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August 2007

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The Impact of Immigration on the Labour Market Outcomes of Native-born Canadians

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Abstract:
Although immigration has become a major growth factor for Canadian labour force, there is little economic research on the effect of immigration on native-born Canadians' labour market performance. This paper examines the relationship between changes in the share of immigrants by sub-labour markets (categorized by skill types and geographic areas) and changes in native wage growth by a two-stage regression analysis, using 1991, 1996 and 2001 Canadian Census microdata. After accounting for biases due to native mobility, endogenous location of immigrants and labour demand shifts, the estimated effects of immigration are consistently insignificant or significantly positive. The results are robust over various specifications of sub-labour markets at city, provincial and national levels, suggesting no evidence for a negative impact on native wage growth rate from the large immigrant influx during the 1990s.

Keywords: immigration, labour supply, labour mobility, wage

JEL Classifications: J31, J61

Résumé:
Bien que l'immigration soit devenue un facteur important de la croissance de la population active canadienne, il existe peu d'études examinant l'incidence de cette dernière sur les performances sur le marché du travail des travailleurs nés au Canada. Cet article présente une étude multivariée de la relation entre la variation de la proportion de la population immigrante selon les différents « sous-marchés du travail» (selon les types de compétences et les zones géographiques) et la variation de la croissance des salaires de la main-d'œuvre née au Canada en se basant sur les micro-données du recensement canadien de 2001. Après avoir tenu compte des biais dus à la mobilité des travailleurs nés au Canada, à la localisation endogène des immigrants et aux variations de la demande de main-d'œuvre, nos estimations démontrent de manière consistante que les effets de l'immigration sont négligeables ou significativement positives. Ces résultats sont robustes à diverses spécifications de « sous-marchés du travail » à l'échelle municipale, provinciale et nationale, suggérant qu'il n'existe aucun impact négatif de la grande vague d'immigration des années 90 sur la croissance salariale de la main-d'œuvre née au Canada.

1. Introduction

Canada has been a major host country for immigrants for more than a century. In the 1980s, when the fertility rate was not high enough for population replacement, immigration became a primary factor of population growth and a means of adjusting the age structure of the labour force. A large number of highly educated working-aged immigrants arrived in Canada and started to compete with natives for job opportunities. On one hand, the increased labour supply tends to put downward pressure on wage rates. On the other hand, immigrant consumption also helps to raise the aggregate demand and, in turn, encourages demand for labour inputs. Since immigration is likely to cause both labour supply and demand curves to shift out, its net effect on equilibrium wage is theoretically ambiguous in sign and is thus an empirical question. Substantial research attempts to address this issue using U.S., Australian and European data. However, there is a paucity of Canadian research.

This paper investigates the effect of immigration on native-born Canadians' wages during the 1990s. It uses both a first difference regression and a two-stage regression approach to associate the change in native wages to the change in the share of immigrants in a sub-labour market defined by skill type and area of residence. The estimates of the effect of immigration are statistically insignificant or significantly positive, depending on the specification of sub-labour markets. The results indicate no negative effect of immigration on the growth rate of native wages.

A number of studies addressing the impact of immigration on natives use American data.

Card, for example, in his influential 1990 paper shows that the 1980 Mariel boatlift has no significant adverse effect on the employment opportunities and wages of Miami natives compared to other areas in the U.S. Butcher and Card (1991) extend the study to 24 major American cities and also find little adverse wage effect from immigration during 1970s and 1980s. They explain that the large immigrant inflows raised the cost of living of the immigrant-intensive cities and increase the wages of high-wage workers. Lalonde and Topel (1991) also find little negative effect on wages of natives, including young minority workers.

Borjas, Freeman and Katz (1992, 1996), on the other hand, argue for an analysis of the impact of immigration at the national level and find that immigrants are responsible for the declining wages and job opportunities of native high school dropouts in the U.S. in the 1980s. In an important study, Borjas (2003) develops a new categorization of the labour force by education and work experience. Using data from 1960 to 1990s, his regression results show that immigrants substantially worsened the labour market performance of natives in the same skill group However, the robustness of Borjas's (2003) methods and results are challenged by researchers using data files from other sources or time periods. For example, Bonin's (2005) replication of the method on 1975-97 German register data results in estimates that are highly sensitive to model specifications and sample restrictions. Ottaviano and Peri (2006) also apply Borjas's (2003) method and economic structure on data files from the U.S. Censuses and the American Community Survey and focus their study on the period 1990-2004. Their findings indicate that recent immigrants, being imperfect substitutes for natives with the same educational attainment and work experience, have not worsened native earnings during this period.

Recently, Aydemir and Borjas (2006) applied Borjas's (2003) method to Canadian census data and found that immigration has decreased native wages and labour supply since the 1970s. However, their estimates from regressions using pooled census data from 1971 to 2001 are open to question, as there have been substantial changes in immigration policies and skill composition of immigrants during the three decades (Green and Green 1999). Since the most recent policy change happened in the mid-1980s when arranged employment was no longer a prerequisite for independent applicants for permanent residence in Canada, it is important to explore the impact of the subsequent rapid flux of immigrants. I replicate Aydemir and Borjas's (2006) education-experience categorization on the 1991, 1996 and 2001 Canadian Census Public Use Microdata files to check the robustness of the method over time. Interestingly, my results differ substantially from those of Aydemir and Borjas (2006): my estimates show close-to-zero effects from immigration and they are all statistically insignificant. A series of sensitivity tests support my conclusion, and are consistent with results from my empirical study using a two-stage approach. Therefore, Aydemir and Borjas's (2006) findings are not robust over different time periods.[1]

The remainder of the paper is organized as follows. I develop theoretical models and link them to Borjas (1996) and Addison and Worswick's (2002) spatial approach in the next section. Section 3 discusses the data and tests native geographic mobility. I present my estimation results in Section 4 and perform robustness check. Section 5 concludes.

[1] For the sake of limited space, I do not report my regression results, but they are available upon request.

2. Theoretical Framework

I divide the Canadian labour market by areas and skill types and assume immigrants enter and affect each sub-market independently. A direct method to estimate the impact of immigration is to regress native wages on the immigrant share of a sub-market with control for other socio-economic variables. To account for shifts in labour demand, an additional variable, such as unemployment rate, is also included in the regression. A native's wages function can be expressed by the following equation:

$$(1)\qquad \log W_{it} = \sum_{h=1}^{H} \beta_{1ht}\, X_{hit} + \sum_{j=1}^{J-1} \beta_{2jt}\, SKILL_{ijt} + \sum_{k=1}^{K-1} \beta_{3kt}\, AREA_{ikt} + \gamma_t\, (M/N)_{it} + \lambda_t Y_{it} + u_i + e_{it}$$

where subscript t stands for census year (t = 1991, 1996, 2001). W_{it} is the weekly wages of a native-born Canadian i. X_{hit} is a vector of natives' labour market characteristics, such as age, sex, marital status, visible minority (h = 1, 2, .., H). Assuming there are J skill types in each of the K areas, $SKILL_{ijt}$ is then a vector of J-1 dummies indicating skill groups and $AREA_{ikt}$ are K-1 area dummies. M is the number of immigrants and N the number of natives with skill j living in area k, so the variable $(M/N)_{it}$ measures the ratio of immigrants to natives in the relevant skill-area group for individual i. Y_{it} measures the demand side factors of the individual's sub-labour market, for example, unemployment rate in a city; u_i is the fixed effect which represents unobserved wage determinants; e_{it} is is a random normal error term. Assuming the β's, γ and λ are time-invariant, first-differencing will cancel out the fixed effects and yield the following equation:

