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Why are the Relative Wages of Immigrants Declining? A Distributional Approach*

Brahim Boudarbat, Université de Montréal

Thomas Lemieux, University of British Columbia

April 2007

ABSTRACT

In this paper, we show that the decline in the relative wages of immigrants in Canada is far from homogenous over different points of the wage distribution. The 9 percent decline in the immigrant-Canadian born mean wage gap hides a much larger decline at the low end of the wage distribution, while the gap hardly changed at the top end of the distribution. Using standard OLS regressions and new unconditional quantile regressions, we show that both the changes in the mean wage gap and in the gap at different quantiles are well explained by standard factors such as experience, education, and country of origin of immigrants. Interestingly, the most important source of change in the wages of immigrants relative to the Canadian born is the aging of the baby boom generation that has resulted in a relative increase in the labour market experience, and thus in the wages, of Canadian born workers relative to immigrants.

*: We would like to thank SSHRC, through its support to TARGET, for financial support.

1. Introduction

Canada and the United States are generally regarded as successful examples of countries where immigrants are well integrated into the labour market and other aspects of society. The successful experience of immigrants in these two countries is often contrasted in the popular press with the situation in Europe where immigrants are not perceived to be doing as well as on the other side of the Atlantic.

On closer examination, however, the economic performance of immigrants in Canada and the United States is far from uniformly positive. In particular, a large body of literature has documented a steep deterioration in the relative earnings of immigrants in both Canada and the United States over the last two or three decades. For example, both Green and Worswick (2004) and Aydemir and Skuterud (2005) find that immigrants who arrived in Canada in the 1990s earned around 30 percent less than Canadian-born workers. By contrast, earlier cohorts of immigrants who arrived in the 1970s were earning about the same as Canadian-born workers. A number of U.S. studies, starting with Borjas (1985), document a similar decline in the relative earnings of U.S. immigrants. These studies point out to a number of possible explanations for the declining economic performance of immigrants. In particular, secular changes in the country of origin of immigrants account for a substantial part of the decline. While most immigrants in the 1960s were from Europe and the United States, about two thirds of immigrants who arrived in Canada in the 1980s and 1990s were from Asia, Africa, and Central and Southern American.

With very few exceptions, however, existing studies only attempt to explain the decline in the *mean* wage of immigrants relative to natives.[1] From a welfare perspective, however, it is essential to go beyond the mean and see how the whole distribution of wages of immigrants has changed relative to the Canadian born. For instance, the fact that recent immigrants earn substantially less, an average, than the Canadian born may be hiding important differences across subgroups of immigrants. Perhaps a substantial fraction of immigrants still do as well as or better as the Canadian born, while a large group of immigrants have very low earnings that makes it unlikely they will ever "catch-

[1] One important exception is DiNardo and Butcher (2002) who look at the whole distribution of wages for the United States.

up" and enjoy standards of living comparable to those of earlier immigrants or the Canadian born. When thinking about the prospects of successful integration of immigrants, it is thus essential to look at the whole distribution of earnings of wages relative to the Canadian born.

The goal of this paper is two-fold. We first want to describe the evolution of the wage distribution of immigrants relative to the Canadian born to see whether the well documented decline the mean relative wage of immigrants is spread over the whole wage distribution, or more concentrated in specific parts of the distribution, and in particular in the low-end of the distribution. We use simple quantile plots to illustrate these changes. The second goal is to try to explain these distributional changes using the standard explanatory factors used in the literature on the mean relative earnings of immigrants. In particular, recent studies by Green and Worswick (2004) and Aydemir and Skuterud (2005) find that secular changes in immigrants' country of origin, language ability, and the decline in the return to foreign labour market experience are the two leading explanations for the decline in the mean earnings of immigrants over time. In this study, we explore whether these factors and others can also account for observed changes in the earnings of immigrants at different points of the distribution.[2]

