

**A distributional analysis of the wage gap between Immigrants and
Canadian-born workers.**

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Abstract

The findings of this paper reveal a distributional analysis of the wage gap between immigrant and Canadian-born workers, considering socioeconomic characteristics. Wage discrimination has been a topic of interest for decades. In labour economics, marginal productivity determines the wage as a function of labour human capital. This study analyses the wage differences between immigrant and Canadian-born workers in labour market outcomes in order to find the measure of hidden discrimination against immigrants. Using the combined data from the Labour Force Survey (LFS) of the six months' gap (April 2018 - October 2018), this paper analyses the wage gap among immigrant and Canadian-born workers in the 25-64-year old age group.

After applying a standard Oaxaca-Blinder technique and the counterfactual decomposition with distribution regression, the main result reveals the impact on the wage differentials encompassing educational attainment, age, geographical location, marital status and province of residence. A conditional distribution regression with counterfactual distribution is used to measure the percentile impact of immigrants and Canadian-born workers' wage impact on wage distribution. The results demonstrate that an immigrant earns less than a Canadian-born worker among all age groups and all-educational levels within the 25-64 age group. The wage gap is larger for Canadian-born workers in provinces, cities and industries and occupational groups. Finally, the result compares an Oaxaca decomposition with counterfactual distribution with distribution regression. The findings highlight that earning differentials favour the Canadian-born workers leave immigrants at a disadvantaged. In Oaxaca, education is a positive that is encouraged for immigrants, whereas for Canadian-born workers it is a negative. Conversely, differentials increase until reaching the higher income distribution before declining. Hence, a low level of discrimination occurs in the higher-income groups. This result suggests that if the differential is reduced then labour market productivity could be increased as well as overall worker motivation.

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1. Introduction

Geographically, Canada is the second largest country in the world geographically next to Russia, with most of its population being sparsely distributed along its border with the United States. Over the past few decades, a significant decline in Canada's birth rate has caused a shortage within its labour force. As a result, the Canadian government has relied on immigrants as a major driver of economic growth, while immigrants typically assume Canada to be a major receiving country in the world with a high standard of living and good working conditions. For instance, Canada has transformed into a manufacturing and highly-industrialized G-7 country, in which 75% of the people work in the service industry. This paper attempts to estimate the determinants of the wage gap between immigrants and Canadian-born workers empirically, using the Labour Force Survey (LFS) Public use microdata obtained for the months of April and October 2018. It is well established that a wage difference exists between foreign-born and Canadian-born workers. The LFS is a class-of worker variable that provides more reliable data information than the Canadian National Census on whether individuals work in either the public or the private sector. Therefore, as LFS is the better data source for investigating this issue. In view that the LFS is also most current source of data, this paper uses the Labour Force Survey (LFS) data as well as to estimate an accurate wage difference between these two demographic groups of employed people.

Studies shows that by human capital and human resource expert suggestion, a country that invests more in its human capital resource development should be rewarded with higher returns than those who have invested less. The hypothesis of this study is to estimate the decomposing wages of immigrant and Canadian-born workers using standard Oaxaca-Blinder Decomposition techniques to detect differences across the earnings function of the income distribution. According to Citizenship Canada (2018), the Government of Canada has developed a plan to accept more immigrants in the coming three years on a phase-by-phase basis. Immigrants undoubtedly provide the economy a positive function to the Canadian economy in mitigating the recent shortages of labour within the Canadian labour force. Immigrants contribute their skills, knowledge and experience to Canada, and Canada in turn saves education and training related expenses to a large degree. Canadian-born workers and employers also benefit from a multicultural society replenished by the successive waves of immigrants that further enrich Canada's cultural and racial diversity. Both Canadian-born workers and immigrants mutually work to develop a better future for themselves and their children, however these benefits are overshadowed by an earnings gap

that still concerns many policy-makers in Canada. The Canadian government has initiated a response by introducing the Employment Equity Act in 1986, which has helped to reduce the wage gap and the problems immigrants facing in the job market.

This paper uses a decomposition method, which is commonly used to reveal the differences in hourly wages between Canadian-born workers and immigrant workers into explained and unexplained components. By observing certain characteristics and by controlling other variables, the productivity-related characteristics are attributed by the explained component. Wage discrimination, however, is attributed to the unexplained component. Other observable factors determine earnings: education predicts a much larger component of the wage gap between immigrants and Canadian-born workers. Similarly, the industry sector is largely unexplained for Canadian-born workers compared to immigrants. This paper investigates whether the returns to the Canadian labor market are different for immigrants and Canadian-born workers.

In Statistics Canada's *Immigrant Population by place of Birth, Period of Immigration, 2016 counts, Both Sexes, Age (Total)*(2018), we see a total of 7,540,830 people, representing 22.20% of the total Canadian population, are immigrants, compared to 26,412,610 (77.8%) people born in Canada (non-immigrant) and 506,625 (1.5%) people that are non-permanent residents. Further, a total of 1,212,075 immigrants arrived in Canada between 2011 and 2016, which is 21.1% of Canada's total immigrant population.

Percentage of Immigrants and Canadian-born		Percentage of Immigrants and Canadian-born		
according to Statistics Canada 2016 Census data		According to Statistics Canada LFS, 2018(Apr & Oct.)		
	Immigrant	Canadian-born	Immigrant	Canadian-born
Male	47.56		50.27	50.38
Female	52.44		49.73	49.62
Total	22.20	77.80	17.00	83.00

Source: Statistics Canada 2016 Census data and Statistics Canada LFS, 2018 (Apr & Oct.)

The wage gap between immigrants and Canadian-born workers can be analysed using two methods. First, an Ordinary Least Square regression using an Oaxaca decomposition can be used to investigate the source of the wage gap differentials between both groups. Second, a distribution regression technique can be used to observe the percentile pointwise wage differences between immigrants and Canadian-born workers.

The remainder of this paper is organized as such: Section 2 which provides a literature review that includes studies on the wage gap between immigrants and Canadian-born workers, Section 3 describes the relevant data and presents summary statistics of some key variables, Section 4 presents the econometric models and methodology used, Section 5 shows the results and interpretations of the preceding sections, and Section 6 presents the counterfactual distribution and distribution regression procedure on counterfactual distributional wage gap between Immigrants and Canadian-born workers. Finally, Section 7 will provide a brief conclusion of this paper.

2. Literature Review

In the field of labour economics and the economics of discrimination, the native-born and immigrant wage gap analysis is a popular research topic. Much analysis and research has been conducted on the Canadian labour market's discrimination against workers in different ages between immigrant and Canadian-born workers. Several studies have been completed on the outcome of immigration on the Canadian labour market, which primarily focus on the distributional income differences between immigrant workers in the host country and Canadian-born workers.

This literature review will focus on two topics: the wage gap between different age groups in different cohorts and the wage difference between Canada's immigrant and non-immigrant workers. Although Canada has experienced a variety of economic downturns throughout its history, the significant wage gap between these groups is a hotly debated topic to this day. Discrimination in labour economics presents some basic understanding on why immigrants might have lower wages than Canadian-born workers, despite having the same level of higher human capital attainment (e.g. skills, education, and experience). The wage gap between different age groups as well as between immigrants versus Canadian-born workers is analysed in the literature section. These findings are ground-breaking. The most important findings on the economics of discrimination against immigrants are summarized below.

Chiswick (1978) observes a substantial earning gap between foreign-born adult white men and the native-born adult white men in the United States while holding other variables constant, such as country of origin, years of schooling, experiences in labour market, weeks worked, years of residence in United States and citizenship status. Chiswick's results demonstrate that the wage gap is correlated with schooling and post-school training. However, during the initial stage since

post immigration period, immigrants earn less income than native-born workers. The population data used from the 1970 US Census comprises 5 percent of the questionnaire. Upon arrival, immigrants to the United States lack adequate job-specific training as well as work experience in the U.S. labour market. These immigrants also earn comparatively less income than native-born persons. Over the course of 10-15 years of assimilation into the labour market, an immigrant's earnings equalize and overlap with those of native-born workers. This result does not separate the U.S. citizens from foreign-born. Immigrants maintain an advantage near to native-born workers in adjusting to their host-country's socioeconomic conditions while gaining the benefits of similarities.

Carliner (1982) observes a variation in the wages for older workers in the United States. Carliner extracted data from the U.S. National Longitudinal Survey about older men across the six consecutive years from 1969-1975. Notably, Carliner found that wages started to decline 1.6% for white men after the age of 60, whereas for black men the wage increased by 2.4% after the age of 60. The higher level of education that an older worker had attained, the more his wage tended to decrease in comparison with workers with less education. Ultimately, Carliner (1982) concludes that in the within the longitudinal sample data, the group of men aged 45-64 had experienced a declined wage rate of 1% when reach at their early fifties.

Chiswick, et al. (1985) examine the perfect substitution of immigrants with the native-born workers where the latter is the less perfect substitute than the earlier because of more in-depth knowledge and skills of the country. However, the study notes that immigrants tend to have characteristics such as ambition, entrepreneurship, and risk-taking capabilities. Chiswick, et al. (1985) use three Decennial Census data for the United States, Canada, and Australia, and two data sets of household surveys for Israel and United Kingdom. Income of immigrants was compared with five major sourcing countries and revealed the proportion of the immigrants and the workers-born as well as the proportion of earnings between native earnings. Second-generation immigrants were analysed while keeping all other variables constant. The result indicates that an adverse relationship prevails since it entails a high elasticity. Researchers found the proportion of average earnings between native-born workers and immigrants in Canada to be the highest and the proportion of those same earnings in Israel to be the lowest. Immigrants have more schooling than Canadian and British-born workers. The study found that immigrant workers within Canada and the United Kingdom had attained more education than their native-born counterparts. Moreover,

the study finds a significant difference in earnings for the mean wage and years of residency among workers and immigrants alike.

Through an empirical study, Borjas (1985) finds two pieces of evidence that implied in most cross-sectional studies regarding immigrant earnings. First, as assimilation occurs with American immigrants, their earnings increase rapidly. Within 10-15 years of assimilation within the labour force, a substantial performance is revealed, much like their native-born coworkers. Borjas applies 1970 and 1980 Public Use Samples data from the U.S. Census. His paper examines a declining trend of education and work experience among immigrants over some consecutive cohorts in the U.S. labour force. Borjas' paper observes a slower convergence among the cohorts of immigrants, which are not compared with white native-born people during the period of 1970-1980. The result implies a clear wage difference in the earnings between the cross-sectioned groups and the immigrant group in the analysis of income decision. Indeed, an indication of unclear observation exists for them and reveals the mechanism of assimilation for immigrants within the labour market. A consistent inference reveals a deterioration of the quality of immigrants to the United States.

Akbari and Devoretz (1992) use data from 1980 to demonstrate the extent to which immigration influences labour market employment for Canadian-born workers struggling for jobs across 125 Canadian manufacturing and non-manufacturing industries. A Trans-log production function in transiting from raw materials as input and output was estimated to be treated as the dependant variable. The paper examines the estimation of Hicksian elasticities for the reciprocal relationship between immigrant and native-born labourers. It calculates that a value of Cross-elasticities values were calculated visible as 0.99 between the pre-1970 foreign-born labour and the Canadian-born labour market.

In their conclusion, Akbari and Devoretz determine no impact for displacement of Canadian-born workers resulting from immigrants. However, Akbari and Devoretz reveal that immigration has an impact with respect to the return on investment made in education as well as to native-born workers' job movement. Nonetheless, early entry immigrants show no significant impact on displacement but showing the positive elasticity with respect to capital. Upon arrival, an immigrants tends to fill the position unwanted by a Canadian-born workers, thus filling a vacancy. Although a portion of the Canadian economy saw displacement within job market, a comparable U.S. study was analyzed as a consequence of the Canadian study.

Baker and Benjamin (1994) study the economic dimension of immigrant settlement in Canada, by examining three data sets from the Canadian Census (1971, 1981 and 1986). Their paper demonstrates a difference in labour market outcomes across an immigrant's cohort over the discovered periods in Canada and the United States. Baker and Benjamin measure wage differences within the relevant cohorts in Canada and United States, particularly in the United States, where wages between 1971 and 1986 reflect a permanent difference in the rate of assimilation experienced among cohorts, while Canada had a smaller negative rate of assimilation among the majority of its own cohorts.

Baker and Benjamin' study also reveal that the unemployment rate among native-born workers tends to be lower than recent immigrants, while inequality has raised over census period of 1971-1986. Their primary observations show that newer immigrants earn less than those who have immigrated earlier. Baker and Benjamin (1994) therefore determine that immigrant's entry in to the U.S. represents a substantial economic impact on himself or herself. However, the assimilation process among new immigrants to the United States was moderately low.

Green (1999) compares the occupational distribution of male Canadian immigrants with that of their native-born counterparts in the 1980's, explaining their distributional differences. Green shows the way in which immigrants adjust their occupational mobility after arrival and, in turn, play a major role in the Canadian economy. Selecting an immigrant under the point system. According to the system's occupational criteria influenced that immigrant's assimilation within the Canadian labour market. Green's hypothesis explains that, despite being skilled, immigrants' wages in the 1980's decreased among the cohorts.

Green (1999) use two sets of data to examine male immigrants' and the Canadian-born workers' patterns by their occupational attainment. He uses 1981, 1986 and 1991 years of Census Canadian data. Moreover, he argues that immigrants tend to be more mobile within their occupation after their arrival in Canada. A crucial role was played showing the flexibility in the workplace not to mention finding a destination to match their soft-skills and occupational job criteria. Green observes that immigrants in the 1980's who were less skilled in the labour force and less fluent in official languages had tended to avoid professional occupations. So, a lack of fluency in language had led to low-quality jobs for those immigrants. Those mobile in the job market targeted their remaining respective occupations succeeded more in the Canadian job market.

Boudarbat, Lemieux and Riddell (2003) observe that wage structure and wage inequality has changed consistently with education, age and gender in Canada over the last two decades. They examine the inequality for individual earnings as well as the effects on the group in society. Several researchers have mentioned the change in wage differential during the 1980s and early 1990s. After the 1990s and a warm recession of 2001, the trendier wage rate as well as the economy fully recovered. Data analysed from the 2001 census shows recent trends in wage disparity in Canada. The matter was investigated during the second half of 1990. Meanwhile, this gap increased tremendously between both men and women with less education. Data sets used in this paper were derived from such works as Survey of Labour and Income Dynamics (SLID) and Labour Force Survey (LFS). An estimated 32% to 40% wage gap prevails between men with a bachelor's degree and men with only a high school diploma. The wage gap increased substantially between immigrant and Canadian-born workers who attended high school.

Finally, Boudarbat, Lemieux and Riddell's research also indicate that a 15-year wage gap with a constant increase of wage differences followed a wage inequality that dropped considerably between 1995 and 2000. Overall, the wage inequality rose consistently between 1980 and 2000.