$$(2)\qquad \Delta\log W_{it} = \sum_{h=1}^{H} \beta_{1h}\, \Delta X_{iht} + \sum_{j=1}^{J-1} \beta_{2jt}\, \Delta SKILL_{ijt} + \sum_{k=1}^{K-1} \beta_{3kt}\, \Delta AREA_{ikt} + \gamma\, \Delta(M/N)_{it} + \lambda\, \Delta Y_{it} + \varepsilon_{it}$$

where "Δ" represents differences between two censuses, for example, $\Delta\log W_{it} = \log W_{it} - \log W_{i(t-\tau)}$, and the error term $\varepsilon_{it} = e_{it} - e_{i(t-\tau)}$. ($\tau$ is the time difference between two censuses) The coefficient γ measures the net effect of a change in the immigrant share on native's wages. However, it is not possible to apply the above first difference equation on census cross sectional data at the individual level. Therefore, I have to aggregate the data into skill-area groups and use the mean values of the variables to construct pseudo-panel data. Then the wage model with aggregated data becomes:

$$(3) \quad \overline{\log W}_{jkt} = \sum_{h=1}^{H} \beta_{1h}\, \overline{X}_{hjkt} + \sum_{j=1}^{J-1} \beta_{2jt}\, SKILL_{jk} + \sum_{k=1}^{K-1} \beta_{3kt}\, AREA_{jk} + \gamma\, (M/N)_{jkt} + \lambda Y_{jkt} + u_{jk} + e_{jkt}$$

where $\overline{\log W}_{jkt}$ is the mean log weekly wage of skill group j in area k in year t; $\overline{X}_{hjkt}$ is the vector of mean values of X variables in the relative group; by definition, $(M/N)_{jkt}$, Y_{jkt} and u_{jk} are average values. The first difference regression of aggregated data under the assumption of fixed β_1's, γ, λ and u will be as follows:

$$(4) \quad \Delta\overline{\log W}_{jkt} = \sum_{h=1}^{H} \beta_{1h}\, \Delta\overline{X}_{jkht} + \sum_{j=1}^{J-1} \beta'_{2tjt}\, SKILL_{jk} + \sum_{k=1}^{K-1} \beta'_{3kt}\, AREA_{jk} + \gamma\, \Delta(M/N)_{jkt} + \lambda\, \Delta Y_{jkt} + \varepsilon_{\mathbf{jk}}$$

I keep the skill and area dummies, because if skill- and area-specific effects, or β_{2jt} and β_{3kt}, are not time-invariant, and first difference does not cancel them out.

This spatial approach is often criticized for its upward bias due to the endogeneity of the immigrant location decision. Altonji and Card (1991) reason that immigrants might be attracted to cities with a booming economy and relatively high earnings, causing a positive relationship between immigrant density and equilibrium wages. Simple ordinary least square regressions would result in positively biased estimates. To solve this problem, an instrumental variable (IV), related to the immigrant location decision, but uncorrelated with wages, is commonly used.

If I relax the restriction on time invariance of coefficients β_l's, γ and λ, the first difference equation should then include interactions between time indicators and all the right-hand-side variables of equation (3). Empirically, it requires an enough large sample size, or number of sub-markets, to estimate all the coefficients. However, the limited number of labour force groups defined by skill types and areas will either make the fully interacted equation unestimatable, or yield oversized standard errors. This problem can be solved by the method of two-stage regressions developed by Borjas et al. (1996) and Addison and Worswick (2002). In the first stage, native mean log weekly wages are calculated for each census separately after controlling for effects of X_{it} variables. The difference in the adjusted mean wage between two surveys is then used as the dependent variable in the second stage and regressed on the change in immigrant to native ratio. The process can be shown as follows:

Stage 1: Run the following regression at individual level separately on each cross-sectional data set:

$$(5) \qquad \log W_{it} = \sum_{h=1}^{H} \varphi_{1mt} X_{iht} + \sum_{j=1}^{J} \sum_{k=1}^{K} \theta_{ijkt} \, (SKILL_{ijt} \cdot AREA_{ikt}) + v_{it}$$

where $(SKILL_{ijt} \cdot AREA_{ikt})$ are interacted dummies indicating the native worker's skill group j and resident area k, and v_{it} is the residual. Then the average log weekly wage of a skill-area group jk observed in year t is:

$$(6) \qquad \overline{\log W_{jkt}} = \sum_{h=1}^{H} \varphi_{mt} \overline{X}_{jkht} + \theta_{jkt} + v_{jkt}$$

The coefficient estimates $\hat{\theta}_{jkt}$ can be treated as average wages of each skill-area group adjusted for effects from the X_{iht} variables. Substituting (6) into (3), I obtain the following relationship:

$$(7) \qquad \theta_{jkt} = \delta_t\,(M/N)_{jkt} + \eta_t Y_{jkt} + \sum_{j=1}^{J-1} \varphi_{2jt}\,SKILL_{jk} + \sum_{k=1}^{K-1} \varphi_{2kt}\,AREA_{jk} + u_{jk} + v_{jkt}$$

Stage 2: The change in the adjusted average wage, $\Delta\hat{\hat{\theta}}_{jkt} = \hat{\hat{\theta}}_{jkt} - \hat{\hat{\theta}}_{jk(t-\tau)}$, is calculated and used as the dependent variable in a first difference regression, assuming δ and η are time invariant and the skill-area fixed effect u_{jk} is canceled out:

$$(8) \qquad \Delta\hat{\hat{\theta}}_{jk} = \delta\,\Delta\,(M/N)_{jkt} + \eta\,\Delta Y_{jkt} + \sum_{j=1}^{J-1} \varphi'_{2jt}\,SKILL_{jk} + \sum_{k=1}^{K-1} \varphi'_{2kt}\,AREA_{jk} + \upsilon_{jkt}$$

where $\upsilon_{jkt} = v_{jkt} - v_{jk(t-\tau)}$. The skill and area dummy variables are included to allow for changes in their specific effects over time.

3. Data

My data are drawn from the 1991, 1996 and 2001 Canadian Census Public Use Microdata File (PUMF) on individuals (3% sample of the population). I select full time (30 hours or more per week, as defined by Census) and full-year (worked for 50 weeks or more per year) paid workers, aged 16 to 65.

Table 1 compares wages and demographic characteristics of native-born Canadians and immigrants at the national level. Native average log weekly wage slightly increased over the three census periods, whereas immigrants experienced a fall in their mean wages. On average, immigrants are three years older and are more likely to be married than natives. There is a large disparity in the visible minority status: less than 2 percent of natives are non-whites, whereas the share of visible minority rose from 37 percent in 1991 to 51 percent in 2001 for immigrants. This is not surprising as the major source of recent immigrants has been Asia.

Individuals are categorized into four education groups: less than high school education, high school diploma, postsecondary certificate and university degrees. Both native and immigrant educational distributions have significantly changed over the decade. For natives, the shares of lower levels have declined while the proportion of university degree holders has risen by 5 percentage points.[2] On the other hand, immigrants initially have larger proportions than natives at both ends of the educational distribution. But the immigrant share of high school dropouts has fallen by 6 percentage points while that of university education have substantially increased by 7 percentage points. Assuming that immigrants' educational attainments are recognized by Canadian employers, natives at the highest level are most likely to be affected.

Cities of residence clearly show immigrants' preference for large census metropolitan areas (CMA). More than 60 percent of immigrants choose to live in Montreal, Toronto and Vancouver, while the total proportion of natives in these three areas is less than 30 percent. About one third of native-born Canadians live in non-CMAs, but only 10 percent of immigrants do. Therefore, urban natives are more likely to be affected by immigrant inflows. Interestingly, the area distribution of both groups has not significantly varied over the three census years. It seems that there is no direct evidence for native geographic mobility, and that native geographic distribution across these CMAs does not vary over time.

