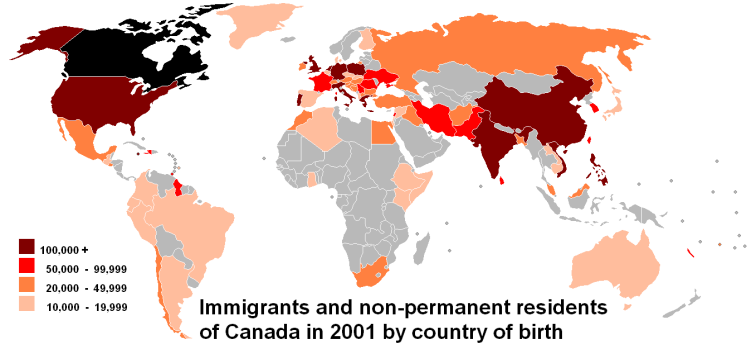


Figure 1.1: Immigrants situation in Canada

From the graphs (available upon request) showing the relationship between C/M ratio and foreign-born shares, I find that a rise in foreign-born share is associated with an increase in the relative C/M task supply from less-educated natives living in all metropolitan areas during 1971-2011. Then, we could easily find that these two factors still have a positive relationship in the very recent census year, which gives a strong support for the lasting of the relationship between the C/M ratio and the foreign-born share. When it comes to the highly-educated group, similar to the less-educated group, I find a rise in the foreign-born share will also lead to an increase in the C/M ratio among highly-educated native workers in metropolitan areas during the whole period. Moreover, an increase in the foreign-born share still has a positive relationship with the relative C/M task supply within the highly-educated group in all metropolitan areas. If we check the data, we could easily find that the proportion of less educated workers in 1971 is about 91% which is much larger than other census years in this study. Therefore, the highly educated workers could gather in the jobs which have extremely high C/M ratios because these jobs like managers, analysts, officers and so on are all communication-intensive.

Figure B.6 demonstrates the shares of population engaged in highly communication-intensive occupations in Canada. Meanwhile, Figure B.7 demonstrates those in five metropolises in Canada: Toronto, Vancouver, Ottawa, Montreal, and Calgary. In

these two figures, we can see that the patterns are quite similar nationwide and in the five metropolises, even if the levels are different. The shares of the population engaged in highly communication-intensive occupations in Canada kept increasing during the period 1991-2011. At the same time, the new immigrant population during this period also kept increasing dramatically. Hence, it is possible that the relationship between aggregated C/M ratio and the foreign-born worker share should be positive in Canada, which is different from the situation in the US as presented by Peri and Sparber (2009). I will use the empirical strategy described above to uncover the true relationship in next sections.

1.4.2 Task Variables

The Canadian Career Handbook assigns numerical values to describe the importance of 9 distinct employee aptitudes required by each occupation. With this set of data, I can define communication and manual tasks in two ways. One is a basic definition, which defines communication skill as Verbal and Clerical Perceptions and manual skill as Finger and Manual Dexterity. The other is an extended definition, which defines manual skill as Finger and Manual Dexterity plus Spatial Perception and Form Perception. One limitation of my study should be concerned that, using a static occupational skill variable may either understate or overstate changes in immigrants' task supplies over time. However, we could understand task supply change mechanism in this way that, if immigrants transit out of certain occupations as those occupations' skill requirements change, then they might be using similar skills over time even if their occupations change. On the other hand, if immigrants stay in similar occupations over time and occupational skill requirements change, then they will be using different skills over time even if their occupations haven't changed.

Table A.1 demonstrates 12 types of occupations with the specific relative communication versus manual task supply values. Columns 2 to 4 display the

values for communication and manual intensity indexes and the percentile of that occupation's C/M ratio among all occupations. The first four rows are those occupations with the highest C/M ratio values, and the medium four are those with the average C/M ratio while the last four represent those with the lowest ratio. In this table, we can see that management consultants, financial and investment analysts, financial auditors, and loan officers have the highest percentile of communication/manual values. The four occupations related to technical, mining, and armed forces possess medium C/M ratio. Finally, what matches our prediction is that laborer-type occupations have the lowest C/M ratio values.

Tables A.2 and A.3 display those occupations with the highest and lowest highly-educated worker shares, respectively, during the census period 1991-2011. In Table A.2, which lists the highest highly-educated worker shares, we see that many occupations repeat in these three census years, such as General Practitioner and Family Physician, Specialist Physicians, Veterinarians, and so on. Furthermore, we will clearly find that almost all of these jobs have a very high communication intensity index which is more than 0.50 with a large manual/manual-ext intensity index. This suggests that highly-educated workers provide both excellent communication and manual tasks, although most of the occupations with a higher highly-educated worker share are more communication intensive. Table A.3 shows the five occupations with the lowest highly-educated worker share in the years 1991, 2001, and 2011. Similar as those in Table A.2, many occupations appear repeatedly in the three census years. All the occupations here have a very low communication intensity index and a low manual intensity index since occupations opened to less-educated workers have low requirements on the job skills. So, these occupations are considered to be relatively manual intensive. Moreover, according to the information in Table A.2, we can see that, in the highly-educated group, workers also have different relative task supply ratios. For instance, occupations with a large number of highly-educated workers

like the “Medical Sonographers”, “Veterinarians”, and “Chiropractors” give us the C/M ratios smaller than “1”, which supports the basic idea of this paper that, not only the lower-educated occupations but the highly-educated ones also vary in their task supplies.

1.4.3 Instrumental Variable

One concern is that unobservable technology and demand factors, which may differ across provinces, might have simultaneously affected the productivity of communicative tasks and attracted immigrants. To establish causality, we use an instrumental variable (IV), “imputed” foreign workers, which captures a large share of the increase in the foreign-born population from some main source countries, beginning in 1971. This IV can be generated by: $IV_{s,t} = \sum \lambda_{c,s,t} I_{c,s,t}$, where $\lambda_{c,s,t}$ is the share of immigrants from country c among all immigrants over time in different metropolitan areas. $I_{c,s,t}$ denotes the share of imputed immigrants from country c among all workers:

$$I_{c,s,t} = I_{c,s,1971} \frac{(1 + g_c)_{1971-t}}{(1 + g_{CA})_{s,1971-t}}$$

In this paper, the source countries/regions I selected for c include the US, Africa, Caribbean region, China, France, Germany, Greece, India, Netherland, Poland, Portugal, Russia/USSR, and UK. I will use this instrument both for the highly-educated and lower-educated groups, since some of source countries send largely highly-educated immigrants while others send largely lower-educated immigrants. Combining these two types of source countries could make the IV suitable for 2SLS estimations in both these two educational groups because this IV would impact both the highly and lower-educated foreign-born worker shares. Moreover, certain important sending countries in recent years were not sending countries in 1971, which affects accuracy of instrument. Therefore, I would improve the source country

selection in future and try to use more detailed geographic areas (e.g. specific African countries instead of Africa as a single group) in this study.

1.5 Empirical Results

1.5.1 Effects From Immigration to Natives

Here, I begin the empirical analysis with the regressions for the immigration effects on the Canadian native group. I will use equation (1.13) to study the relationship between the foreign-born share and the relative supplies of tasks by native workers within the lower and highly-educated groups separately. In addition, I will use two separate equations to study the relationship between the foreign-born share and natives' unit supplies of communication and manual tasks. These two equations are given by

$$\ln(c_D)_{st} = \alpha_s^C + \tau_t^C + \gamma^C f_{st} + \varepsilon_{st}^C \quad (1.16)$$

$$\ln(m_D)_{st} = \alpha_s^M + \tau_t^M + \gamma^M f_{st} + \varepsilon_{st}^M \quad (1.17)$$

Table A.4 shows the regression results for highly educated group. In columns (1) and (2), I use the least squares estimation, weighting by employment in each year and each CMA. In columns (3) and (4), I present 2SLS estimates, which use the instrument I described in last section. The difference between column (1) and (2) is that I use basic definitions for both communication and manual tasks in (1) while I use the basic definition for communication tasks but extended definition for manual tasks in (2). It is the same case between column (3) and (4). From the results, we can see that the relationship between the foreign-born share and the relative supply of communication versus manual tasks from native highly-educated workers is statistically significant at the 1% significance level in all four regressions. One thing should be claimed that, while these results are not reported, the first stage F tests all have very small p

values. The results suggest that 1% increase in the foreign-born share will result in a 0.37% increase in native's communication-manual task ratio under WLS and a 0.62% increase under 2SLS. Then, a 1% increase in the foreign-born worker share among all highly-educated workers will lead to a statistically significant 0.24% increase in a native worker's communication unit supply and a significant 0.17% decrease in the manual unit supply in the WLS regressions approximately if we use both basic definitions for communication and manual tasks. However, the decrease in the manual unit supply is insignificant and smaller if we use extended definition for manual. That might be due to the inclusion of spatial and form perception which are not quite substitutable as professional aptitudes. Moreover, there might be some factor in the error term, such as a special immigration policy in some year for the emergent need of some types of laborers, impacting both the natives manual task unit supply and the foreign-born worker share in the labor market and hard to be generated as a variable, which could also affect the coefficient. When it comes to the 2SLS regressions, the increase in the communication task unit supply would be around 0.22% resulting from a 1% increase in the foreign-born share, while manual task unit supply would decrease by 0.40%. Most of the results are statistically significant at the 5% level. From the results in the 2SLS regressions, we could verify the significantly negative relationship between the natives' manual task unit supply and the foreign-born worker share in the Canadian labor market.

Table A.5 demonstrates the regression results for the less-educated native group. In this group, the results give us a similar pattern to the highly-educated group in Canada. An increase in the foreign-born worker share will cause the relative supply of communication versus manual tasks to increase, which means native workers will transfer to more language intensive jobs. An increase in the foreign-born share will also lead to an increase in the communication task unit supply and a decrease in the manual task unit supply from less-educated workers.

From these two tables, we can see that both within the highly and less-educated worker groups, the effects of immigration on natives appear quite similar. From these two tables, we can see that immigrants will push native workers transfer to supply more communication task and less manual task to prevent potential economic loss. Although the immigration requirement for immigrants' educational attainment and language proficiency is getting higher and higher, native workers still have a relative advantage in communication intensive jobs. In the less-educated group, I only find the insignificantly negative effect that natives supply fewer manual tasks per unit time when the share of less-educated foreign-born workers increases. Large part of workers could engage only in the low-level technical jobs in this group which have similar manual task supply productivity, so this makes the transfer from the low communication-intensive jobs to the higher ones insignificantly affect a worker's unit supply of manual task.

1.5.2 Effects From Immigration on Total Task Supply

Similarly to what I did for the native workers group, in this part, I will study the effects on the total population from the foreign-born worker share. I still run three types of regressions in this part. One uses the relative supply of communication versus manual tasks in Canada, which is equation (1.14), while the other two use the average amount of communication (c) and manual (m) tasks supplied per unit time by the total population. I aggregate the supply of manual and language skills to generate the tasks supplied by the total population.

Tables A.6 and A.7 illustrate these results for both the high and lower-educated groups, respectively. Columns 1 and 3 use the basic-basic definitions while Columns 2 and 4 use the basic-extended definitions. In Table A.6, the regressions yield significant and positive estimates for γ_{TOT} . This implies that an increase in the share of foreign highly-educated workers causes a mass of the population to transfer

to communication-intensive jobs. More specifically, from the estimates of γ_{TOT}^C and γ_{TOT}^M I find that a 1 percent rise in the foreign born share in the highly-educated group will increase the communication task productivity of the total population by 0.18-0.22 percent in all four regressions and decrease manual task productivity by 0.14 in the WLS and 0.40 in the 2SLS regressions. This implies that, with an increase in the share of highly-educated foreign born workers, the total highly-educated population will shift toward more communication intensive tasks (C/M ratio) by increasing communication task productivity while decreasing manual task productivity at the same time. The results in Table A.6 are opposite to the results in Peri and Sparber's (2009) study of the US, which indicates a significantly positive relationship between the foreign born worker share and the total population's relative task supply (C/M ratio). The reason might be that the immigrants coming to Canada are overwhelmingly skilled workers and business people, which are quite different from those going to the US. These types of immigrants in Canada may increase the demand for some communication-intensive jobs a lot, such as finance advisors, investment consultants, real estate agents, and new immigrant service positions. This high demand for communication-intensive jobs may encourage Canadian workers to transfer to these jobs to get highly paid. Meanwhile, since many immigrants chosen by Canada have good language skill and the same cultural background as their compatriots, they may also engage in communication-intensive jobs. These facts could cause an increasing relative supply of the communication versus the manual tasks of the total population in the Canadian labor market.

Table A.7 shows the regressions for the lower-educated group. In this table, we can tell that almost all of the estimated coefficients are statistically insignificant. This confirms our prediction for the lower-educated workers in Canada. Since the foreign born share of the lower-educated population is quite small, the immigrant (the majority of whom have high educational attainment) will not affect this group

much. This finding supports the idea that, different from the US, we should care more about the highly-educated immigrants who form the majority of the foreign-born workers in the Canadian labor market.

1.5.3 Effects From Immigration onto Task Compensations

Regression Model

In this section, I study the immigration effects on the two task compensations, w_C and w_M , by estimating equation (1.18). The first step of the empirical analysis is to generate these two task compensations since we do not observe the unit wage paid to manual or communication tasks but only the wage paid to workers in each occupation. Here I will use a two-step procedure for each CMA and year. I first generate real hourly wages (w_{jst}) for each metropolitan area, year and occupation within those two educational groups. In the second step, I regress w_{jst} on occupation specific measures of manual (m_j) and communication (c_j) skills. I allow coefficients on skills to vary across location and time. Hence, by running the regression in equation (1.18)⁷, I will get the task compensations. After the running the regression, I will get the coefficients $\hat{w}_{M_{st}}$ and $\hat{w}_{C_{st}}$, and I will interpret them as the weekly compensation of a unit of manual and communication task.

$$w_{jst} = (w_M)_{st}m_j + (w_C)_{st}c_j + \varepsilon_{jst} \quad (1.18)$$

With these regression results, I am able to generate the relative compensation of communications and manual tasks ($\hat{w}_C/\hat{w}_M$) for each CMA and each census year. After this, I will be able to introduce this compensation ratio variable into Equation (1.15) to derive the effects of immigration on task compensations.

⁷This is a non-constant regression model

Regression Results

Tables A.8 and A.9 demonstrate the results for the immigration effects on two educational groups' task compensation ratios, respectively. According to Table A.8 which shows the effect on compensations for the highly-educated group, the coefficients from the weighted least square regressions are both positive using the basic-basic and basic-extended task definitions. This implies that the relative compensation of communication versus manual tasks has a positive relationship with the foreign-born share. Furthermore, when I estimate the regressions by 2SLS, the coefficients for both groups with different task definitions are statistically significant, which indicates a positive immigration effect on relative task compensation in the highly-educated labor market. However, when it comes to the less-educated labor market showed by Table A.9, I find that all the results are insignificant. This implies that, in Canada, less-educated foreign-born workers will not significantly impact the ratio of communication versus manual task compensation.

Combined with the results in Section 1.5.2, we can see that, in the highly-educated group, the immigration effect in Canada could lead an increase both in equilibrium relative task supply and equilibrium relative compensation, which is showed by Figure B.5. An increase in immigration to Canada will shift the demand curve of C/M rightward by a large distance. This increase will exceed the decrease of C/M resulting from the leftward shift of the supply curve. Hence, we may see that an increase in immigration to Canada will lead to an increase both in the equilibrium relative tasks usage and the equilibrium relative tasks compensation.

Here are some other explanations for this result. Laryea (1998b) shows that the foreign-born share in the Canadian labor market has a high-elasticity complementary effect on Canadian wages in some communication-intensive industries and a lower-elasticity substitutable relationship in other industries. For instance, more wealthy immigrants coming to Canada might increase the demand for some occupations such

as finance advisor, investment consultant, new immigration service positions, and so on. The wages of these communication-intensive occupations will be increased quite dramatically, meanwhile, the substitution effect in the manual-intensive industries will lead to an increase in the relative compensation of the communication versus the manual tasks as well. This may generate a significantly positive relationship between the foreign born share and this relative compensation. Moreover, my instrument is slightly different from Peri and Sarber's (2009). My instrumental variable is based on some different countries of origin, which means the composition of immigrants I use is different, and hence I get different results from those in Peri and Sparber's paper. Then, for the less-educated labor market, since there is not much low skilled immigration relative to the entire low skilled population in the Canadian labor market, immigration may not have a dramatic impact on the less-educated labor market.

1.5.4 Impacts Across Demographic Groups

In this section, I study how the increase in foreign-born shares in high and less-educated groups would impact different demographic groups. First, I will still take studies on the two educational group respectively as what I did in previous sections. Then, I assume long-term immigrants are different from both new ones and native workers which means that they will perform specially under the effects from the increase of new immigrants. Therefore, I want to take a look at the different immigration effects on natives and long-term immigrants.

Impact on Long-Term Immigrants

Column 1 in Tables A.10 and A.11 show the impact on long-term immigrants and natives from immigrants within two educational group. I have already described the impact on natives in Section 1.5.1. Thus, here I will focus on long-term immigrants. In both of these two groups, the impacts from new immigrants seem not to be quite

significant. From the two 2SLS regression results, it appears that the rise in new immigrants will push the early-immigrated highly-educated workers to decrease their communication task supply while the early lower-educated ones increase their manual task supply. This means that new immigrants with higher educational attainment seem to be more substitutable with those early immigrants in the communication field. However, in the less educated group, long-term immigrants have a weaker tendency to respond to immigration by moving into communication tasks.

Impact by Gender

Column 2 in Tables A.10 and A.11 shows the immigration effects on different gender groups. Within both of the high and lower-educated worker groups, a rise in the immigrant share will make both male and female natives move to communication-intensive jobs. However, the magnitude of the response is larger for men in the highly educated group, but it is larger for women in the lower educated group.

Impact on Age Groups

In this paper, we also assume that the increase in immigrants will result in different magnitude of impacts on workers of different ages both in the two educational groups. As is shown by Columns 3 in Tables A.10 and A.11, most of the regressions give significant results. Within the highly educational group, the tendency to move away to communication-intensive jobs under the influx of immigrants is more significant among young workers. However, this tendency is more significant among elders when it comes to the less-educated workers group.

Impact on Race Groups

Now, I take the race discrepancy into consideration. From Column 4 in Tables A.10 and A.11, we can see that immigrants did not affect black workers' task supplies

significantly either in the highly or lower educated workers group. Furthermore, an increase in immigration tends to shift native nonblacks to communication-intensive jobs in both of the two educational groups. It seems that black Canadians were less responsive to competition with immigrants.

1.6 Conclusion

The effects of immigration on the Canadian labor market depend on how the native workers respond to foreign-born workers' entry. In this paper, I apply Peri and Sparber's empirical procedures, guided by theoretical models, to study the immigration effects on two separate worker groups with different levels of education attainment. First of all, I assume that the production of goods and services occurs by combining different labor skills. Then, with the Canadian Career Handbook, I define communication and manual skills in two ways (basic and extended). By doing this, I generate communication and manual task variables for each occupation and combine these two variables with census data between 1971 and 2011 to undertake the empirical analysis. In Canada, there is a dramatic increase in the highly-educated immigrant population since the 1970s. Many of these new immigrants are considered to be more skilled than native workers and/or quite wealthy since quite a part of them are required quite strictly to pass the immigration points system (Warman, Webb, and Worswick, 2019).

From the results in this paper, we can draw some conclusions. First, foreign-born workers have led Canadian natives of all educational backgrounds to transfer to more communication intensive jobs. It may be that if immigrant workers from developing countries have high-level technical skill or language skill or both but are willing to supply labor at lower wages, they will be preferentially hired by employers. Moreover, when it comes to the aggregate population, I find that larger parts of the

population will engage in more communication-intensive jobs than before. According to the empirical results, I can claim that an increase in immigration will both increase the task compensation ratio and the aggregated task supply ratio of communication versus manual tasks in the highly educated Canadian labor market. However, we need to be aware that the aggregated task supplies of lower educated workers are not influenced by immigrants very significantly because the majority of immigrants to Canada highly educated workers.

Finally, when I divide the population into demographic groups, I find differences in task performances. Once again, because of the small population of low skilled immigrants coming to Canada, the task performance is different in these two educational groups in terms of demographic characteristics. These findings are quite different from those in Peri and Sparber's paper (2009) because the immigration situation in the Canadian labor market is quite different from that in the US. This deviation may lead a different equilibrium in Canada.

According to these results in this study, we may conclude that a different system of immigration from the US may generate a different task supply transition in the Canadian labor market. At the same time, language ability and cultural background still plays quite an important role in this immigration effect. Natives are still able to use their communication advantage to acquire benefits or avoid potential economic loss.

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Chapter 2

A Study on The Discrepancies Between Immigrants Working in The Regular and The Ethnic Enclave Sectors in The Canadian Labor Market

2.1 Introduction

Borjas (2000) writes that, “The economic impact of immigration on a host country depends crucially on the skill differential between immigrant and native workers.” The relative skills of the immigrant population at a point in time are determined by two factors: how the skills of immigrants compare to those of natives at the time of entry, and how the rate of skill accumulation (in the post-immigration period) differs between immigrants and natives. In other words, both entry conditions and the rate of economic assimilation which is measured by the wage convergence that

occurs between immigrants and natives over time. These insights have already guided much of the empirical research in the economics of immigration in the US, beginning with Chiswick's (1978) pioneering work. The accumulation of empirical evidence over the past two decades has generated a number of potentially important findings. For instance, the relative entry wages of successive immigrant cohorts have declined since the 1960s (Borjas, 1985). Moreover, it is found in the US that, although the wage gap between immigrants and natives narrows over time as immigrants assimilate, the rate of wage convergence is relatively slow. Consequently, most recent immigrant waves in the US will probably have a substantial wage disadvantage throughout their working lives (Smith and Edmonston, 1997).