Gray, Mills and Zandvakili (2003) examine the relative income-impairity between the entry earning for most recent immigrant cohorts and native-born workers in the Canadian labour market. They estimate the degree of income inequality by the decomposable Theil statistics and compare the degree of inequality between native-born Canadians and different immigrant cohorts. They observe that this difference is associated with levels of education among different age groups. They believe that income inequality between workers and immigrants are positive, but not in magnitude. This inequality remained low and stable until 1990 as well as showed how immigrant assimilation had been merged into the Canadian labour force in similar fashion. Bootstrap is a technique used to analyze the hypothesis for income inequality of the Canadian labour force.

The data eventually used for empirical research was drawn from Statistics Canada's Survey of Consumer Finances, Household Income and Finance and Equipment for the 7 years from 1991-1997. Approximately 37,000 observations were polled from 7 years of data and divided into three groups. The first group treated immigrants entering Canada before 1981, the second group arrived after 1981 and the last group were the economic class family and the native-born Canadians. The study found that the cohort of immigrants who arrived in Canada before 1981 had faced similar income disparity as the immigrants who arrived after 1981. However, the income of native-born

Canadians was statistically significant in comparison to the immigrant group in all years except for 1994. Nonetheless, the degree of inequality was much higher among most recent immigrants.

Gray et al. examine the degree of income-disparity which had increased substantially for the immigrants who arrived after 1981 and immigrant groups who arrived before 1981, concluding that immigrants' "economic quality" had declined since their entry into Canada post 1981, which is surprising in terms of income inequality.

Green and Worswick (2004) show a significant change in earnings among immigrants' after their arrival in Canada; their earnings are valued as post-arrival human capital investment. The article addresses how immigration policy has changed over time to measure immigrant income and employment. The authors divide the immigrants into 7 cohorts based on their entry into the Canadian labour market. They use three data sets: the first is the combined Longitudinal immigrant Database (IMDB), which is based on immigrants' administrative data and tax data, the second is the Survey of Consumer Finances (SCF) used for native-born citizens, the third is the Survey of Labour and Income Dynamics (SLID) for broad in-depth labour market information. All the data sets are for the period 1980 to 2002. The study reveals an inequality in the income and employment between the immigrants' various cohorts. This strongly affected the new-age-arrival immigrants by cohort and education. Green and Worswick conclude that, in the short-term, the refugees under this category arriving through private-sponsored agency have achieved an impressive income level. Over the survey period, the immigrants under economic class had earned more than other immigrant categories in the long-run.

Reitz and Verma (2004) study unionization among visible-minority immigrants and white, native-born Canadians. They examine the lesser rates of unionization for racial minorities than the rest of the workforce. They use the longitudinal large-scale national based Survey of Labour Income Dynamics (SLID) data merged into the two panels' period like 1993-1998 and 1996-2001. The sample is drawn from Canadian LFS samples, and it is comprised of 32,637 persons. The result indicates that unionization rates across the survey period were significantly higher for the white majority than for visible minorities. Although they stipulate a higher gap of visible minority unionization for men, both genders are statistically significant. Over these periods, racial-minority differences had been reduced in Canada due to rapid assimilation of immigrants into unionization.

Reitz and Verma observe a low unionization rate among both white and non-white immigrants. However, the higher rate of unionization for those immigrants are the same as for

Canadian-born workers or both groups who resided in Canada. They observe a significant racial difference in unionization among the native-born Canadians. Immigrants of European origin, as compared to native-born racial minorities, had a lower rate of unionization among both groups at young ages. The authors conclude that unionization plays a big role in lessening the wage gap for minor immigrants in Canada. We might conclude that a policy regarding union race relations should be given higher priority when discussing unionization and collective bargaining.

Liu, Zhang and Chong (2004) describe differences in intra-occupational and inter-occupational income gaps between immigrants and native-born workers in Hong Kong, using Census data from the Hong Kong population in 1996. Liu, Zhang and Chong apply the decomposition method of Brown et al. (1980) to show that inter-occupational earnings were less significant than intra-occupational earnings. As considered by gender-based income, females' immigrants face less hurdles to enter a good occupational job than their male counterparts.

They also examine how younger ages of both group types experienced a low rate of unionization. In most cases, intra-occupational did not explain, while the unexplained part was less than half for inter-occupational differential. As years of dwelling increased, a small segregation part was found to be inappropriate for young immigrants coming to Hong Kong at early ages. Data showed that immigrants who moved to Hong Kong in their respective job fields enjoyed higher success. The authors divide the sample as per duration of residency and view a different occupational distribution among immigrants and native-born workers. If human capital characteristics were not carefully considered, then the immigrants and native-born workers had the same access to occupations.

Skuterud and Aydemir (2005) identify the wage gap among the immigrants depending on some observable characteristics of human capital. Their study observe that a degree of wage inequality has prevailed among immigrants, and that in the years after their arrival, immigrants have gradually assimilated into the Canadian work force. Also, their data show that most immigrants in Canada had a tendency to work and to reside in major urban areas such as Toronto, Montreal and Vancouver. The data used from the paper of the Workforce and Employee Survey (WES) was pooled from the employee data from 1999 and 2001. WES data has been used as a rich source of information about employees and employers that also represents the job characteristics of human capital.

Skuterud and Aydemir observe that men get paid less within the establishment of the immigrants. They also estimate independent results for men and women within the establishment of immigrants as a result of geographic region. This trend is important for men arriving as immigrants for low paid work in Canada's major cities because of a lack of skills within the establishment. This study analyses immigrant men's process of getting established within the labour force, and as it finds that they take approximately the same amount of time as native-born male workers. Immigrant men required education and job experience by completing similar work to native-born workers. Immigrant women encountered a larger wage disadvantage within the establishment, although the case is not explained by the lower return to human capital of immigrant workers. On the other hand, their job occupations and level of education were not correlative factors. The authors conclude that for both men and women, immigrants coming at a younger age from non-traditional regions of immigration, such as Africa and Asia, experience an unexplained wage gap with Canadian-born workers. This gap exists across the country within their establishment, which is also considered as negative sorting.

Firpo, Fortin and Lemieux (2009) introduce a new dimension of regression method to estimate the effect of covariates on the unconditional quantile distribution of an outcome variable. They suggest a technique that consists of running a regression of RIF (Re-centered Influence Function) of the unconditional quantile on the covariates. To estimate each point of quantile, the influence function is a much widely accepted technique to estimate and check the robustness. They study a partial effect and policy effects due to regression approach. The study shows three different regression methods: RIF-Logit, Non-parametric logit Regression (RIF-OLS), and Standard OLS Regression (RIF-OLS). They further analyse those approaches beside the quantile regression.

Boudarbat and Lemieux (2014) also analyse immigrants' wages in the Canadian labour force from the perspective of heterogeneity in wages among the immigrants in a different point of wage distribution. The study shows that the wage gap changed completely from the upper distribution to the lower distribution, which reveals a declining trend in the mean wage between immigrants and Canadian-born workers. By considering some standard factors like education, experience and country of birth, Boudarbat and Lemieux also demonstrate a difference in the wage gap using unconditional (marginal) quantile regression and the standard OLS regression. The aging baby boomers in the Canadian-born labour force led to a relative increase of labour market experience with respect to the wages of Canadian-born workers as compared to immigrants. The

paper looks at a number of reasons for justifying a relative decrease of immigrant wages. One reason is job market performance. An immigrant's performance decreases due to lack of transferable skills. The authors use percentage point of change in quantile regression for this wage gap. The distributional wages among the different cohorts of immigrant changes resulted from an economic challenge in the Canadian labour market. The 1981 Canadian Census data allowed for their estimation of results; however, an 8% significant decline of mean wage difference between immigrants and Canadian-born workers would occur from 1980 to 2000. The pattern of wage change seems less potent for immigrant women.

Ferrer and Riddell (2008) also study immigrant educational attainment as related to the history of success within the Canadian labour market. They demonstrate the relative wage differences in the Canadian labour force since immigration. The immigrants are rewarded for their hard work, but, at the same time, they experience discrimination by their employers' wage policies, which increases the gap between themselves and Canadian-born workers. The paper introduces a new concept like the ship-skin effect for immigrant's impacted more than Canadian-born workers. Ferrer and Riddell also demonstrate that Canadians-born workers with similar levels of human capital have lesser effect than those who earn less among native-born immigrants.

Both researchers believe the down trending earning of the recent immigrant is the factor of their lack of education. They find that the key factor behind the market differences among immigrants as being the reason for different birthplaces. Likewise, evidence proves that immigrants from the United Kingdom or United States have similar levels of earnings as compared to Canadian-born experienced workers. In addition, immigrants born in other regions of the world have closer earnings as compared to Canadian-born experienced workers. Wages for those less experienced workers had no difference from Canadian-born women.

Ferrer and Riddell (2008) use census data for their study from 1981, 1986, 1991, 1996 and 2001. Their study find a significant ship-skin effect related to immigrants at the university level and post-graduate level. Immigrants who arrived at younger age earn less than those who arrive as adults. Moreover, an immigrant's work experience and years of schooling are relevant as their rate of returning to schooling is lower than that of native-born workers.

Ferrer and Riddell (2008) conclude that in consideration of immigrant earnings, both the years of schooling or the attainment of a degree are the main factors in the Canadian labour market. Nonetheless, Canadian-born citizens generally have higher return of income due to schooling and

more work experience than immigrants. However, the authors believe that the Canadian employer evaluates less the immigrants for work experience, years of schooling from countries of origin and degree of attainment than Canadian-born workers with respect to their arrival into Canada. Immigrants, however, have more tendency to complete their education for early assimilation into the Canadian job market.

Boudarbat, Lemieux and Riddell (2010) discuss the declining trend of associated income of immigrants in Canada, which is not the same wage distribution as Canadian-born citizens: the wage gap between immigrants and Canadian-born citizens decreased significantly during from 1980-2002. The authors use standard OLS regression to apply Oaxaca-blinder decomposition to show the impact of immigrants' wage distribution at different unconditional quantile regressions. The data as accessed from the 1981 Canadian census about the educational variable. They showed a significant decrease of wage by 8% in creating the mean-wage difference between immigrants and Canadian-born citizens for men during 1980-2000. Nevertheless, the difference among immigrant and Canadian-born women is not large. The wage gap has been reduced between immigrants and Canadian-born citizens because of the retirement of the baby boomer generation.

Asplund and Napari (2011) assume two occupational groups: one is innovation and the other one is non-innovation, which distinguishes the service sector and the manufacturing sector separately. They show the gender wage discrimination among these groups by examining the private-sector data in Finland. The study's objective is to decompose the method based on Unconditional Quantile Regression technique, as well as a Difference in Differences (DiD) method. However, they figured out the main causes that influence gender gaps in the whole wage distribution during the time 2002-2009 in the private sector market in Finland. The authors found intangible capital that creates the legible gender wage difference and distributional wage gap over a period among professionals. The research is done to evaluate the sector target mechanism, which is crucial and cannot be eliminated.

The data used was a small number of observations containing 22,402 people and obtained from Confederation of Finish Industries EK. The study also used the Official Consumer Price Index (CPI). Asplund and Napari conclude that the unique differences in both wage structure and intangible capital intensity clearly show the wage differences in the occupational industry in a particular group in the wage distribution. They suggest that sector-specific factors play a huge role in making a difference in the gender wage gap between the innovation and the non-innovation

sector. Therefore, the occupational-specific factors could mislead the conclusion between the two groups of workers, which may produce the factual role of intangible capital.

Sweetman and Warman (2013) investigate earning discrepancies among the different class of immigrants, and they show a simple relationship between immigrant selection methods in connection with the point system. The paper empirically presents the various labour market outcomes of immigrants' income and employment observed across classes. For this result, they apply the Longitudinal Survey of Immigrants to Canada (LICS) from 1 October 2010 to 30 September 2001. According to their findings, the economic class shows a remarkable income among immigrants in the long run. Certain occupations have higher earnings as compared to the economic class immigrants in the short-term. Moreover, in the short-term, privately sponsored refugees have comparatively good employment turnover compared to principal applicants who arrived as federal skilled workers.

Morissette, Picot and Lu (2013) study the evolution of the Canadian worker in real wages from 1998 to 2001, focusing on gender, age, education, industry, and occupation. The authors indicate a large real wage gap between younger and older people. The paper is formulated by a time series of hourly wages using several household surveys like the 1981 Survey of Work History (SWH), the 1984 Survey of Union Membership (SUM), the 1986 to 1990 Labour Market Activity Survey (LMAS), and the 1997-2001 Labour Force Survey (LFS). Most of the data they use is from the United States. The average estimated wages of men aged between 45-54 increases approximately 20% of wages rapidly from 25 to 34 from 1981-1998. This difference is visible in unionization, job tenure, country and employment. Out of the total wage gap, 40% are for men that is explained by occupations and 80% for women.

Their research sees significantly faster wage growth in the finance sector during the 1981-1998 period. This wage growth is more rapid among the experienced young workers than the older ones. Therefore, in the analysis of the paper, the earnings of workers are captured by the same characteristics as education, marital status, geography, and working weeks. Many earlier studies conclude a wage gap between men and women in the workplace.

Chernozhukov, Fernandez-Val and Melly (2013) show that counterfactual distribution plays a crucial role in formulating a policy guideline in most economics papers. The authors analyse modelling techniques for the interpretation of counterfactual distribution, which greatly depends on regression techniques. They eventually use a joint functional central limit theorem and

bootstrap strategy to build a model that interprets results. The distribution of counterfactual outcome, as mentioned by Chernozhukov, Fernandez-Val and Melly (2013), as well as unconditional quantile functional and other inter-related functions, are used here to show some different effects. Chernozhukov, Fernandez-Val and Melly present the total outcomes in their paper using the hypothesis testing to decompose the wage on a distributional regression pattern applicable to wage decomposition. The authors recommend applying different distributional functions like quantile functions and its effects, marginal distributional effects, Lorenz curve, and Gini coefficient. Finally, they display the distribution regression that challenges the Cox duration regression and provide a better substitution for quantile regression.

Li and Sweetman (2014) point out that the quality of education of immigrants who received education in their home country is a key factor for further study in the receiving country. They indicate that the international test scores of the receiving country are related to the quality of education, which has an impact on immigrants' achievement. However, this approach is inapplicable to young immigrants who are educated in the receiving country. The quality of education and the return to education of the source country have a strong positive correlation. These conditions do not change whether or not the source country's GDP is included. Nonetheless, other control variables are used to assess the related attributes. Li and Sweetman use a 20% combined sample of Canadian census data of 1986, 1991, 1996 and 2001 as an index of the educational framework of the source country to measure the quality of education. The study considers 87 countries in order to measure the quality of educational outcome.