The occupational distributions of natives and immigrants do not reflect immigrants'

[2] Checking the educational composition by age cohorts, I find that almost half of natives aged between 61 and 65 in 1991 Census have less than high school education, while the average share of rest of the natives is only 21 percent. This oldest native group is over 65 five years later and leaves the 1996 Census sample. The native share of high school dropouts declines by 4 percentage points. This indicates an increase in natives' education and skill types.

advantageous position in educational attainment. A large proportion, 22 to 24 percent, of immigrants work in low-paid jobs, such as manual workers, sales and service personnel, whereas the figure for natives is only 18 percent. Therefore, I use occupation as another measure of skill type, in addition to educational attainment, in my empirical analysis.

4. Empirical Specifications and Results

I first categorize skill types by individuals' educational attainments and areas by CMA of residence. Regression results of the first difference equation and the two-stage approach are presented respectively, and they both indicate no evidence for negative impact of immigration on native wage growth rates. The robustness of the results from the two-stage approach is checked by other specifications of skill-area groups.

Before I move on to the discussion of my regression results, it is important to address the issue of native mobility. If natives, in response to competition from immigrants, move to areas with lower immigration, the increase in local labour force from immigration will be offset by such native mobility, and the impact of immigration on wages will be underestimated. I then check for native migration in using Card and DiNardo's (2000) method. The results indicate that natives do not move out of immigration-intensive sub-markets during the 1990s. (The mathematical derivation and empirical results are presented in the Appendix.) Therefore, the bias due to native mobility is not a crucial problem with my data.

4.1 First Difference Regressions with Unadjusted Mean Wages

The first difference regression is specified by equation (4), in which the dependent variable is the change in (unadjusted) mean log weekly wages of natives with educational level j in city k, and the independent variables are the change in immigrant-native ratio, change in unemployment rates and changes in average X_{jk} variables. Since there are four education types in 19 CMAs, the number of skill-area groups is 76 with this specification. With the three censuses, there are three types of intercensal differences: the five-year intervals 1991-1996 and 1996-2001, and the ten-year interval 1991-2001, and I plot the changes in native wages $\Delta\overline{\log W}$ against the changes in immigrant to native ratios $\Delta(M/N)$ for these intervals in Figure 1 and 2, and highlight skill groups in Toronto and Vancouver.

In Figure 1, most of the plots gather around the origin, and regression lines of periods 1991-96 and 1996-2001 are both flat. Although Toronto and Vancouver are outliers, exclusion of these two most immigrant- intensive cities does not significantly change the slopes. Figure 2 shows the decadal differences between 1991 and 2001. The regression line is still nearly horizontal, indicating a low correlation between immigrant inflows and changes in native wages.

The coefficient estimates of $\Delta(M/N)$ from regressions with the three types of differences are reported in Table 2. The first column is the baseline model in which the skill- and area-specific effects are both assumed time invariant and cancelled out in the first difference equation. As illustrated by the diagrams, the estimates are insignificant and close to zero. For example, the 0.044 coefficient indicates 0.44 percent increase in native's wage growth rate, given a 10 percentage-point rise in the change of immigrant share in an education-area group during 1991-2001.[3]

In order to separate out area- and skill-specific effects, I run the regressions including vectors of area dummies, education dummies and both,[4] and present the results in column (2), (3) and (4) of Table 2, respectively. When the CMA-specific effects are controlled, the coefficients of $\Delta(M/N)$ in the second column become lower in value or turn negative, but still insignificant. One explanation for the lower estimates is that economic growth in these cities optimally affects all education groups, and increases native wages. The inclusion of CMA dummies takes away the positive area-effects on wages and lower the estimates of immigrant effect. For the regressions of the 1991-2001 decadal difference, the second column reports the most negative estimate and indicates an adverse impact from immigrant inflow in the long run, that is, a 10 percentage point rise in immigrant share reduces native wage growth rate by 0.65 percent. On the other hand, the inclusion of education dummies alone does not affect the coefficients substantially, as estimates in column (3) of each panel are accordingly similar to the first column. Column (4) reports regression results when both CMA and education effects are controlled. They mostly become closer to zero than the other columns, indicating a negligible effect on native wages.

However, in the case of endogenous immigrant location decisions, OLS regression results are subject to an upward bias. An appropriate instrumental variable should be used to solve for this

[3] I also pool together the two five-year differences and run the same OLS regression including a time dummy variable to identify the intercensal difference in the intercept. The result is again insignificantly positive, but higher in magnitude. (A Chow test of the consistency of coefficients reveals no structural difference between the two periods.)

[4] Joint tests show that the area dummies are insignificant for the two five-year intervals, but significant for the ten-year period. The education indicators are all insignificant over the four difference specifications.

bias problem. It is well documented (Altonji and Card 1991, for example) that new entrants tend to live in areas where there is a large stock of immigrants with the same ethnicity. This is also true for the Canadian census data, from which I find similar geographic distributions of recently arrived and old immigrants. I use the existing immigrant-native ratio as the IV for changes in immigrant share in each sub-labour market, and the regression results are reported in Table 3.[5]

The IV coefficient estimates are bigger in absolute value than OLS results, and are mostly insignificant, for example, the 0.522 estimate of baseline model with 1991-2001 decadal difference implies a 5.2 percent increase in native wage growth rate when there is a 10 percentage point increase in immigrant share. However, such positive relationship between changes in natives' wages and changes in immigrant shares is again primarily driven by area-specific effects, as all the estimates become insignificant when CMA dummies are added. I run Durbin–Wu–Hausman tests for endogeneity of $\Delta(M/N)$ to justify the use of IV. The results show no evidence for endogeneity in the two five-year intervals, but in regressions with the ten-year difference and pooled data (the last two rows) the null hypothesis of no endogeneity is rejected in the baseline model and the model controlling for education (Column 1 and 3). Since the IV estimates are all positive in these cells, there is no evidence of negative impact from immigration by the IV regressions either.

[5] Although the existing share of immigrants in a city may be a good instrument for changes in immigrant share of the corresponding city, such relationship is not strong across skill-area groups. A simple regression of changes in *M/N* ratio against the existing ratio shows a positive relationship between them, but the R squared is lower than 0.30. This weak correlation makes the IV estimates inconsistent under different model specifications. Albeit, I report the IV results for comparison.

4.2 First Difference Regressions with Adjusted Mean Wages: Two-Stage Regressions

In the previous model, I assumed that returns to native human capital characteristics were unchanged between any two censuses. In order to allow for time-varying coefficients on these control variables, I use the two-stage approach specified by equation (8). While the first stage includes an exclusive set of the X variables, only changes in *(M/N)* and dummies indicating skill and area groups are used in the second stage, in order to explain the variation in the adjusted mean wages.

Before reporting the regression results, I plot the dependent variable $\Delta\hat{\theta}$, changes in the adjusted native mean log weekly wage, against changes in immigrant shares for the two five-year differences in Figure 3. The regression line is slightly positive during 1991-1996, but nearly horizontal during 1996-2001. Unlike Figure 1, these two regression lines have substantially different intercepts, indicating that natives experienced faster wage growth (controlling for X) during 1996-2001 than in the previous five years. Additionally, Figure 4 plots the 1991-2001 decadal differences in which the regression line is insignificantly negative.

Table 4 reports coefficient estimates of equation (8). The OLS coefficient estimates of $\Delta(M/N)$ are all insignificant and similar to those in Table 2. Results with the ten-year interval are similar to the sum of the first two panels and are around zero. For example, a 10 percentage point increase in the immigrant to native ratio reduces native wage growth rate by 2 percentage points after controlling for both area and education. The last row reports the regression results by pooling the two five-year differences, and the numbers are even smaller in absolute values.

However, Chow tests show that there are structural changes in native wage growth pattern between the two five-year periods, which weakens the reliability of the estimates presented in the last row.