In Canada, immigrants also performed differently in the regular and ethnic enclave sectors. In this study, an ethnic enclave economy is defined as a full, self-supporting economy that generates a variety of inputs and outputs within itself. Warman (2007) finds that, "consistent with U.S. findings, enclaves are found to have a negative impact on the earnings growth of male immigrants." And then, "Living in an enclave was found to be particularly harmful for individuals immigrating as adults." Moreover, he finds that enclaves impact high-skilled male immigrants receiving their education outside Canada more negatively. In the study of the variations in business performance among immigrant entrepreneurs in Canada, Ley (2006) found that human capital, though not the scale of investment capital, influenced business success. Meanwhile, consistent with European research, the ethnic enclave economy imposed a penalty on outcomes. The enclave entrepreneurs confronted markets that offered more precarious opportunities than they had expected. In response to these barriers they made greater use than planned of the ethnic enclave economy. As suggest by Ley's research (2006), use of the ethnic enclave economy was associated with lower business performance, and this effect was magnified when location was considered, with the ethnic enclave economy offering meagre opportunities.

This paper will be a comparison between the outcomes of immigrants working in the ethnic enclave sector and those working in the regular sector. Relative to previous studies, I will expand my focus to other outcomes, such as the return to observable characteristics like education and race by using the probit estimation, the labor market segment a person works in, and task supplies.

In recent years, we could find the labor force composition keeps changing in the labor market over time. One explanation for this might be the dramatic increase in the immigrant population. The mass of immigrants coming to the Canadian labor market has significantly modified employees' average characteristics, such as age, education, wages, and so on. One expects that workers with different characteristics will perform diversely in the labor market. Moreover, workers with different demographic characteristics and skills will have different economic performances and enter different classes of occupations since different occupations have different requirements on workers (Doeringer and Piore, 1971).

According to Statistics Canada, Canada is currently experiencing the fifth wave of immigration, which began in the 1970s. In this wave, immigrants have overwhelmingly been members of visible minorities from the developing world. This was influenced by the revision of the Immigration Act in 1976, which continued to be official government policy. Therefore, in this paper, I will choose the start year, 1970, of this wave and the most recent census year, 2015, to study the different performance of immigrants in the Canadian labor market.

Employers in Canada evaluates educational attainment acquired in other countries with a very negative attitude. Some recent reports (e.g. "The value of a degree earned in Canada vs. one earned abroad", University Affairs) claim that the employment rate of job market candidates with Ph.D. degrees acquired in foreign universities is lower than that of local college graduates. Li and Sweetman (2014) show a substantial positive relationship between the quality of educational outcomes and

average Canadian labor market earnings among immigrants, using immigrants' source country educational quality measured by Hanushek and Kimko's (2000) index based on six sets of source country test scores in math and science. Li and Sweetman (2014) claim that the quality of national educational outcomes is associated with labor productivity. Moreover, it is a major concern when recent immigrants to Canada face high rates of both underemployment and unemployment. Statistics Canada (Galarneau and Morissette, 2009) reported that between 1991 and 2006, "the proportion of immigrants with a university degree in jobs with low educational requirements (such as clerks, truck drivers, salespersons, cashiers, and taxi drivers) increased. This increase suggests that established immigrants had more difficulty finding jobs reflecting their educational attainment in 2006 than in 1991. This form of underemployment of immigrants reduces their contribution to Canada's economic prosperity and constitutes a loss of well-being for them because it affects their earnings." Even after being in Canada for fifteen years, "immigrants with a university degree are still more likely than the native-born to be in low-skilled jobs." Naturally, it may be of interest to study the effect of educational attainment on immigrants' job performance in the Canadian job market. We want to see if immigrants are facing discrimination on earnings and job segment selections in the Canadian labor market due to their foreign educational backgrounds. We also wonder if they could assimilate with natives, not only in terms of earnings, but also in terms of tasks or job categories. This paper will focus on differences in outcomes of immigrants working in and out of the ethnic enclave sector.

Virtually all labor market studies have shown that the labor force is segmented in some sense. Based on previous research (Doeringer and Piore 1971, Osterman 1975), it is clear that entry into the academic profession is not open to everyone who possesses the modal amount of intellectual ability and knowledge of those already in the profession. The successful aspirant must climb a ladder, receive a certificate,

and compete on the job market. Field studies of geographic labor markets, such as Reynolds's (1951), have confirmed that imperfect knowledge about and unequal access to jobs, mobility, promotion, and most other attributes of work lead to segmented labor markets within the larger labor pool. Previously, earnings differences across segments have been studied many times. In this paper, I want to test whether the task supplies will have different performance in different segments when we compare immigrants with natives as well as immigrants who work in and out of the ethnic enclave sector. At the same time, based on the segmentation in the Canadian labor market, I also study the effects of natives' and immigrants' educational attainment on the labor market segment they work in.

In this paper, I study differences between immigrants who work in the regular sector and immigrants who work in the ethnic enclave sector on several dimensions. First, I use an earnings model to estimate the difference in the returns to educational attainment and the difference in the impact of race on wages for natives, immigrants who work in the regular sector, and immigrants who work in the ethnic enclave sector. I offer some explanations for these differences. In addition to studying the impacts of education and race on the wages, I also divide the labor market into three discrete segments to see how observable characteristics impact a worker's labor market segment. Highly-educated workers tend to have more professional jobs, however, sometimes "more professional jobs" is not equivalent to "higher wages". For instance, the wage of a scientist could be lower than that of a good salesman. Therefore, using the labor market segments in this study is not only a robustness check, but provides some new information and context. In the following part, after defining three types of tasks used by workers, I estimate task usage gaps and wage gaps between immigrants and natives by labor market segment and immigration cohort, as well as these gaps between immigrants working in and out of the ethnic enclave sector. This will shed light on the task and wage assimilation of the two types of immigrants.

In the fourth section of this chapter, I present results from my analysis of the effects of workers' demographic features on job earnings, separately for three groups (natives, the immigrants working in the regular sector, and immigrants working in the enclave sector). I find that natives' wages have the largest return to education and the smallest wage penalty from being a member of a visible-minority. In the study of the differences between immigrants working in the regular and enclave sectors, I find that immigrant workers in the regular sector benefit more from a higher educational attainment than those working in the enclave sector. Meanwhile, the wage penalty from being a member of a visible minority is heavier in the enclave immigrant worker group.

After this, I examine the impacts of educational attainment and race (visible minority or not) on immigrant workers' labor market segments, using ordered probit and logit models. By taking some tests and applying the AME study, I find that educational attainment and race have significantly different effects in the regular and enclave sectors.

In the following section, I use a new method to define three classes of tasks, "analytical task, interactive task and manual task", which are employed by workers in each occupation in order to produce final goods or services. In previous papers, the O*NET data was used to generate these tasks. However, in my study, to fit Canada better, I use a data set called the Canadian Career Handbook, from Statistics Canada, to generate the quantity of these three types of tasks supplied in each occupation, which will be presented in the third section. With these task supplies from each worker, I will introduce how to derive task usage gaps between immigrants and natives by using a regression model to estimate the predicted task supplies of immigrants. Then, task usage gaps for different groups (natives, regular sector immigrants, ethnic enclave immigrants) are presented for different labor market segments.

The differences in task usages between natives and immigrants appear to be different in different labor market segments. Those immigrants working in the enclave sector supply significantly fewer interactive tasks than immigrants working in the regular sector in all the three segments. Meanwhile, using a similar method to that used to derive task usage gaps, I will calculate wage gaps between immigrants and natives as well as between two types of immigrant employees. I find immigrants in different cohorts have different task and wage gaps both in the comparisons between natives and immigrants as well as between regular sector and ethnic enclave immigrants.

Finally, in Sections 2.5.4 and 2.5.5, I study how assimilation performance differs between immigrants in regular and ethnic enclave sectors by labor market segment. I find that immigrants in the lower segment have the fastest assimilation in task supply. At the same time, immigrants working in the enclave sector appear to have a small but solid deficit in task supply relative to those working in the regular sector. Moreover, compared to the small task supply gaps, the weekly wage difference between the two types of immigrant employees is relatively large specially in the upper tier I conclude that the lower earnings of enclave immigrants compared with their compatriots in the regular sector and natives , do not result from different task supplies, since all task supply gaps are relatively small. Instead, lower wages in the ethnic enclave sector may be the result of discrimination on the basis of immigrant identity. These negative impacts on earnings are the most significant in the upper segment of the labor market.

2.2 Literature Review

2.2.1 Studies of the Ethnic Enclave Economy

With the increasing ethnic and cultural diversity in large Canadian and American cities, residential patterns have become an area of interest in determining the

outcomes of immigrants and ethnic groups. Generally, an “enclave” is defined as a country or an outlying portion of a country, entirely or mostly surrounded by the territory of another country. Furthermore, some literature has defined an enclave economy as a sector that has virtually no connections with the domestic economy. Waldinger (1993) writes that, “Most importantly, profits are exported; consequently, enclave economies fail to generate growth in other sectors.” In this paper, I define the ethnic enclave economy as a full, self-supporting economy that generates a variety of inputs and outputs within itself. The profits and earnings produced by this type of economy will be also ploughed back into the ethnic community, producing a multiplier effect, as wage earners and firms buy from coethnic suppliers.

Many previous papers have studied the ethnic enclave economy in the US. Wilson and Martin (1982) contended that the enclave labor market is similar to the primary labor market. Then, Waldinger (1993) refers to their finding and claims that ethnic communities could make employers gain more knowledge about their workers than their non-enclave sector counterparts. At the same time, unemployed risks are reduced for workers in the ethnic enclave sector. Moreover, in Portes and Shafer’s working paper (2006), they conclude that the building of a business enclave was the key tool that allowed immigrants to carve a socially respectable and economically viable place in the midst of American society. There is also a literature on ethnic enclaves in Canada. Using the 1991 Canadian Census, Chiswick and Miller (2001) show a negative effect of concentration of people with the same mother tongue on language proficiency in Canada. Looking at three visible minority groups (Chinese, South Asian, and Black), Hou and Picot (2003) found a negative impact of ethnic concentration on labor market outcomes. Warman (2007) finds that, in Canada, enclaves are found to have a negative impact on the earnings growth of male immigrants. He claims that, “Living in an enclave was found to be particularly harmful for individuals immigrating as adults.” Moreover, Warman

(2007) finds enclaves impact high-skilled male immigrants receiving their education outside Canada more negatively.

In a study of Indo-Canadian entrepreneurs, Marger (1989) determined that class resources were integral to business formation, while Li (1992) reached the same conclusion about Chinese immigrant entrepreneurs. The assets they brought to Canada permitted business start-ups and corporate activity, displacing the older model of blocked mobility resulting from racial exclusion. Such resources include finance capital, human capital and professional or entrepreneurial experience, which in principle have a global range of applications. Indeed such blocked mobility in the mainstream society is frequently invoked as a precondition for minority self-employment (Collins 2003). Li (1979), for example, stressed the racialized environment in the first half of the twentieth century that excluded Chinese-Canadians from the professions and encouraged them to select self employment. In the United States (see Borjas 1986) and in Australia (see Le 2000), a positive impact of enclaves was found on the incidence of self-employment of immigrants, while in the paper written by Razin and Langlois (1996), no impact in Canada was found.

2.2.2 Segmentation in Labor Market

A number of labor market studies showed that the labor force is segmented in some sense. Clark Kerr (1954) argued that many jobs exist in internal labor markets characterized by limited ports of entry and internal sorting procedures. Then, in Reynolds's paper, "the structure of Labor Markets", he confirmed that segmentation in labor markets within the large labor pool could result from the imperfect knowledge about and unequal access to jobs, mobility, promotion, and most other attributes of work. A key question is how we can define the boundaries between each labor segment. Doeringer and Piore (1971) propose a theory of the dual labor market

which introduces a useful concept of segmentation between primary and secondary jobs. They defined these two segments in the following way:

“The primary market offers jobs which possess several of the following traits: high wages, good working conditions, employment stability and job security, equity and due process in the administration of work rules, and chances for advancement. The secondary market has jobs which, relative to those in the primary sector, are decidedly less attractive. They tend to involve low wages, poor working conditions, considerable variability in employment, harsh and often arbitrary discipline, little opportunity to advance (p. 70).”

The two segments have different job and technological requirements, which is that the primary has a higher requirement on employees while the secondary merely has some requirements on employees’ basic manual skills. Employers have little incentive to hire secondary segment employees because there are increasingly number of highly-educated job seekers in the recent Canadian labor market. Thus, these employees will face job instability and lower wages. Osterman (1975) claimed that:

“In times of expansion, many employers will often avoid hiring secondary workers in primary markets by subcontracting, using overtime, and changing job requirements. Clearly this dual market theory can be quite useful in understanding the problems faced by disadvantaged workers and in explaining a number of empirical findings, such as evidence of high frictional unemployment among the working poor. (p. 509)”

However, this simple definition which divides the labor force into two segments leaves a primary segment of enormous variety and poor definition. Many previous research divided this primary segment by blue-collar and white-collar. For instance, in Blau and Duncan’s study of occupational ability, they reaffirm these distinctions: “The American occupational structure appears to be partitioned by two semi-permeable class boundaries that limit downward mobility between generations as well as within lifetime careers (p. 294).” Later, this division of the primary segment

was found inaccurate. Gordon (1972) pointed out that there is substantial earning overlap between these two groups.

Then, Osterman (1975) introduced a new method to divide the primary segment which he argues is more accurate. He claims that degree of autonomy is considered to place greatest emphasis on different types of occupations. Some jobs in this segment will make workers enjoy a high degree of autonomy and a large amount of personal participation in the production of the final product or service, while others do not offer a great deal of worker autonomy and lead workers to lack a sense of personal commitment or attachment to the final product or service. With these distinctions, Osterman divides the primary sector into two parts, upper tier and lower tier.

“Upper tier occupations embody those characteristics: higher pay and status, greater promotional opportunities, mobility and turnover patterns similar to the secondary market but associated with advancement, lack of elaborate work rules but presence of internalized codes of behavior, and greater variety and room for individual creativity. Upper tier employees are authorities themselves, authorities unto themselves. It is precisely the endowment of professionals with this inner self-sufficing power that gives them a higher status than others with economic power. For their autonomy makes them seem market-proof in that they can perform their function no matter what is happening to others around them. Their nurturing power appears as an ability that they bring to people; others need them in a way that they do not need others. It is in this sense that the professional is the only truly independent person in a class society- needed more than he or she needs. (p. 511) ”

Following this literature, I define these three types of occupations in Table A.12.

2.2.3 Immigrants’ Assimilation

Historically, the earnings of immigrants in Canada have assimilated to those of natives with time passing since immigration. In Borjas’ paper (2015), he claimed that, in

the US, not only has the initial labor market performance of immigrants declined with newer cohorts compared to prior cohorts, but that the economic assimilation rates of recent cohorts are also markedly slower than past cohorts. Baker and Benjamin (1994) study first generation immigrants in the Canadian labor market. They use data from the 1971, 1981 and 1986 Canadian census and show that the entry earnings of immigrants have been falling and the rates of assimilation across successive immigrant groups were small. Beyond that, the ethnicity is also believed to have a significant effect on immigrants' assimilation. Bloom et al (1995) established that, using pooled 1971, 1981, and 1986 Canadian census data, economic assimilation was particularly slow for immigrant men from Asia, Africa, and Latin America relative to immigrant men from Europe and the United States. To examine movements in entry earnings across cohorts of Canadian immigrants and understand the sources of those movements, Green and Worswick (2010) compare a unique dataset (the IMDB) in which immigrant landing records are linked to subsequent tax records to survey data for the native born and find that large declines in entry earnings over the 1980s are followed by even larger declines in the 1990s and early 2000s. Boudarbat and Lemieux (2014) impute growing wage gap between immigrants and Canadian-born workers to immigrants' increasingly lower returns for their educational skills, and greater penalization for lower language skills. They suggest that, "low earnings and high poverty rates among immigrants are likely to remain quite persistent over time".

Using 1991 Canadian census data, Pendakur and Pendakur (1998) concluded that both foreign-born and Canadian-born visible minorities earned less than Canadian-born Caucasians. Moreover, Antecol et al (2005) found that immigrants of Asian origin tend to have lower earnings relative to first generation immigrants of European origin and Canadian-born immigrants. Therefore, I believe it is necessary to take the ethnic enclave sector into consideration to study economic assimilation of immigrants

since visible minority workers might have different performance in ethnic enclave sector.

There are some papers which study the skill assimilation of immigrants. Greens (1999) aggregate occupations into a small number of groups, and finds that immigrants tend to work in more skilled occupations than natives, but this relationship has declined with newer cohorts. Then, Warman, Sweetman and Goldmann (2011) find that immigrants tend to move to higher skilled occupations following migration, with the proportion of males in high skilled occupations increasing from 41.2% six months after migration to 60.5% four years after migration. Cassidy (2015) introduced a method that uses the task usage gap to measure the job assimilation of immigrants in each cohort by following previous studies (Imai, Stacey and Warman 2019 and Warman and Worswick 2015) to generate analytical, interactive, and manual tasks. In the next year, Cassidy (2016) expanded this method to study the wage assimilation of immigrant workers in different cohorts. This task usage (or supply) idea is from Peri and Sparber’s paper (2009), which also combines several Census decennial samples with O*NET task usage variables. The focus of that paper is the effect of immigration on the task specialization of natives. In this study, I will refer to the task specialization ideas from Peri and Sparber’s paper (2009) and Cassidy (2015 & 2016) so that I can study the assimilation of immigrants’ skill supply.

2.3 Data and Key Variables

2.3.1 Description

The data used in this paper comes mostly from the Canada Censuses of 2001 and 2006 and the National Household Survey in 2011. In addition, to classify occupations

into segments and also to assign task usage variables, I use the occupation categories defined by Canadian Career Handbook.

The census data I use in this paper are from two recent years, 2001 and 2006. The data are collected by Statistics Canada, and contain many individual characteristics such as age, educational attainment, ethnicity, immigration status, occupation, income, and so on. However, the census was cancelled in 2011 and the National Household Survey (NHS) replaced it. Therefore, for the year 2011, I will use NHS 2011 as my data source to be combined with the previous years' data. My core sample consists of all full-time workers between the age of 18 to 65.

To classify occupations according to labor market segment and tasks used, I use another data set from Statistics Canada, which is called Canadian Career Handbook. This data set gives grades from 1 to 5 to define the aptitudes requirement in each occupation. Aptitudes in each occupation are: General Learning, Verbal, Numerical, Spatial Perception, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, and Manual Dexterity. Each aptitude is given five values (1-5) to describe its grade among the entire working population¹. However, to undertake my empirical analysis, I will need to generate a new variable to describe the importance of each aptitude. Here, I will use the median of each aptitude's ranking percentile range among the entire working population to represent that aptitude's importance. For example, the median of the highest 10 percent is 0.95. Therefore, I will replace the value 1 by 0.95. Using this method, we will get 0.75 for the value 2, 0.50 for 3, 0.25 for 4, and 0.05 for 5.

Next, I use the aptitude importance to define the task requirement for each occupation. The task requirement could also be defined as the task supply per unit of time or task productivity of employees with this occupation. Similar to what Cassidy

¹The value 1 means the aptitude for this occupation is the highest 10 percent among all the working population. The value 2 means the upper third, exclusive of the highest 10 percent. The value 3 means the middle third. The value 4 means the lowest third, exclusive of the lowest 10 percent. The value 5 means the lowest 10 percent.

(2015) does in his papers, I will define three types of tasks: analytical (A), interactive (I), and manual tasks (M). Analytical tasks are a combination of General learning ability (G), numerical ability (N), spatial perception (S), and form perception (P), while interactive tasks are a combination of Verbal ability (V) and clerical perception (Q). Finally, I combine the aptitude importance values of Motor coordination (K), finger dexterity (F), and manual dexterity (M) to define manual tasks. The method of the combination is to take the mean of the importance values for each type of task.

2.3.2 Descriptive Statistics: Immigrants by Labor Market Segment

Using census data, I characterize workers' demographic characteristics by labor market segment. Based on the degree of professional and autonomy, the occupations in the Canadian labor market are categorized into three segments which are upper tier, lower tier and secondary segment. Using the variable, "the language used most often at work", I define immigrants who do not use English or French most often at work as those working in ethnic enclave sector. This might miss some people who live/work in ethnic enclaves, and there are alternative ways to define enclaves. Figure B.8 shows the share of immigrant workers in each segment in three census years: 2001, 2006, and 2011. Panel A shows these shares for the regular sector, while Panel B shows shares for the ethnic enclave sector. From this figure, it is clear that the majority of immigrants working in the regular sector are engaged in occupations in the lower tier, and the population shares are around 56% among all in these three census years. The upper tier employs the second largest share of immigrant workers, around 30% in 2001 and 2006 and 37% in 2011. Moreover, the worker shares of the secondary segment are just around 10% which are significantly smaller than those of the other two segments. In the ethnic enclave sector, the employment shares are similar to those in the regular sector. In addition, in both panels, the share

of immigrants in the upper tier becomes larger, while the shares in the other two segments get smaller, in 2011 compared to 2001 and 2006.