The conclusion is that quality of education has a significant impact on the Canadian labour market performances. A substantial impact on wages affects men and women without children.

Hou and Picot (2014) mention the economic significance of the immigrants in the Canadian labour market in terms of fulfilling demand in local labour markets. Moreover, immigrants play several objectives since it scales up the cost-benefit analysis of immigrant levels. The paper examines the long-term impact on immigrant entry earnings in the Canadian labour market. Hou and Picot use the Longitudinal Immigrant Database (IMDB) data over the years 1982 to 2010. For the comparison of men, the number rose to 10% in the size of cohorts since their entry earnings related with 0.8% decline in real entry earnings among the immigrant's men. For female immigrants, the data decreased by only 0.3%, considering some control variables in immigrant's characteristics and macroeconomic variables. Persistent constant effects are visible across the

earnings of immigrants who enter in Canada in the early stage; however, the paper empirically shows that those who enter Canada early have an impact with general macroeconomic conditions.

The consecutive impact of those immigrants' level varies in accordance to weaker relative in the economic market performance, such as an economic boom or recession. Finally, a strong correlation exists between the size of entry cohorts and entry earnings among the prime working age immigrants in the cohorts.

Fortin, Lemieux and Torres (2016) compare the wage gap between immigrant workers and native-born Canadians by their location of study respective of the highest post-secondary achievement. The paper examine key points regarding the level of heterogeneity to the returns of foreign schooling. Fortin, Lemieux and Torres use the 2006 long-form Canadian Census data in their work. Location of study, which varies substantially across countries and region that perhaps has decreased according to the size of the country of origins' fixed effects. Both foreign work experience and the return to Canada help us show the major gaps between immigrants and native-born workers. However, Asian-born immigrants, are negatively and significantly impacted by the obtainment of additional degrees or diplomas. For immigrants who obtained their highest-degrees from a reputable country weighs a lot towards earning salary. Although not as large, data shows a negative impact for degrees obtained from the South American region, Africa or Eastern Europe. A small, but positive premium exists for British degrees and for degrees from other Western countries. The inputted procedure was compared instead of the direct measurement favouring for the overstate return to education obtained from abroad. In addition, returning to foreign work experiences is undervalued for workers' premium of wages where most degrees obtained from foreign countries is underestimated.

Different fields of study lead to different negative wage premium. Some advantages and heterogeneity exist across place of birth given the location of study as the fixed effect. Some field of study is portable where human capital skills are acquired, such as "Health Assistance".

Hu (2016) mention that the universal approach to conduct social research by social scholars in their field is the counterfactual decomposition method. In other research fields such as economics, sociology and topics like the wage inequality and the class of groups in their respective educational attainment. Control and treatment effect are used for their outcome. The paper studies the rationality of two counterfactual decomposition approaches and compares the counterfactual decomposition method with Rubin's counterfactual casual inference framework. They investigated

the wage gap in their analysis and see the methodological difference such as observed state and counterfactual facts. The study gives us the increasing methodological decomposition. He argues about the two approaches of estimation. First, one is set to control quantities for both the observed and counterfactual state at base year on the other approach does not consider the successive periods. He finally sums up with trivial limitation in the application of both approaches from typical journal and researches.

Finally, the LFS does have some limitation of the data, which controls some variables to affect the earnings of immigrants. The important variables are years since immigration (YSM), language ability and communication skills, experience and education or training from the host country before immigrating to Canada. A highly experienced employee will perform better on the ladder of income distribution.

3. Data and descriptive Analysis

3.a Data

The paper primary uses data from the Canada Labour Force Survey (LFS) for 2018 in order to assess the wage gap between different age groups as well as between immigrants and Canadian-born individuals. The reason for choosing the 2018 data file that it contains the most recent information about immigrants and non-immigrants, as well as Canadian-born individuals' job status and situation. The paper combines the data set of two months, both April 2018 and October 2018. A six-month gap exists between two data sets. A total 204,449 survey data have been conducted during this time, which represents two percent of the total Canadian population aged 15 and over. The data file for the month of April contains 103,234 with the month of October containing 101,185 survey data. The LFS is a nationwide monthly survey data series that allows one to create employment and unemployment datasets that can be seasonally adjusted to show the performance of the Canadian economy, making labour market information regarding employed, unemployed and not-in-the-labour-force people accessible for research. LFS is a descriptive and explained dataset to estimate the unemployment rate and true market indicators to show the Canadian labour force participation rate by industry and occupation. LFS also provides private and public sector data, including total working hours, job permanency data, and employment by industry specific job. Furthermore, the LFS's data shows the employee's union status, sex, immigrant and non-immigrant wage, workplace size and full time or part-time job characteristics,

and it makes it possible to interpret this information in regional terms, such as by province and region. Employment and Social Development Canada (ESDC) can also estimate insurance policy data by analyzing the LFS data. There are approximately 60 categorical variables available to be estimated in the set of tabular cross-classification. An additional 52 variables have been generated in my dataset. In LFS, an employee is not considered a temporary foreign worker or not. Also excluded are those in the Canadian Armed forces, rural residents, institutionalized persons living on reserves and other indigenous people living in the territories. The immigrants consider in the LFS data that include refugee claimants, foreign-born Canadian citizens, foreign students with study permits, and non-landed immigrants among family members. The LFS survey data divides the working-class population by age into three mutually exclusive classifications: employed, unemployed and not-in-the-labour-force. This survey provides us with sufficient information on the education, age, and main ingredients of the human capital theory, and also enriches the models with other important determinants of the earnings function.

3b. Sample

This sample is based on the stratified, multi-stage design used by LFS. Each cluster-like province represents each stratum. The LFS uses a rotating panel sample of residents in its monthly survey for a total of 56,000 households from which data is collected for labour market analysis. The LFS sample gives weight to each province, territory, and census metropolitan area (CMA) such as large cities, economic regions and employment regions. A total of 96,798 observations occur in this sample data after imposing some restrictions, combining and dropping data; immigrants represent 16,451 of those observations, and Canadian-born people represent 80,347.

The proportion of immigrants represented in the sample is 17% and 83% for their Canadian-born workers in counterpart. Combining both data sets can help observe the transition between jobs and labour force of immigrants and non-immigrant employees. This set allows us to create a meaningful statistical comparison of these transitions between different sub-groups of the population. At first, the study focuses on individuals aged between 20 to 69, who are active in the labour force; they may be immigrant or non-immigrant. Those immigrant workers who landed 10 years ago or less and those that landed 10 years or more are combined by adding IMMIG variable value 1 and 2. This creates a dummy variable, which allows immigrants to equal 1 and Canadian-born workers to equal to 0. Secondly, individuals, who are unemployed, not participating in the

labour market, or who are otherwise not in the labour force have been dropped. For ease of calculation, the age group 15-19 and 70 and over age group have been dropped as well.

Additionally, employees that are self-employed incorporated and unincorporated with paid help or no help and unpaid family workers have been dropped. Hours are generated as AHRSMAIN wage like actual hour worked per week at main job. Dummy variables are created for sex like sex=0 for male and sex=1 for female and 10 provincial dummies, 4 sub-categorized educational dummies like high school dropout, high school and some post-secondary and bachelor and above, generate l wage as log (HRLYEARN) and weight equal to FINALWT. A total of 10 occupational dummies, ten industrial dummies, and four sub-categorized marital Status dummies are created. Full time (greater than 30 hours of work) and part timer (less than 30 hours of work) are taken in account as well.

3c. Variables

Dependant Variable

This paper explores the differences in wages among immigrants and Canadian-born workers by wage discrimination. The natural logarithm of the employees' hourly wage is denoted as logged (HRLYEARN). The sample here includes employed individuals only.

Independent variable

The LFS classifies education according to eight groups: geographic, education, demographic, immigration, industry, occupation, and job status. The demographic group is comprised of four categories such as sex, age, marital status and different age groups. The sex variable is "inc" to divide the labour force into male and female workers. Marital status is based on four dummy variables groups: (1) Married; (2) Common-law; (3) "Previously married," which is a combined group of those who are divorced, separated, and widowed; and (4) Single. The single and never married is used as a reference group, and it is worth mentioning that marital status has an impact on labour market outcomes due to the fact that those married with children generally work less hours than the reference group of single and never married individuals.

Table-F.3 in the appendix depicts four educational variables in the logbook to compare different years of schooling to different educational attainment levels, grouped into four categories. Apart from marital status, education plays a major influence on wages and employment status.

This condition indicates the highest level of education attainment for 'ith' individual. The education variables are divided into four categories.

This table shows in the LFS data where seven categories of educational attainment levels are included. Four categories are combined: "high school dropout," "high school diploma and some post-secondary," "post-secondary diploma" and "bachelor's and above". High school dropout is the reference group. Industry is a vector of ten dummy variables where the North American Industry Classification System (NAICS) is used in LFS data. The reference group is "Natural resources" for industrial sector. Ten dummy variables in Occupation work at their main job. The reference group is "Occupations in manufacturing and utilities". Ten provincial dummies, a union dummy, a sex dummy and six age dummies are applied.

For the age group under demography, the ten years' age bracket to get a continuous age variable was chosen. The sample restricts for individuals aged 20-64 while individuals under 20 years of age are students and those over 64 are more likely to receive a pension. The study also removes individuals not in the labour force as well as the unemployed and the self-employed. It also excludes the class of workers whose main job who happens to be self-employment, incorporated and unincorporated with unpaid family workers. The main job based on industry is classified into ten categories. Firstly, the variables are combined. The immigration group was set into a dummy variable where the classification of immigrant is equal to one and non-immigrants (Canadian-born workers) are equal to zero. Immigrants as a category was originally divided into those who entered ten years ago or more and those who entered less than ten years ago. These categories were combined. A dummy variable was also created for job status, where one is for full-time workers and zero is for part time workers. Moreover, a class of worker according to their main job with industry specific occupational group are created at different categories.

My reference group is defined as individuals who is Canadian-born (non-immigrant), single and never married male (male=1) who work some hours in the unionized private sector (Public=0) with some tenure under the natural resources industry in the manufacturing sector, residing in Ontario. This individual has some high school or some post-secondary education, by the age group between 20-29 years old. On the last, the geography related variables includes ten provinces and of residences along with provinces in geographic group based on where an individual live. However, 49.74% of immigrants live in Ontario and nearly 27.6% reside in Quebec and British Columbia after Ontario.

4. Econometric model and Methodology

4a. Decomposition Analysis

I apply the decomposition technique of Blinder (1973) and Oaxaca (1973) to estimate the wage differences and extended to the distribution regression in order to capture the earning gap across the wage distribution among immigrants and between immigrants and Canadian-born workers.

I assume that the variable Y_j denotes wages and X_j denotes job market related characteristics, which affect wages for populations $j=0$ and $j=1$.

The conditional distributions functions $F_{Y_0|X_0}(y|x)$ and $F_{Y_1|X_1}(y|x)$ state the stochastic of wages of workers with characteristics x , for immigrants and Canadian-born. $F_{Y(0|0)}$ and $F_{Y(1|1)}$ is assumed to represent the observed distribution function of wages for immigrants and Canadian-born workers. Also, it is assumed that $F_{Y(0|1)}$ shows us the counterfactual distribution function of wages that an immigrant if they had faced the Canadian-born workers' wage schedule $F_{Y_0|X_0}$:

$$F_{Y(0,1)}(y) = \int_{X_1} F_{Y_0|X_0}(y|x) dF_{X_1}(x)$$

In this section, the study analyses the econometric model for the Ordinary Least Squares (OLS) model and distribution regression. The approach is based on estimation of two separate equations for each group to determine the relationship between group-specific characteristics and their wages. For the estimation of the wage gap, two separate equations are used to observe the differences in characteristics and wages defined as explained part of the differences. The unobserved characteristics related to discrimination are defined as the unexplained part. This paper uses the regressions of the log of hourly wages, respectively for immigrants and Canadian-born workers, on the relative of independent variables for the sample. The paper uses a two-fold decomposition approach to estimate the differentials of basic human capital earnings equations for both immigrants and non-immigrants samples (Hunt, P. (2008)

$$\ln(wage)_i = \beta_0 + \beta_i X_i + \varepsilon_i \quad i = 1, 2, 3 \dots, n$$

Here, “ i ” denotes the number of observations, α and β are the intercepts and coefficients respectively of the statistical model and ε is the error. This model includes all the variables of human capital such as education, tenure, marital status, a dummy of immigrant status, a dummy of industry sectors and geographical workplaces. This paper uses Oaxaca decomposition and

distribution regression with counterfactual distribution. The econometric models are estimated for Canadian-born and immigrants with various assumptions and characteristics.

OLS model

For Immigrant:

$$\begin{aligned} \ln wage_i^{Imm} = & \beta_0^{Imm} + \beta_1^{Imm} fulltime_i + \beta_2^{Imm} union_i + \beta_3^{Imm} educ_i + \beta_4^{Imm} industry_i + \\ & \beta_5^{Imm} occupation_i + \beta_6^{Imm} age_i + \beta_7^{Imm} marital_i + \beta_8^{Imm} Immigrant_i + \\ & \beta_9^{Imm} province_i + \beta_{10}^{Imm} tenure_i + \beta_{11}^{Imm} hours_i + \beta_{12}^{Imm} male_i + \varepsilon_i^{Imm} \end{aligned} \quad (1)$$

For Canadian-Born (CB):

$$\begin{aligned} \ln wage_i^{CB} = & \beta_0^{CB} + \beta_1^{CB} fulltime_i + \beta_2^{CB} union_i + \beta_3^{CB} educ_i + \beta_4^{CB} industry_i + \\ & \beta_5^{CB} occupation_i + \beta_6^{CB} age_i + \beta_7^{CB} marital_i + \beta_8^{CB} Immigrant_i + \\ & \beta_9^{CB} province_i + \beta_{10}^{CB} tenure_i + \beta_{11}^{CB} hours_i + \beta_{12}^{CB} male_i + \varepsilon_i^{CB} \end{aligned} \quad (2)$$

Where, “imm” denotes immigrant and CB means Canadian-born, ‘ $\ln(wage)_i$ ’ is the natural logarithm of the annual wage of *individual* i , ‘ $marital_i$ ’ is a binary variable for an individual who has never married means single; ‘ $province_i$ ’ is a set of dummy variables for province of usual residence, with Ontario as the base group. The job-related variable ‘full-time’ is a dummy variable, taking the value of one for individuals who worked mainly full-time in the 2018 LFS and the value of zero for individual who work mainly part-time. Similarly, ‘ $public_i$ ’ is a dummy variable, taking the value of one for individuals who work in public sector and the value of zero for individual who work in the private sector. Similarly, union status is combined as union member and not yet a member but covered by a union contract or collective bargaining agreement. Thus, ‘ $union_i$ ’ is a dummy variable, taking the value of one to represent an individual who is unionized and under contract, and zero to represents non-unionized workers. The base group: ‘ $educ_i$ ’ measures an individual’s highest educational attainment, with high school drop-outs, and the base group, ‘ $industry_i$ ’ is the dummy variable for different industries where some industries such as agriculture, forestry, fishing, hunting, mining, and oil and gas extraction are combined into natural resources as a reference group.