I again use the existing immigrant-native ratio as instrumental variable to correct for potential endogeneity of the immigrant location decision, and present the coefficient estimates of $\Delta(M/N)$ in Table 5. The baseline models show a significantly positive effect of immigration. During 1991-96, for example, native wage growth rate rises by 8 percentage points when the immigrant ratio increases by 10 percentage points. However, when CMA dummies are added into the regression, they control for area-specific effects and make the estimates less positive and insignificant. Inclusion of education dummies does not affect the results. The low values of the last column indicate insignificant correlation between changes in native wages and changes in immigrant shares. The decadal difference results in the third row are similar to those in the first two rows, and the effect of immigration is smallest in magnitude after controlling for education and area effects. Although the existing immigrant share is not a perfect instrumental variable, the IV estimates imply that the seemingly positive relation between native wage growth rate and changes in immigrant ratios is largely due to area effects. When the area effects are controlled, the estimates become insignificant, indicating that immigration has almost no impact on native wage growth.

4.3 Sensitivity Tests

In this section, I check the robustness of the two-stage regression model by using different definitions of sub-labour markets, and compare OLS and IV estimates in Table 6. The first panel reiterates results with education-CMA groups and is constructed by the first three columns of Table 4 and 5. The following panels present estimates of immigrant effects using occupation-CMA, education-province and education-occupation categorizations. The three sets of columns for each panel present the 1991-96, 1996-2001 and 1991-2001 intercensal intervals.[6]

The low credential value of immigrants' foreign education puts them on a disadvantageous position in finding a job matching their recorded education levels (Sweetman 2003). In this sense, defining skills by educational attainments might not correctly show the real substitution and competition between immigrants and natives, so I alternatively categorize skill types by occupations. One benefit of this alternative comes from the fact that the three censuses have one common occupation variable defined on the 1991 classification basis which includes 14 occupations, defined in terms of the individuals' kind of work and the description of the main activities in their job. Proceeding in this way, I substitute occupation for education in dividing sub-labour markets and run the two-stage regressions. As shown by the second part of Table 6, both OLS and IV results are insignificantly negative or nearly zero with the three types of difference. Durbin–Wu–Hausman tests indicate endogeneity of $\Delta(M/N)$ in baseline models and models with occupation dummies (column 1 and 3) of the 1996-2001 and 1991-2001 periods, where IV estimates are both positive and large in absolute value.

Since Borjas (1996) argues that enlarging geographic boundaries may reduce the probability

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[6] Since almost all the Chow tests reject null hypothesis that there is no change in the slope, I omit regressions using pooled data of both five-year differences.

of native mobility and to lessen the upward bias on the estimates, I then use provinces to define areas and run the two-stage regressions by dividing individuals into education-province groups. As reported in the third part of Table 6, the OLS results are still insignificant or positive. However, the IV results vary in sign. For example, during 1991-96, a 10 percentage point increase in the immigrant-native ratio decreases native wage growth rate by about 13 percent when provincial fixed effects are controlled, but the negative effect is greatly reduced when both education and province dummies are included. The ten-year difference regression results also indicate strong area effects, as inclusion of province dummies turns the estimates negative and on the margin of significance.

Finally, I extend the two-stage regression approach to the national level and substitute education and occupation for *SKILL* and *AREA* terms in equation (8). Now, with no possibility of geographic mobility for natives, the coefficient estimates are expected to be more negative. However, most OLS results in the fourth part of Table 6 are close to zero and insignificant, and the IV estimates are even more positive for the two five-year intervals. Only the IV estimates in the last two columns of the 1991-2001 difference are significantly negative. For example, the coefficient –0.413 means that a 10-percentage point increase in immigrant-native ratio is accompanied by a 4-percentage point drop in native wage growth rate. Still, the overall effects of immigration on native wages, even estimated at the national level, are insignificant or moderately negative.

5. Conclusion

There have been debates on the effect of immigration on the labor markets in the host country. Theoretically, immigrants tend to increase the labour supply, while their consumption of goods and services raises the demand for labour input. A number of empirical studies using different approaches and data sources have obtained conflicting estimates of the net effect of immigration on native earnings. This question is important when policy makers need to know the benefit and cost of immigration policies and their interaction with local economy. However, little literature analyzes this question using Canadian data despite the large immigrant population in Canada.

This paper provides a comprehensive analysis of the impact of immigration on native-born wages during the 1990s using a two-stage regression method. Cross sectional data are aggregated by skill-area groups, and changes in the adjusted mean log weekly wage of natives are regressed on the change in immigrant shares of the corresponding group. All the OLS regressions using data aggregated by education-CMA groups yield small and insignificant coefficient estimates of immigrant effects. Using the ratio of existing immigrants as an instrument to avoid bias from endogenous immigrant location decisions, I obtain even more positive estimates. The results with education-CMA groups indicate that the increasing immigrant inflows are correlated with a slight increase in native wage growth rates.

I apply the two-stage regression approach to a variety of specifications of sub-labour markets, including occupation-CMA, education-province and education-occupation groups, to check robustness of my findings. There is no clear evidence of a negative impact of immigration in either the OLS or IV results with these specifications. Although the regression results of education-occupation groups at national level show significantly negative estimates during 1991-2001, the effects are small in magnitude. In sum, the two-stage regression on 1991-2001 census data indicates that the substantial immigrant inflows after the policy change in late 1980s did not adversely affect native wage growth rates in the following decade.

References

Addison, T. and C. Worswick (2002). “The Impact of Immigration on the Earnings of Natives: Evidence from Australian Micro Data.” *Economic Record*, 78 (1), 68-78.

Altonji, J. and D. Card (1991). “The Effects of Immigration on the Labor Market Outcomes of Less-Skilled Natives.” In *Immigration, Trade, and the Labor Market*, edited by J. M. Abowd and R. B. Freeman. University of Chicago Press.

Aydemir, A. and G. J. Borjas (2006).”A Comparative Analysis of the Labor Market Impact of International Migration: Canada, Mexico, and the United States.” NBER Working Papers 12327, National Bureau of Economic Research, Inc.

Bonin, H. (2005). “Is the Demand Curve Really Downward Sloping?” Working Paper, IZA.

Borjas, G. J. (1991). “Immigrants in the U.S. Labor Market, 1940 – 80.” *American Economic Review*. 81 (2), 287-91.

__________ (2003). “The Labor Demand Curve *Is* Downward Sloping: Reexamining the Impact of Immigration on the Labor Market.” *Quarterly Journal of Economics*, 118, 1335–1374.

__________ (2005). “Foreign-Born Domestic Supply of Science and Engineering Workforce: The Labor-Market Impact of High-Skill Immigration.” *American Economic Review*. 95 (2), 56-60.

Borjas, G. J., R. B. Freeman, and L. F. Katz (1996). “Searching for the Effect of Immigration on the Labor Market.” *American Economic Review,* 86(2), 246-51.

Borjas, G. J., R. B. Freeman, and L. F. Katz (1997). “On the Labor Market Impacts of Immigration and Trade.” in *Immigration and the Work Force: Economic Consequences for the United States and Source Areas*, ed. by G. G. Borjas, and R. B. Freeman, 213–244. Chicago University Press, Chicago.

Butcher, K. F., and D. Card (1991). “Immigration and Wages: Evidence from the 1980s.” *American Economic Review,* 81 (2), 292–96.

Card, D. (1990): “The Impact of the Mariel Boatlift on the Miami Labor Market.” Industrial and Labor Relations Review, 43 (1), 245–257.

_______ (2001). “Immigrant Inflows, Native Outflows, and the Local Labor Market Impacts of Higher Immigration.” *Journal of Labor Economics*, 19, 22-64.

_______ (2005). “Is the New Immigration Really So Bad?” *The Economic Journal,* 115(507), F300–F323

Card, D. and J. DiNardo (2000). “Do Immigrant Inflows Lead to Native Outflows?” *American Economic Review,* 90(2), 360-67.

Durbin, J. (1954) “Errors in Variables.” *Review of the International Statistical Institute*, 22, 23-32.