Figures B.9 and B.10 illustrate the educational background of workers in each segment. The two panels of Figure B.9 show the shares of immigrants working in each segment that are highly educated in the three segments in the regular and enclave sectors. Here, “highly-educated” refers to a level of educational attainment above high school. In Figure B.9, we can see that the upper tier has the largest proportion of highly-educated workers in both sectors: around 80% in the regular sector and 71% in the enclave sector. The highly-educated share of workers is the second largest in the lower tier and the smallest in the secondary segment in both panels. Clearly, the highly educated immigrant shares in all the three segments and all the three years are significantly larger in the regular sector than the enclave sector. Figure B.10 demonstrates the shares of immigrants with educational attainment above the university level in each segment in both sectors. In generally, the patterns in both panels are similar to those in Figure B.9. The shares are the largest in the upper tier, smaller in the lower tier and the smallest in the secondary segment; meanwhile, shares in the ethnic enclave sector are all smaller than the corresponding ones in the regular sector. Moreover, in this figure, the university-education shares in the upper tier are substantially higher than other two segments. At the same time, this share in the secondary segment occupies the lowest position, which is intuitive, as workers’ education level does not substantially affect productivity in jobs in this segment. These two graphs display a generally lower educational attainment of immigrants in the ethnic enclave sector. In addition, we should notice that, there may be changes in the composition of ethnic enclaves or immigrants working in different segments which might be a potential confounding factor affecting the interpretation of the results in this study.

2.4 Immigrant Performance by Sector: Earnings and Labor Market Segment

2.4.1 Earnings

First, I study differences in the weekly earnings of three groups: natives, immigrants who work in the regular sector, and immigrants who work in the ethnic enclave sector. Similar to previous literature, assuming coefficients are not allowed to vary over time, I will use the following equation to estimate these differences.

$$\ln W_{ipt} = X'_{ipt}\beta + \sum \alpha_j I_j + \delta_p + \lambda_t + \varepsilon_{ipt} \quad (2.1)$$

Here, W represents a worker's weekly wage. The vector X contains many demographic variables including age, age squared, educational attainment level (education categories), race, marital status, and working hours per week. Here and everywhere else, "race" is a dummy for visible minority status. Then, "I" represents industry fixed effects. The vector " δ " contains province fixed effects, while " λ " represents census year fixed effects. Furthermore, the subscripts i , p , and t index individuals, provinces (the results are similar with city fixed effects), and census years, respectively. The subscript " j " indexes the detailed category of industries. I estimate equation (2.1) for each of the three groups.

Table A.13 displays results from the weekly earnings model. In this table, there are twelve columns. Every group of three columns forms a comparison group. The difference between these comparison groups is which dummies are included in the regression. First of all, I will concentrate on the first comparison group, in which none of the year, province or industry dummies are included in the regressions. Focusing on the returns to the education and the impact of the race on earnings, these results show that the return to education is the largest in the native group. For natives,

an increase in educational attainment of one level leads to around a 16.1% increase in weekly earnings. The regular immigrant group has the second largest return to education, and the group of immigrants in the enclave sector has the lowest return, which is only about a 5% increase in weekly earnings with a one level increase in education. The impact on earnings of being a visible minority demonstrates a similar pattern to the returns to education. Native workers who are members of visible minorities experience the smallest wage penalty. Regular immigrant workers are hurt more by non-white identify than the natives, while workers in the ethnic enclave sector suffer the worst impact of race on their weekly wage.

In the other three comparison groups, in which I control for different dummies in the regressions, I find that the returns to the education and the impact of race on the earnings have a similar pattern to what we see in the first group. Only the magnitudes of the coefficients are slightly different. Now, if we pay attention to the last comparison group, in which I include all the dummies in all three regressions, we see the return to education and the impact of race are broadly similar to the other groups, however, the coefficients on educational attainment in the last group have the most significant difference in magnitude from those in the other groups. When I include all the time, location and industry dummies, the returns to education become smaller. In addition, it is possible that highly educated workers in ethnic enclaves are negatively selected on unobservable skill, which would tend to depress the estimated return to education in enclaves. This might also partly explain the smaller returns to education in the ethnic enclave sector.

Education and race have different impacts on immigrants' earnings in different sectors. Do these variables also affect immigrants' choice of sector? In this part, I will use probit and logit models to study differences in the propensity of immigrants to work in the ethnic enclave sectors by educational attainment and race. Here, I define one's immigrant type to be "1" if he or she is working in the regular sector and

“0” if in the enclave sector. Therefore, I estimate the following probit model:

$$Imm_i = \begin{cases} 1 & \text{if } X_i' \beta > \epsilon_i \\ 0 & \text{Otherwise} \end{cases} \quad (2.2)$$

Here, $\epsilon_i \sim N(0, 1)$ and X_i is a set of demographic variables.

Table A.14 presents results from the probit and logit estimation, focusing only on the educational attainment and race variables. In both the probit and logit models, education has a significantly positive effect on the probability that an immigrant works in the regular sector, while visible minority status has a significantly negative effect. Both of the two LR Chi square test values are quite high, which indicates the important effect of demographic variables on immigrants’ job sector. Table A.15 gives the average marginal effect of the education and race variables on immigrants’ job sector. The results in this table indicate that, if an immigrant worker’s educational attainment goes up by 1 level, the probability of working in the regular sector will go up by about 1.7%. At the same time, if an immigrant worker is a member of a visible minority, the probability of working in the enclave sector will increase by 5.4%.

According to these results, immigrant workers in the regular sector benefit more from a higher educational attainment than those working in the enclave sector. Meanwhile, the wage penalty from being a visible minority is greater in the enclave immigrant worker group. It is plausible that many immigrants working in the enclave sector only have a foreign educational background, which is undervalued in the Canadian labor market. Perhaps these immigrants enter the enclave sector so that they can find jobs more easily because of their lack of local cultural and educational background. At the same time, in the enclave sector, workers with a local educational background will be more valued than those with a foreign one, even the locally-educated worker has fewer years of education than the foreign-educated worker,

because these locally-educated workers are considered to be more beneficial in deals with both their coethnic and the Canadian native markets. Moreover, I found that immigrants in the ethnic enclave sector tend to have lower educational attainment. Meanwhile, previous research has found that jobs in the regular sector are more likely to be technology-intensive. Recently, the majority of immigrants coming to Canada is formed by those from developing countries. Many of the immigrants from these countries are capable to build lower-technological business and have no incentives to hire highly-educated workers. This may cause the lower return to education in the enclave job sector. When I look at the impact of immigrants' race, I see that workers who are members of visible minorities tend to work in the enclave sector, compared to whites. Also, the wage difference between whites and members of visible minorities is wider in the enclave sector, which means members of visible minorities are worse off in this sector.

2.4.2 Labor Market Segmentation

Immigrants who work in and out of the ethnic enclave sector may find themselves working in different segments of the labor market. Intuitively, there should be strong barriers between the ethnic enclave sector and other sectors, as employers in this sector may look only for co-ethnic employees. People of other ethnicities may find it quite hard to enter this sector. Meanwhile, workers in the ethnic enclave sector may have more difficulty accessing other types of jobs, as they could get themselves more accurately estimated here and have a convenient surrounding such as the same race colleagues and the same languages. In this paper, I define workers employed in the ethnic enclave sector as those speaking languages other than English or French most frequently during their working time. Since the majority of immigrants to Canada is formed by economic class, we might predict a complicated ethnic economy here. In those papers which studied the ethnic performance in the US, we could

find that the authors often focused on the small or low-technological ethnic business which made this segment in the US as an entirety. Most of the workers in the ethnic firms were considered to engage in the jobs similar as those in the secondary segment. However, when it comes to the Canadian labor market, a more complex situation will be faced. Some economic immigrants could found large and/or high-technological business which lead us to define this segment in Canada more similar as a closed economy containing different job segments. Therefore, we will process some examination independently with this segment. Therefore, I will examine the relative propensity of immigrants working in and out of the enclave sector to be employed in three labor market segments: upper tier primary, lower tier primary, and secondary (defined earlier). I also try to find the different impacts of education and race on workers' job segment.

Following Dickens and Lang (1985), I will define the probability of a worker to be hired in the primary sector as

$$P = Pr\{ln(E_p) - ln(E_s) > C\} \quad (2.3)$$

Then, incorporating the weekly earning model, I will have

$$P = Pr\{X(\beta_p - \beta_s) + I(\alpha_p - \alpha_s) + \varepsilon_p - \varepsilon_s - C > 0\} \quad (2.4)$$

Since we have three segments here, I will estimate an ordered probit model. Now, assume the exact but unobservable human capital based on demographic characteristics for each worker is E_i^* i.e. $E_i^* = C' + X_i'W + I_i'V + \mu_i$. Then, we will

have

$$Seg_i = \begin{cases} 3 & \text{if } E_i^* \leq C_0 \\ 2 & \text{if } C_0 < E_i^* \leq C_1 \\ 1 & \text{if } E_i^* > C_1 \end{cases} \quad (2.5)$$

Here, seg is an indicator for labor market segment: “seg=1” represents the primary segment upper tier, “seg=2” means the primary segment lower tier, and “seg=3” the secondary segment.

Table A.16 presents estimation results for the ordered probit model, using a sample of immigrants working in the regular sector. To test the robustness of these results, I also estimate an ordered logit model, and results are presented in the second column. In this table, all the coefficients have a large t value. At the same time, the LR χ^2 test value is very large. This indicates that immigrants’ demographic characteristics have a large impact on their job market segment in the Canadian labor market.

Next, I examine the impact of immigrants’ demographic characteristics on their job market segmentation within the ethnic sector, similarly to what I did in Table A.16. The results are presented in Table A.17. This table shows that each estimated coefficient in the ordered probit and logit models are statistically significant at 1% level. Meanwhile, the Chi-square values are both quite high.

Effects of Education and Race on Segmentation

Table A.16 gives ordered probit and logit estimation results about segmentation in the regular immigrant labor market, while Table A.17 gives results about the ethnic enclave sector’s segmentation. To test whether education and race have significantly different effects on the segmentation of immigrants in the regular sector and the enclave sector, I pool these two sectors’ observations together and include an indicator for working in the enclave sector. I interact the educational attainment dummies and race dummy with the enclave dummy. The results are not presented here, but the tests

of the two dummies give very large Chi-square values, which supports the different effects in different sectors.

The average marginal effects (AMEs) of education and race are presented in Table A.18. Four columns of results are given in this table. The left two display the AME of education and race in the regular sector while the right display the corresponding AME in the enclave sector. Both in the regular and enclave sectors, the ordered logit estimation presents really similar results to the probit estimation. Based on Table A.18, in the regular sector, if an immigrant worker’s educational attainment goes up by 1 level, he or she is approximately 10.8% more likely to work in the upper tier, 5.2% less likely to work in the lower tier, and 5.6% less likely to work in the secondary segment. Compared to whites, an immigrant who is a member of a visible minority is 7.4% less likely to acquire an upper-tier job, 3.6% more likely to work in the lower tier, and 3.9% more likely to work in the secondary segment.

Estimates in the right two columns of Table A.18 suggest that educational attainment affects a worker’s job segment in the enclave sector in a similar way as it does in the regular sector. However, the difference between its effect in these two sectors is hardly to be ignored. Results in this table indicate that, for workers in the enclave sector, an increase in educational attainment of one level is associated with a 7.9% increase in the probability of working in the upper tier and while a 0.2% and 7.6% decrease in the probability of working in the lower tier and secondary segment, respectively. The “return to education” in terms of segment seems also to be smaller in the enclave sector. Meanwhile, in the enclave sector, an immigrant who is a member of a visible minority would be 2.6% more likely to work in the upper tier, 0.1% more likely to work in the lower tier, and 2.5% less likely to work in the secondary segment. The race effects in the regular and enclave sectors have opposite signs and is much smaller in the magnitude in the enclave sector. This could support the perspective that the race is relatively less important in determining outcomes

in the enclave sector. Since most of the ethnic enclave economies are founded by members of visible minorities, their co-ethnic employees may receive preferential treatment. Furthermore, it seems that the effects of educational attainment and race on an enclave-sector immigrant's propensity to work in the primary segment lower tier are quite small. In the enclave sector, the share of workers in the lower tier is above 70%.

Many argue that employees with a foreign educational background suffer from discrimination. Ferrer, Green, and Riddell (2006) examine the impact of literacy on immigrant earnings and the sources of lower returns to education and experience among immigrants in Canada. It is found in their study that, among the university-educated, literacy differences account for about two-thirds of the earnings gap, low returns to foreign experience have a larger impact on this differential, however, literacy differences and differences in the returns to experience have similar effects on the earnings differential among the less-educated. Meanwhile, the quality of education may differ across countries, which could also explain why foreign degrees are rewarded differently. I have shown different effects of immigrants' educational attainment on their job segmentation, which are consistent with this phenomenon. From the results in this section, we can see that the educational effects on job segmentation are significantly weaker in the ethnic enclave sector than the regular one. I believe immigrants with foreign education backgrounds are more likely to enter the ethnic enclave because of the difficulty of finding a job in the regular sector, and immigrants working in the regular sector are more likely to have a Canadian educational background. However, even in the enclave sector, foreign educational degrees may be rewarded less than domestic educational attainment, because employees with a domestic educational background may still be thought to fit the local culture better. For example, an employee with a domestic bachelor's degree may be a manager while another with a foreign master's degree might just

be a driver or a clerk in an enclave company. Another factor is that the majority of jobs in the enclave sector are not technology-intensive. As the return to education is high in technology-intensive jobs, this may also lead to a lower return to education in this sector. This finding matches the results from the earning model in the previous subsection.

2.5 Assimilation in Earnings and Task Usage

In this section, using regression models, I derive task usage and wage gaps between natives and immigrants as well as those between the two types of immigrants in different cohorts. By looking at the results, I try to provide some evidence of immigrant assimilation in the Canadian labor market.

2.5.1 Task Gaps

In Cassidy's papers (2015&2016), he introduced a method to estimate the assimilation of foreign workers using the task usage gap between foreign and native workers. In my research, I will separate my sample into primary upper tier, primary lower tier, and secondary segments to see the assimilation performance of immigrants in different cohorts within each segment.

Task Gaps Between Immigrants and Natives

The task usage gap is defined as $TG_f = T_f - \widehat{T}_f$ which is the difference between immigrants' average task usage and the predicted task usage in Cassidy's papers ($\widehat{T}_f$). It is assumed here that observable characteristics affected task supply in the same way for immigrants and natives, so these gaps would suit both the task supply and usage. Using this gap, I want to answer the question that, abstracting from the fact that immigrants and natives have different characteristics, how differently they will

behave in the labor market, in terms of task supply? To derive $\widehat{T}_f$, I will regress native workers' task usage on their demographic characteristics, which are age, age square, age cubic, race, and education, to get an estimated coefficient matrix $\widehat{\zeta}_n^2$. Therefore, the estimated average task usage of natives is given by $\widehat{T}_n = Z_n \widehat{\zeta}_n$. Now, I can derive the predicted task usage for immigrants by using the formula $\widehat{T}_f = Z_f \widehat{\zeta}_n$. This is how the task usage gap is generated in Cassidy's paper. Now, expanding on this idea, I will improve this study by using the following model:

$$T^j = \gamma_0^j + \gamma_1^j age + \gamma_2^j age^2 + \gamma_3^j age^3 + \gamma_4^j edu + \sum_i \eta_i^j * coh^i + \sum_i (\delta_{i,1}^j age + \delta_{i,2}^j age^2 + \delta_{i,3}^j age^3 + \delta_{i,4}^j edu) * coh^i + \lambda_t + \mu^j \quad (2.6)$$

Where T^j represents the type-j(analytical, interactive, or manual) task usage in the occupation, “edu” is the educational attainment level of the person, the “coh” dummy denotes the immigration cohort³. The term “ λ_t ” is a year dummy. In this regression model, industry has not been used as a control. Industry is endogenous to skill, so using industry as a control may be problematic. However, this is commonly done in the literature. Based on this model, I can calculate task gaps between natives and the immigrants in each cohort. Suppose we observe type-j task usage by an immigrant employee “m” in cohort $n(n \in i)$ is T_m^j . Then, we could express it as

$$T_{m,n}^j = \hat{\gamma}_0^j + \hat{\gamma}_1^j age_{m,n} + \hat{\gamma}_2^j age_{m,n}^2 + \hat{\gamma}_3^j age_{m,n}^3 + \hat{\gamma}_4^j edu_{m,n} + \hat{\eta}_n^j + \hat{\delta}_{n,1}^j age_{m,n} + \hat{\delta}_{n,2}^j age_{m,n}^2 + \hat{\delta}_{n,3}^j age_{m,n}^3 + \hat{\delta}_{n,4}^j edu_{m,n} + \hat{\lambda}_t + \hat{\mu}_{m,n}^j$$

²This regress expression will be: $T_{it}^j = \gamma_0 + \gamma_1 age_{it} + \gamma_2 age_{it}^2 + \gamma_3 age_{it}^3 + \sum_l \eta_l edu_{it}^l + \sum_l (\delta_{l,1} age_{it} * edu_{it}^l + \delta_{l,2} age_{it}^2 * edu_{it}^l + \delta_{l,3} age_{it}^3 * edu_{it}^l) + \mu_{it}$.

³Here, I will consider three cohorts in which the immigration period of the immigrants is 1971-1980, 1981-1990, and 1991-2000.

. If I assume he or she was a native, I could predict his or her task usage as

$$\widehat{T}_{m,n}^j = \hat{\gamma}_0^j + \hat{\gamma}_1^j age_{m,n} + \hat{\gamma}_2^j age_{m,n}^2 + \hat{\gamma}_3^j age_{m,n}^3 + \hat{\gamma}_4^j edu_{m,n} + \hat{\lambda}_t + \hat{\mu}_{m,n}^j$$

. Now, I can derive the type-j task gap between an immigrant m in cohort n and his or her native counterfactual as

$$T_{m,n}^j - \widehat{T}_{m,n}^j = \hat{\eta}_n^j + \hat{\delta}_{n,1}^j age_{m,n} + \hat{\delta}_{n,2}^j age_{m,n}^2 + \hat{\delta}_{n,3}^j age_{m,n}^3 + \hat{\delta}_{n,4}^j edu_{m,n}$$

. Therefore, we could derive the average type-j task gap between immigrants in cohort n and natives by

$$\overline{T}_n^j - \overline{\widehat{T}}_n^j = \hat{\eta}_n^j + \hat{\delta}_{n,1}^j \overline{age_n} + \hat{\delta}_{n,2}^j \overline{age_n^2} + \hat{\delta}_{n,3}^j \overline{age_n^3} + \hat{\delta}_{n,4}^j \overline{edu_n} \quad (2.7)$$

This is like the “unexplained” part of a Oaxaca-blinder decomposition.

Task Gaps Between Immigrants In and Out of the Ethnic Enclave Sector

In this study, I focus on task usage gaps between immigrants in this sector and their counterparts working in the regular sector. Hence, I will use a model that is similar to the one I use for the natives/immigrants comparison to derive the task gaps between immigrants working in and out of the enclave sector. The regression model used for this comparison group is

$$\begin{aligned} T^j = & \sum_i (\gamma_{i,0}^j + \gamma_{i,1}^j age + \gamma_{i,2}^j age^2 + \gamma_{i,3}^j age^3 + \gamma_{i,4}^j edu) * coh^i + \\ & \sum_i \eta_i^j encl * coh^i + \sum_i (\delta_{i,1}^j age + \delta_{i,2}^j age^2 + \delta_{i,3}^j age^3 + \delta_{i,4}^j edu) * encl * coh^i + \lambda_t + \mu^j \end{aligned} \quad (2.8)$$

Where “encl” is a dummy to indicate if this immigrant is in the enclave sector or not. Replicating what I did in the natives/immigrants comparison, I will get the average type-j task gap between immigrants working in and out of the enclave sector in cohort n by

$$\overline{T}_n^j - \widehat{T}_n^j = \hat{\eta}_n^j + \hat{\delta}_{n,1}^j \overline{age}_n + \hat{\delta}_{n,2}^j \overline{age}_n^2 + \hat{\delta}_{n,3}^j \overline{age}_n^3 + \hat{\delta}_{n,4}^j \overline{edu}_n \quad (2.9)$$

Recall that, I estimate this model separately for three labor market segments. Therefore, I will estimate task usage gaps between immigrants working in and out of the enclave sector in the three segments to see how these two types of immigrants work differently with respect to task usage.

2.5.2 Task Usage Gaps between Immigrants and Natives

Tables A.19 and A.20 demonstrate the three task usage (in one unit of time) gaps between immigrants and natives in three labor market segments. Table A.19 gives the task gaps between natives and immigrants while Table A.20 gives those between immigrants in the regular sector and the enclave sector. Meanwhile, I will compare results across three immigrant cohorts: those who immigrated during 1971-1980, 1981-1990, and 1991-2000.

In the primary upper tier segment, the only large task usage gap is the analytical gap between immigrants and natives. The average gap for the three cohorts is about 0.020(2% in difference). In the meantime, immigrants in the more recent cohort tend to supply more analytical task than the those in the earlier cohorts. The interactive and manual gaps in this segment are all below 0.005, which is very tiny. When it comes to the primary lower tier segment, the situation changes a lot. The only large task gap is the interactive one, while the other two task gaps are very small in the magnitude. More recent immigrant cohorts tend to supply fewer interactive

tasks in their work. While the immigrants in these three cohorts in the primary lower tier segment perform similarly to natives in the analytical and manual fields, their communication skill seems to be underused significantly compared with native employees. Finally, if we take a look at the secondary segment, we will see that almost all the task gaps between immigrants and natives in all cohorts are quite small, which will lead us conclude that the difference between immigrants and natives in the secondary segment is really small. This is broadly consistent with the previous literature.

Next, I will estimate task gaps between immigrants working in and out of the ethnic enclave sector in Table A.20. This table displays the difference between the task usage of immigrants working in the regular sector in the primary upper tier, primary lower tier, and secondary segments, and their corresponding comparison groups in the ethnic enclave sector. This table indicates that the significant gaps between the two types of immigrants working in the primary upper tier segment are in analytical and interactive task usage. Immigrants in and out of the enclave sector in the more recent cohort appear to have narrower analytical and interactive gaps. The gap in manual task usage of immigrants in the primary upper tier appears to be relatively small, the regular sector workers use little more manual task in this segment. Then, when it comes to the primary lower tier segment, we can see that the usage of interactive tasks in the enclave sector is lower than those not in this sector while manual task usage in the enclave sector is a little bit higher than it is in the regular sector, which is more obvious in earlier cohorts. However, the analytical task usage gap is quite tiny between the two types of immigrant employees. Finally, the task usage is not very different between the two groups of immigrants working in the secondary segment. The largest task gap is the interactive gap, which is just below 0.010. We might conclude that there are some differences in task usage between immigrants working in the regular primary segments and the enclave ones. However,

the deviation between immigrants in the secondary segments is not very apparent. Later, I will use regression models to study assimilation in task usage of immigrant employees in next section.