Oaxaca decomposition

In addition to the above analysis, the Oaxaca decomposition technique is employed to examine the immigrants and Canadian-born workers’ overall wage gap. The wage gap is

decomposed into an explained part and unexplained part. The regression for immigrants and Canadian-born are first estimated.

$$\text{Regression for immigrant: } \ln(\text{wage}_i^{\text{imm}}) = X_i^{\text{imm}} \beta_i^{\text{imm}} + \varepsilon_i^{\text{imm}} \quad (3)$$

$$\text{Regression for Canadian-born: } \ln(\text{wage}_i^{\text{CB}}) = X_i^{\text{CB}} \beta_i^{\text{CB}} + \varepsilon_i^{\text{CB}} \quad (4)$$

Where $\ln(\text{wage}_i^{\text{imm}})$ and $\ln(\text{wage}_i^{\text{CB}})$ are the natural logarithms of the hourly wage of *individual*_{*i*} for immigrants and non-immigrants, respectively, X_i^{imm} and X_i^{CB} are the corresponding characteristic vectors of *individual*_{*i*} and $\varepsilon_i^{\text{imm}}$ and $\varepsilon_i^{\text{CB}}$ are the error terms. The Oaxaca is a two-fold decomposition of the average logarithmic annual wage gap between immigrants and Canadian-born workers, and it takes the following form:

$$\overline{\ln(\text{wage}^{\text{imm}})} - \overline{\ln(\text{wage}^{\text{CB}})} = \Delta = (\bar{X}^{\text{imm}} - \bar{X}^{\text{CB}}) \beta^{\text{imm}} + X^{\text{CB}} (\beta^{\text{imm}} - \beta^{\text{CB}}) \quad (5)$$

Where the bar signs over variables indicate the mean values. The left-hand side is raw wage gap is denoted by $\Delta = \overline{\ln(\text{wage}^{\text{imm}})} - \overline{\ln(\text{wage}^{\text{CB}})}$, and the right-hand side shows the raw differentials of decomposition. The first component of the right-hand side is the explained part, which represents the wage gap due to different productivity-related characteristics. This result is called the endowment effect. The second part of the right-hand-side represents the wage gap due to different coefficients, which is conventionally defined as labour market discrimination.

4b. Distribution regression with counterfactual distribution.

This paper applies estimation from both the standard OLS regression equation to capture the average effects and the Distribution regression with Logit link function. The paper has used the distribution regression model that produces an unbiased estimation technique. It compares the linear regression model when the data do not follow an assumption that it will be a normal distribution. Hence, this paper considers the distribution regression model by the analysis of the counterfactual distribution. Overall, applying counterfactual distribution with distribution regression gives a result with a more robust estimate. In addition to the above analysis, the distribution regression with counterfactual distribution is employed to examine the wage distribution in pointwise percentile. The regression for immigrants and Canadian-born are first estimated.

Distribution regressions.

The study investigates a similar decomposition formula for the different quantiles of the wage distribution. The paper uses the conditional distribution regression method of (Chernozhukov, V.I. et al. (2013)) to decompose changes in the Immigrant-Canadian born wage gap at different quantiles of the wage distribution. The various quantiles can be fully characterized by the wage distribution at different stages of quantiles for decomposing the Immigrant-Canadian born wage gap. In order to decompose the wage gap at different quantile, the whole difference in distributions has been estimated between immigrants and Canadian born workers (Chernozhukov, V.I. et al. (2013)).

Let, zero denote the Canadian-born population and one represent the immigrant population.

Y_j , denotes wages and X_j denotes job market-relevant characteristics that affects wages for population, $j = 0$ or 1 .

$F_{Y_j|X_j}(y|x)$, explains the stochastic assignment of wages to workers with characteristics x in population, $j = 0$ or 1 ,

$F_{Y(0,0)}(y)$ and $F_{Y(1,1)}(y)$ represents the observed distribution functions of wages of Canadian-born workers and immigrant respectively.

In our estimation, immigrant wage difference, let $F_{Y(0,1)}(y)$ represents the counterfactual distribution of wages that would have prevailed for an immigrant had he she faced the Canadian-born workers' wage schedule, $F_{Y_0|X_0}(y|x)$, then,

$$F_{Y(0,1)}(y) = \int_{\chi_1} F_{Y_0|X_0}(y|x) dF_{X_1}(x)$$

The above integral is well described if the support of Canadian-born characteristics, X_0 , includes the support of the immigrant's characteristics, χ_1 i.e. $\chi_1 \subseteq \chi_0$. We can perform a decomposition in the spirit of Oaxaca-Blinder,

$$F_{Y(1,1)}(y) - F_{Y(0,0)}(y) = \underbrace{F_{Y(1,1)}(y) - F_{Y(0,1)}(y)}_{\text{Structural effect or discrimination.}} - \underbrace{F_{Y(0,1)}(y) - F_{Y(0,0)}(y)}_{\text{Composition or endowment effect}}$$

Structural effect or discrimination. Composition or endowment effect

We have population that are labeled by $k \in \mathcal{K}$.

For each population k , there is a random d_x -vector X_k with support X_k of covariates and a random outcome variable Y_k with support \mathcal{Y}_k . The covariate vector is observable in all populations, but the outcome is only observable in populations $j \in \mathcal{J} \subseteq \mathcal{K}$. we can identify F_{X_k} for each population $k \in \mathcal{K}$. We can identify the conditional distribution $F_{Y_j|X_j}$ for all $j \in \mathcal{J}$

We want to construct these counterfactuals:

$$F_{Y(j|k)}(y) = \int_{\mathcal{X}_k} F_{Y_j|X_j}(y|x) dF_{X_k}(x)$$

$$Q(j|k)(\tau) = F_{Y(j|k)}^{\leftarrow}(\tau)$$

Where, $F_{Y(j|k)}^{\leftarrow}(\tau) = \inf. \{y F_{Y(j|k)}^{\leftarrow}(\tau) \geq \tau\}$ (often denoted F^{\leftarrow})

There are three types of Counterfactual distributions like as

Type 1: CE of changing the conditional distribution: $F_{Y(j|k)}(y) - F_{Y(i|k)}(y)$

Type 2: CE of changing the covariate distribution: $F_{Y(j|k)}(y) - F_{Y(j|m)}(y)$

Type 3: CE of changing the conditional and covariate distribution: $F_{Y(j|k)}(y) - F_{Y(i|m)}(y)$

The counterfactual effects have a causal interpretation only if their assignment to group j is random, i.e. $(Y_j^* : j \in \mathcal{J}) \perp\!\!\!\perp J|X$, where, Y_j^* is the potential outcome vector in j.

First stage: Estimate the covariate distributions: X_{ki}

$$\widehat{F}_{X_k}(X) = \frac{1}{n_k} \mathbb{1}[X_{ki} \leq x]$$

Second stage: Estimate the conditional distribution directly X_{Jl} .

$$\widehat{F}_{Y_j|X_j}(y|x) = \Lambda(P((x)\widehat{\beta}_j(y))), \quad \forall (y, x) \in Y_j X_j$$

$$\text{Where. } \widehat{\beta}_j(y) = \underset{b \in \mathcal{R}^{d_p}}{\text{arg max}} \sum_{i=1}^{n_j} \{\mathbb{1}[Y_{Jl} \leq y] \ln[\Lambda(P(X_{Jl})'b)] + \mathbb{1}[Y_{Jl} > y] \ln[1 - \Lambda(X_{Jl}'b)]\}$$

and Λ is some link function (logit), $P(\cdot)$ is some vector transformation of X_j (can be X_j itself if the expression is linear) and $d_p = \dim P(X_j) X'$

Third stage: Estimate the counterfactual distribution

$$F_{Y(j|k)}(y) = \int_{\mathcal{X}_k} \widehat{F}_{Y_j|X_j}(y|x) d\widehat{F}_{X_1}(x)$$

We can also estimate any functional of the counterfactual distribution

$$\widehat{\Delta}(\omega) = \phi(F_{Y(j|k)} : (j, k) \in \mathcal{J}\mathcal{K}) (\omega)$$

We can also estimate the unconditional counterfactual quantile function

$$Q(j|k)(\tau) = F_{Y(j|k)}^{\leftarrow}(\tau)$$

Where, $\widehat{F}_{Y(j|k)}^r$ is the re-arrangement of $F_{Y(j|k)}$ if, $F_{Y(j|k)}$ is non-monotonic decomposition.

Both OLS and distribution regressions are similar in the model to estimate the parameter of the equation to minimize the errors, but the difference is that OLS minimizes the sum of squared

errors and distribution regression minimizes the sum of weighted absolute values of errors, where weights are the percentile consider different values of the interest of the researchers.

The paper uses distribution regression because OLS can be inefficient if the errors are highly non-normal. However, distribution regression is more robust to non-normal errors and outliers. Distribution regression also gives us a richer characterization of the data used for this sample. This regression also allows us to consider the effect of a covariate on the entire distribution of Y, not only on the conditional mean.

The paper peruses the decomposition of the wage gap at the selected quantile of the interest from the whole characteristics. By using the percentile, bootstrapping of 100 times is used to conduct the analysis such as 0.10, to 0.90 and to check the possible deviations in the income distribution between immigrants and Canadian-born workers.

5. Descriptive Summary statistics

Table-A provides a summary of statistics of some the preferred independent variables for both groups divided into immigrants and Canadian-born workers in the sample. The study analyses the wage gap between immigrants and Canadian-born workers in this paper. From the Table-A, 204,509 (103,324+101,185) cases occur in the sample of two months (April,2018 and October, 2018) of LFS survey data for working conditions. Among them, 96,798 observations are left after imposing some restriction on data and combined groups. Among them, a total of 16,451 immigrants and 80,347 Canadian-born workers appear in these two groups. The proportion of immigrants is approximately 17% and 83%, for Canadian-born workers. According to the most recent census ‘Census 2016’, immigrants represent 21.6% of the whole population. The ratio of the immigrants signifies an increase in the Canadian labour force. If we look at some selected variables, some differences occur in the education variable. On average, the rate of holding bachelor’s degree and above is higher for immigrants than for Canadian-born workers. This outcome shows that immigrants who arrive in Canada tend to have higher education. However, other education levels tell us that Canadian-born workers are more educated than immigrants. For the education level “no certificate or diploma”, the difference is 1%. According to Table-A, immigrants’ log of hourly wage is 3.1588, which is smaller than the Canadian-born wage by 7.16 percentage points. The table also shows that 86.72% of immigrants work full time and 85.17% of Canadian-born workers are full time.

Table-A provides the mean values and standard deviations of wages of the different variables for all individuals. The table reveals 16,451 immigrants and 80,347 Canadian-born workers. Among the immigrants, 50.27% are male while 49.73% are female. The analysis focuses on individuals in the 20-29 age group and single Canadian-born workers living in Ontario. Similarly, the percentage of Canadian-born males is 50.38%, and 49.62 % are female. The natural log of hourly wages is the income for both groups. Three groups of variables are relevant: job related variable, personal related and geographical variables in order avoid estimation biases, and weights are included in the estimation process. This estimation shows the average hourly earnings for immigrants and Canadian-born workers. Similarly, 86.72% of immigrants are full timers, and 85.16% are full timers among the Canadian-born. The difference between the two groups is only 1.55% for full timers. On average, immigrants work 32.87 hours a week and 32.51 hours a week a Canadian works within a week. A total of 64.79% of immigrants are married, whereas 41.79% are married among the Canadian-born workers.

Education is explained by wage determination, which is a key indicator of individual productivity. Furthermore, 45.66% of immigrants have received their post-secondary education in Canada compared to the 27.97% of Canadian-born workers who have attained post-secondary education and above. However, 40.64% of Canadian-born have obtained their post-secondary diploma. For immigrants, the pattern of educational attainment compared to Canadian-born is similar. Therefore, we can conclude that the education level of immigrants is higher than that of Canadian-born workers and do better in perusing higher degrees. For immigrants, the proportion of subject acquiring a higher school diploma or equivalent is 20%. Among this number, 5% are high school dropouts, and a total of 29.44% are post-secondary diploma holders. A higher proportion of Canadian-born workers have an educational attainment in high school diploma and drop out (25.36% and 6.3%, respectively), which is lower than immigrants as a whole. Among the Canadian-born workers, the average values of schooling are slightly lower than immigrants. Similarly, Canadian-born workers work less hours in a week than immigrants.

Finally, the above summary statistics provide different information among the immigrants and Canadian-born workers with respect to some selected variables. Within industry comparison, more immigrants work in food services in comparison to Canadian-born workers. However, Canadian-born workers have more education in general than immigrants except for bachelor's degrees and above. True, immigrants work harder as full timers than Canadian-born workers.

Most immigrants work and live in the province of Ontario, which is more than 14% Canadian-born workers. The majority of immigrants work in the manufacturing sector, which is 7.7%, compared to 4.46% of Canadian-born. However, the wage gap between immigrants and Canadian-born workers is similar in all age groups except the young age 20-29 group. Immigrants relatively work more in manufacturing, trade, healthcare, construction, transportation and professional services, which comprises 66.16% while 1.2% work in the agriculture, forestry, mining and the fishing industry. The situation for Canadian-workers is different, where 9.61% work in manufacturing and less than 6% work in the food sector. Nearly 15.06% of immigrants belong to this group where 25.45 % are Canadian-born workers. The average hourly earnings for immigrants is 23.54 Canadian dollars, compared to 25.28 Canadian dollars for Canadian-born workers. The gap is close indeed. Table-A provides some statistics for the wages by age group for immigrants and Canadian-born workers where the middle age group, 30-39 and 40-49, have the highest wages compare to others. The difference in the wage gap between immigrants and Canadian-born workers in the age group of 20-29 is 10.39%. Canadian-born workers in this group have higher incomes compared to their immigrant counterparts. Nevertheless, the difference is the same for middle age groups. The wage gap is lower at a young age than for other age groups. The results suggest that as immigrants assimilate into Canada, the wage gap inequality decreases (Skuterud and Aydemir, (2005).