Friedberg, R. M. and J. Hunt (1995). “The Impact of Immigration on Host Country Wages, Employment, and Growth.” *Journal of Economic Perspectives,* 9, 23-44.

Green, A. G. and D. A. Green (1999).”The Economic Goals of Canada's Immigration Policy, Past and Present.” *Canadian Public Policy*, University of Toronto Press, 25(4), 425-451.

Hausman, J. (1978). “Specification Tests in Econometrics.” *Econometrica*, 46 (6), 1251-1271.

LaLonde, R. J. and R. H. Topel (1991). “Immigrants in the American Labor Market: Quality, Assimilation, and Distributional Effects.” *American Economic Review*, 81(2), 297-302.

Ottaviano, G. I.P. and G. Peri (2006). “Rethinking the Effects of Immigration on Wages” *NBER Working Papers 12497*, National Bureau of Economic Research, Inc.

Shan, J., A. Morris and F. Sun (1999). “Immigration and Unemployment: New Evidence from Australia and New Zealand.” *International Review of Applied Economics*, 13(2) 253-260.

Sweetman, A. (2003). “Immigrant Source Country School Quality and Canadian Labour Market Outcomes.” Queen’s University, School of Policy Studies.

Welch, F. (1979): “Effects of Cohort Size on Earnings: The Baby Boom Babies’ Financial Bust,” *Journal of Political Economy*, 87, S65–S97.

Wu, D. (1973). “Alternative Tests of Independence Between Stochastic Regressors and Disturbances.” *Econometrica*, 41 (4), 733-750.

Figure 1. Native $\Delta \log W$ against $\Delta(M/N)$ over Education-CMA Groups for 1991-1996 and 1996-2001 Intervals

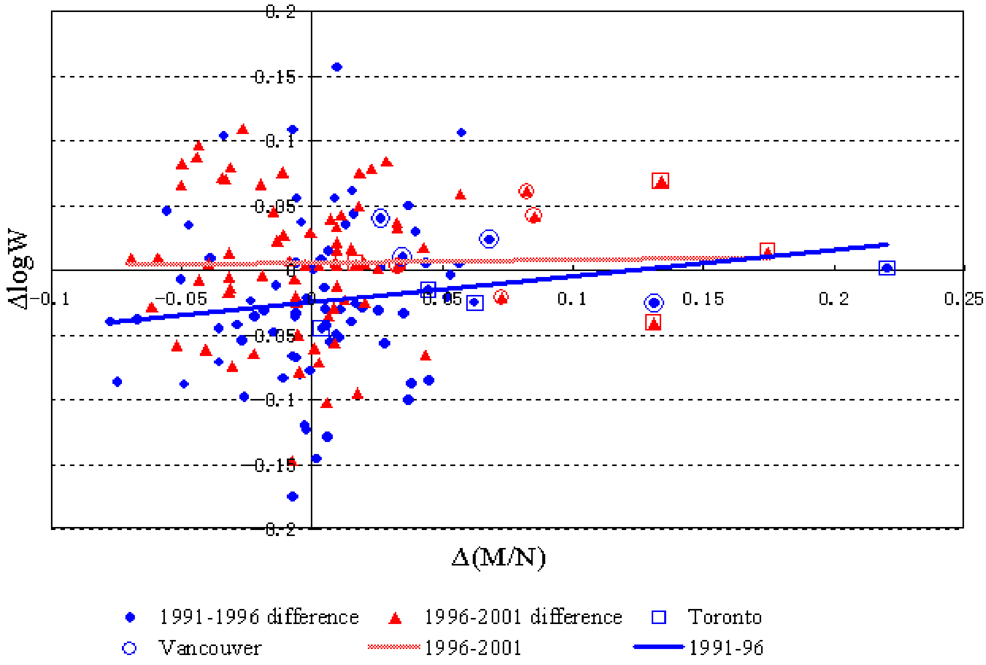

Figure 2. Native $\Delta \log W$ against $\Delta(M/N)$ over Education-CMA Groups for 1991-2001 Interval

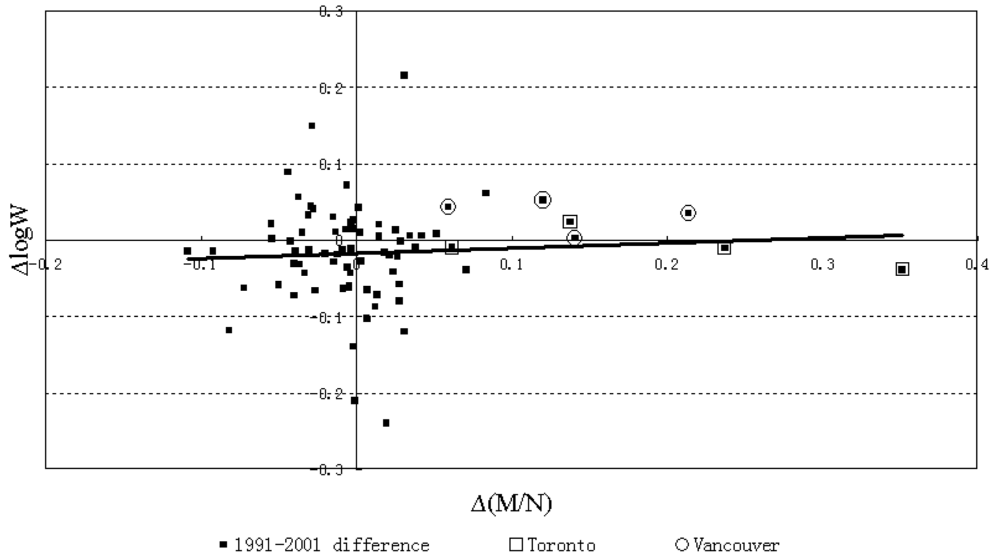

Figure 3. Changes in Adjusted Mean Log Weekly Wages ($\Delta\hat{\theta}$) of Natives against $\Delta(M/N)$ over Education-CMA Groups for 1991-1996 and 1996-2001 Intervals

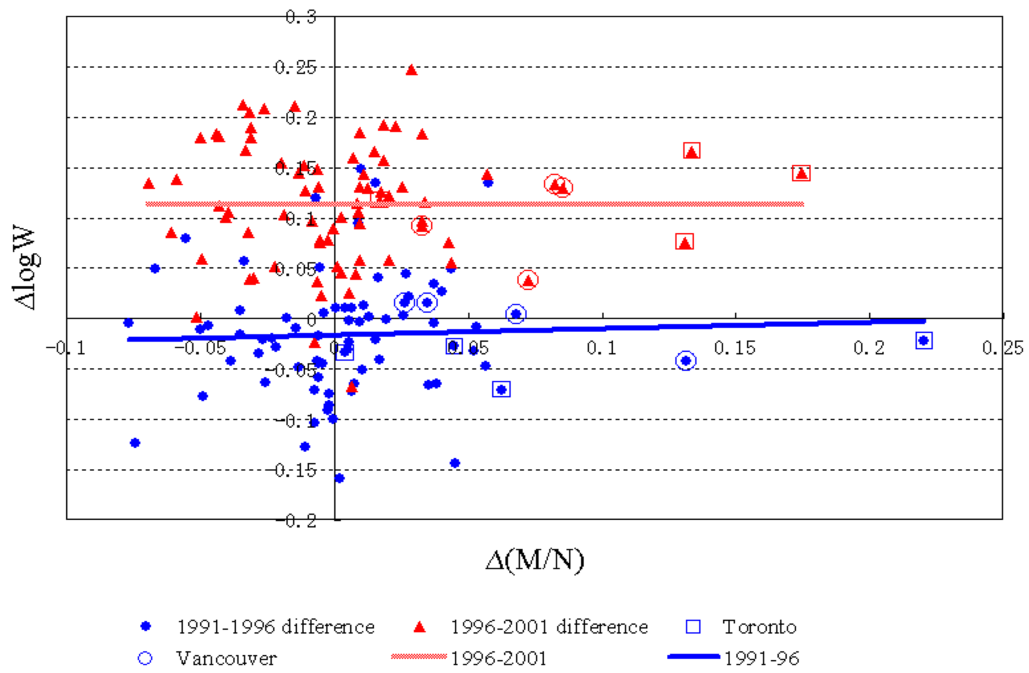

Figure 4. Changes in Adjusted Mean Log Weekly Wages ($\Delta\hat{\theta}$) of Natives against $\Delta(M/N)$ over Education-CMA Groups for 1991 - 2001 Interval