In the primary upper tier segment, it is plausible that many immigrants have a domestic educational background. In addition, the average educational attainment of immigrants is higher than that of natives in the primary upper tier segment. Therefore, it is intuitive that immigrants in the upper tier could supply more analytical tasks than natives and have no big difference in interactive and manual task supplies. However, in the lower tier, it may be that the educational backgrounds are similar for immigrants and natives, and many immigrants only have foreign or a partial domestic educational background, so that the interactive task gap is the biggest one among all the three task gaps. Moreover, a potential language barrier of immigrants might also contribute to this task gap. Lastly, in the secondary segment, both immigrants and natives are poorly educated, but natives may be more attractive in the labor market. Therefore, immigrant employees appear to be a little worse in all three task supplies.

In the comparison between immigrants in the enclave sector and those in the regular sector, we should notice that many of the immigrants in the enclave sector may only have a foreign educational background. Within all the three segments, the interactive task supplies of immigrants in the enclave sector are less than those in the regular sector. In other words, immigrants in enclave companies use less interactive skills. Jobs in the enclave upper tier segment may be rarer and have lower requirements than those in the regular upper tier segment, which may generate the large analytical task gap between two groups of immigrants in this segment.

2.5.3 Wage Gaps

In addition to the task usage gap between natives and immigrants, I will estimate the wage gap between these two groups of workers. This is an estimation of the “unexplained” portion of a Oaxaca-blinder decomposition similar to what I did in last subsections.

Here, I am going to use the equation

$$\overline{\ln W}_n^j - \widehat{\overline{\ln W}}_n^j = \hat{\eta}_n^j + \hat{\delta}_{n,1}^j \overline{age}_n + \hat{\delta}_{n,2}^j \overline{age}_n^2 + \hat{\delta}_{n,3}^j \overline{age}_n^3 + \hat{\delta}_{n,4}^j \overline{edu}_n \quad (2.10)$$

to estimate the unexplained part of the wage gap in a oaxaca-blinder decomposition between natives and immigrants from cohort n as well as those between immigrants in cohort n working in and out of the enclave sector. Tables A.21 and A.22 present these results.

I divide the sample into the following immigration cohorts: 1971-80, 1981-90, and 1991-2000. Table A.21 presents the wage gap between native and immigrant workers in the three labor market segments (primary upper tier, primary lower tier, secondary). In general, we infer that the wage gaps are narrowing with the time since immigration in all three segments because the earlier cohorts have smaller wage gaps than later cohorts. In the first column, we can see that the wage gaps between immigrants from the 1971-80 cohort and natives are positive in the primary lower tier and the secondary segment, which means that immigrants from this cohort actually earn more than natives in these two segments. Furthermore, from the mean wage gaps presented in the last column, we can see that the wage gap between immigrants and natives in the primary upper tier segment appears to be the largest, while that in the secondary segment is the smallest.

Table A.22 presents the wage gaps between immigrant employees working in the ethnic enclave sector and immigrants working in the regular sector for three different

immigration cohorts and three different labor market segments. The situation here is a little different from that in Table A.21. Wage gaps between the two types of the immigrants appear to be much bigger than those between the natives and immigrants in each cohort and segment. Wage gaps in the primary upper tier segment tend to be the largest overall. On average, immigrants in the enclave sector earn 43.7% less in than immigrants working outside the enclave sector. Similar to Table A.21, the more recent cohort has the larger gap between the two types of immigrants in each segment. Another similarity with the comparisons between immigrants and natives is that the wage gaps in the primary upper tier segment are the largest while those in the secondary segment are the smallest. This may be evidence of the existence of the discrimination against immigrants in the Canadian labor market, and even worse discrimination against immigrants working in the ethnic enclave sector, but other explanations (such as selection into ethnic enclaves) may also be a factor. Same as the previous section, I will use repeated cross sectional regression models to study the economic assimilation within these immigrant employees in next subsection.

2.5.4 Assimilation in Task Usage

In this section, I analyze the way in which immigration years affect task usage. I will use a regression model that is similar but somewhat different from what Cassidy (2015&2016) used in his study. The model I use here is:

$$T^j = \theta_0 + \theta_1 X + \theta_2 (ysi * X) + \sum_i \theta_{3,i} edu^i + \sum_i \theta_{4,i} (edu^i * X) + \theta_5 I + \theta_6 AG + \delta_p + \lambda_t + \varepsilon \quad (2.11)$$

Here, X is an immigrant or enclave sector indicator variable. The variable “ysi” denotes years since immigration conflating cohort and year effects. The variable “edu” is an education dummy. The variable “I” is an industry dummy, and AG is a cubic in age.

I will run two groups of regressions with this model. The first group estimates task gaps between natives and immigrants in each labor market segment, while the second group estimates task gaps between immigrants in the enclave sector and those who are not in.

Natives and immigrants

In Table A.23, I present results for the difference in the task usage per unit of time (or task supply productivity) between immigrants and natives in three labor market segments: primary upper tier, primary lower tier, and secondary. I am especially interested in how the number of years since immigration affects immigrants' task usage. In the columns for the primary upper tier segment, we can see that the variable "immigrant" has the largest positive effect on analytical task usage. This is similar to what I showed in Section 2.5.2, that immigrants working in the primary upper tier appear to supply significantly more analytical task than natives. New immigrants seem to supply fewer interactive and more manual tasks than Natives. The differences in these two task supplies are statistically significant but small, compared to the differences in analytical task supply. The "ysi" variable is denominated in units of 10 years, so the coefficient on "ysi" shows the effect of an additional decade of time spent in Canada on immigrants' task usage. The coefficients on this variable are all very small, with the opposite signs as the immigrant variable coefficients, which means the task usage gaps between natives and immigrants tend to narrow slowly.

Results for the primary lower tier segment are in the middle three columns of Table A.23. New immigrants working in this segment appear to supply fewer analytical and interactive tasks per unit of time but more manual tasks than natives. The largest gap is in interactive task usage. The three coefficients on "ysi" have the opposite signs as the immigrant variable coefficients again. However, the interactive

task usage gap tends to narrow faster between immigrants and natives. For the other two task usage gaps, the narrowing trends are also significant but very slow.

The last three columns in Table A.23 show results for the secondary segment. Since the majority of workers in this segment are considered to be lower skilled and lower educated, the results match what I predicted. All three estimated coefficients on the immigrant dummy variable have their magnitudes below 0.005. At the same time, all three estimated coefficients on the “ysi” variable have their magnitudes below 0.001 which present an extremely slow narrowing of the task usage gaps with an increase in the years since immigration in the secondary segment. This table verifies our perspective that in the secondary segment immigrants and natives are not distinguished so apparently, especially in the analytic task supply.

Regular and Ethnic Enclave Sectors

Table A.24 presents results comparing immigrants working in and out the ethnic enclave sector. First of all, I will focus on the three columns for immigrants in the primary upper tier segment. All the three task usage gaps between the two types of immigrant employees are not very big. In all the three task supplies, new immigrants working in the enclave sector perform worse than those working in the regular upper tier segment. The coefficient on the “enclave” variable is statistically significant at the 1% level for analytical task usage, but insignificant in the second column and only significant at the 10% level in the third column. Immigrants in the enclave sector supply significantly fewer analytical tasks per unit of time but insignificantly fewer interactive and manual tasks. The coefficients on “ysi” are quite close to those in Table A.23. In the upper tier segment, the population ratio of immigrants in the regular sector versus those in the enclave sector is very large, which makes the immigrants in the regular upper tier segment overwhelmingly lead the immigrant-year effect in the general comparison between natives and immigrants. With an

increase in the number of years since immigration, the analytical task gap between the immigrants narrows very slowly. At the mean time, the interactive and manual task usage in one unit of time of the immigrants in the enclave sector do not have a significantly different assimilation from that of the immigrants in the regular sector. Similar to the gaps between natives and immigrants, the task usage gaps between the two types of immigrants in the upper tier segment appear to be very small and follow a similar pattern with respect to years since immigration.

The middle three columns of Table A.24 display the results for immigrants in the primary lower tier segment. There is no statistically significant difference in analytical task supply between immigrants working in and out the enclave sector, and the coefficient on the enclave variable is about -0.005 which represents a tendency for new immigrants in the enclave sector to supply fewer analytical tasks than new immigrants in the regular sector. New immigrant employees working in the enclave sector appear to supply 1.1% fewer interactive tasks but 0.5% more manual tasks per unit of time compared with immigrants out of the enclave sector. These coefficients on “ysi” are similar to those in Table A.23. However, when it comes to the effects of “ysi”, it shows a different result other than those in the upper tier segment. The analytical task supply of the immigrants in the enclave sector increases relatively faster than that of the immigrants in the regular lower tier with an increase in years since immigration. Then, there seem to be no significant difference between the effects of “years since immigration” on the interactive task supply of two types of immigrants. The immigrants working in the regular lower tier tend to reduce their manual task supply with an increase in years since immigration, while those in the enclave lower tier seem to keep constant.

The last three columns present results for immigrants in the secondary segment. The differences in task usage between immigrants of different types is still the smallest of all the three segments. Similar to the phenomenon we observed in the

comparison between natives and immigrants in the secondary segment, gaps in all three task supplies for new immigrants are really tiny. The magnitudes of the “enclave” coefficients are all under 0.002. Furthermore, an increase in the years since immigration in this segment has hardly any impact on task usage for both the two types of immigrants. For the usage of manual tasks, we see an opposite time trend for the regular-secondary immigrants and enclave-secondary ones. Immigrants in the regular secondary segment tend to supply more manual tasks with years since immigration, while enclave-secondary workers tend to supply fewer manual tasks over time.

2.5.5 Assimilation in Earnings

In this section, I am going to study earnings assimilation of immigrant workers by labor market segment. Similar to what I did in the last section, I will estimate the following regression model:

$$\ln W = \theta_0 + \theta_1 X + \theta_2 (ysi * X) + \sum_i \theta_{3,i} edu^i + \sum_i \theta_{4,i} (edu^i * X) + \theta_5 I + \theta_6 AG + \delta_p + \lambda_t + \varepsilon \quad (2.12)$$

Here the explanatory variables are the same as those used in equation (2.11), and “W” represents an individual’s weekly wage. Once again, I divide my study of assimilation into two types of comparisons: “natives/immigrants” and “immigrants in/not in the enclave sector”.

Tables A.25 and A.26 give the regression results for this model. Again, Table A.25 compares natives and immigrants in the three labor market segments, while Table A.26 compares immigrants in and out of the ethnic enclave sector. I first focus on Table A.25. The results indicate that new immigrants’ weekly wage is less than natives’ in all three segments of the regular labor market. Furthermore, the difference in the primary upper tier segment is very large, exceeding 33%. The gap

appears to be the largest in the upper tier segment and the second largest in the lower tier segment. The gap in the secondary segment is the smallest, less than 5% and only statistically significant at the 10% level. Moreover, the results for these three segments show that the gaps are narrowing with the increase years since immigration. Immigrants appear to be capable of earning the same weekly wage as natives after ten years in Canada in the secondary segment, but the gap in the primary upper tier segment is still quite large with time passing. One interesting thing is that the results support a perspective that immigrants' assimilation with natives should be the fastest in the secondary group compared with other groups because most of the jobs in this segment are basic manual jobs with few skill requirements for the employees.

Table A.26 gives the results for earnings discrepancies within immigrant employees. This table shows that new immigrant workers in the enclave upper tier segment tend to earn dramatically less than new immigrants working in the regular upper tier, while new immigrants in the other two segments seem to have smaller earnings difference (both below 8%). In the upper tier, the weekly wage gap tends to narrow gradually with the increase in years since immigration. However, in the lower tier, things becomes quite different. Base on the estimated coefficient on the variable "ysi*encl", the weekly wage gap between immigrant employees in and out of the enclave lower tier appears to be widening slowly with the passage of time. Finally, I cannot find statistically significant evidence of assimilation in the secondary segment.

2.6 Conclusion

In this paper, I study immigrants' economic and task performance and assimilation in the Canadian labor market. I divide workers in Canada into three labor market

segments: primary upper tier, primary lower tier, and secondary. I compare immigrants working in and out of the ethnic enclave sector. This is an especially interesting comparison because there are a lot of immigrants in this sector with high educational attainment that is not well rewarded in the Canadian labor market, which might be because enclave workers are more likely to be foreign educated.

Here are key findings in this paper. First of all, in the study on immigrants' earning, it is found that, the return to education is higher for natives than immigrants, and is also higher for immigrants in the regular sector than the enclave sector. This may be driven by foreign educational attainment being less valued in the labor market than domestic educational attainment.

Secondly, correcting for differences in observables, highly skilled immigrants use more analytical skills than natives, but they earn substantially lower wages. This may also point to discrimination of some sort to immigrants in the Canadian labor market.

Thirdly, highly skilled immigrants working in ethnic enclaves are significantly less likely to use analytical skills than highly skilled immigrants working in the regular sector. So, perhaps task usage differences among highly skilled immigrants can explain part of why the return to education is lower in ethnic enclaves. The technology sector might be less represented in the ethnic enclave sector. As is claimed in this paper, the majority of jobs in the enclave sector are believed to be lower technology-intensive ones, which may lead to a lower return to education in this sector.

Lastly, immigrants of all skill levels are less likely than natives to use interactive skills, and enclave sector workers are less likely to use interactive skills than immigrants working in the regular sector. This pattern is most pronounced for middle-skilled workers (primary lower tier segment). Therefore, it is believed that, immigrants in Canada still have drawbacks in the language skill. Many of the jobs

in enclave sector might be less communication-intensive, compared to those in the regular sector.

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Chapter 3

Task Supply, Wage Earning, and Segmentation among Natives and Two Generations of Immigrants

3.1 Introduction

According to Statistics Canada, Canada is currently experiencing its “fifth wave” of immigrants, which began in the 1970s. In this wave, immigrants have overwhelmingly been members of visible minorities from the developing world. This was influenced by the 1976 revision of the Immigration Act, which continues to be official government policy. Historically, the majority of immigrants coming to Canada were from Europe. As time passed, the number of new European immigrants entering the country steadily declined, while the number of immigrants originating from South and South-East Asia (India, China, the Philippines, and so on) rose dramatically. By the 1980s, these Asians became the largest ethnic group immigrating to Canada. Canadians do not have the stereotypical American “melting pot” and instead enjoy ethnic diversity. Canada is a multicultural society that depends on immigration as its key source of

labor force growth (Bloom et al 1995, Baker and Benjamin 1994). There has been a lot of research on immigrants' performance in the North American labor market. Research on this topic has evolved from the original cross-sectional evidence on immigrants' economic assimilation (Chiswick 1978) through the study of the qualities of different immigration cohorts (Borjas 1985) to controversies over measurement issues (Lalonde and Topel 1992) and subsequent studies (Borjas 1993). Peri and Sparber (2009) define two intermediate tasks (communication and manual tasks) supplied in each occupation using O*NET data to study the effect of the immigrant share on native workers' provision of these two tasks in the US labor market. Following this research, I study the economic outcomes of different generations of immigrants to see if I can find any differences between the first generation immigrants and their children in the Canadian labor market. The outcomes I will focus on are earnings and task usage.

Chiswick (2003) argues that there is evidence of positive selection bias in migration in the US, that is, individuals who are relatively more skilled than their peers in their home country are more likely to migrate to the US. If this positive selection bias is present among immigrants in the US, then one could argue that selection bias should play an even greater role in Canada. US immigration policy emphasizes family unification to a greater extent than Canadian immigration policy. Canada's "point system" does take family ties into account, but substantial consideration is given to the amount of human capital attained by applicants (Baker and Benjamin, 1994). The goal of this stringent evaluation process is to simultaneously minimize racial discrimination when determining the eligibility of foreigners and to ensure that those who are entering into Canada can make a positive contribution to the economy. Therefore it may be that second generation immigrants in Canada have higher levels of ability and motivation relative to third generation (and higher) immigrants if these traits are transmitted from parents to children. Black et al (2005) also suggested that

“unobserved parental characteristics”, such as patience or attitudes, could influence the development of children. Moreover, Warman et al (2019) claims that, although recent immigrants to Canada have had some difficulty fully realizing their potential suggested by their high levels of pre-immigration human capital, their children have integrated well and in many cases have surpassed the outcomes of the third or higher generation.

In this paper, I study differences in the economic performance of natives, and first generation immigrants, and second generation immigrants in 1970 and 2015. I choose the years 1970 and 2015 because they are the beginning of the fifth wave of immigration and the most recent census year in Canada, respectively. In addition to earnings, I compare the task supply performance of natives (third generation or more) and first and second generation immigrants in 1970 and 2015. Then, I link earnings and task supply performance together using a Oaxaca Decomposition. This sheds light on the relative importance of differences in task productivity and differences in the return to task productivity in determining weekly wage differences between natives and two generations of immigrants. Lastly, I investigate differences in the labor market segment that first and second generation immigrants work in. By presenting average marginal effects from ordered probit and logit models, I present the relative probabilities of working in each segment for first generation or second generation immigrants, compared to the third generation or higher (natives).

3.2 Literature Review

There is a large literature on differences in the outcomes of first generation immigrants, second generation immigrants, and natives. According to Lay and Nguyen (1998), in addition to the general daily hassles encountered by most people, immigrants often face chronic difficulties specific to the acculturation experience,

including conflicts with family members, members of the ethnic ingroup, and members of ethnic outgroups. Moreover, it has been suggested that the children of immigrants born in Canada (i.e., second-generation immigrants) may experience different acculturative stressors from their parents (i.e., first-generation immigrants). In the discussion of minority student stressors, Saldaña (1994) includes issues such as the perceived lack of support from members of the ethnic ingroup, difficulties in romantic relationships with members of the ingroup (particularly the availability of dating partners), and being perceived by the ethnic ingroup as behaving too much like outgroup members. Pawliuk, Grizenko, Chan-Yip, Gantous, Mathew, and Nguyen (1996) found that, although children's acculturation style was not related to their psychological functioning, the parents' acculturation style was an important predictor of their children's functioning. They argued that, because children were more acculturated into the mainstream society than their parents were, the more accepting parents were of the majority culture, the healthier was the psychological functioning in children. In their study of Chinese-Canadian youths, Lay and Verkuyten (1999) found that the life experience of these adolescents, particularly whether they are Canadian-born or foreign-born, has implications for ethnic identity and self-esteem.

In the US, it is widely believed that the socioeconomic performance of the children of immigrants far surpasses that of their parents. Chiswick (1977) and Carliner (1980) compared the earnings of various generations of workers in the US at a particular point in time, the 1970 decennial census. Borjas (2014) studied wage differentials across generations, and he found that the relative wages of immigrants have declined steadily since 1940, and second generation Americans earn more than both their parents and their children. However, when he controlled for education in the regression models, the difference between first Americans and their children's weekly earnings became much smaller. Borjas (2014) claimed much of the intergenerational progress observed between first and second generations can be explained by differences in educational

attainment between these two groups, as the native-born children of immigrants go through the American education system.

Using data from the 1991 Canadian census, Pendakur and Pendakur (1998) concluded that both foreign-born (first generation) and Canadian-born (second generation and higher) visible minorities earned less than Canadian-born Caucasians. They suggested that this wage discrepancy is due to racial discrimination since it cannot be fully explained by observable characteristics. However, Hum and Simpson (1999) discovered no evidence of a wage gap between visible minority and non-visible minority groups. Bloom et al (1995) established that, using pooled 1971, 1981, and 1986 Canadian census data, assimilation was particularly slow for immigrant men from Asia, Africa, and Latin America relative to immigrant men from Europe and the United States.

Aydemir and Sweetman (2007) find that, the second generation in both the US and Canada has very good educational and labor market outcomes, which is similar to, and in some cases better than, the third generation, and clearly much better than the first generation. Meanwhile, they conclude that, in the US, current immigrant characteristics, holding the structure of educational attainment and earnings constant, are associated with lower outcomes in the future than is the case for the current second generation, whereas in Canada the reverse can be expected. Warman et al (2019) indicate that the criteria employed in Skilled Worker, CEC, and PNP admission categories lead to the selection of immigrants likely to succeed in the Canadian labour market in more nuanced ways than merely choosing those with high education and good language skills in English or French. Their analysis suggests that selecting immigrants based on economic criteria in general and a points system (as in the Skilled Worker category) in particular both improves the outcomes of the Principal Applicant and also leads to higher earnings outcomes for the Child Arrival immigrants once they enter the labour market.

3.3 Data and Variables

3.3.1 Data Source

I use two of data sets in this paper. The first is Canadian census data published in the years 1971 and 2016, which refer to the data in the years 1970 and 2016. This data set is collected by Statistics Canada, and contains respondents' characteristics, including age, education attainment, ethnic information, immigration status, occupation, income, and so on. The second data set is the Canadian Career Handbook (CHA), which I will describe in more detail in Section 3.3.3.

Data Selection

The cleaned data set I use in this paper will only contain individuals who are between the ages of 18-65 and have identified themselves as working mainly full time in the years 1970 and 2015. In addition, I will exclude self-employee workers and those working on farms because I believe these workers' incomes will cause biases in the study since their incomes might not be a base on task supplies and educational attainments. Institution residents and part-time workers are also excluded from this study. Using the CHA data, I am able to classify occupations into labor market segments. Jobs in the Canadian labor market are classified into three segments, the primary upper tier, the primary lower tier, and the secondary segment. The key feature I use to assign occupations to segments is the degree of autonomy and skill professional required by them.