Table-A also shows that two-thirds of immigrant workers are legally married. For Canadian-born workers this figure is 45.80 percent. Comparatively, for part-time working immigrants, the figure is 13.28% and it is 14.83% for Canadian-born workers. This result indicates that immigrants and Canadian-born employees work less as part-timers. However, 49.74% of immigrants live in Ontario and nearly 27.6% reside in Quebec and British Columbia after Ontario. In contrast, 35.08% of Canadian-born individuals live in Ontario, with 25.85%, 12.12% and 12.30% living in Quebec and British Columbia and Alberta, respectively for a total of 50.27%. Although immigrants prefer to reside in major provinces and cities, but Canadian-born workers choose to live Alberta, British Columbia and Quebec provinces. The figures regarding occupational distributions for immigrant workers and Canadian-born workers show that a greater portion of immigrants take to working in construction, manufacturing, trade and healthcare. A total of 24.65% of immigrants work in the sales and services sector, while only 22.44% of Canadian-born workers are employed there.

Finally, a minor difference has been observed between the proportion of immigrants' workers and Canadian-born workers in other occupations, except for natural and applied sciences, manufacturing, and utilities occupations.

5a. Analysis of OLS wage regression

Table-B and Table-C demonstrate the ordinary least-square results on log of hourly wages for the two groups: immigrants and Canadian-born workers, respectively. They also include a standard error for both groups. Before discussing the result of OLS, the study selects some reference group in the estimation process. A Canadian-born worker who is a single female, never married, high school dropout, part-timer, aged between 20-29 years and who works in private offices within the natural resource sector in manufacturing and utilities as his/her occupation, and also lives in Ontario. Table-B indicates that remaining other coefficient constant, immigrants earn 11.65% less hourly wages than Canadian-born workers.

As Table-C shows, in the first two columns for immigrant's coefficient and standard errors as well as the third and fourth columns represents for Canadian-born workers. The more educational attainment an individual in either group possesses, the higher the wage he or she earns. This result is consistent for both immigrants and Canadian-born workers. The regression results indicate that the return to schooling is greater for Canadian-born workers than for immigrants. For example, both immigrants and Canadian-born workers earn higher wages if they have bachelor's degrees and above (immigrants earn 17.41% higher wages with a post-secondary degree, while Canadian-born workers earn 30.40% higher), as compared to high school drop-outs. Nevertheless, immigrants who have a bachelor's degree and above, earn 13.00% less than Canadian-born workers. The effect of age group is not similar compared to high school dropouts. Earnings increase among the middle age groups including (30-39 and 40-49), by 6%-9%. Nevertheless, coefficient of age among 60-64 years olds increases slightly compared to reference age group. The wage of Canadian-born workers at age 60-64 year-olds increases the wage by 12.10% compared to the reference age group. Most of the difference observed in the middle age groups (30-39, 40-49) by 4-5% on average. A significant difference in wages occurs between married and single immigrants as well as married and single Canadian-born workers. Being a married person, Canadian-born workers have an advantage of 6.44% higher wages than immigrants. Examining the impacts of marital status for immigrants, single workers earn 3.85% less wage rate than married

workers, 7.43% less wage rate than common-law workers and 5.40% less wage than separated, divorced and widowed workers. Similarly, male immigrants earn 12.09% more than female and 12.83% wage a male earns than a female in the Canadian-born workers. However, this result is not similar for Canadian-born workers. An 8.79% wage difference has been observed between single and married among Canadian-born workers. A 6.58% wage difference occurs between single and common law workers and a 5.3% difference occurs from separated, divorced and widowed workers among the Canadian-born.

In terms of geographical variables, immigrants living in Alberta earn 7.58% more than Ontario immigrant workers and 14.05% and 2.73% more income for Canadian-born residents living in Alberta and British Columbian than Ontarian. In terms of geographical variables, workers in Alberta enjoy higher wages than workers in Ontario for both groups. This condition could be explained by Alberta's richness in natural resources. Alberta has a higher minimum wage than any other province. All other wage groups have higher income compared to the young age group, except for the 60-64 group. Middle-aged workers perform relatively better than others. Moreover, new immigrants choose to set up their homes and businesses in Toronto in Ontario due to the fact that those immigrants can easily find jobs as well as social and cultural returns there. Ontarian immigrants' earn 6-18% higher wages compared to those in other provinces, excluding Alberta, British Columbia. Immigrants' wages are lower compared to Canadian-born workers in other provinces.

In summary, both education and age have significant positive effects on wages. Likewise, public sector immigrants earn 17.74% more than private service sector immigrants, while a 12.05% difference has been observed in their Canadian-born counterparts. The wage gap between full-timers and part-timers remains the same for both immigrants and Canadian-born workers. Overall, the coefficients generally have the expected sign and magnitude and remain statistically significant at the 5% level. For immigrants and Canadian-born workers, the higher the education, the more the wage earnings. Individual immigrants working in agriculture, fishing, mining, and hunting have more wage earnings potential than they would have in other sectors. Similar patterns have been observed among the Canadian-born workers. With respect to occupation and employment, wage rate is higher across all industries except natural resources and agriculture relative to manufacturing sectoral jobs (reference Group). Immigrants who work in management, business, finances and administration, natural and applied sciences, health, education, and sales

and service have relatively higher wages than those working in manufacturing jobs. However, the effects of those same occupations are the same with the exception of immigrants who work in sales, services, and natural resources. The same picture can be applied to Canadian-born workers. The difference in wages rate among unionized and non-unionized workers is 7.48% among immigrants and 8.18% for Canadian-born workers. On average, one percentage increase in the number of hours leads to a wage rate increase by 0.04% and 0.08% for immigrants and Canadian-born workers, respectively. Hence, Canadian-born workers earn 0.04% more wage than immigrants.

Summarizing these key points, there are several significant results in this part. First, the positive effects on individual educational attainment on immigrants' wages are not as strong as those on the Canadian-born workers. However, immigrants have more education compared to Canadian-born workers with respect to bachelor's degrees and above. The return to schooling is also higher for Canadian-born workers. Canadian-born workers who are part-timers earn less than their immigrant counterparts do. Immigrants working in different industries have comparatively more wages compared to Canadian-born workers. Lastly, the positive effect of Canadian-born workers in post-secondary education is higher than for immigrants.

5b. Oaxaca decomposition

The Oaxaca decomposition shows that a 7.16% difference in average log-hourly earnings exists between immigrant and Canadian-born workers. Since non-immigrant earn higher hourly income than immigrants. The decomposition of the gap explains which is equal to explained/unexplained = $0.0156229 / -0.0873141 = -17.89\%$, where the proportion that is not explained is equal to unexplained / differences = $-0.0850627 / -0.0716912 = 1.18\%$. However, the differences are significant since $p=0.011$ for explained and $p=0.000$ for unexplained at 0.1 % significance level. Respectively ($p < \alpha$), the single factor that contributes the most to the explained component of the differentials are education, but personal factors like age, marital status, sex, union and public job and provinces are also significant with $p=0.0000$.

In order to investigate the effects of the chosen variables on wage variation, the Oaxaca decomposition technique applies to separate into an explained part and unexplained part the wage gap between immigrants and Canadian-born citizens.

Table-D explains the decomposition results of the wage gap overall for immigrants and Canadian-born citizens separately. To see the effects of the variables in the regression, the groups are broken down into categories. Specifically, age, marital status, full-time job, union, hours of work, tenure, public and male gender and all are categorized into “personal”. Educational attainments are categorized as “education”. Moreover, ten industries are combined as “industry”, and ten occupations are combined into “occupation”.

The result show some positive variables for immigrants, such as higher education level. Additionally, as mentioned earlier, the explained part indicates the mean values of productivity-related characteristics while the unexplained part indicates the differences with respect to the coefficient, which is sometimes interpreted as discrimination in the work force. The explained parts account for 1.56% of the total difference and the unexplained parts accounts for minus 8.50% of the total difference. The positive sign in the explained part for immigrants and Canadian-born workers indicates that immigrants’ return of return to education is higher than of Canadian-born workers. However, it shows a negative sign in the unexplained part for immigrants and Canadian-born. A 1.95% wage gap can be explained by education variables while minus 0.1% and 0.02% wage gap is unexplained with respect to industry and education. The difference is that the constant terms again play an important role and is positive in sign.

5.c Empirical result of Distribution Regression

The quintiles of the wage distribution can be modelled using distribution regression. This approach produces different results than one would expect until a linear regression. The regression coefficient estimation will not be the same. An OLS regression is based on minimizing the squared residuals, whereas with a distribution regression, the weighted (absolute) residuals is minimized. The extreme values of the outcome variables are evaluated using a logistic regression, which measures the change in the outcome distribution of a particular quantile due to an increase in the predictor value by one unit. The paper also examines the wage distribution gap with three effects: with industry, with some industry, and with full industry.

The result of the conditional distribution regressions for the 10th to 90th quantiles (10, 20, 30, 40, 50, 60, 70, 80, 90) are reported in Table-E. The result is similar at first 10th quantile for the all. The factors largely affect the 10th quantile and the 90th quantile and vice versa. This result will be found in the regression estimation. This paper finds three empirical effects on wages of quantile

regression applying in three models. The models are: no industry effect, some industry effect and with industry effect.

An analysis of the counterfactual is also assessed in the LFS data. The counterfactual population is comprised of a pseudo-transformed version of the reference population. Two different groups named ‘immigrants’ and ‘Canadian-born workers’ have been included in the estimation process. To observe the wage decomposition with respect to immigrant status, the reference and counterfactual populations correspond to the number of observations estimated during the process. The reference group is ‘Canadian-born workers’ and the counterfactual group is ‘immigrants.’

Using the LFS, I estimate the wage gap between immigrants and Canadian-born workers before describing the estimates of the quantile effects (QE) of a change in the distribution of the wages that would be the result by a fluctuation in wage differences. The conditional distribution is estimated using the distribution regression method. First, the distribution of the counterfactual wage creates the ‘counterfactual wage’ variable, which is then plotted. The counterfactual distribution corresponds to a mean, which maintains the spread of the distribution in the reference population and allows for the reduction of the standard deviation by 25%. The majority of the differences in wage between the reference and counterfactual groups is explained by the fact that varied structural effect across the quantiles. (Chernozhukov, V., I. et al. (2013).

The simultaneous hypothesis of zero, constant, positive and negative effect of the wage redistribution at all the deciles is rejected. The Distribution Regression (DR) model for the conditional distribution cannot be rejected at traditional significance levels. Lastly, I have plotted an identical confidence band over the subset $\{0.10, 0.11 \dots 0.90\}$ building up by empirical bootstrap with 100 replications. In Figure 1b, 2b and 3b, it can be seen that we can reject the hypothesis of zero, constant, positive and negative effect at the percentiles considered.

The combined LFS is used to estimate a wage decomposition with respect to immigrant status. The reference and counterfactual groups are explained by the dependant variable, log of hourly wage ($\ln wage$), and the independent variables, which include tenure, education, full time, union, male gender and industries, occupations, age groups, and ‘immigrants,’ a dummy variable with a value of 1 equal to being an immigrant and 0 equal to being a Canadian-born workers.

The tables show that immigrant workers earn lower wages than Canadian-born workers do throughout the distribution. However, the immigrant wage gap is decreasing in the quantile index.

This gap can be aptly explained by differences in tenure, education and industry, occupation difference between immigrant and Canadian-born workers in the upper tail of the distribution and by the immigrants in the rest of the distribution. Figures 1b, 2b and 3b show that the structure effect is varied across the quantile indexes and explains most of the immigrant wage gap below the third quartile. The majority of the wage gap above the third quartile can be explained by constancy in the composition effect over the quantiles.

5 d. Analysis of counterfactual distribution with distribution effects

Without industry effect

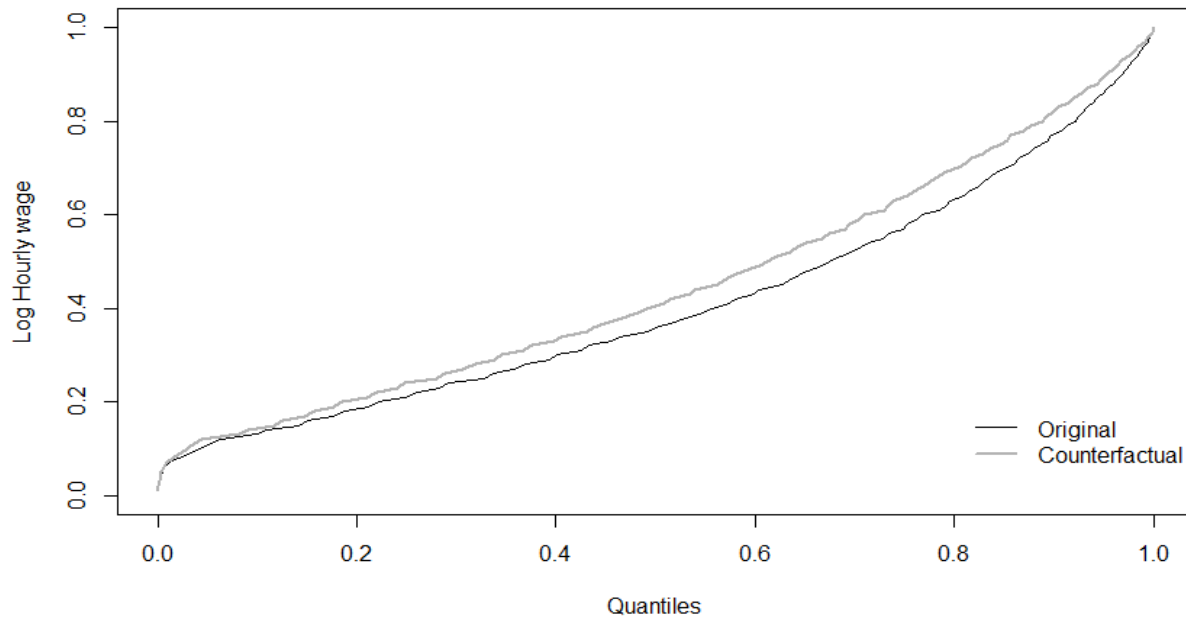


Figure 1a: Observed and counterfactual distributions of wages

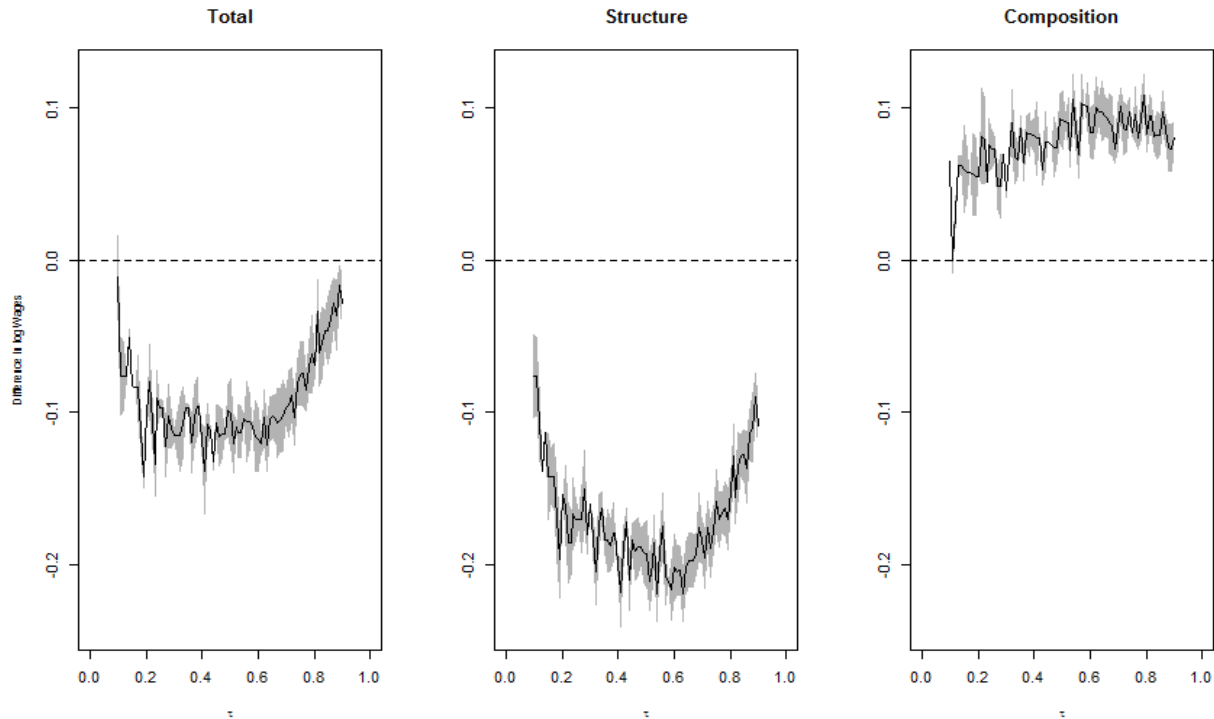


Figure 1b: Wage decomposition with respect to immigrant: logit regression estimates