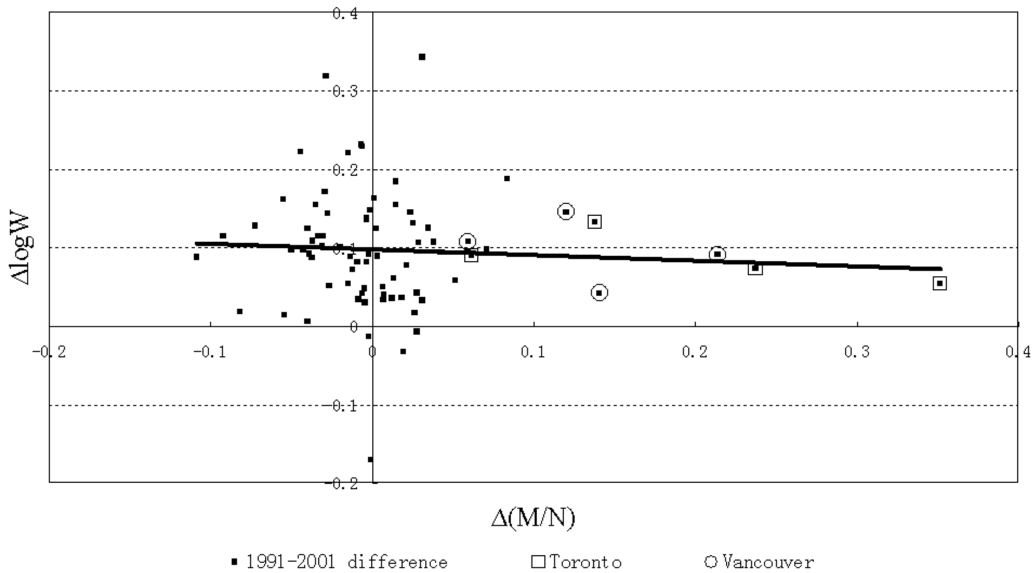

Table 1. Statistical Summary of Natives and Immigrants: 1991, 1996, 2001 Censuses

	1991		1996		2001	
	Natives	Immigrants	Natives	Immigrants	Natives	Immigrants
Log weekly wage	6.352	6.353	6.351	6.305	6.362	6.314
Age (number of years)	37.800	42.218	39.215	42.671	39.796	43.248
Male	0.588	0.594	0.578	0.583	0.568	0.563
Visible minority	0.013	0.372	0.012	0.434	0.018	0.513
Married	0.708	0.774	0.713	0.764	0.686	0.752
No knowledge of official language	-	0.026	-	0.028	-	0.024
CMA						
Montreal	0.125	0.102	0.121	0.101	0.122	0.101
Ottawa	0.046	0.034	0.045	0.037	0.045	0.036
Toronto	0.120	0.401	0.115	0.396	0.114	0.424
Vancouver	0.052	0.101	0.053	0.114	0.051	0.119
Other CMAs	0.276	0.230	0.278	0.225	0.284	0.218
non-CMA	0.381	0.132	0.388	0.127	0.384	0.102
Educational Attainment						
Less than high school	0.242	0.266	0.196	0.221	0.178	0.197
High school diploma	0.327	0.268	0.308	0.251	0.301	0.250
Certificate	0.266	0.257	0.301	0.280	0.318	0.276
University	0.164	0.209	0.196	0.248	0.203	0.277
Occupations						
Senior managers	0.012	0.012	0.012	0.012	0.017	0.015
Middle managers	0.113	0.108	0.104	0.092	0.116	0.108
Professionals	0.155	0.163	0.172	0.182	0.176	0.192
Semi-professionals and technicians	0.063	0.058	0.061	0.056	0.077	0.072
Supervisors	0.020	0.018	0.020	0.017	0.018	0.016
Supervisors of crafts and trades	0.028	0.025	0.027	0.025	0.027	0.021
Administrative and senior clerk	0.078	0.059	0.070	0.054	0.065	0.052
Skilled sales and service personnel	0.049	0.053	0.050	0.052	0.043	0.044
Skilled crafts and trades workers	0.082	0.086	0.078	0.075	0.088	0.083
Clerical personnel	0.126	0.109	0.129	0.114	0.109	0.100
Intermediate sales & service	0.091	0.076	0.092	0.083	0.085	0.075
Semi-skilled manual workers	0.104	0.126	0.105	0.134	0.104	0.131
Other sales and service personnel	0.052	0.067	0.053	0.073	0.048	0.058
Other manual workers	0.027	0.039	0.025	0.031	0.026	0.033

Table 2. OLS Coefficient Estimates of Δ(M/N), First Difference Regressions over Education-CMA Sub-Markets

Control Variables	(1) No Control	(2) Area Only	(3) Education Only	(4) Area and Education
Census 1991-1996	0.170	-0.042	0.206	0.036
	(0.178)	*(0.230)*	*(0.190)*	*(0.275)*
Census 1996 - 2001	-0.024	-0.001	-0.074	-0.061
	(0.203)	*(0.280)*	*(0.212)*	*(0.301)*
Census 1991 - 2001	0.044	-0.065	-0.003	-0.035
	(0.149)	*(0.208)*	*(0.148)*	*(0.185)*
Census 1991-1996 and	0.119	-0.030	0.123	-0.042
1996-2002 pooled	*(0.118)*	*(0.146)*	*(0.120)*	*(0.153)*

Notes:
Model specification is equation (4).
Standard errors are in parentheses.
The coefficient estimates of other variables are omitted but available upon request.

Table 3. IV Coefficient Estimates of Δ(M/N), First Difference Regressions over Education-CMA Sub-Markets

	(1) No control	(2) Area	(3) Education	(4) Area + Education
Census 1991-1996	0.522	0.622	0.463	0.569
	(0.380)	*(0.810)*	*(0.374)*	*(0.926)*
Census 1996 - 2001	0.162	-0.537	0.158	-0.816
	(0.481)	*(1.322)*	*(0.447)*	*(1.429)*
Census 1991 - 2001	0.730	0.737	0.780	1.256
	(0.372)#	*(1.031)*	*(0.411)*#	*(1.522)*
Census 1991-1996 and	0.832	0.510	0.826	0.762
1996-2002 pooled	*(0.298)**#	*(1.486)*	*(0.303)**#	*(4.173)*

Notes:
Model specification is equation (4).
Standard errors are in parentheses.
The coefficient estimates of other variables are omitted but available upon request.
** means Significant at 5% level.*
 # means Durbin–Wu–Hausman statistic significant at .05 level, indicating endogeneity of Δ(M/N) and justifying the use of IV.

Table 4 OLS Estimates of Two-Stage Regressions over Education-CMA Sub-Markets

	(1) No control	(2) Area	(3) Education	(4) Area + Education
Census 1991-1996	0.207	0.007	0.293	0.129
	(0.160)	*(0.191)*	*(0.166)*	*(0.204)*
Census 1996 - 2001	-0.075	-0.182	-0.119	-0.327
	(0.143)	*(0.197)*	*(0.150)*	*(0.218)*
Census 1991 - 2001	0.098	-0.158	0.099	-0.199
	(0.124)	*(0.183)*	*(0.125)*	*(0.187)*
1991-1996 and	0.071	-0.046	0.071	-0.053
1996-2002 pooled	*(0.106)*	*(0.137)*	*(0.107)*	*(0.139)*

Notes:
Model specification is equation (8).
Standard errors are in parentheses.
The coefficient estimates of other variables are omitted but available upon request.