3.3.2 Independent Variables Description

In my empirical models, I have some key independent variables. I define first generation immigrants as those who were born outside Canada. For second generation immigrants, there are two different definitions. The first one is those

born inside Canada with parents both born outside. The second one defines second generation immigrants as those born inside Canada with at least one parent born outside Canada. In this paper, I will use the second definition because I believe that even one foreign-born parent can influence their children with outside culture, ideas, education concepts, and so on. These will make second generation immigrants different from third generation immigrants and higher. Another key independent variable is a worker’s language skill. In this paper, I define a worker as not a native speaker (nolang) if his or her most often used language at home is neither English nor French. Moreover, there would be an alternative way to approach the language proficiency variable as using place-specific language indicators (e.g. French for Quebec, both for NB, English for other provinces.), which I will explore in future work. This “nolang” is a dummy variable (nolang=1 means this worker does not speak English or French as a first language.). I believe a person who is capable of speaking the Canadian official languages at home could use them very well at work. Moreover, I have some other control variables in the empirical models including years of schooling, marital status, industry dummies, and metropolitan area dummies (CMAs).

3.3.3 Task Variables Generation

To assign task supplies to occupations, I will use a data set, the Canadian Career Handbook (CHA), which is also from Statistics Canada. This data set gives values indicating the aptitudes requirement in each occupation. Aptitudes in each occupation are categorized as: General Learning, Verbal, Numerical, Spatial Perception, Form Perception, Clerical Perception, Motor Coordination, Finger Dexterity, and Manual Dexterity. Each aptitude is given one of five values (1-5) to describe its grade among all working population¹. I generate a new variable to

¹The value 1 means the aptitude for this occupation is the highest 10 percent among all the working population. The value 2 means the upper third, exclusive of the highest 10 percent. The

describe the importance of each aptitude. I will use the median of each aptitude's ranking range among the entire working population to represent that aptitude's importance. For example, the median of the highest 10 percent is 0.95. Then, I will replace the value 1 by 0.95. Using this method, I will assign 0.75 for the value 2, 0.50 for 3, 0.25 for 4, and 0.05 for 5.

Next, I can use the aptitude importance variable to define task requirements for each occupation. The task requirement can also be considered the task supply per unit of time or task productivity of employees with this occupation.² Similar to what Imai, Stacey and Warman (2019) and Warman and Worswick (2015) did in their papers, I will define three types of tasks: analytical (A), interactive (I), and manual (M). Analytical tasks are defined as a combination of General learning ability (G), numerical ability (N), spatial perception (S), and form perception (P), while interactive tasks are defined by the combination of Verbal ability (V) and clerical perception (Q). Finally, I combine the aptitude importance values of Motor coordination (K), finger dexterity (F), and manual dexterity (M) to define manual task. The method of the combination is to take the mean of these importance values for each type of task.

3.4 Empirical Framework

To do the empirical work, I estimate the following regression equation:

$$Y = \beta X + \alpha F + \gamma S + \delta C + \varepsilon \quad (3.1)$$

value 3 means the middle third. The value 4 means the lowest third, exclusive of the lowest 10 percent. The value 5 means the lowest 10 percent.

²Since only full-time workers are included in this study, task supply per unit of time (task productivity) here could be treated as well as the aggregated task supply by a worker.

Y: The outcome variables (Natural logarithm of weekly wages or task supplies by workers).

X: Vector of standard demographic variables (age, age², age³, schooling years/education attainment, language ability, industry, genders, marital status)

F: A dummy variable for first generation immigrants. (1: the first generation. 0: others)

S: A dummy variable for second generation immigrants. (1: the second generation. 0: others)

C: Census Metropolitan Areas (CMA).

To predict the segments first and second generation immigrants will be in, compared to the third generation and higher, I will assume the exact but unobservable human capital based on demographic characteristics for worker i is E_i^* i.e. $E^* = \beta X + \alpha F + \gamma S + \delta C + \varepsilon$ or simply, $E^* = Zw + \varepsilon$. Then, we will have

$$Seg_i = \begin{cases} 1 & \text{if } E_i^* \leq \theta_1 \\ 2 & \text{if } \theta_1 < E_i^* \leq \theta_2 \\ 3 & \text{if } E_i^* > \theta_2 \end{cases} \quad (3.2)$$

Here, “seg” represents job segments. “seg=1” represents the secondary segment while “2” means primary segment, lower tier, and “3” means primary segment, upper tier. “Z” is the combination matrix of all the independent variables on the RHS.

3.5 Empirical Results

3.5.1 Earnings

In this part, I estimate the following equation:

$$\ln w = \beta X + \alpha F + \gamma S + \delta C + \varepsilon \quad (3.3)$$

Where “ $\ln w$ ” represents the natural logarithm of the employee’s weekly wage.

The regression estimates presented in Table A.28 briefly outline any noticeable differences in weekly wages between the three immigrant generations when controlling for language skill and education in two census years. The base group in each regression consists of third and higher generation immigrants. In this table, there are two columns of results for each year. One controls for observations’ educational attainment, while the other does not. In 1970, immigrants in Canada were still overwhelmingly from European, as this year is considered the start of the fifth wave of immigration in Canada. At first glance, it appears that the two columns for this year give us two different results. When education is not controlled for, first generation immigrants look not very different from third and higher generation immigrants, in terms of weekly earnings. The second generation has 3% higher weekly wages than third generation immigrants. Limited proficiency in an official language also leads to a significant reduction in the weekly wage. However, after I control for years of schooling, things turn out to be different. First generation immigrants tend to have a weekly wage 2.2% lower than the third generation. The second generation does not have a very different weekly wage from third generation immigrants (only 1.1% higher) when education is controlled for. The effect of the weakness of language skill on earnings is also weakened when I control for education. The coefficients on the gender and marital status variables are not affected very

much by adding years of schooling to the regression. Female workers tend to earn a lower weekly wage while married workers tend to earn more.

The results suggest that, in 1970, the higher weekly wages of first and second generation immigrants is driven by their higher educational attainment, compared to third generation immigrants. After I control for years of education, first generation immigrants tend to earn a lower weekly wage than third generation immigrants, while second generation immigrants have a similar weekly wage as third generation immigrants. In addition, the lack of official language ability might also result from lower education attainment.

The third and fourth columns in the table present the results for the year 2015. In this year, Canada had been experiencing the fifth immigration wave for more than four decades. More and more immigrants from South Asia, China and the Caribbean were coming to Canada during those years. Because of the points-based immigration system, most immigrants have high educational attainment and a “not bad” Canadian official language ability. Therefore, in the year 2015, things look different from the year 1971. Without controlling for education, first generation immigrants appear to have 6.3% lower weekly wages and second generation immigrants have 2.7% higher wages, compared to third generation immigrants. Controlling for education, the wage gap between first generation immigrants and third generation immigrants widens to 11.5%. However, the wage gap between second generation immigrants and third generation narrows. The weekly wage of second generation immigrants is merely 0.9 percent higher than that of the third generation, controlling for educational attainment. The coefficients on the other three control variables are not affected by controlling for education quite as much.

In 2015, the majority of immigrants in the Canadian labor market were from China, India, South Asia, and other developing countries. First and second generation immigrants appear to benefit from higher educational attainment, compared to

the third generation. Controlling for education in the regression, first generation immigrants have an even bigger wage gap relative to the third generation. Meanwhile, second immigrants have earnings quite close to third generation immigrants when they have the same educational attainment. This might be evidence for the assumption that, second generation immigrants are more educated on average than natives (third and higher generation immigrants) in the Canadian labor market in recent years, which is claimed in many places.

These regression results lead to several conclusions about the economic performance of first and second generation immigrants in the Canadian labor market. First, since many recent immigrants to Canada are from South Asia, China, Caribbean, and similar countries, the difference between the weekly earnings of the first generation and natives appears to be much wider in 2015 than in 1970. However, wage differences between second generation immigrants and natives are quite similar in these two census years, whether or not I control for education. In both years, second generation immigrants appear to obtain a higher wage through higher education attainment. When I control for education in the regressions, the difference between the second and third generations becomes very tiny but still positive. In 2015, official language ability plays a more important role in earnings. Finally, the gender pay gap is much smaller in 2015 than 1970, which might suggest a lessening of gender discrimination in the Canadian labor market.

3.5.2 Task Supplies

To study differences in task supplies of first and second generation immigrants, I will estimate the following empirical model:

$$T = \beta X + \alpha F + \gamma S + \delta C + \varepsilon \tag{3.4}$$

Here, T represents the task supplies which is A (analytical), I (interactive), and M (manual).

Table A.29 presents results from twelve regressions. These results display differences in the three task supplies (analytical, interactive and manual) between three generations of immigrants in two census years. The differences between the two columns of results for each task supply in each census year is whether industry fixed effects are included in the regression. Each regression includes a control for education. In 1970, the results do not change much with the inclusion of industry fixed effects. In 1970, both first and second generation immigrants supply significantly more analytical tasks than third generation immigrants, although the difference is small. The difference between second and third generation immigrants (0.3%) is not as big as that between the first and third generations (around 0.7%). However, when looking at the supplies of interactive and manual tasks, first and second generation immigrants give the opposite result. Compared to third and higher generation immigrants, first generation immigrants supply fewer interactive tasks but more manual tasks, while second generation immigrants tend to supply more interactive tasks but somewhat fewer manual tasks.

As in 1970, industry dummies do not play an important role in the regressions for the year 2015. Different from 1970, first generation immigrants appear to supply fewer analytical and interactive tasks but more manual tasks than the third generation. Conversely, second generation immigrants supply more analytical and interactive tasks but fewer manual tasks than the third generation with the baseline being the third generation or more.

Based on the results in this section, if we link wage differences between natives and immigrants to task supply differences, we can draw some interesting conclusions. The wage gap between first generation immigrants and natives is smaller in 1970 than that in 2015. In fact, in 1970, first generations earned more than natives before

controlling for education. This may be the result of different immigration source countries and different task supplies from first generation immigrants in these two years. In addition, first generation immigrants and natives could receive different returns to their task supplies when working, which might lead to a lessening of the earnings gap as well. Task supply performance is similar between second generation immigrants in 1970 and 2015, which might partly explain the similarity in the earnings of the second generation and natives in these two years.

3.5.3 Blinder-Oaxaca Decomposition

In this section, I explore the effect of task supplies on the average earnings gap between the two generations of immigrants and natives. I will apply a decomposition method to do this. Many previous studies use a similar methodology to study systematic differences in labor market outcomes by group (sex, race, and so on). The procedure is known in the literature as the Blinder-Oaxaca decomposition (Blinder (1973); Oaxaca (1973)). It divides the wage differential between two groups into a part that is “explained” by group differences in productivity characteristics, such as education or work experience, and a residual part that cannot be explained by such differences. This “unexplained” part is often used as a measure for discrimination, but it also subsumes the effects of group differences in unobserved characteristics. Most applications of the technique can be found in the labor market and discrimination literature (for meta studies, see, e.g., Stanley and Jarrell (1998) or Weichselbaumer and Winter-Ebmer (2005)). However, the method can also be useful in my study. I will apply a threefold decomposition method, which I will describe in detail below.

Methods and Formulas

Given two groups, 1 and 2; outcomes of these two groups, Y_1 and Y_2 ; and a combination of predictors. In my study, these two groups are either first generation

immigrants and natives or second generation immigrants and natives. Outcomes are (log) weekly wages of natives, first generation immigrants, and second generation immigrants, and are denoted w_n , w_f , and w_s , respectively. Task productivity variables and demographic characteristics such as age, female, education and so on are predictors.

Now, I can derive the the mean outcome difference as

$$\begin{aligned} R &= E(Y_1) - E(Y_2) \\ &= E(w_i) - E(w_n) \end{aligned}$$

Where $i \in \{f, s\}$, n =natives, f =the first generation immigrants, s =the second generation immigrants, and w is log weekly wages.

Now, I assume

$$w_i = X_i' \beta_i + \varepsilon_i \quad (3.5)$$

Where $i=n, f, s$; X is a matrix of independent variables including task variables and the independent variables in Equation (3.4). I can derive the native-first generation immigrant wage gap (see Winsborough and Dickinson (1971); Jones and Kelley (1984); and Daymont and Andrisani (1984)) which is

$$\begin{aligned} R_1 = E(w_f) - E(w_n) &= \underbrace{\{E(X_f) - E(X_n)\}' \beta_n}_{\text{endowments}} + \underbrace{E(X_n)'(\beta_f - \beta_n)}_{\text{coefficients}} + \\ &\quad \underbrace{\{E(X_f) - E(X_n)\}'(\beta_f - \beta_n)}_{\text{interactions}} \end{aligned} \quad (3.6)$$

This is a “threefold” decomposition; that is, the outcome difference is divided into three components: endowments effects, coefficients effects, and interactions effects. Since in this paper, I just want to study the effects of the task supply productivity

on the wage differences, Equation (3.6) could be rewritten as

$$\begin{aligned}
R_1 = E(w_f) - E(w_n) = & \underbrace{\{E(T_f) - E(T_n)\}'\eta_n}_{\text{endowments}} + \underbrace{E(T_n)'(\eta_f - \eta_n)}_{\text{coefficients}} + \\
& \underbrace{\{E(T_f) - E(T_n)\}'(\eta_f - \eta_n)}_{\text{interactions}} + v
\end{aligned} \tag{3.7}$$

Where T is a matrix of task shares (analytical, interactive, manual), η is a matrix of coefficients on the task shares, and v contains the terms in the decomposition associated with variables other than task supplies. Using the same method, I can decompose the native-second generation immigrant wage gap as

$$\begin{aligned}
R_2 = E(w_s) - E(w_n) = & \underbrace{\{E(T_s) - E(T_n)\}'\eta_n}_{\text{endowments}} + \underbrace{E(T_n)'(\eta_s - \eta_n)}_{\text{coefficients}} + \\
& \underbrace{\{E(T_s) - E(T_n)\}'(\eta_s - \eta_n)}_{\text{interactions}} + v
\end{aligned} \tag{3.8}$$

I use Stata to obtain the Blinder-Oaxaca decomposition results (see Jan (2008)).

Table A.30 presents results for model (3.5). All the regressions control for both education and industry fixed effects. From this table, we can see that the three task supplies have similar effects on earnings for all three types of employees in both census years. Supplying more analytical and interactive tasks benefits employees' weekly wages, while manual task supply hurts them. This finding matches my prediction that analytical and interactive task supply is rewarded while manual task supply is "punished" in the Canadian labor market. Naturally, there are some differences in effects of task supply in these two years. In 2015, the increase in the weekly wage driven by a 1% increase in analytical task supply from all the three types of employees is larger than it is in 1970. Furthermore, the returns to interactive task supply are smaller in 2015. Finally, the negative effect of manual task supply on wages become even larger in 2015, compared to 1970. Similar to what we saw in Table A.30, the lack

of official language ability hurts weekly earnings even more in 2015, and the gender wage gap shrinks at the same time.

As showed by equations (3.7) & (3.8), I will use the different returns to tasks, different task supplies per unit of time, and their interactions to decompose the weekly wage gap between natives (the third generation or more) and first and second generation immigrants.

Table A.31 presents results for the Blinder-Oaxaca decomposition. Panel A gives the amount of the wage gap explained by differences in task supply, while Panel B shows the amount of the wage gap explained by the different returns to tasks. First of all, I will focus on the year 1971. In 1970, on average, both first and second generation immigrants earn a statistically significantly larger weekly wage than natives (the third generation or more). First generation immigrants earn 8.9% more per week than natives, while the second generation earns 10.9% more. Based on the results in Table A.30, in 1970, both generations of immigrants have advantages in the return to analytical and interactive tasks. However, the penalty from manual task productivity is the largest for secondary generation immigrants and smallest for first generation immigrants. In Panel B of Table A.31, we can see that the higher return to interactive task supply generates a (significant) 3.7% widening of the wage gap between first generation immigrants and natives. The returns to analytical and manual task supply of first generation immigrants tend to widen the wage gap insignificantly. From Panel A, the amounts of the wage gap explained by different task supplies are all statistically significant but very tiny, which is very similar to the results given by the interactions in Panel C.

Turning to the wage gap between natives and second generation immigrants, we can see that the biggest effect on the wage gap is also from the higher return to interactive task supply of second generation immigrants, which leads to a 6.2% widening in the gap. The higher return to second generation immigrants'

analytical task supply leads to a (significant) 1.3% increase in the wage gap, while the larger penalty from manual task supply significantly reduces the wage gap by 2%. Meanwhile, similar to the native-first generation immigrant wage gap, the endowments and interaction effects are both small in comparison to the overall wage difference between second generation immigrants and natives.

The third and fourth columns of Table A.31 present results for 2015. Here, things look a little different. The mean weekly wage of first generation immigrants is 2.2% lower than natives (the third generation or more), but the weekly earnings of second generation immigrants are 9.3% higher than those of natives. Both differences are statistically significant. From Table A.31, in 2015, natives have a significant advantage over first generation immigrants in the supply of analytical and interactive tasks, controlling for educational attainment and industry fixed effects. Naturally, if we assume a diminishing marginal return in the production process, we would predict a significantly lower return to natives' analytical and interactive task supply compared with a first generation immigrant with the same demographic characteristics. In Table A.31, we can see that higher the returns to analytical and interactive tasks for first generation immigrants leads to a significant 3.5% and 4.9% narrowing in the weekly wage gap with natives. The larger wage penalty from manual task supply widens the wage gap by 0.8%, which is statistically insignificant.

The effects of the endowments and interactions are relatively small again. Generally, if I do not control for education and industry fixed effects, first generation immigrants tend to supply more analytical and interactive tasks than natives, which in fact narrows the weekly wage gap between natives and first generation immigrants. Therefore, the smaller mean weekly wage earned by first generation immigrants is driven by other factors such as a discrimination in the return to immigrants' educational attainment, compared with a similar native. However, foreign degrees

being less valued is conjecture on my study, and it would be quantified in future work using the relevant census variable.

Regarding the wage gap between natives and second generation immigrants in 2015, we can see that the most significant driver is the difference in the return to manual task supply, which narrows the gap by 3.3%. Meanwhile, most of the endowments and interactions effects are very small except the higher analytical task productivity of second generation immigrants which widens the wage gap by about 2%.

From this exercise, we can learn some things. First of all, immigrants seem to be more rewarded for “high skill” tasks than natives, and this has a significant effect on their relative earnings. Moreover, task provision and the return to task provision for both generations has not changed much from 1970 to 2015, even though their relative earnings have changed (especially first generation immigrants). So, this change in immigrants’ relative earnings is not driven by the fact that immigrants are performing systematically different tasks, or being rewarded differently for tasks.

3.5.4 Segment Prediction

In this part, I will use ordered probit and ordered logit models to predict the labor market segments (primary upper tier, primary lower tier, and secondary segment) that first and second generation immigrants work in, using the third generation as the base group.

Probit and logit coefficients do not have a straightforward intuitive interpretation. So, I will present average marginal effects. I define

$$\begin{aligned}
P(seg_i = n|Z) &= P(\theta_{n-1} < E_i^* < \theta_n) \\
&= P(\theta_{n-1} < w'Z_i + \varepsilon < \theta_n) \\
&= F(\theta_n - w'Z_i) - F(\theta_{n-1} - w'Z_i) \\
&= F(w'Z_i)
\end{aligned}$$

Here, $n=1, 2, 3$. Marginal effect at point Z_i is $\frac{\partial E[seg|Z]}{\partial Z}|_{Z=Z_i} = \frac{\partial F(w'Z)}{\partial Z}|_{Z=Z_i} = f(w'Z_i)w$. Then, I define the average marginal effect of a variable x_k on being “seg n ” as

$$\frac{w_k}{N} \sum_{i=1}^N f_{seg=n}(w'Z_i) \quad (3.9)$$

if x_k is continuous. If x_k is discrete, the average partial effect is the average of the discrete differences in the predicted probabilities.

Tables A.32 and A.33 present the estimated effect of immigrant status on labor market segmentation. Table A.32 applies the ordered probit estimation while Table A.33 uses the ordered logit estimation. All the coefficients in these two tables are statistically significant at the 1% level, which indicates that the generation dummies do impact which segment an employee should be in both in the past and present. All the Chi square values of LR (likelihood-ratio) tests are quite large, which supports the importance of the immigrant generation to segmentation in the Canadian labor market as well. Generally, we can see that, whether or not we control or education in the regressions, first generation immigrants tend to work in lower segments while second generation immigrants tend to work in the higher ones, compared to natives (the third and more generation immigrants). However, these two tables only give us a sense of the sign of the effect of immigrant status

on segmentation. To understand the magnitude of the impact, I will derive average marginal effects.

Average Marginal Effects on Immigrants' Segmentation

Tables A.34 & A.35 present average marginal effects (AME) of immigrant status on segmentation based on the ordered probit and logit estimates presented above.

Table A.34 presents results based on ordered probit estimates. Taking a look at the results for the year 1971, with natives as the baseline, we can see that controlling for education does not impact the AME of being a first generation immigrant very much, while the impact of being a second generation immigrant appears to be more significant. After I control for education in the probit model, the effects of being a second generation immigrant tend to be smaller. Based on these results, being a first generation immigrant leads to a 2% reduction in the probability of working in the upper tier segment, a 0.9% increase in the likelihood of working in the lower tier, and a 1.2% increase in the probability of being a secondary-segment worker. Before controlling for education in the probit model, second generation immigrants tend to be 1.7% more likely to be in the upper tier, 0.7% less likely to be in the lower tier, and 1% less likely to be in the secondary segment, compared with the third and higher generation immigrants. When I control for workers' education, all these segmentation differences become quite a bit smaller, but the signs remain the same.