Three models in the Table-E display industry effects, some industry effects, and no industry effects. The separate results and picture are drawn in each case. The results calculate at every quantile that the total effect is negative while composition effect is positive and structural effect is negative. It can be seen that there is an impact on counterfactual distribution on dummy immigrant coefficient. The impact on wages decreases in the lower quantile to upper quantile. At the upper quantile of the wage distribution, the wage gap between immigrants and Canadian-born workers increases after adding some industries. When economic activity is controlled for, the wage gap between immigrants and Canadian-born workers at the upper tail of the wage distribution (80th and 90th) decreases. Moreover, adding some industries as some control variables does not change the results as pairwise comparison of each model at each quantile in which the coefficients are significant.

With some industry

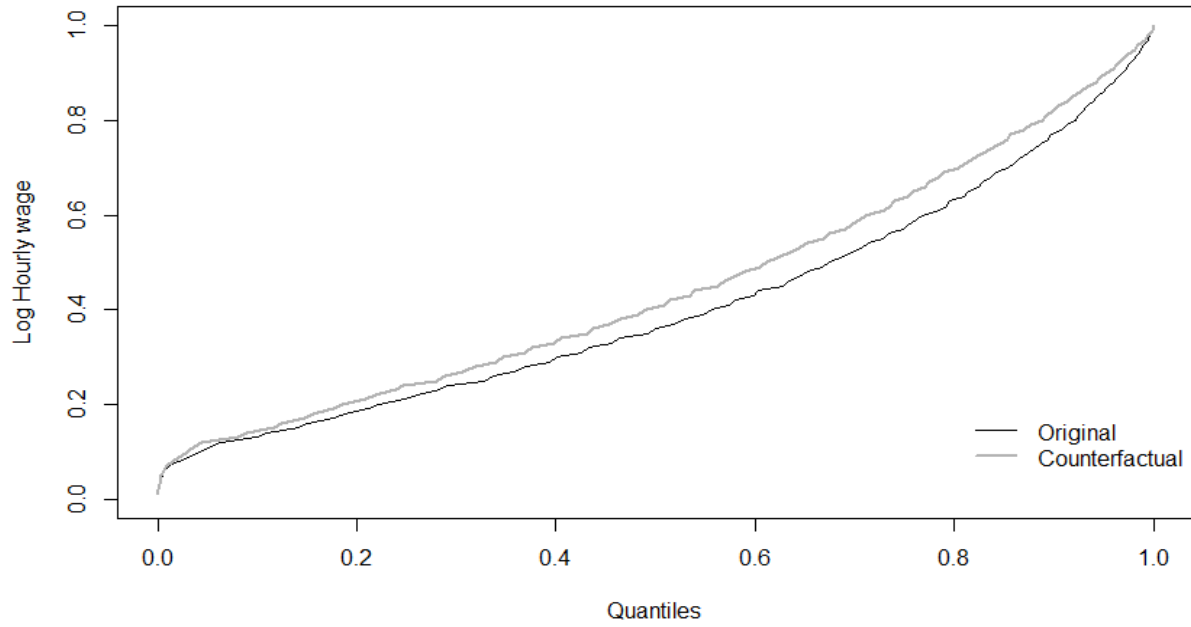


Figure 2a: Observed and counterfactual distributions of wages

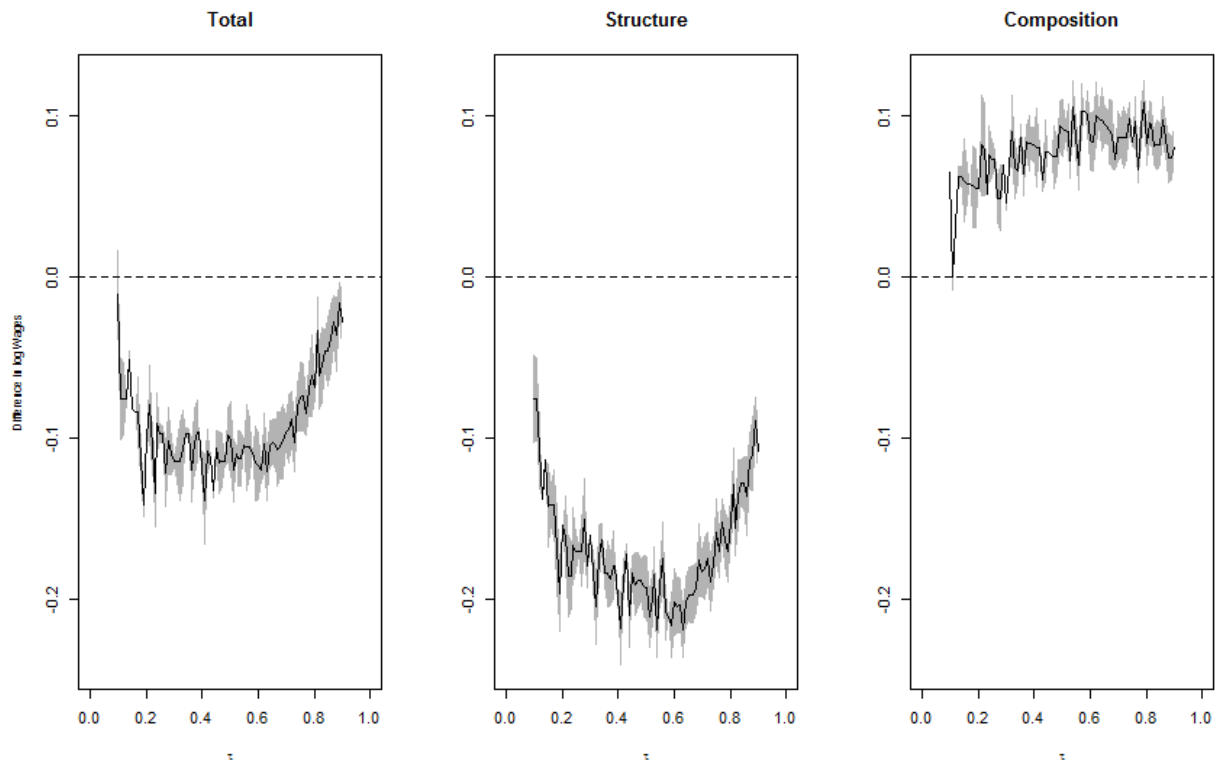


Figure 2b: Wage decomposition with respect to immigrant: logit regression estimates

Comparing with some industry effect, Figure 2a shows initial results of more detailed and equally spaced percentiles ranging from 10th to 90th with an interval of 10 percentile appears in the Table-E. The estimation of distribution regression presents the discriminatory tendencies increased across from the bottom quantiles to middle-income distribution 1.11% to 11.8% and then decline slightly by 2-3%. The negative sign for the coefficient indicates discrimination in earnings across the wage distribution for immigrants. The advantages to immigrants at first decreases before gradually increasing the gap over the distribution. To sum up the distribution regression, the estimate of the decomposition reveals that the discrimination first increases then declines. The wage differences between immigrants and Canadian-born at the initial stage is not larger but gradually increases when they are both graduated and post-graduated, it becomes larger at the middle of the quantile, but, at last, it diminishes. Total effects and structural effects are negative, while composition effect is positive. The exact same results estimated in this specification appear like without industry effect.

With industry

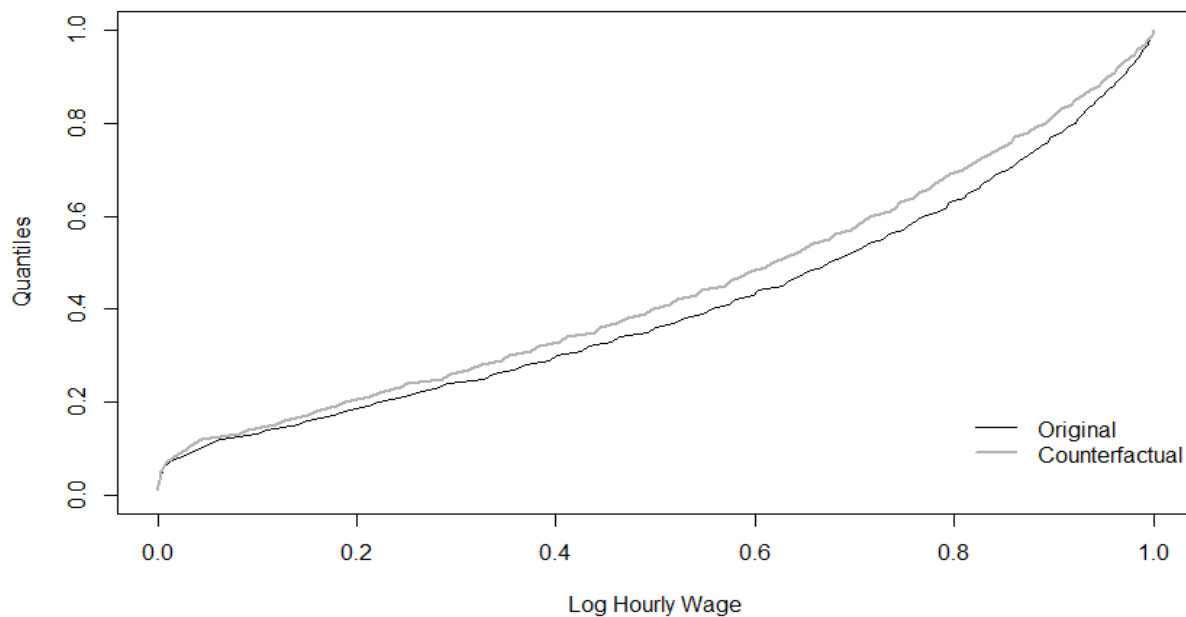


Figure 3a: Observed and counterfactual distributions of income

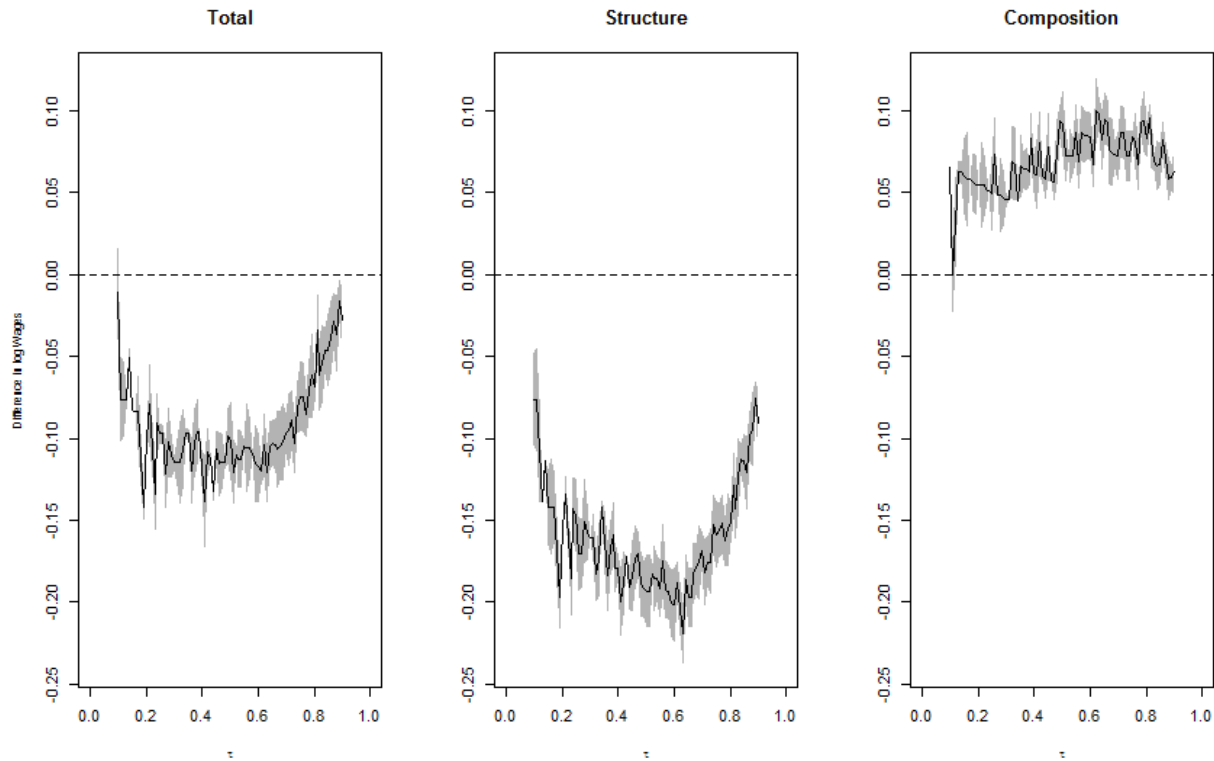


Figure 3b: Wage decomposition with respect to immigrant: logit regression estimates

Comparing the with industry effect, figure 3a shows more detailed and equally spaced percentiles ranging from 10th to 90th, and Table-E similarly shows 100 percentiles graphs. Table 3b presents distribution regression that increased a discriminatory tendency from bottom to middle income quantiles: 1.11% to 11.8%, then a slight decline from 2-3%. The negative quantile coefficients indicate a discrimination in earnings for immigrants across the distribution of wages. The advantages to immigrants realized until the middle-income quantile. The wage differences between immigrants and Canadian-born workers at the lower distribution are negligible, but gradually increase for both the groups with higher education. It increases at the middle of the quantile, but, at last it diminishes at the lower levels. Total effects levels and structural effects levels are negative, while the composition effect is positive. There are only a small differences apparent here for the with industry effect. The magnitude of the structural effect and composition effect are somewhat different.