Table 5. IV Estimates of Two-Stage Regressions over Education-CMA Sub-Markets

	(1) No control	(2) Area	(3) Education	(4) Area + Education
Census 1991-1996	0.804	0.304	0.798	0.100
	(0.343)#*	*(0.679)*	*(0.335)**	*(0.700)*
Census 1996 - 2001	0.541	0.190	0.543	0.264
	(0.339)#*	*(1.479)*	*(0.348)#*	*(0.943)*
Census 1991 - 2001	0.707	0.555	0.700	0.061
	(0.232)#*	*(0.993)*	*(0.233)*#*	*(1.759)*
1991-1996 and	0.660	0.144	0.667	1.830
1996-2002 pooled	*(0.236)**	*(2.275)*	*(0.241)**	*(11.967)*

Notes:
Model specification is equation (8).
Standard errors are in parentheses.
The coefficient estimates of other variables are omitted but available upon request.
** means Significant at 5% level.*
 # means Durbin–Wu–Hausman statistic significant at .05 level, indicating endogeneity of $\Delta(M/N)$ and justifying the use of IV.

Table 6. Comparison of Two Stage Regression Results by Sub-Labour Market Specifications

	(a) Census 1991 - 1996				(b) Census 1996 - 2001				(c) Census 1991 - 2001			
Sub-Markets	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
1. Education-CMA	No control	Area	Education	Area & Education	No control	Area	Education	Area & Education	No control	Area	Education	Area & Education
OLS	0.207	0.007	0.293	0.129	-0.075	-0.182	-0.119	-0.327	0.098	-0.158	0.099	-0.199
	(0.160)	*(0.191)*	*(0.166)*	*(0.204)*	*(0.143)*	*(0.197)*	*(0.150)*	*(0.218)*	*(0.124)*	*(0.183)*	*(0.125)*	*(0.187)*
IV	0.804	0.304	0.798	0.100	0.541	0.190	0.543	0.264	0.707	0.555	0.700	0.066
	(0.343)#*	*(0.679)*	*(0.335)**	*(0.700)*	*(0.339)*#*	*(1.479)*	*(0.348)#*	*(0.943)*	*(0.232)*#*	*(0.993)*	*(0.233)*#*	*(1.759)*
2. Occupation-CMA	No Control	Area	Occupation	Area & Occupation	No Control	Area	Occupation	Area & Occupation	No Control	Area	Occupation	Area & Occupation
OLS	-0.016	-0.066	-0.016	-0.074	-0.132	-0.134	-0.166	-0.175	0.025	-0.021	0.014	-0.046
	(0.072)	*(0.073)*	*(0.077)*	*(0.078)*	*(0.085)*	*(0.091)*	*(0.085)*	*(0.091)*	*(0.069)*	*(0.078)*	*(0.072)*	*(0.082)*
IV	-1.428	0.464	-2.619	0.211	3.449	-0.354	1.996	-0.576	1.872	0.224	1.726	-0.052
	(4.337)	*(0.314)*	*-5.879*	*(0.245)*	*(4.214)#*	*(0.308)*	*(1.488)#*	*(0.365)*	*(1.217)#*	*(0.292)*	*(0.855)*#*	*(0.310)*
3. Education-Province	No Control	Area	Education	Area & Education	No Control	Area	Education	Area & Education	No Control	Area	Education	Area & Education
OLS	-0.068	-0.417	0.196	-0.159	0.22	-0.031	0.186	-0.162	0.489	-0.492	0.633	-0.301
	(0.301)	*(0.235)*	*(0.317)*	*(0.243)*	*(0.294)*	*(0.249)*	*(0.333)*	*(0.284)*	*(0.269)*	*(0.267)*	*(0.252)**	*(0.211)*
IV	24.778	-1.332	6.146	-0.71	0.954	-17.497	0.773	-0.361	3.683	-3.712	2.662	-1.164
	(84.611)#	*(0.558)*#*	*(5.801) #*	*(0.648)*	*(1.063)*	*(132.229)*	*(1.259)*	*(0.768)*	*(1.773)*#*	*(1.937)*	*(1.091)*#*	*(0.613)*
4. Education-Occupation	No Control	Occupation	Education	Occupation& Education	No Control	Occupation	Education	Occupation & Education	No Control	Occupation	Education	Occupation & Education
OLS	0.016	0.165	0.009	0.159	0.094	0.133	0.015	0.036	0.005	0.025	-0.150	-0.176
	(0.247)	*(0.258)*	*(0.254)*	*(0.267)*	*(0.072)*	*(0.075)*	*(0.079)*	*(0.085)*	*(0.083)*	*(0.081)*	*(0.085)*	*(0.077)**
IV	30.603	10.444	15.624	7.969	0.221	0.267	0.087	0.117	-0.024	0.125	-0.413	-0.324
	(185.522)#	*(32.829)#*	*(30.270)#*	*(8.784)#*	*(0.107)**	*(0.104)**	*(0.135)*	*(0.134)*	*(0.112)*	*(0.108)*	*(0.142)*#*	*(0.125)**

Notes:

Model specification is equation (8). Standard errors are in parentheses.

** means Significant at 5% level.*

 # means Durbin–Wu–Hausman statistic significant at .05 level, indicating endogeneity of $\Delta(M/N)$ and justifying the use of IV.

Appendix 1. Test for Native Mobility

Table 1 of this paper shows that there is almost no change in native geographic distribution over the decade, however, little is shown about shifts in skill distribution of natives across cities. When native geographic migration is not affected by immigration, immigrant inflows into a particular skill group increase the labour supply of this group; otherwise, if native out-migration offsets the increase in supply, there will be a smaller change on the equilibrium wages. I use the empirical methodology derived by Card and DiNardo (2000) to test for the presence of native migration across skill-area groups.

Define P = total population of a sub-labour market, and it is the sum of immigrants and natives, that is $P = M + N$. Let j define a skill group and k an area, the following equation holds:

(9) $P_{jk} / P_k = (M_{jk} + N_{jk}) / (M_k + N_k)$

The logarithm form of equation (9) is as follows:

(10) $\ln (P_{jk} / P_k) = \ln (M_{jk} + N_{jk}) - \ln (M_k + N_k)$

The percentage change in the share of total population in a skill group j in area k is then approximately:[7]

(11) $\Delta\ln (P_{jk} / P_k) = (\Delta M_{jk} + \Delta N_{jk}) / (M_{jk} + N_{jk}) - (\Delta M_k + \Delta N_k) / (M_k + N_k)$

$\Delta\ln (P_{jk} / P_k) = (\Delta M_{jk} + \Delta N_{jk}) / P_{jk} - (\Delta M_k + \Delta N_k) / P_k$

$\Delta\ln (P_{jk} / P_k) = (\Delta M_{jk} / P_{jk} + \Delta N_{jk} / P_{jk}) - (\Delta M_k / P_k + \Delta N_k / P_k)$

Re-write the above equation into the sum of relative growth rate of immigrants and of natives:

[7] Similar to equation (1) and (2) of Card and DiNardo (2000).

$$(12) \quad \Delta\ln (P_{jk} / P_k) = (\Delta M_{jk} / P_{jk} - \Delta M_k / P_k) - (\Delta N_{jk} / P_{jk} - \Delta N_k / P_k)$$

Assuming native's reaction linearly depends on immigrant inflow:

$$(\Delta N_{jk} / P_{jk} - \Delta N_k / P_k) = a + b\, (\Delta M_{jk} / P_{jk} - \Delta M_k / P_k) + \xi_{jk}$$

Substitute it into equation (12):

$$(13) \quad \Delta\ln (P_{jk} / P_k) = a + (1 + b)(\Delta M_{jk} / P_{jk} - \Delta M_k / P_k) + \xi_{jk}$$

Then the regression estimate of (1+b) shows the relation between immigrant inflow and relative labour supply of skill j across areas. When this coefficient is close to zero, that is, b close to –1, native mobility offsets the immigration-induced impact on labour supply. However, when the coefficient estimate is 1, or b = 0, native mobility across areas is not correlated with immigrant inflows and immigration increases the relative supply of labour.