In the results for the year 2016, the education control has a larger effect on the first generation immigrants' segmentation tendency. After I control for educational attainment, the relative tendency of a first generation immigrant to be in the upper tier is decreased from -1.4% to -4.3%, while the relative tendency to be in the lower tier and secondary segment is increased from 0.6% and 0.8% to 1.8% and 2.5%, respectively. Similar to 1971, before controlling for education in the probit model, second generation immigrants tend to be 2.4% more likely to be in the upper tier, 1%

less likely to be in the lower tier, and 1.4% less likely to be in the secondary segment, compared with third and higher generation immigrants. After I control for workers' education, all these segmentation differences shrink in magnitude, but the signs stay the same. These findings are consistent with those in the wage difference study that both of the two generations of immigrants benefit from their higher educational attainments when compared to the third generation. Table A.35 gives a similar estimation as Table A.34 with ordered logit models instead of ordered probit models. All the values in this table are quite close to Table A.34, which support the comments I gave in last paragraph.

From the exercise in this subsection, here are some key points I learn. First, segmentation results look “worse” for first generation immigrants than the wage results did. It looks like first generation immigrants are “boxed out” of the upper tier – they earn more than natives in 1970, but are still less likely to work in the upper tier, which is interesting. Moreover, first generation immigrants do a lot worse conditional on years of education in 2015 than 1970. They are much less likely to work in the upper tier conditional on educational attainment. This is consistent with the discrimination against those with a foreign educational background story that mentioned in this study.

3.6 Conclusion

In this paper, I examined how first and second generation immigrants behave differently from natives, which is shorthand for third generation immigrants or higher, in many aspects of the Canadian labor market. I use data from two census years, 1971 and 2016, because 1970 is considered to be start of the fifth immigration wave in Canada, and 2016 is the most recent Canadian census year. Using these

data, I explore differences in earnings, task supply, and segmentation between the two generations of immigrants and natives.

I find that first generation immigrants perform differently from natives in terms of weekly earnings and task supplies. First of all, there has been a decline in the performance of first generation immigrants over time, especially conditional on educational attainment. This is apparent in both earnings and labor market segments. Secondly, second generation immigrants have not changed quite much (in terms of relative performance) from 1970 to 2015. They seem to do better than natives because they are more educated on average. Lastly, the change in immigrants' fortunes cannot be explained by the fact that the tasks they perform in the labor market have changed, or that they are rewarded differently for performing certain tasks.

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Appendix A

Tables

Table A.1: Occupations and Task Intensity

Occupations	Communication intensity index	Manual intensity index	C/M percentile
Four occupations with highest communication/manual values			
Management Consultants	0.75	0.33	0.992
Financial and Investment Analysts	0.75	0.33	0.992
Financial Auditors	0.75	0.33	0.992
Loan Officers	0.75	0.33	0.992
Four occupations with average communication/manual values			
Supervisors, Mining and Quarrying	0.375	0.375	0.487
Operating Room Technicians	0.375	0.375	0.487
Commissioned Officers, Armed Forces	0.375	0.375	0.487
Petroleum, Gas and Chemical Process Operat	0.375	0.375	0.487
Four occupations with lowest communication/manual values			
Sewing Machine Operators	0.15	0.46	0.008
Butchers and Meat Cutters, Retail and Whole	0.15	0.50	0.006
Labourers in Food, Beverage and Tobacco Pr	0.05	0.25	0.004
Labourers in Rubber and Plastic Products Ma	0.05	0.25	0.002

Note: This table shows groups of occupations with the highest, average, and the lowest C/M ratios as well as the percentiles of them among all the occupations in the Canadian Census.

Table A.2: Occupations with the highest highly-educated workers share

Occupations	Communication intensity index	Manual intensity index	Manual-ext intensity index	Highly-educated workers' share (%)
Year 1991				
Specialist Physicians	0.73	0.67	0.70	100
General Practitioners and Family Physicians	0.73	0.67	0.70	100
Veterinarians	0.73	0.75	0.79	100
Medical Sonographers	0.38	0.50	0.50	100
Dietitians and Nutritionists	0.50	0.25	0.35	100
Year 2001				
General Practitioners and Family Physicians	0.73	0.67	0.70	99.7
Chiropractors	0.50	0.75	0.75	99.6
Psychologists	0.73	0.25	0.30	99.5
Audiologists and Speech-Language Pathologists	0.63	0.25	0.35	99.4
Specialist Physicians	0.73	0.67	0.70	99.4
Year 2011				
General Practitioners and Family Physicians	0.73	0.67	0.70	99.9
Geological Engineers	0.73	0.25	0.40	99.8
Specialist Physicians	0.73	0.67	0.70	99.7
Optometrists	0.63	0.50	0.60	99.6
Veterinarians	0.73	0.75	0.79	99.6

Note: This table shows groups of occupations with the highest shares of workers with educational attainment above high school as well as the C, M, and M extended values of these occupations in three Canadian census years.

Table A.3: Occupations with the lowest highly-educated workers share

Occupations	Communication intensity index	Manual intensity index	Manual-ext intensity index	Highly-educated workers' share (%)
Year 1991				
Ironing, Pressing and Finishing Occupations	0.15	0.42	0.35	16.3
Sewing Machine Operators	0.15	0.50	0.50	17.4
Chainsaw and Skidder Operators	0.15	0.42	0.40	20.2
Labourers in Fish Processing	0.15	0.42	0.35	21.5
Logging Machinery Operators	0.15	0.42	0.40	21.6
Year 2001				
Harvesting Labourers	0.15	0.42	0.35	14.5
Sewing Machine Operators	0.15	0.50	0.50	22.5
Labourers in Fish Processing	0.15	0.42	0.35	23.6
Fish Plant Workers	0.15	0.33	0.30	24.9
Ironing, Pressing and Finishing Occupations	0.15	0.42	0.35	25.4
Year 2011				
Harvesting Labourers	0.15	0.42	0.35	14.6
Fish Plant Workers	0.15	0.33	0.30	23.4
Aquaculture and Marine Harvest Labourers	0.25	0.33	0.30	25.0
Labourers in Fish Processing	0.15	0.42	0.35	25.1
Logging Machinery Operators	0.15	0.42	0.40	29.1

Note: This table shows groups of occupations with the lowest shares of workers with educational attainment above high school as well as the C, M, and M extended values of these occupations in three Canadian census years.

Table A.4: Foreign-Born Workers and the Native Supply of Tasks

(Workers with a degree higher than high school)					
Explanatory variable: foreign-born share of workers with a degree higher than high school					
		(1)	(2)	(3)	(4)
Communication definition		Basic	Basic	Basic	Basic
Manual definition		Basic	Extended	Basic	Extended
Method of estimation		WLS		2SLS using imputed foreign-born share as instrument	
Additional controls		CMA and year fixed effects		CMA and year fixed effects	
Dependent variables					
$\ln(C_D/M_D)$	γ	0.41*** <i>0.10</i>	0.34*** <i>0.10</i>	0.63*** <i>0.17</i>	0.61*** <i>0.14</i>
$\ln(c_D)$	γ^C	0.24*** <i>0.04</i>	0.24*** <i>0.04</i>	0.22** <i>0.10</i>	0.22** <i>0.10</i>
$\ln(m_D)$	γ^M	-0.17*** <i>0.07</i>	-0.10 <i>0.08</i>	-0.41*** <i>0.10</i>	-0.39*** <i>0.10</i>
First stage					
Joint F-test of the instruments (p-value)		NA	NA	7.59 <i>0.01</i>	7.59 <i>0.01</i>
Observations		630	630	409	409

Note: Each cell contains estimates from a separate regression. The dependent variable in each is indicated in the first column. The explanatory variable is the immigrant share of labor hours worked in the Census Metropolitan Areas(CMA) and year. All regressions include CMA and year fixed effects. The method of estimation in specifications (1)–(2) is weighted least squares. Regressions use employment as an analytic weight for each observation, and the standard errors are heteroskedasticity-robust and clustered by CMA. Specifications (3)–(4) use 2SLS using the imputed share of immigrants from chosen countries as the instrument. ***Significant at 1% level. **Significant at 5% level.

Table A.5: Foreign-Born Workers and the Native Supply of Tasks

(Workers with a high school degree or less)					
Explanatory variable: foreign-born share of workers with a high school degree or less					
		(1)	(2)	(3)	(4)
Communication definitio		Basic	Basic	Basic	Basic
Manual definition		Basic	Extended	Basic	Extended
Method of estimation		WLS		2SLS using imputed foreign-born share as instrument	
Additional controls		CMA and year fixed effects		CMA and year fixed effects	
Dependent variables					
$\ln(C_D/M_D)$	γ	0.18*** <i>0.04</i>	0.14*** <i>0.04</i>	0.23*** <i>0.07</i>	0.16** <i>0.06</i>
$\ln(c_D)$	γ^C	0.16*** <i>0.04</i>	0.16*** <i>0.04</i>	0.14*** <i>0.05</i>	0.14*** <i>0.05</i>
$\ln(m_D)$	γ^M	-0.02 <i>0.02</i>	0.02 <i>0.02</i>	-0.09** <i>0.04</i>	-0.02 <i>0.03</i>
First stage					
Joint F-test of the instruments (p-value)		NA	NA	21.06 <i>0.00</i>	21.06 <i>0.00</i>
Observations		630	630	409	409

Note: Each cell contains estimates from a separate regression. The dependent variable in each is indicated in the first column. The explanatory variable is the immigrant share of labor hours worked in the Census Metropolitan Areas(CMA) and year. All regressions include CMA and year fixed effects. The method of estimation in specifications (1)–(2) is weighted least squares. Regressions use employment as an analytic weight for each observation, and the standard errors are heteroskedasticity-robust and clustered by CMA. Specifications (3)–(4) use 2SLS using the imputed share of immigrants from chosen countries as the instrument. ***Significant at 1% level.

**Significant at 5% level.

Table A.6: Foreign-Born Workers Aggregate Supply of Tasks and Communication-Manual Wage Elasticity

(Workers with a degree higher than high school)					
		(1)	(2)	(3)	(4)
Panel A: Explanatory variable: foreign-born share of workers with a high school degree or less					
Communication definition		Basic	Basic	Basic	Basic
Manual definition		Basic	Extended	Basic	Extended
Method of estimation		WLS		2SLS using imputed foreign-born share as instrument	
Additional controls		CMA and year fixed effects		CMA and year fixed effects	
Dependent variables					
$\ln(C/M)$	γ_{TOT}	0.35*** <i>0.08</i>	0.29*** <i>0.08</i>	0.63*** <i>0.16</i>	0.61*** <i>0.14</i>
$\ln(c)$	γ_{TOT}^C	0.18*** <i>0.04</i>	0.18*** <i>0.04</i>	0.22*** <i>0.08</i>	0.22*** <i>0.08</i>
$\ln(m)$	γ_{TOT}^M	-0.17*** <i>0.05</i>	-0.10*** <i>0.06</i>	-0.41*** <i>0.11</i>	-0.39*** <i>0.11</i>
First stage					
Joint F-test of the (p-value)		NA	NA	7.59 <i>0.01</i>	7.59 <i>0.01</i>
Observations		409	409	409	409

Note: Each cell contains estimates from a separate regression. The dependent variable in each is indicated in the first column. The explanatory variable is the immigrant share of labor hours worked in the Census Metropolitan Areas(CMA) and year. All regressions include CMA and year fixed effects. The method of estimation in specifications (1)–(2) is weighted least squares. Regressions use employment as an analytic weight for each observation, and the standard errors are heteroskedasticity-robust and clustered by CMA. Specifications (3)–(4) use 2SLS using the imputed share of immigrants from chosen countries as the instrument. ***Significant at 1% level. **Significant at 5% level.

Table A.7: Foreign-Born Workers Aggregate Supply of Tasks and Communication-Manual Wage Elasticity

(Workers with a high school degree or less)					
		(1)	(2)	(3)	(4)
Panel A: Explanatory variable: foreign-born share of workers with a high school degree or less					
Communication definition		Basic	Basic	Basic	Basic
Manual definition		Basic	Extended	Basic	Extended
Method of estimation		WLS		2SLS using imputed foreign-born share as instrument	
Additional controls		CMA and year fixed effects		CMA and year fixed effects	
Dependent variables					
$\ln(C/M)$	γ_{TOT}	-0.04 <i>0.04</i>	-0.07 <i>0.04</i>	0.04 <i>0.08</i>	-0.01 <i>0.08</i>
$\ln(c)$	γ_{TOT}^c	-0.03 <i>0.05</i>	-0.03 <i>0.05</i>	-0.04 <i>0.05</i>	-0.04 <i>0.05</i>
$\ln(m)$	γ_{TOT}^M	-0.00 <i>0.02</i>	0.04 <i>0.02</i>	-0.08*** <i>0.04</i>	-0.03 <i>0.04</i>
First stage					
Joint F-test of the (p-value)		NA	NA	21.06 <i>0.00</i>	21.06 <i>0.00</i>
Observations		409	409	409	409

Note: Each cell contains estimates from a separate regression. The dependent variable in each is indicated in the first column. The explanatory variable is the immigrant share of labor hours worked in the Census Metropolitan Areas(CMA) and year. All regressions include CMA and year fixed effects. The method of estimation in specifications (1)–(2) is weighted least squares. Regressions use employment as an analytic weight for each observation, and the standard errors are heteroskedasticity-robust and clustered by CMA. Specifications (3)–(4) use 2SLS using the imputed share of immigrants from chosen countries as the instrument. ***Significant at 1% level. **Significant at 5% level.

Table A.8: Communication-Manual Compensation Ratio

(Workers with degree higher than high school)

	(1)	(2)	(3)	(4)
Panel: Explanatory variable: foreign-born share; dependent variable: $\ln(w_C/w_M)$				
Communication definition	Basic	Basic	Basic	Basic
Manual definition	Basic	Extended	Basic	Extended
Method of estimation	WLS		2SLS	
γ_w	1.91 <i>1.13</i>	1.41 <i>1.08</i>	2.75** <i>1.36</i>	4.80*** <i>1.31</i>
First stage				
Joint F-test of the	NA	NA	136.77	137.59
(p-value)			<i>0.00</i>	<i>0.00</i>
Observations	402	402	402	402

Note: The dependent variable is the relative compensation to communication versus manual tasks. The explanatory variable is the immigrant share of labor hours worked in the Census Metropolitan Areas(CMA) and year. All regressions include CMA and year fixed effects. The method of estimation in specifications (1)–(2) is weighted least squares. Regressions use employment as an analytic weight for each observation, and the standard errors are heteroskedasticity-robust and clustered by CMA. Specifications (3)–(4) use 2SLS using the imputed share of immigrants from chosen countries as the instrument. ***Significant at 1% level. **Significant at 5% level.

Table A.9: Communication-Manual Compensation Ratio

(Workers with a high school degree or less)

	(1)	(2)	(3)	(4)
Panel: Explanatory variable: foreign-born share; dependent variable: $\ln(w_C/w_M)$				
Communication definition	Basic	Basic	Basic	Basic
Manual definition	Basic	Extended	Basic	Extended
Method of estimation	WLS		2SLS	
γ_w	-0.09 <i>0.99</i>	0.27 <i>0.99</i>	-0.22 <i>1.05</i>	0.12 <i>0.99</i>
First stage				
Joint F-test of the	NA	NA	80.55	80.55
(p-value)			<i>0.00</i>	<i>0.00</i>
Observations	403	403	403	403

Note: The dependent variable is the relative compensation to communication versus manual tasks. The explanatory variable is the immigrant share of labor hours worked in the Census Metropolitan Areas(CMA) and year. All regressions include CMA and year fixed effects. The method of estimation in specifications (1)–(2) is weighted least squares. Regressions use employment as an analytic weight for each observation, and the standard errors are heteroskedasticity-robust and clustered by CMA. Specifications (3)–(4) use 2SLS using the imputed share of immigrants from chosen countries as the instrument. ***Significant at 1% level. **Significant at 5% level.

Table A.10: Impact of Foreign-Born Workers on the Supply of Tasks Among Different Demographic Groups

(Controlling for individual characteristics in the construction of aggregate skills)					
Explanatory variable: foreign-born share among workers with a degree higher than high school					
Dependent variables: relative communication/manual skills for the group, basic definition					
Only CA native worker are included in specifications (2) to (4)					
		(1)	(2)	(3)	(4)
Group 1		Long-term immigrants	Women	Young (18-40)	Black
Group 2		Natives	Men	Old (41-66)	Non Black
Dependent variables					
Group 1, $\ln(C_1/M_1)$	γ	-4.69 2.69	0.51** 0.22	0.82*** 0.20	1.65 1.85
Group 1, $\ln(c_1)$	γ^C	-2.05** 1.00	0.17 0.14	0.36*** 0.10	0.26 0.80
Group 1, $\ln(m_1)$	γ^M	2.64 1.80	-0.34*** 0.10	-0.46*** 0.12	-1.39 1.18
Group 2, $\ln(C_2/M_2)$	γ	0.63*** 0.17	0.77*** 0.19	0.55*** 0.15	0.65*** 0.17
Group 2, $\ln(c_2)$	γ^C	0.22** 0.10	0.34*** 0.10	0.16 0.10	0.23** 0.10
Group 2, $\ln(m_2)$	γ^M	-0.41*** 0.10	-0.43*** 0.11	-0.39*** 0.09	-0.41*** 0.10
Observations		409	409	409	409

Note: Each cell contains estimates from a separate regression. The dependent variable is calculated for specific demographic groups. Column 1 shows the estimates for immigrants and natives. Columns 2–4 include native workers only in each group. In each comparison, Group 1 earns lower wages than Group 2 does. The average manual m_i and communication c_i skill supply for each group i in a CMA-year are calculated by averaging individual supply using personal weight times hours worked as weights. All regressions include CMA and year fixed effects. The method of estimation is 2SLS using imputed share of immigrants as IV. Regressions use employment in the cell as an analytic weight for each observation, and the standard errors are heteroskedasticity-robust and clustered by CMA. ***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

Table A.11: Impact of Foreign-Born Workers on the Supply of Tasks Among Different Demographic Groups

(Controlling for individual characteristics in the construction of aggregate skills)					
Explanatory variable: foreign-born share among workers with a high school degree or less					
Dependent variables: relative communication/manual skills for the group, basic definition					
Only CA native worker are included in specifications (2) to (4)					
		(1)	(2)	(3)	(4)
Group 1		Long-term immigrants	Women	Young (18-40)	Black
Group 2		Natives	Men	Old (41-66)	Non Black
Dependent variables					
Group 1, $\ln(C_1/M_1)$	γ	0.04 <i>0.27</i>	0.41*** <i>0.09</i>	0.20** <i>0.08</i>	-0.29 <i>0.34</i>
Group 1, $\ln(c_1)$	γ^C	0.17 <i>0.30</i>	0.25*** <i>0.07</i>	0.14** <i>0.06</i>	-0.15 <i>0.41</i>
Group 1, $\ln(m_1)$	γ^M	0.13** <i>0.06</i>	-0.16*** <i>0.04</i>	-0.06*** <i>0.03</i>	0.13 <i>0.38</i>
Group 2, $\ln(C_2/M_2)$	γ	0.23*** <i>0.07</i>	0.13** <i>0.05</i>	0.35*** <i>0.11</i>	0.23*** <i>0.07</i>
Group 2, $\ln(c_2)$	γ^C	0.14*** <i>0.05</i>	0.10** <i>0.04</i>	0.20*** <i>0.06</i>	0.14*** <i>0.05</i>
Group 2, $\ln(m_2)$	γ^M	-0.09** <i>0.04</i>	-0.04 <i>0.03</i>	-0.15** <i>0.06</i>	-0.09** <i>0.04</i>
Observations		409	409	409	409

Note: Each cell contains estimates from a separate regression. The dependent variable is calculated for specific demographic groups. Column 1 shows the estimates for immigrants and natives. Columns 2–4 include native workers only in each group. In each comparison, Group 1 earns lower wages than Group 2 does. The average manual m_i and communication c_i skill supply for each group i in a CMA-year are calculated by averaging individual supply using personal weight times hours worked as weights. All regressions include CMA and year fixed effects. The method of estimation is 2SLS using imputed share of immigrants as IV. Regressions use employment in the cell as an analytic weight for each observation, and the standard errors are heteroskedasticity-robust and clustered by CMA. ***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

Table A.12: Job Segmentation Details

Occupations	Characteristics
Secondary	Low wages, poor working conditions considerable variability in emp harsh and often arbitrary discipline, little opportunity ot advance, w interest or hope in keeping a job for long.
Lower Tier	The separation from ownership of the means of production and the product; inability to influence general managerial policies; lack of co conditions of employment; lack of control over the immediate work
Upper Tier	Work is not merely a job that maximizes income, but a series of rela job advances which provide the breadwinner with higher income, g responsibility, higher job autonomy, and greater job satisfaction.