6. Summary and conclusion:

In this paper, I use the LFS monthly data to interpret the factors that influence immigrants and Canadian-born citizens' labour market outcomes. Individual age groups that have been divided into four groups, as well as two methods are used to decompose the wage differentials between immigrants and Canadian-born citizens.

Immigrants earn less compared to Canadian-born workers for all age groups except the 40-49 years old age group. The wage gap is larger for the age 60-64 group. Married individuals are more likely to find a job and earn more money than single and never married individuals. Unions ultimately have no effect on the gap, but public jobs have a moderate impact to differentiate the wage gap between immigrants and Canadian-born workers. Geographic location has different influences on wage discrimination. All the wage group finds higher wages if they attain a higher educational level, especially for immigrants. However, considering all levels of education, Canadian-born workers have higher wages than immigrants.

The impact of immigration on wages in Canada has been investigated using distribution regression and standard Oaxaca-Blinder decomposition. The evidence shows that immigrants earn lower wages as compared to Canadian-born workers, although immigrants have a higher average human capital. By using the Oaxaca decomposition method, this paper finds significant wage differentials between wages of the Canadian-born workers and immigrants. It also estimates that average earnings do increase according to the number of years of education obtained for member of both groups; however, the increase is higher for Canadian-born workers compared to immigrants. From the analysis of the data, immigrants demonstrate equal quality of employment to Canadian-born workers. However, discrimination and/or bias exists, thereby creating a significant wage gap between the two groups. Immigrants' relative wages are lower in the service sector. The results estimate that there is 7.16 log points gap between the wages of immigrants and Canadian-born workers, and that gap is only partly explained by differences in the observables ranging from 13.37 log points and 85.06 log points due to the unexplained part. The significant differences have been unexplained as indicated in the sample. The distribution regression also indicates discrimination at least to the extent of estimates. Previous researchers have showed that wage discrimination is persistent in the labour market (Boudarbat, Lemieux and Riddell (2003), Sweetman and Warman (2013)). If a discrimination-free Canadian labour market were to prevail,

then immigrants would be better able to contribute their knowledge, skills, and experience to the Canadian economy, thereby contributing to its dynamism and growth.

Finally, the decomposition of the wage differentials suggests that the explained part is low and has generated mainly job-related and educational variables. Overall, the wage differentials between immigrants and Canadian-born citizens are well explained by education in all age groups. To sum-up, I find similar results to Boudarbat and Lemieux (2013) and Boudarbat et al (2010). In comparison to Boudarbat and Lemieux (2013), there is a 1% difference, which is not substantial. Boudarbat and Lemieux (2013) found an 8.16 difference between immigrant and Canadian-born workers, while I found a 7.16 difference, not a significant difference. Thus, my findings confirms and reinforce those of previous authors regarding the barriers that immigrants encounter to attaining high wages, demonstrated by the decomposition of their wages. The longer that immigrants live in Canada, the greater their language skills and their experience in the labour market, moderating the wage differential.

There is, however, an increasing trend of wage inequality between immigrant and Canadian-born workers that needs to be explored further. Indeed, immigrants' income standard plays a major impact on how they acculturate and assimilate into Canadian society. The Government of Canada wants more immigrants to successfully assimilate into Canadian society. Policymakers are concerned about the impact of immigration on the aggregate unemployment rate as well as wage disparity between immigrant and Canadian-born workers.

In this paper, there are data limitations with the Canadian Labour Force Survey regarding explanatory variables, which include years since immigration, source country, number of children and languages spoken. The forgoing variables would help researchers to shed more light on wage inequality and to better inform public policy decisions. As one public policy area, which such studies would help inform, the Canadian government should undertake more language and vocational training programs to improve transferable soft skills and more quickly adapt to the new society.

7. References

- Akbari, A. H., & Devoretz, D. J. (1992). The Substitutability of Foreign-Born Labour in Canadian-Production: Circa 1980. *Canadian Journal of Economics*, 25(3), 604-614.
- Asplund, R., and Napari, S. (2011). Intangibles and the Gender Wage Gap: An Analysis of Gender Wage Gaps across Occupations in the Finnish Private Sector. *Journal of Labor Research*, 32(4), 305-325.
- Baker, M., and Benjamin, D. (1994). The Performance of Immigrants in the Canadian Labour Market. *Journal of Labor Economics*, 12(3), 369-405.
- Borjas, G. J. (1985). Assimilation, Changes in Cohort Quality, and the Earnings of Immigrants. *Journal of Labor Economics*, 3(4), 463-489.
- Boudarbat, B., & Lemieux, T. (2014). Why Are the Relative Wages of Immigrants Declining? A Distributional Approach. *ILR Review*, 67(4), 1127-1165.
- Boudarbat, B., Lemieux, T., & Riddell, W.C. (2006). Recent Trends in Wage Inequality and the Wage Structure in Canada. In: Green, D. and J. Kesselman (eds.), *Dimensions of Inequality in Canada*, Vancouver: UBC Press, 273-306.
- Blinder, A.S. (1973). Wage Discrimination: Reduced Forms and Structural Estimates. *Journal of Human Resources*, 8(4), 436-455.
- Brown, R.S., Moon, M., Zoloth, S. (1980). Incorporating Occupational Attainment in Studies of Male-Female Differentials. *Journal of Human Resources*, 14, 3-28.
- Citizenship Canada. (2019, February 26). 2018 *Annual Report to Parliament on Immigration*. Retrieved from <https://www.canada.ca/en/immigration-refugees-Citizenship/corporate/publications-manuals/annual-report-parliament-immigration-2018/report.html>
- Carliner, G. (1982). The Wages of Older Men. *Journal of Human Resources*, 17(1), 25-39.
- Chernozhukov, V., I. Fernández-Val and B. Melly (2013), Inference on Counterfactual distributions. *Econometrica*, 81 (6), 2205-2268.
- Chiswick, B.R. (1978). The Effect of Americanization on the Earnings of Foreign-born Men. *Journal of Political Economic*, 86(5), 897-921.
- Chiswick, B. R., Chiswick, C.U., and Miller, P. W. (1985). Are Immigrants and Workers Perfect Substitutes in Production? *International Migration Review*, 19(4), 674-685.
- Ferrer, A., & Riddell, W. C. (2008). Education, credentials, and immigrant earnings. *Canadian Journal of Economics*, 41(1), 186-216.

- Firpo, S., Fortin, N.M., and Lemieux, T. (2007). Unconditional Quantile Regressions. *NBER Working Paper Series, Technical Working Paper, 0339*, National Bureau of Economic Research.
- Firpo, S., Fortin, N.M., and Lemieux, T. (2009). Unconditional Quantile Regressions. *Econometrica*, 77(3), 953-973.
- Fortin, N., Lemieux, T., & Torres, J. (2016). Foreign Human Capital and the Earnings Gap between Immigrants and Canadian-born Workers. *Labour Economics*, 41, 104-19.
- Gray, D., Mills, J. & Zandvakili, S. (2003). An Analysis of Differential Provincial Income Inequality Trends in Canada. *University of Cincinnati, Economics Working Papers Series, 2003-02*, University of Cincinnati, Department of Economics.
- Gray, D., Mills, J. & Zandvakili, S. (2003). Statistical Analysis of Inequality with Decompositions: The Canadian Experience. *Empirical Economics*, (2003) 28(2): 291-302
- Green, D. A. (1999). Immigrant Occupational Attainment: Assimilation and Mobility over Time. *Journal of Labor Economics*, 17(1), 49-79.
- Green, A.D., and Worswick, C. (2004). Immigrant Earnings Profiles in the Presence of Human Capital Investment: Measuring Cohort and Macro Effects. *Labour Economics*, 19(2), 241-259.
- Hou, F., & Picot, G. (2014). Annual Levels of Immigration and Immigrant Entry Earnings in Canada. *Canadian Public Policy*, 40(2), 166-181.
- Hu, Anning (2016). Two Approaches to Counterfactual Decomposition: Clarification and Illustration. *Social Currents*, 3 (4), 403-419.
- Hunt, J.C., Kau, J.B., (1985). Migration and Wage Growth: A Human Capital Approach. *Southern Economic Journal*, 51(3), 697-710.
- Hunt, P. (2008). Are Immigrants So Stuck to the Floor that the Ceiling is Irrelevant? *University of Warwick, Department of Economics, The Warwick Economics Research Paper Series (TWERPS)*, 838. Retrieved January 12, 2019 From http://www2.warwick.ac.uk/fac/soc/economics/research/papers/twerp_838.pdf
- Li, Q., & Sweetman, A. (2014). The Quality of Immigrant Source Country Educational Outcomes: Do They Matter in the Receiving Country? *Labour Economics*, 26, 81-93.
- Liu, P., Zhang, J., & Chong, S. (2004). Occupational segregation and wage differentials between workers and immigrants: Evidence from Hong Kong. *Journal of Development Economics*, 73(1), 395-413.

- Morissette, R., Picot, G. and Lu, Y. (2013). The Evolution of Canadian Wages over the Last Three Decades. *Analytical Studies Branch Research Paper Series, no. 347*. Statistics Canada Catalogue no. 11F0019M. Ottawa: Statistics Canada.
- Oaxaca, R. (1973). Male-Female Wage Differentials in Urban Labour Markets. *International Economic Review*, 14(3), 693-709.
- Reitz, J. G., & Verma, A. (2004). Immigration, Race, and Labor: Unionization and Wages in the Canadian Labor Market. *Industrial and Labour Relations*, 43(4), 835-854.
- Skuterud, M., and Aydemir, A. (2005). The Immigrant Wage Differential Within and Across Establishments. *Industrial and Labor Relations Review*, 61(3), 334-352.
- Skuterud, M., & Su, M. (2012). Immigrants and the Dynamics of High-Wage Jobs. *Industrial and Labor Relations Review*, 65(2), 377-397.
- Statistics Canada. (2018). *Immigrant Population by Place of Birth, Period of Immigration, 2016 Counts, Both Sexes, Age (Total), Canada, 2016 Census – 25% Sample Data* [Table]. Ottawa: Statistics Canada. Retrieved February 8, 2019 from <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/hlt-fst/index-eng.cfm>
- Statistics Canada. (2018). *Labour Force Survey, April - October 2018* [public-use microdata file]. Ottawa, Ontario: Statistics Canada, Labour Statistics Division [producer], Statistics Canada: Data Liberation Initiative [distributor]. Retrieved January 13, 2019 from <http://www.odesi.ca>
- Sweetman, A., and Warman, C. (2013). Canada's Immigration Selection System and Labour Market Outcomes. *Canadian Public Policy*, 39 (s1), 141-160.

8. Appendix and Table:

Table-A

Summary of means (Standard Deviation of variables for Immigrant and Canadian-born.
Summary statistics:

Variables	Immigrant		Canadian-born	
	Mean	Std.	Mean	Std.
A. Earnings				
Log Hourly Wages	3.1588	0.4712	3.2304	0.4613
Person related variables				
B. Educational attainment				
No certificate, diploma or degree	0.0508	0.2197	0.0603	0.2381
High school and some post-secondary diploma	0.1982	0.3986	0.2536	0.4351
Postsecondary diploma (Below Bachelor)	0.2944	0.4558	0.4064	0.4912
Bachelor's degree and above	0.4566	0.4981	0.2797	0.4489
C. Marital Status				
Married	0.6479	0.4777	0.4180	0.4932
Living in Common Law	0.0699	0.2549	0.1997	0.3998
Separated/divorced/widowed	0.0835	0.2766	0.0804	0.2719
Single never married	0.1988	0.3991	0.3019	0.4591
D. Sex				
male	0.5027	0.5000	0.5038	0.5000
E. Age Group				
20-29 Years	0.1506	0.3577	0.2545	0.4356
30-39 Years	0.2491	0.4325	0.2395	0.4268
40-49 Years	0.2701	0.4440	0.2074	0.4054
50-59 Years	0.2341	0.4235	0.2123	0.4090
60-64 Years	0.0961	0.2948	0.0863	0.2808
Job related variables				
F. Job status				
fulltime	0.8672	0.3394	0.8517	0.3554
hours	32.8724	13.2738	32.5164	14.5140
tenure	78.7912	75.2265	89.8342	82.0647
union	0.2549	0.4358	0.3349	0.4720
Public	0.1877	0.3905	0.2728	0.4454
G. Industry				
Natural Resources (Agriculture, Forestry, Fishing, mining)	0.0119	0.1083	0.0312	0.1738
Utilities, Construction, Transportation and warehousing	0.1074	0.3097	0.1393	0.3463
Manufacturing	0.1451	0.3523	0.0961	0.2948
Trade	0.1385	0.3454	0.1535	0.3604

Finance, Insurance and Real estate	0.0805	0.2721	0.0568	0.2316
Professional Business Services	0.1288	0.3350	0.0944	0.2924
Education Services	0.0595	0.2366	0.0926	0.2899
Health care	0.1418	0.3488	0.1371	0.3440
Food Services	0.0727	0.2596	0.0534	0.2248
Other Services (Public Administration Information culture and recreation)	0.1137	0.3175	0.1455	0.3526
H. Occupation				
Management	0.0608	0.2390	0.0697	0.2547
Business, finance and administration	0.1842	0.3877	0.1781	0.3826
Natural and Applied Sciences	0.1205	0.3255	0.0746	0.2627
Health	0.0850	0.2789	0.0767	0.2661
Education, Law and Social, community and Gove	0.0954	0.2938	0.1348	0.3415
Art, Culture, recreation and sports	0.0142	0.1183	0.0192	0.1373
Sales and Services	0.2465	0.4310	0.2244	0.4172
Trades, Transport and equipment operators	0.1096	0.3124	0.1570	0.3638
Natural resources and Agriculture	0.0067	0.0816	0.0210	0.1434
Manufacturing and Utilities	0.0770	0.2665	0.0446	0.2064
Geographical variables				
I. Provinces/Regions				
Ontario	0.4974	0.5000	0.3509	0.4772
Alberta	0.1231	0.3285	0.1230	0.3284
British Columbia	0.1529	0.3600	0.1212	0.3264
Manitoba	0.0343	0.1819	0.0352	0.1844
New Brunswick	0.0044	0.0659	0.0250	0.1560
Newfoundland and Labrador	0.0015	0.0383	0.0169	0.1288
Nova Scotia	0.0067	0.0819	0.0312	0.1739
Prince Edward Island	0.0011	0.0329	0.0049	0.0700
Quebec	0.1596	0.3662	0.2586	0.4378
Saskatchewan	0.0191	0.1369	0.0331	0.1790

Regression statistics: Table-B

Variables

A. Earnings

Dependant Variable: Log Hourly Wages

Person related variables

B. Educational attainment (Reference: High School Dropout)

	Coef.		Std.
High school and some post-secondary diploma	0.0607	***	0.0047
Postsecondary diploma (Below Bachelor)	0.1272	***	0.0045
Bachelor's degree and above	0.2743	***	0.0050

C. Marital Status (Reference: Single never married)

Married	0.0747	***	0.0031
Living in Common Law	0.0638	***	0.0035
Separated/divorced/widowed	0.0522	***	0.0046

D. Sex (Reference: Female)

male	0.1279	***	0.0026
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Immigrant

	-0.1166	***	0.0030
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E. Age Group (Reference: 20-29 yrs.)