In accordance with my skill-area approaches, I run the regression of equation (13) on the four specifications of sub-markets: education-CMA, occupation-CMA, education-province and education-occupation, and report the estimates of (1+b) in Table A.1. In this table, each cell stands for a separate regression of a time interval. All the estimates of (1+b) are significantly different from zero, which implies that natives have not deviated from immigrant-intensive skill groups to offset immigrants' impact on labour supply. I also test the restriction on (1+b) = 1, and find most coefficient estimates are significantly greater than 1, except for those in the 1991-2001 five-year interval. Such results indicate that natives do not move out of a skill-area group in response to immigrant inflow during the 1990s, and that native migration is even positively correlated with changes in immigrant share of a particular group during 1991-96.

Table A.1. Estimates of (1+*b*) in Equation (13) with

Various Specifications of Skill-Area Groups

	(1)	(2)	(3)	(4)
Sub-Labour Markets	1991-96	1996-2001	1991-2001	Pooled 1991-96 and 1996-2001
Education-CMA	3.506	1.532	2.763	2.778
	(0.343)	*(0.301)*#	*(0.283)*	*(0.175)*
Occupation-CMA	1.517	2.066	2.216	1.953
	(0.142)	*(0.161)*	*(0.181)*	*(0.094)*
Education-Province	2.759	1.119	2.674	2.445
	(0.880)	*(0.416)*#	*(0.591)*	*(0.371)*
Education-Occupation	2.588	0.741	1.445	1.504
	(0.214)	*(0.106)*#	*(0.159)*	*(0.102)*

Standard errors in parentheses, all coefficients are significantly different from zero.

 # Estimates are not different from 1 at 5% significance level (or b = 0); otherwise, significantly greater than 1 (or b>0).

Appendix 2. Replication of Borjas' s (2003) Method on 1991-2001 Canadian Censuses

Aydemir and Borjas (2006) extend Borjas's (2003) method on Canadian 1970-2001 census data and find negative impacts of immigrant inflow on native-born Canadians' labour market outcomes. However, due to the substantial policy changes within the thirty years, it is possible that the immigration has a different effect on natives during the 1990s. I therefore replicate Borjas's education-experience categorization on the 1991-2001 Canadian Census data[8] to check the robustness of his method over time periods.

In this model, native males are grouped in terms of educational attainment and years of work experience. The five education groups are: high school dropouts, workers with a high school or a vocational degree, high school and vocational degree or a post-secondary certificate or diploma below the bachelor's degree, bachelor degree holders, and those with post-graduate degrees. Potential work experience is calculated by *AGE – YEARS OF EDUCATION* – 6, and workers are grouped into 8 five-year intervals (1-5, 6-10, … 35-40). Define the share of immigrants by:

$$p_{jxt} = M_{jxt} / (M_{jxt} + N_{jxt})$$

where M_{jxt} is the number of immigrants and N_{jxt} the number of natives in a group with educational attainment j and experience x observed in census year t. Native wages is then regressed on the immigrant share as follows:

$$\text{(14)} \quad \log W_{jxt} = c_1\, p_{jxt} + c_2\, SKILL_{jt} + c_3\, EXP_{xt} + c_4\, T_t + c_5\, (SKILL_{jt} \times EXP_{xt}) + c_6\, (SKILL_{jt} \times T_t) + c_7\, (EXP_{xt} \times T_t) + \xi_{jxt}$$

where log$W$ is the mean log earnings (annual or weekly) for native men. *SKILL* is a vector of education dummies; *EXP* a vector of experience groups; and *T* a vector of fixed effects

[8] Aydemir and Borjas (2006) use the 20 percent internal using Canadian Census microdata files maintained by Statistics Canada, while I only have access to the 3 percent Public Use microdata files.

indicating the census year. The linear fixed effects control for differences in labor market outcomes across schooling groups, experience groups, and over time.

In order to be consistent to Aydemir and Borjas, "All regressions are weighted by the number of observations used to calculate the dependent variable. The standard errors are clustered by education-experience groups to adjust for possible serial correlation."[9]

I run the regressions for males and females separately. In the following tables, the first row is for baseline model, and the second is restricted to full-time (more than 30 hours a week) and full-year (over 50 weeks a year) workers. In the last row, the dependent variable is still men's mean log earnings, but women are included in computing the share of immigrants p_{jxt}. Table (A.2.a) reports my estimates of θ, and Table (A.2.b) are excepts from Aydemir and Borjas's (2006) study in which seven censuses from 1970 to 2001 are used.

Table A.2.a Impact of immigration on native earnings

	A. Both genders		B. Male		C. Females	
	(1)	(2)	(3)	(4)	(5)	(6)
Earnings	Annual	Weekly	Annual	Weekly	Annual	Weekly
Baseline	0.401	0.245	0.338	0.210	0.268	0.203
	(0.413)	(0.317)	(0.415)	(0.285)	(0.434)	(0.331)
Full-time Full-year	-0.039	-0.040	-0.044	-0.043	0.067	0.067
	(0.294)	(0.292)	(0.250)	(0.249)	(0.278)	(0.277)
Includes women in measure of supply shock			0.248	0.081		
			(0.456)	(0.369)		

Table A.2.b Aydemir and Borjas's (2006) Estimates

[9] Aydemir and Borjas (2006) Page 17.

	A. Both genders		B. Male	
	(1)	(2)	(3)	(4)
Earnings	Annual	Weekly	Annual	Weekly
Baseline	-0.679	-0.510	-0.617	-0.507
	(0.195)*	(0.149)*	(0.246)*	(0.202)*
Full-time Full-year	-	-	-0.518	-0.398
	-	-	(0.222)*	(0.173)*
Includes women in measure of supply shock			-0.766	-0.642
			(0.229)*	(0.191)*

Interestingly, I have totally different results from Aydemir and Borjas (2006): all their estimates are significantly negative but mine are closer to zero and all insignificant. My baseline models yield positive results for all gender groups, and the coefficients from regressions with annual earnings as dependent variable are greater than those using weekly earnings. It seems that immigrant inflows not only increase natives' earnings, but encourage their labour supply as well. But Aydemir and Borjas have negative estimates of θ, and the more negative coefficients in the first column of panel A and B implies that natives' labour supply is also reduced by the adverse impact from immigration.

When I restrict my samples to full-time full-year workers, the estimates in the second row turn negative or less positive but still insignificant. The negative coefficients suggest that natives who work full year full time are less likely to benefit from immigration. However, the corresponding cells in Table 2 report significant negative estimates again, and are large in magnitude than my results.

In the last row, I include females in the measure of supply shock, but keep using men's earnings to calculate the dependent variable. Now my estimates are again insignificantly positive, but slightly lower than those in the first row. This indicates that competition from women does not alter the immigration effect on males too much. Likewise, Aydemir and Borjas's estimates are also close to their baseline models.

In summary, my results are different from Aydemir and Borjas's (2006) in that none of them shows a negative effect from immigrant inflows on native wages. A series of sensitivity tests similar to theirs also support my conclusion, and are consistent with results from my previous results using a spatial approach. Therefore, it is not likely that their education-experience approach is robust in estimating immigration impact over a long period of time.

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