Table A.13: Effects of education and race in natives, regular immigrants, and enclave immigrants

	Dependent Variable: log of weekly wages											
	(1) Natives	(2) Imm. Reg	(3) Imm. Enc.	(4) Natives	(5) Imm. Reg	(6) Imm. Enc.	(7) Natives	(8) Imm. Reg	(9) Imm. Enc.	(10) Natives	(11) Imm. Reg	(12) Imm. Enc.
age	0.099*** 0.000	0.078*** 0.001	0.046*** 0.003	0.098*** 0.000	0.077*** 0.001	0.046*** 0.003	0.099*** 0.002	0.077*** 0.002	0.046*** 0.003	0.082*** 0.002	0.067*** 0.002	0.041*** 0.003
age^2	-0.001*** 0.000	-0.001*** 0.000	-0.000*** 0.000	-0.001*** 0.000	-0.001*** 0.000	-0.000*** 0.000	-0.001*** 0.000	-0.001*** 0.000	-0.000*** 0.000	-0.001*** 0.000	-0.001*** 0.000	-0.000*** 0.000
edu	0.161*** 0.000	0.115*** 0.001	0.050*** 0.002	0.161*** 0.000	0.116*** 0.001	0.049*** 0.003	0.160*** 0.006	0.117*** 0.005	0.049*** 0.007	0.126*** 0.005	0.074*** 0.003	0.024*** 0.005
race	-0.093*** 0.001	-0.164*** 0.002	-0.198*** 0.010	-0.092*** 0.001	-0.159*** 0.002	-0.191*** 0.010	-0.115*** 0.018	-0.168*** 0.004	-0.207*** 0.030	-0.112*** 0.013	-0.145*** 0.009	-0.173*** 0.021
marital	-0.141*** 0.001	-0.043*** 0.002	-0.041*** 0.013	-0.140*** 0.001	-0.042*** 0.002	-0.042*** 0.013	-0.140*** 0.006	-0.040*** 0.005	-0.041*** 0.007	-0.117*** 0.005	-0.041*** 0.004	-0.049*** 0.004
sex	0.311*** 0.001	0.244*** 0.002	0.208*** 0.008	0.310*** 0.001	0.243*** 0.002	0.208*** 0.008	0.310*** 0.016	0.246*** 0.016	0.208*** 0.007	0.253*** 0.010	0.222*** 0.010	0.179*** 0.007
hours	0.013*** 0.000	0.012*** 0.000	0.010*** 0.000	0.013*** 0.000	0.012*** 0.000	0.010*** 0.000	0.013*** 0.001	0.012*** 0.000	0.010*** 0.001	0.013*** 0.001	0.012*** 0.000	0.010*** 0.001
Year Ctrl.	NO	NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES
Pro. Ctrl.	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Ind. Ctrl.	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES	YES
Obs.	5,518,713	1,398,119	63,681	5,518,713	1,398,119	63,681	5,518,713	1,398,119	63,681	5,518,713	1,398,119	63,681

Note: Standard errors are given in italics. A person is a visible minority when the variable "race" equals 1. A person is never married when the variable "marital" equals 1. A person is male when the variable "sex" equals 1.
 +: Statistically significant at the 10% level or lower. *: Statistically significant at the 5% level or lower. **: Statistically significant at the 1% level or lower.

Table A.14: Probit/Logit results of education and race impacts within the two types of immigrants

	Probit (1)	Logit (2)
edu	0.193*** <i>0.001</i>	0.442*** <i>0.003</i>
race	-0.614*** <i>0.004</i>	-1.37*** <i>0.010</i>
LR chi ²	46539.37	47952.61
obs	1,461,800	1,461,800

Note: Standard errors are given in italics. A person is a visible minority when the variable "race" equals 1. A person is never married when the variable "marital" equals 1. A person is male when the variable "sex" equals 1. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1% level or lower.

Table A.15: AME of the education/race on the types of immigrants

	Immi. Reg	
	Probit	logit
Educational Attainment	0.016*** <i>0.000</i>	0.018*** <i>0.000</i>
Race	-0.052*** <i>0.000</i>	-0.055*** <i>0.000</i>
obs	1,461,800	1,461,800

Note: Standard errors are given in italics. A person is a visible minority when the variable "race" equals 1. A person is never married when the variable "marital" equals 1. A person is male when the variable "sex" equals 1. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1% level or lower.

Table A.16: Probit/Logit results within the regular immigrants

	Probit (1)	Logit (2)
age	-0.031*** <i>0.001</i>	-0.053*** <i>0.001</i>
age^2	0.000*** <i>0.000</i>	0.000*** <i>0.000</i>
edu	-0.358*** <i>0.001</i>	-0.642*** <i>0.001</i>
race	0.245*** <i>0.002</i>	0.414*** <i>0.004</i>
marital	0.013*** <i>0.003</i>	0.025*** <i>0.005</i>
LR chi^2	326691.54	337435.75
obs	1,398,119	1,398,119

Note: Standard errors are given in italics. A person is a visible minority when the variable "race" equals 1. A person is never married when the variable "marital" equals 1. A person is male when the variable "sex" equals 1. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1%

Table A.17: Probit/Logit results within the enclave immigrants

	Probit (1)	Logit (2)
age	-0.044*** <i>0.003</i>	-0.075*** <i>0.006</i>
age^2	0.000*** <i>0.000</i>	0.001*** <i>0.000</i>
edu	-0.315*** <i>0.003</i>	-0.565*** <i>0.006</i>
race	-0.107*** <i>0.012</i>	-0.186*** <i>0.020</i>
marital	-0.031 <i>0.017</i>	-0.041 <i>0.029</i>
LR chi^2	11438.78	11636.04
obs	63,681	63,681

Note: Standard errors are given in italics. A person is a visible minority when the variable "race" equals 1. A person is never married when the variable "marital" equals 1. A person is male when the variable "sex" equals 1. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1%

Table A.18: Predicts of average marginal effects of probit/Logit model by education and race

		Regular		Enclave	
		Probit	logit	Probit	logit
Educational Attainment	Seg I	0.108*** <i>0.000</i>	0.113*** <i>0.000</i>	0.078*** <i>0.001</i>	0.079*** <i>0.001</i>
	Seg II	-0.052*** <i>0.000</i>	-0.059*** <i>0.000</i>	-0.002*** <i>0.001</i>	-0.002*** <i>0.001</i>
	Seg III	-0.056*** <i>0.000</i>	-0.054*** <i>0.000</i>	-0.076*** <i>0.001</i>	-0.077*** <i>0.001</i>
Race	Seg I	-0.074*** <i>0.001</i>	-0.073*** <i>0.001</i>	0.026*** <i>0.003</i>	0.026*** <i>0.003</i>
	Seg II	0.036*** <i>0.000</i>	0.038*** <i>0.000</i>	-0.001*** <i>0.000</i>	-0.001*** <i>0.000</i>
	Seg III	0.039*** <i>0.000</i>	0.035*** <i>0.000</i>	-0.025*** <i>0.003</i>	-0.025*** <i>0.003</i>
obs		1,398,119	1,398,119	63,681	63,681

Note: Standard errors are given in italics. A person is a visible minority when the variable "race" equals 1. A person is never married when the variable "marital" equals 1. A person is male when the variable "sex" equals 1.
 *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1% level or lower.

Table A.19: Task Usage Gaps Between Immigrants and Natives

		71-80	81-90	91-00	mean
Seg 1	Ana.	0.017*** <i>0.000</i>	0.018*** <i>0.000</i>	0.025*** <i>0.000</i>	0.020
	Int.	-0.002*** <i>0.000</i>	-0.004*** <i>0.000</i>	-0.005*** <i>0.000</i>	-0.004
	Man.	0.008*** <i>0.000</i>	0.006*** <i>0.000</i>	-0.002*** <i>0.000</i>	0.004
Seg 2	Ana.	-0.001*** <i>0.000</i>	-0.009*** <i>0.000</i>	-0.016*** <i>0.000</i>	0.009
	Int.	-0.010*** <i>0.000</i>	-0.021*** <i>0.000</i>	-0.030*** <i>0.000</i>	-0.020
	Man.	0.002*** <i>0.000</i>	0.003*** <i>0.000</i>	0.002*** <i>0.000</i>	0.002
Seg 3	Ana.	-0.002*** <i>0.000</i>	-0.001*** <i>0.000</i>	0.001*** <i>0.000</i>	-0.001
	Int.	-0.015*** <i>0.001</i>	-0.013*** <i>0.001</i>	-0.006*** <i>0.000</i>	-0.011
	Man.	-0.010*** <i>0.000</i>	-0.012*** <i>0.000</i>	-0.011*** <i>0.000</i>	-0.011

Note: Standard errors are given in italics. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1% level or lower.

Table A.20: Task Usage Gaps Between Immigrants In and Out of Enclave Sector

		71-80	81-90	91-00	mean
Seg 1	Ana.	-0.043*** <i>0.004</i>	-0.034*** <i>0.003</i>	-0.033*** <i>0.002</i>	-0.037
	Int.	-0.019*** <i>0.002</i>	-0.015*** <i>0.002</i>	-0.009*** <i>0.001</i>	-0.014
	Man.	-0.003 <i>0.003</i>	-0.006*** <i>0.002</i>	-0.006*** <i>0.002</i>	-0.005
Seg 2	Ana.	0.003 <i>0.002</i>	0.001 <i>0.001</i>	-0.003*** <i>0.001</i>	0.000
	Int.	-0.030*** <i>0.002</i>	-0.017*** <i>0.002</i>	-0.015*** <i>0.001</i>	-0.021
	Man.	0.013*** <i>0.002</i>	0.009*** <i>0.001</i>	0.006*** <i>0.001</i>	0.009
Seg 3	Ana.	0.001 <i>0.001</i>	0.001 <i>0.001</i>	-0.001 <i>0.001</i>	0.000
	Int.	-0.011*** <i>0.003</i>	-0.008*** <i>0.002</i>	-0.010*** <i>0.002</i>	-0.009
	Man.	-0.005*** <i>0.002</i>	-0.004*** <i>0.002</i>	-0.001 <i>0.001</i>	-0.003

Note: Standard errors are given in italics. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1% level or lower.

Table A.21: Wage Gaps Between Immigrants and Natives

		71-80	81-90	91-00	mean
InW	Seg1	-0.008*** <i>0.003</i>	-0.128*** <i>0.003</i>	-0.291*** <i>0.003</i>	-0.142
	Seg2	0.009*** <i>0.003</i>	-0.101*** <i>0.002</i>	-0.223*** <i>0.002</i>	-0.105
	Seg3	0.096*** <i>0.006</i>	-0.020*** <i>0.005</i>	-0.129*** <i>0.004</i>	-0.018

Note: Standard errors are given in italics. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1% level or lower.

Table A.22: Wage Gaps Between Immigrants In and Out of Enclave Sector

		71-80	81-90	91-00	mean
lnW	Seg1	-0.399***	-0.429***	-0.483***	-0.437
		<i>0.026</i>	<i>0.019</i>	<i>0.013</i>	
	Seg2	-0.311***	-0.301***	-0.306***	-0.306
		<i>0.015</i>	<i>0.010</i>	<i>0.007</i>	
	Seg3	-0.091***	-0.139***	-0.158***	-0.129
		<i>0.031</i>	<i>0.021</i>	<i>0.015</i>	

Note: Standard errors are given in italics. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1% level or lower.

Table A.23: Task Assimilation of Immigrants to Natives by Segments

	Seg 1			Seg 2			Seg 3		
	ANA	INT	MAN	ANA	INT	MAN	ANA	INT	MAN
Immigrant	0.009*** 0.001	-0.004*** 0.001	0.003*** 0.001	-0.011*** 0.004	-0.030*** 0.005	0.014*** 0.001	0.001*** 0.000	-0.005*** 0.001	-0.003*** 0.000
ysi(/10)	-0.002*** 0.000	0.001*** 0.000	-0.001*** 0.000	0.004*** 0.000	0.007*** 0.001	-0.002*** 0.000	0.000 0.000	0.001*** 0.000	0.000 0.000
Obs	1,990,456	1,990,456	1,990,456	1,990,456	1,990,456	1,990,456	1,990,456	1,990,456	1,990,456

Note: Standard errors are given in italics. The dependent variable is analytical, interactive and manual tasks in each job segment. Each regression includes explanatory variables as immigrant status, years since immigration(ysi), educational attainment, the interaction of educational interaction and immigration status, age, age squared, age cubic, dummies of industry, province, and year. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1% level or lower.

Table A.24: Task Assimilation difference Between Immigrants In and Out of Enclave Sector

	Seg 1			Seg 2			Seg 3		
	ANA	INT	MAN	ANA	INT	MAN	ANA	INT	MAN
encl	-0.008*** 0.004	-0.009 0.005	-0.003* 0.001	-0.005 0.003	-0.011*** 0.004	0.005*** 0.001	-0.001* 0.000	-0.002*** 0.000	0.002*** 0.001
ysi(/10)	-0.003*** 0.001	0.001*** 0.000	-0.001*** 0.000	0.004*** 0.001	0.010*** 0.001	-0.003*** 0.000	0.000*** 0.000	0.002*** 0.000	0.001*** 0.000
ysi(/10)*encl	0.002*** 0.001	-0.001 0.000	0.001 0.001	0.005*** 0.001	0.002 0.002	0.003*** 0.000	0.000 0.000	-0.000 0.000	-0.002*** 0.001
Obs	456,793	456,793	456,793	456,793	456,793	456,793	456,793	456,793	456,793

Note: Standard errors are given in italics. The dependent variable is analytical, interactive and manual tasks in each job segment. Each regression includes explanatory variables as enclave sector status, years since immigration(ysi), the interaction of ysi and enclave sector status, educational attainment, the interaction of educational interaction and enclave sector status, age, age squared, age cubic, dummies of industry, province, and year. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1% level or lower.

Table A.25: Wage Assimilation of Immigrants to Natives by Segments

	Seg 1	Seg 2	Seg 3
	I	II	III
Immigrant	-0.339*** <i>0.030</i>	-0.145*** <i>0.009</i>	-0.050* <i>0.024</i>
ysi(/10)	0.086*** <i>0.005</i>	0.060*** <i>0.005</i>	0.052*** <i>0.004</i>
Obs	1,990,456	4,265,137	724,920

Note: Standard errors are given in italics. The dependent variable is log weekly wage of each worker in each job segment. Each regression includes explanatory variables as immigrant status, years since immigration(ysi), educational attainment, the interaction of educational interaction and immigration status, age, age squared, age cubic, dummies of industry, province, and year. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1% level or lower.

Table A.26: Wage Assimilation difference Between Immigrants In and Out of Enclave Sector

	Seg 1	Seg 2	Seg 3
	I	II	III
encl	-0.319*** <i>0.018</i>	-0.044*** <i>0.018</i>	-0.083*** <i>0.016</i>
ysi(/10)	0.089*** <i>0.007</i>	0.066*** <i>0.005</i>	0.050*** <i>0.004</i>
ysi(/10)*encl	0.043*** <i>0.009</i>	-0.025*** <i>0.006</i>	0.010 <i>0.018</i>
Obs	456,793	848,179	156,828

Note: Standard errors are given in italics. The dependent variable is log weekly wage of each worker in each job segment. Each regression includes explanatory variables as enclave sector status, years since immigration(ysi), the interaction of ysi and enclave sector status, educational attainment, the interaction of educational interaction and enclave sector status, age, age squared, age cubic, dummies of industry, province, and year. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1% level or lower.

Table A.27:

Top Ten Occupations in Each Segment by the Largest population in 2010			
Segments	Occupations	Digit Number	Population
Upper Tier	Retail trade managers	0621	62,066
	Financial auditors and accountants	1111	38,106
	Restaurant and food service managers	0631	18,189
	Other financial officers	1114	16,935
	Lawyers and Québec notaries	4112	14,914
	Electrical and electronics engineers	2133	14,542
	Landscape architects	2152	14,154
	Manufacturing managers	0911	13,252
	Construction managers	0711	12,346
	Professional occupations in business services to management	1122	11,895
Lower Tier	Retail salespersons and sales clerks	6421	103,109
	General office clerks	1411	61,295
	Administrative officers	1221	46,292
	Early childhood educators and assistants	4214	32,616
	Secretaries (except legal and medical)	1241	32,500
	Nurse aides, orderlies and patient service associates	3413	30,273
	Accounting and related clerks	1431	26,584
	Receptionists and switchboard operators	1414	26,427
	Material handlers	7452	25,326
	Carpenters	7271	24,842
Secondary	Cashiers	6611	42,701
	Grocery clerks and store shelf stockers	6622	21,994
	Construction trades helpers and labourers	7611	20,193
	Landscaping and grounds maintenance labourers	8612	13,763
	Other labourers in processing, manufacturing and utilities	9619	9,238
	Labourers in food, beverage and tobacco processing	9617	9,085
	Public works and maintenance labourers	7621	5,470
	Other elemental sales occupations	6623	4,401
	Service station attendants	6621	3,284
	Labourers in wood, pulp and paper processing	9614	3,131

Table A.28: Estimates of log weekly wages by immigrant generation status

	1971		2016	
	I	II	V	VI
First Generation	0.013*** <i>0.001</i>	-0.022*** <i>0.001</i>	-0.063*** <i>0.002</i>	-0.115*** <i>0.002</i>
Second Generation	0.028*** <i>0.001</i>	0.011*** <i>0.001</i>	0.027*** <i>0.002</i>	0.009*** <i>0.002</i>
Non-official Language	-0.121*** <i>0.002</i>	-0.020*** <i>0.002</i>	-0.207*** <i>0.002</i>	-0.209*** <i>0.002</i>
Female	-0.532*** <i>0.001</i>	-0.511*** <i>0.001</i>	-0.225*** <i>0.001</i>	-0.211*** <i>0.001</i>
Married	0.065*** <i>0.001</i>	0.076*** <i>0.001</i>	0.126*** <i>0.001</i>	0.103*** <i>0.001</i>
Education Controlled	NO	YES	NO	YES
obs	1,583,380	1,583,380	1,872,670	1,872,670

Note: Standard errors are given in italics. The baseline is the third generation immigrants and more. A person is a female when the variable "female" equals 1. A person is never married when the variable "marital" equals 0. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1% level or lower.

Table A.29: Estimates of task supplies by immigrant generation status

	1971		2016	
	A	A	A	A
First Generation	0.008*** <i>0.000</i>	0.006*** <i>0.000</i>	-0.019*** <i>0.000</i>	-0.014*** <i>0.000</i>
Second Generation	0.003*** <i>0.000</i>	0.003*** <i>0.000</i>	0.004*** <i>0.000</i>	0.003*** <i>0.000</i>
	I	I	I	I
First Generation	-0.024*** <i>0.000</i>	-0.015*** <i>0.000</i>	-0.046*** <i>0.000</i>	-0.033*** <i>0.000</i>
Second Generation	0.011*** <i>0.000</i>	0.010*** <i>0.000</i>	0.010*** <i>0.000</i>	0.006*** <i>0.000</i>
	M	M	M	M
First Generation	0.009*** <i>0.000</i>	0.005*** <i>0.000</i>	0.010*** <i>0.000</i>	0.011*** <i>0.000</i>
Second Generation	-0.001*** <i>0.000</i>	-0.001*** <i>0.000</i>	-0.003*** <i>0.000</i>	-0.002*** <i>0.000</i>
Industry Controlled	NO	YES	NO	YES
obs	1,583,380	1,583,380	1,872,670	1,872,670

Note: Standard errors are given in italics. The baseline is the third generation immigrants and more. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1% level or lower.

Table A.30: Estimates of log weekly wages by immigrant generation status and task

	1971			2016		
	Natives	First Gen.	Second Gen.	Natives	First Gen.	Second Gen.
Analytical	0.409*** <i>0.007</i>	0.434*** <i>0.010</i>	0.446*** <i>0.011</i>	0.642*** <i>0.007</i>	0.742*** <i>0.011</i>	0.671*** <i>0.014</i>
Interactive	0.268*** <i>0.006</i>	0.358*** <i>0.009</i>	0.412*** <i>0.010</i>	0.176*** <i>0.006</i>	0.292*** <i>0.011</i>	0.203*** <i>0.014</i>
Manual	-0.189*** <i>0.007</i>	-0.175*** <i>0.010</i>	-0.245*** <i>0.011</i>	-0.443*** <i>0.007</i>	-0.467*** <i>0.011</i>	-0.522*** <i>0.014</i>
Non-official Language	-0.031*** <i>0.017</i>	-0.044*** <i>0.002</i>	-0.058*** <i>0.009</i>	-0.153*** <i>0.007</i>	-0.167*** <i>0.002</i>	-0.098*** <i>0.006</i>
Female	-0.465*** <i>0.002</i>	-0.530*** <i>0.003</i>	-0.617*** <i>0.003</i>	-0.225*** <i>0.002</i>	-0.185*** <i>0.003</i>	-0.190*** <i>0.003</i>
Married	0.081*** <i>0.001</i>	0.053*** <i>0.002</i>	0.035*** <i>0.003</i>	0.107*** <i>0.001</i>	0.027*** <i>0.003</i>	0.127*** <i>0.003</i>
Ind. Controlled	YES	YES	YES	YES	YES	YES
Education Controlled	YES	YES	YES	YES	YES	YES
obs	874,135	371,145	338,100	1,116,651	436,616	279,936

Note: Standard errors are given in italics. The baseline is the third generation immigrants and more. A person is a female when the variable "female" equals 1. A person is never married when the variable "marital" equals 0. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1% level or lower.

Table A.31: Blinder-Oaxaca Decomposition Results

Panel A: Explain by different tasks (Endowments)				
	1971		2016	
	N vs F	N vs S	N vs F	N vs S
Analytical	0.003*** <i>0.000</i>	0.002*** <i>0.000</i>	0.012*** <i>0.000</i>	0.016*** <i>0.000</i>
Interactive	-0.007*** <i>0.000</i>	0.005*** <i>0.000</i>	0.003*** <i>0.000</i>	0.007*** <i>0.000</i>
Manual	0.001*** <i>0.000</i>	0.002*** <i>0.000</i>	0.005*** <i>0.000</i>	0.006*** <i>0.000</i>
Panel B: Explain by return to tasks (Coefficients)				
	1971		2016	
	N vs F	N vs S	N vs F	N vs S
Analytical	0.009 <i>0.005</i>	0.013*** <i>0.006</i>	0.035*** <i>0.006</i>	0.009 <i>0.007</i>
Interactive	0.037*** <i>0.005</i>	0.062*** <i>0.005</i>	0.049*** <i>0.006</i>	0.013 <i>0.007</i>
Manual	0.007 <i>0.005</i>	-0.020*** <i>0.005</i>	-0.008 <i>0.005</i>	-0.033*** <i>0.005</i>
Panel C: Explain by interactions				
	1971		2016	
	N vs F	N vs S	N vs F	N vs S
Analytical	0.000 <i>0.000</i>	0.000*** <i>0.000</i>	0.001*** <i>0.000</i>	0.001 <i>0.000</i>
Interactive	-0.002*** <i>0.000</i>	0.002*** <i>0.000</i>	0.002*** <i>0.000</i>	0.001 <i>0.001</i>
Manual	0.000 <i>0.000</i>	-0.000*** <i>0.000</i>	0.000 <i>0.000</i>	0.001*** <i>0.000</i>
Difference	0.089*** <i>0.001</i>	0.109*** <i>0.002</i>	-0.022*** <i>0.001</i>	0.093*** <i>0.002</i>

Note: Standard errors are given in italics. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1% level or lower. This table displays the wage mean gap decomposition between the first generation immigrants and the natives as well as those between the second generation immigrants and the natives in 1970 and 2015. The gaps are decomposed as Equation 7 & 8 showed.