30-39 Years	0.0975	***	0.0036
40-49 Years	0.1064	***	0.0038
50-59 Years	0.0746	***	0.0040
60-64 Years	0.0175		0.0049

Job related variables

F. Job status

fulltime	0.0977	***	0.0036
hours	0.0008	***	0.0001
tenure	0.0009	***	0.0000
union	0.0791	***	0.0029
public	0.1306	***	0.0038

G. Industry (Reference: Natural Resources)

Utilities, Construction, Transportation and warehousing	-0.1871	***	0.0080
Manufacturing	-0.2007	***	0.0084
Trade	-0.2979	***	0.0081
Finance, Insurance and Real estate	-0.1372	***	0.0088
Professional Business Services	-0.2159	***	0.0081
Education Services	-0.2990	***	0.0092
Health care	-0.3388	***	0.0086
Food Services	-0.3495	***	0.0091
Other Services (Public Administration Information culture and recreation)	-0.2512	***	0.0081

H. Occupation (Reference: Manufacturing job)

Management	0.4710	***	0.0076
Business, finance and administration	0.1252	***	0.0068
Natural and Applied Sciences	0.3287	***	0.0072
Health	0.2882	***	0.0082
Education, Law and Social, community and Gove	0.2252	***	0.0076
Art, Culture, recreation and sports	0.1089	***	0.0110
Sales and Services	-0.0609	***	0.0069
Trades, Transport and equipment operators	0.1254	***	0.0066
Natural resources and Agriculture	-0.0603	***	0.0107

Geographical variables

I. Provinces/Regions (Reference: Ontario)

Alberta	0.1249	***	0.0039
British Columbia	0.0186	***	0.0038
Manitoba	-0.0941	***	0.0041
New Brunswick	-0.1720	***	0.0054
Newfoundland and Labrador	-0.1066	***	0.0064
Nova Scotia	-0.1513	***	0.0053
Prince Edward Island	-0.1876	***	0.0069
Quebec	-0.0768	***	0.0034
Saskatchewan	0.0112	***	0.0045
constant	2.7791	***	0.1121
R-squared		0.4720	
observations		96,798	

All observations are restricted to paid employees between 20-64 years of age.
S.D errors are in brackets on side. *significance at 10%, **significance at 5%,
***significance at 1% level

Regression statistics: Table-C

Variables	Immigrant		Canadian-born		
A. Earnings					
Dependant Variable: Log Hourly Wages					
Person related variables					
B. Educational attainment (Base Group: High School Dropout)					
High school and some post sec. diploma	0.0370	0.0130	0.0650	***	0.0050
Postsecondary diploma (Below Bachelor)	0.0901	*** 0.0127	0.1359	***	0.0048
Bachelor's degree and above	0.1741	*** 0.0129	0.3040	***	0.0054
C. Marital Status (Base Group: Single never married)					
Married	0.0385	*** 0.0082	0.0879	***	0.0033
Living in Common Law	0.0743	*** 0.0123	0.0658	***	0.0037
Separated/divorced/widowed	0.0540	*** 0.0124	0.0530	***	0.0049
SEX (Ref. Female)					
male	0.1209	*** 0.0083	0.1284	***	0.0029
D. Age Group (Ref. 20-29 yrs.)					
30-39 Years	0.0597	*** 0.0099	0.1069	***	0.0038
40-49 Years	0.0700	*** 0.0103	0.1160	***	0.0041
50-59 Years	0.0501	*** 0.0110	0.0795	***	0.0043
60-64 Years	-0.0008	0.0132	0.0197	***	0.0052
Job related variables					
E. Job status					
fulltime	0.0863	*** 0.0090	0.1004	***	0.0039
hours	0.0004	** 0.0002	0.0008	***	0.0001
tenure	0.0010	*** 0.0004	0.0009	***	0.0000
union	0.0748	*** 0.0073	0.0818	***	0.0031
public	0.1774	*** 0.0097	0.1205	***	0.0041
F. Industry Base Group: Natural Resources)					
Utilities, Construction, Transportation and Warehousing	-0.2787	*** 0.0258	0.17434	***	0.0083
Manufacturing	-0.2710	*** 0.2599	-0.1893	***	0.0089
Trade	-0.3537	*** 0.0255	-0.2902	***	0.0085
Finance, Insurance and Real estate	-0.1791	*** 0.0265	-0.1381	***	0.0094
Professional Business Services	-0.2767	*** 0.0253	-0.2096	***	0.0085
Education Services	-0.3508	*** 0.0287	0.2956	***	0.0096
Health care	-0.4211	*** 0.0267	-0.3251	***	0.0090
Food Services	-0.4244	*** 0.0267	-0.3351	***	0.0097
Other Services (Public Administration Information culture and recreation)	-0.3120	*** 0.0258	-0.2426	***	0.0085
G. Occupation(Base Group: Manufacturing)					

Management	0.5746	***	0.0181	0.4340	***	0.0084
Business, finance and administration	0.2050	***	0.0154	0.0967	***	0.0075
Natural and Applied Sciences	0.4690	***	0.0157	0.2777	***	0.0082
Health	0.3221	***	0.0193	0.2677	***	0.0091
Education, Law and Social, comm. and Gove	0.2919	***	0.0183	0.1950	***	0.0084
Art, Culture, recreation and sports	0.2695	***	0.0287	0.0653	***	0.0119
Sales and Services	-0.0178		0.0157	-0.0797	***	0.0077
Trades, Transport and equipment operators	0.1606	***	0.0155	0.1058	***	0.0072
Natural resources and Agriculture	-0.1314	***	0.0347	-0.0711	***	0.0114
Geographical variables						
H. Provinces/Regions (Reference: Ontario)						
Alberta	0.0758	***	0.0087	0.1405	***	0.0043
British Columbia	-0.0082		0.0083	0.0273	***	0.0042
Manitoba	-0.1189	***	0.0087	-0.0639	***	0.0047
New Brunswick	-0.1392	***	0.0233	-0.1689	***	0.0055
Newfoundland and Labrador	-0.0689	*	0.0386	-0.1009	***	0.0064
Nova Scotia	-0.1128	***	0.0207	-0.1497	***	0.0054
Prince Edward Island	-0.1662	***	0.0271	-0.1849	***	0.0071
Quebec	-0.1085	***	0.0096	-0.0647	***	0.0037
Saskatchewan	-0.0834	***	0.0114	0.0364	***	0.0048
constant	2.8122	***	0.0322	2.7636	***	0.0120
R-squared			0.4597			0.4787
observations			16,451			80,347

All observations are restricted to paid employees between 20-64 years of age. Standard errors are in brackets on side. *significant at 10%, **significant at 5%, ***significant at 1% level

Table-D

Decomposition of mean log hourly earnings differentials for immigrants and Canadian-born:		
Variables	Explained	Unexplained
Education	1.95%	-8.19%
Personal related variables	-2.40%	-4.74%
Male	-0.013%	-0.006%
Job related variables		
Industry	-0.13%	-10.76%
Occupation	0.24%	10.46%
Geographic variables		
Provinces	1.92%	-2.42%
Constant	-	6.92%
Total	1.56%	-8.73%
Total difference		7.17%
Observations		96798

Table: E- Counterfactual Distribution

Quantiles	No Industry effect			Some Industry Effect			Full Industry Effect		
	Quantile Effect Total	Quantile Effect Structure	Quantile Effect Composition	Quantile Effect Total	Quantile Effect Structure	Quantile Effect Composition	Quantile Effect Total	Quantile Effect Structure	Quantile Effect Composition
0.1	-0.0111	-0.0761	0.0649	-0.0111	-0.0761	0.0649	-0.0111	-0.0761	0.0649
0.2	-0.0996	-0.1540	0.0548	-0.0996	-0.1540	0.0548	-0.0996	-0.1540	0.0548
0.3	-0.1150	-0.1600	0.0457	-0.1150	-0.1600	0.0457	-0.1150	-0.1600	0.0457
0.4	-0.1180	-0.2000	0.0820	-0.1180	-0.2000	0.0820	-0.1180	-0.1790	0.0615
0.5	-0.1010	-0.1930	0.0921	-0.1010	-0.1930	0.0921	-0.1010	-0.1930	0.0921
0.6	-0.1180	-0.2020	0.0842	-0.1180	-0.2020	0.0842	-0.1180	-0.2020	0.0842
0.7	-0.0967	-0.1830	0.0868	-0.0967	-0.1830	0.0868	-0.0967	-0.1690	0.0720
0.8	-0.0687	-0.1510	0.0826	-0.0687	-0.1510	0.0826	-0.0687	-0.1510	0.0826
0.9	-0.0282	-0.1090	0.0805	-0.0282	-0.1090	0.0805	-0.0282	-0.0906	0.0625

Table-F.1

Immigration and Ethno-cultural Diversity Highlight Tables of immigrant population by place of birth, period of immigration, 2016 counts, both sexes, age (total)

Place of Birth	Period of Immigration						
	Total immigrant population	Before 1981	1981 to 1990	1991 to 2000	2001 to 2005	2006 to 2010	2011 to 2016
Total	7,540,830	1,941,505	915,555	1,486,660	928,940	1,056,095	1,212,075
Male	3,586,495	927,790	439,245	696,715	439,885	500,680	582,175
Female	3,954,330	1,013,715	476,315	789,945	489,055	555,415	629,895

Sources: Statistics Canada, 2016 Census

Table-F.2

Age-Gender	Period of Immigration						
	Total immigrant population	1971 to 1980	1981 to 1990	1991 to 2000	2001 to 2005	2006 to 2010	2011 to 2016
0-14 Male	191,010	0	0	0	16,265	63,450	111,300
0-14 Female	184,645	0	0	0	18,370	61,255	105,020
15 ages and over age							
15-24 Male	191,010	0	0	55,560	80,105	81,285	76,385
15-24 Female	278,300	0	0	56,040	74,870	73,575	73,820
25-34 Male	465,680	0	43,240	122,295	64,760	85,275	150,110
25-34 Female	535,590	0	42,630	117,475	71,785	114,870	188,830
35-44 Male	595,480	38,140	72,490	117,380	101,095	131,545	134,825
35-44 Female	698,525	37,295	72,435	151,965	138,970	155,955	141,900
45-54 Male	687,910	132,290	113,000	190,400	107,880	83,820	60,520
45-54 Female	745,455	135,120	127,790	225,220	110,460	87,275	59,590
55-64 Male	687,910	132,290	113,000	190,400	107,880	83,820	60,520

55-64 Female	745,455	135,120	127,790	225,220	110,460	87,275	59,590
65 years and over							
65-74 Male	460,225	306,040	56,085	50,120	15,870	14,985	17,115
65-74 Female	500,895	325,675	57,470	56,595	19,730	19,135	22,290
75 years and over male	327,345	249,035	24,480	30,070	8,930	6,975	7,850
75 years and over Female	396,425	286,015	37,325	43,040	12,015	9,165	8,870

Sources: Statistics Canada, 2016 Census

Table F.3 Number of Years of Schooling Variable Variables Highest certificate degree or diploma

Variables	Highest educational Attainment
educ_1	0-8 years and Some High School
educ_2	High school graduate and Some post-secondary
educ_3	Post-secondary certificate or diploma
educ_4	Bachelor's degree and above Master's degree Earned doctorate degree

Table F.4: Education classification and estimated years of study		
Education	Highest certificate, degree or diploma	Years of study
No certificate, diploma or degree (High School Dropout)	No certificate, diploma or degree	8
High school graduate and some post- secondary diploma	High school diploma or equivalent	12
Postsecondary diploma (below Bachelor's (degree))	Trades certificate or diploma (other than apprenticeship)	13
	Registered Apprenticeship certificate	13
	College, CEGEP or other non-university certificate or diploma from a program of 3 months to less than 1 year	13
	College, CEGEP or other non-university certificate or diploma from a program of 1 year to 2 years	14
	College, CEGEP or other non-university certificate or diploma from a program of more than 2 years	15
	University certificate or diploma below bachelor level	15
Bachelor's degree and above	Bachelor's degree	16
	University certificate or diploma above bachelor level	17
	Degree in medicine, dentistry, veterinary, medicine or optometry	17
	Master's degree	18
	Earned doctorate degree	22

Table F.5 Classification of industry into aggregated sectors and concordances	
Industries (NAICS_21)	Aggregated sectors
Agriculture, Forestry, Fishing and Hunting (1,2,3)(NAICS4-11)	Natural resources
Mining and Oil and Gas Extraction (4)(NAICS4-21)	
Utilities (5) (NAICS-22)	
Construction (6) (NAICS-23)	Construction
Manufacturing-durable goods (7) (NAICS 31-33)	Manufacturing
Manufacturing-non-durable goods (8) (NAICS 31-33)	
Wholesale Trade (9) (NAICS-41)	Wholesale Distributors
Retail Trade (10) (NAICS 44-45)	Sales
Transportation and Warehousing (11) (NAICS 48-49)	
Services Information and Cultural Industries ((NAICS 51)	
Finance and Insurance (12) (NAICS 52)	
Real Estate, Rental, and Leasing (13) (NAICS 53)	
Professional, scientific and technical services (14) (NAICS54)	Professional services
Business, Building and other support Services (15) (NAICS55)	Service
Educational Services (16) (NAICS 61)	
Health Care and Social Assistance (17) (NAICS 62)	
Information, culture and Recreation (18) (NAICS 71)	
Accommodation and Food Services (19) (NAICS 72)	
Other Services - except Public Administration (20) (NAICS 81)	
Public Administration (21) (NAICS 91)	
Source: Statistics Canada, LFS and Canada Revenue Agency, Industry Code. NAICS refers to the North American Industry Classification System.	