Table A.32: Estimates of segmentation by immigrant generation status and probit

	1971		2016	
	I	II	III	IV
First Generation	-0.078*** <i>0.003</i>	-0.099*** <i>0.003</i>	-0.051*** <i>0.002</i>	-0.161*** <i>0.002</i>
Second Generation	0.071*** <i>0.003</i>	0.022*** <i>0.003</i>	0.085*** <i>0.002</i>	0.043*** <i>0.002</i>
LR chi ²	363327.97	550180.20	663441.49	858186.55
Education Controlled	NO	YES	NO	YES
obs	1,573,834	1,573,834	2,440,492	2,440,492

Note: Standard errors are given in italics. The baseline is the third generation immigrants and more. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1% level or lower.

Table A.33: Estimates of segmentation by immigrant generation status and logit

	1971		2016	
	I	II	III	IV
First Generation	-0.122*** <i>0.005</i>	-0.171*** <i>0.005</i>	-0.076*** <i>0.004</i>	-0.275*** <i>0.004</i>
Second Generation	0.124*** <i>0.005</i>	0.042*** <i>0.005</i>	0.144*** <i>0.004</i>	0.072*** <i>0.004</i>
LR chi ²	404614.07	579458.84	666859.73	873238.60
Education Controlled	NO	YES	NO	YES
obs	1,573,834	1,573,834	2,440,492	2,440,492

Note: Standard errors are given in italics. The baseline is the third generation immigrants and more. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1% level or lower.

Table A.34: Predicts of average marginal effects of probit model by immigrant generation status

		1971		2016	
		I	II	III	IV
First Generation	Seg I	-0.019*** <i>0.001</i>	-0.022*** <i>0.001</i>	-0.014*** <i>0.001</i>	-0.043*** <i>0.001</i>
	Seg II	0.008*** <i>0.000</i>	0.009*** <i>0.000</i>	0.006*** <i>0.000</i>	0.018*** <i>0.000</i>
	Seg III	0.011*** <i>0.000</i>	0.013*** <i>0.000</i>	0.008*** <i>0.000</i>	0.025*** <i>0.000</i>
Second Generation	Seg I	0.017*** <i>0.001</i>	0.005*** <i>0.001</i>	0.024*** <i>0.001</i>	0.011*** <i>0.001</i>
	Seg II	-0.007*** <i>0.000</i>	-0.002*** <i>0.000</i>	-0.010*** <i>0.000</i>	-0.005*** <i>0.000</i>
	Seg III	-0.010*** <i>0.000</i>	-0.003*** <i>0.000</i>	-0.014*** <i>0.000</i>	-0.007*** <i>0.000</i>
Edu controlled		NO	YES	NO	YES
obs		1,573,834	1,573,834	2,440,492	2,440,492

Note: Standard errors are given in italics. The baseline is the third generation immigrants and more. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1% level or lower.

Table A.35: Predicts of average marginal effects of logit model by immigrant generation status

		1971		2016	
		I	II	III	IV
First Generation	Seg I	-0.016*** <i>0.001</i>	-0.020*** <i>0.001</i>	-0.012*** <i>0.001</i>	-0.042*** <i>0.001</i>
	Seg II	0.008*** <i>0.000</i>	0.009*** <i>0.000</i>	0.005*** <i>0.000</i>	0.019*** <i>0.000</i>
	Seg III	0.009*** <i>0.000</i>	0.011*** <i>0.000</i>	0.007*** <i>0.000</i>	0.023*** <i>0.000</i>
Second Generation	Seg I	0.016*** <i>0.001</i>	0.005*** <i>0.001</i>	0.023*** <i>0.001</i>	0.011*** <i>0.001</i>
	Seg II	-0.008*** <i>0.000</i>	-0.002*** <i>0.000</i>	-0.010*** <i>0.000</i>	-0.005*** <i>0.000</i>
	Seg III	-0.009*** <i>0.000</i>	-0.003*** <i>0.000</i>	-0.013*** <i>0.000</i>	-0.006*** <i>0.000</i>
Edu controlled		NO	YES	NO	YES
obs		1,573,834	1,573,834	2,440,492	2,440,492

Note: Standard errors are given in italics. The baseline is the third generation immigrants and more. *: Statistically significant at the 10% level or lower. **: Statistically significant at the 5% level or lower. ***: Statistically significant at the 1% level or lower.

Appendix B

Figures

Figure B.1: Equilibrium of the relative task supply and relative task compensation-
Stage 1

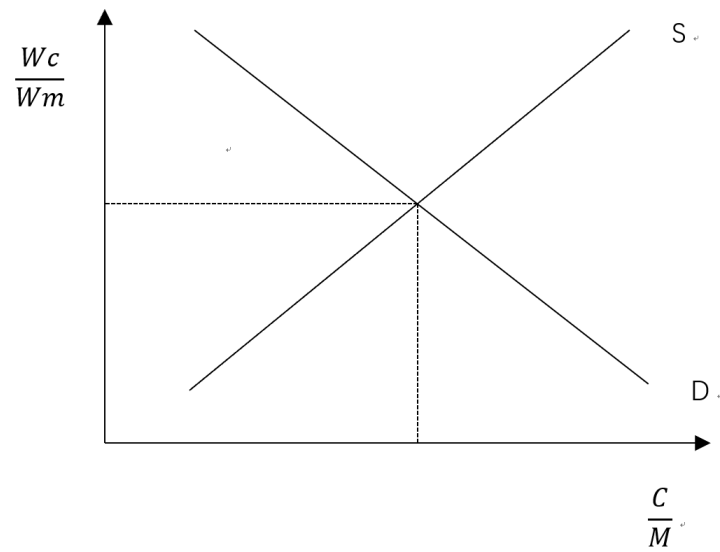


Figure B.2: Equilibrium of the relative task supply and relative task compensation-
Stage 2

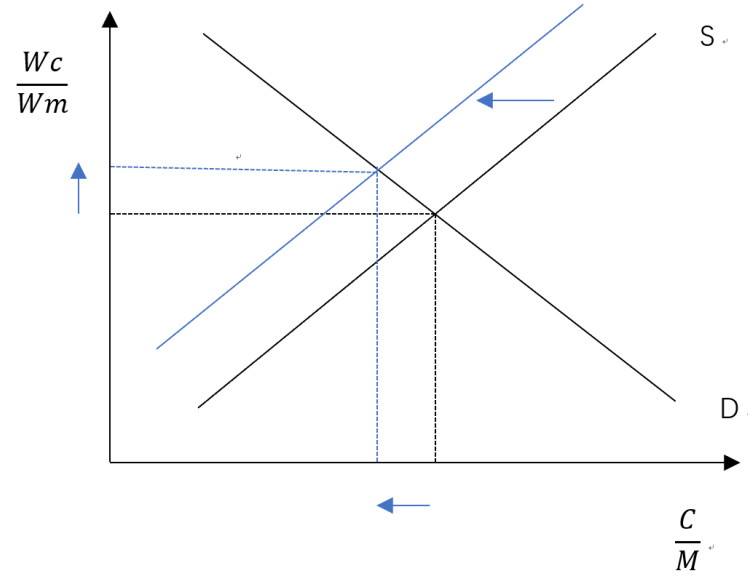


Figure B.3: Equilibrium of the relative task supply and relative task compensation-
Stage 3

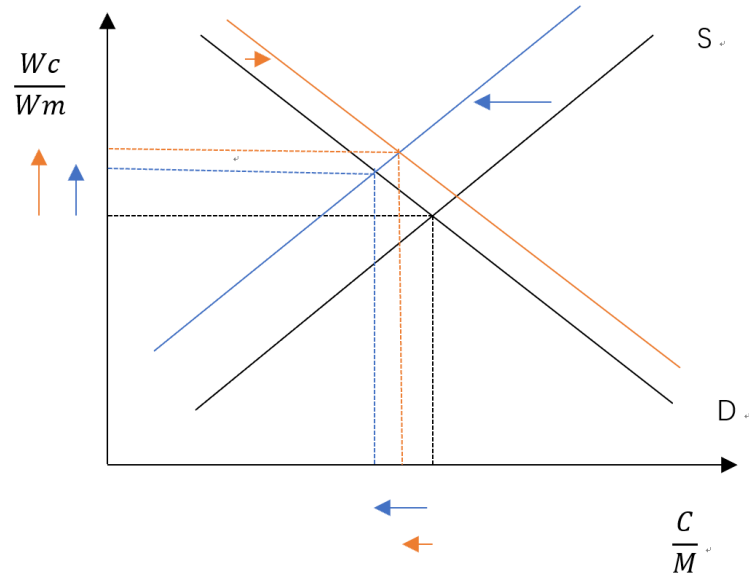


Figure B.4: Equilibrium of the relative task supply and relative task compensation-
Stage 4

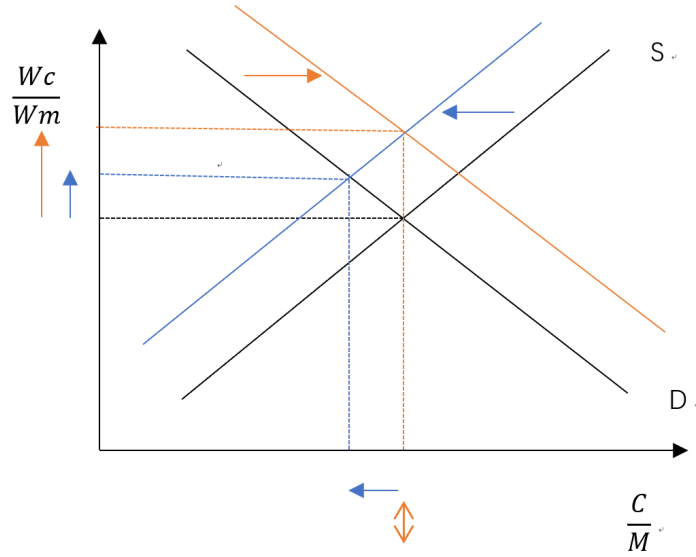


Figure B.5: Equilibrium of the relative task supply and relative task compensation-
Stage 5

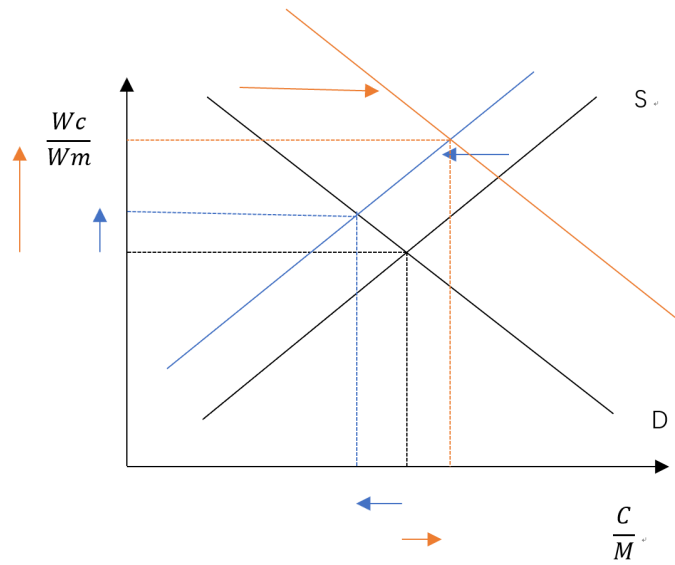


Figure B.6: Communication intensive occupation population share in Canada

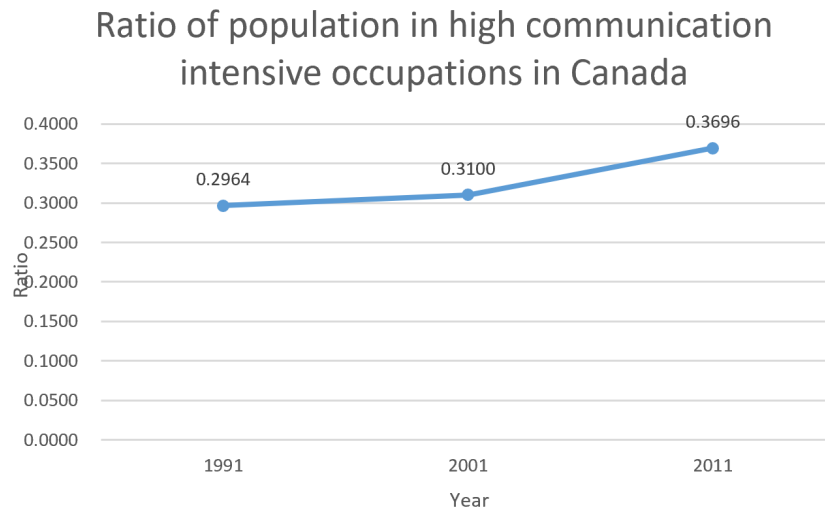


Figure B.7: Communication intensive occupation population share in Canadian cities

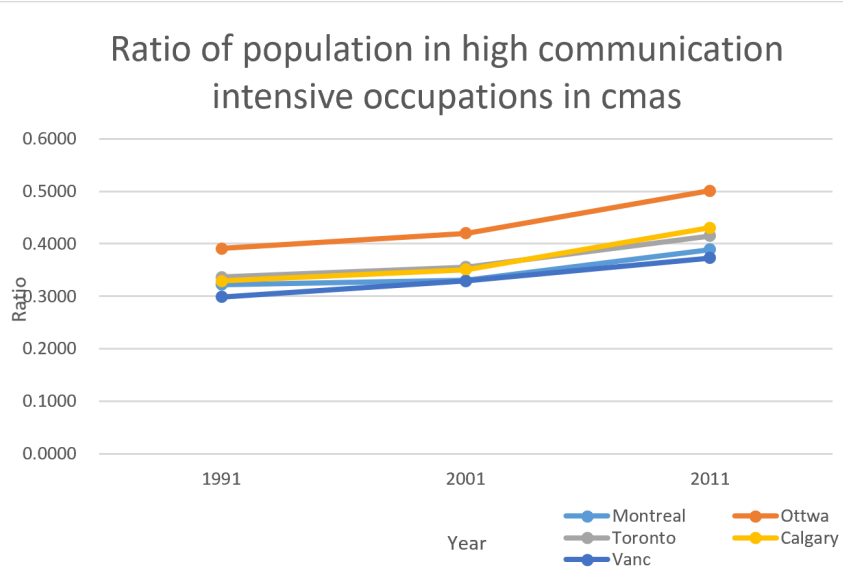


Figure B.8: Immigrant share in two sectors

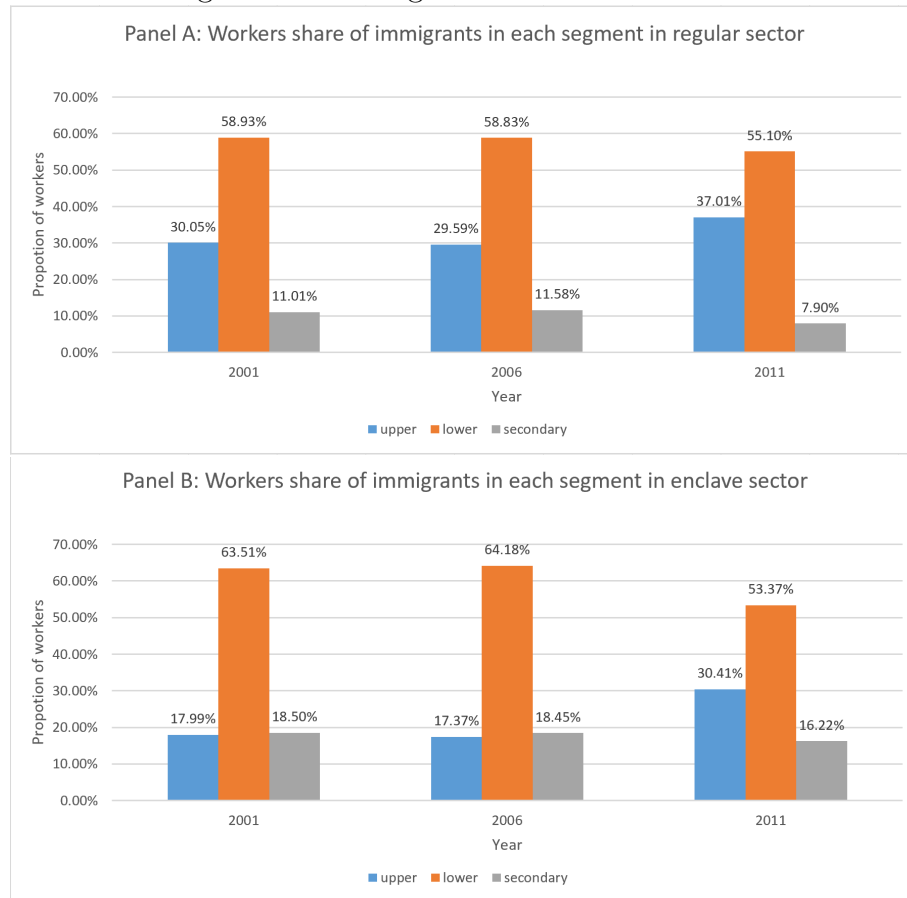
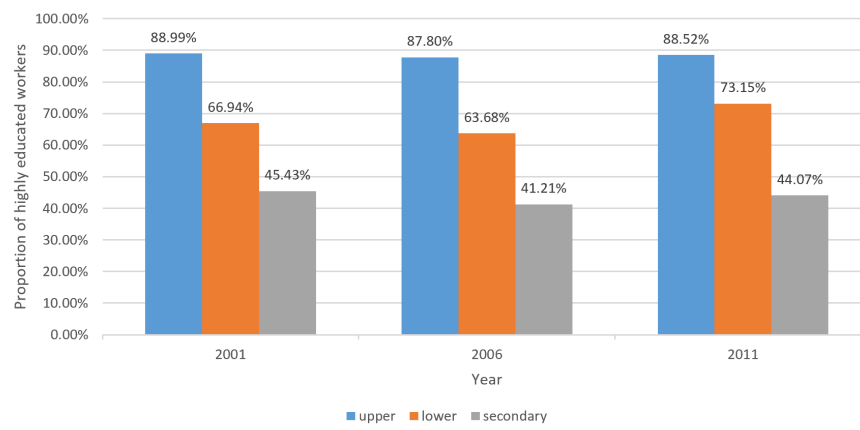


Figure B.9: Highly-educated immigrant share in two sectors

Panel A: Highly educated workers share of immigrants in regular sector



Panel B: Highly educated workers share of immigrants in enclave sector

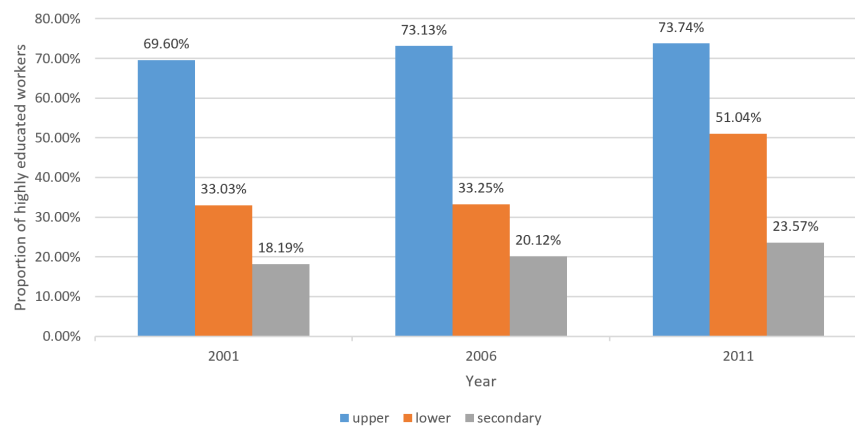
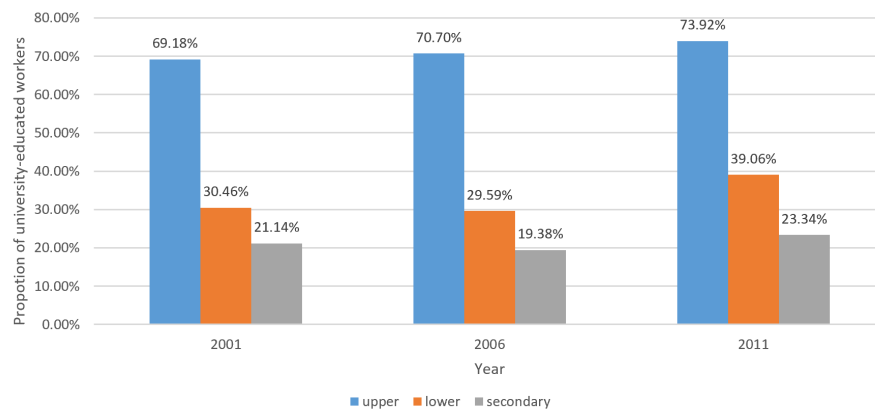


Figure B.10: University-educated immigrant share in two sectors

Panel A: University-educated workers share of immigrants in regular sector



Panel B: University-educated workers share of immigrants in enclave sector