While the goal of the paper is relatively simple, trying to account for the role of different explanatory factors at different points of the earnings distribution is not an easy econometric problem. When looking at means, it is well known that OLS estimates can be used to perform a standard Oaxaca-Blinder decomposition that precisely accounts for the contribution of each explanatory factor to the overall mean gap. In the case of quantiles or other distributional statistics, however, comparable decomposition procedures have only been developed recently. In this paper, we use the unconditional quantile regression method of Firpo, Fortin, and Lemieux (2006) to decompose changes in the immigrant-Canadian born wage gap at different quantiles of the wage distribution. Since the wage distribution can be fully characterized in terms of its various quantiles, decomposing the immigrant-Canadian born wage gap at "enough" quantiles amounts to

[2] Picot and Hou (2003) is the only other study we know that looks at distributional issues, but the only focus on the low-income threshold, while we look through the entire wage distribution.

decomposing the whole difference in distributions between immigrants and the Canadian born.

The plan of the paper is as follows. In Section 2, we describe the (census) data and present a descriptive analysis of the distribution of immigrants and Canadian born earnings. In section 3, we discuss the estimation method used to decompose quantiles and explain how different factors are expected to differential impact the earnings of immigrants at different quantiles of the wage distribution. We present our main results in section 4 and conclude in section 5.

2. Data and Descriptive Statistics

2.1. Data

Since 1981, the Canadian Census has been collecting consistent information on immigrant status (including year of immigration and country of origin), educational attainment, earnings and work experience during the previous year (annual earnings from different sources, weeks worked, and full-time employment status), and other socio-economic characteristics of individuals.[3] The information on educational attainment is unusually rich. The Census provides detailed information on years of schooling and degrees and diplomas obtained. We combine these variables to compute the number of years of completed schooling, and to classify workers into six education groups: some elementary or secondary schooling, high school diploma, trade certificate, some post-secondary degree or diploma below a university bachelor's degree, university bachelor's degree, and post-graduate degree (Masters, PhD, and professional degrees).

Another advantage of the Census for studying immigration and wages is the large sample size. In the Census, basic questions about demographics are asked to all individuals in the population. Twenty percent of individuals are also asked an additional set of questions (the "long form") about additional issues such as educational attainment, earnings and labour market activities. Over the years, Statistics Canada has made available public use samples that are random samples of 10 to 15 percent (depending on the years) of individuals who completed the "long form". These represent large samples

[3] Public use files are available for the 1971 census, but education is coded quite differently and it is not possible to compute weekly earnings directly (because the weeks worked variable is grouped in few categories).

of 2 to 3 percent of all individuals in the country. Following the existing literature, we focus our analysis on "adults" age 16 to 65 at the time of the Census (June).[4] We perform our analysis for the first (1981) and last (2001) year for which consistent data are available.[5]

One drawback of the Census for studying the evolution of the wage structure is that it only provides limited information on annual hours of work. As a result, it is not possible to construct a direct measure of average hourly wages by dividing annual earnings by annual hours of work.[6] Following Card and Lemieux (2001) and many U.S. studies such as Katz and Murphy (1992), we use weekly earnings of full-time workers as our main measure of wages. Following most of the literature, we only use wage and salary earnings for computing weekly earnings of full-time workers.[7]

In the public use files of the Census, earnings are top-coded for a small fraction (usually less than one percent) of individuals with very high earnings. Statistics Canada adjusts the top-code over time to keep it more or less constant in real terms.[8] Since the top-code in the 2001 Census ($200,000) is smaller in real terms than the top-code in 1981, we "re-topcode" the 1981 Census data so that the top-codes are the same in real terms in both year. Finally, we trim all wage observations with weekly earnings below $75 (in $2000) since they yield implausibly low values for hourly wages.[9]

2.2. Descriptive Statistics.

[4] The information on weeks worked and annual wage and salary earnings refers to the previous year. Thus, the individuals in our samples were age 15 to 64 during the period for which our wage measures apply.
[5] We are in the process of gaining access to the master files of the census (the full 20 percent sample) and will use all available censuses (1981, 1986, 1991, 1996, and 2001) in the next version of the paper.
[6] The census asks about weeks of work and part-time/full-time status during the previous year, as well as actual weekly hours of work during the census week (in June). Since weekly hours of work vary considerably over time for many individuals, hours of work in the survey week is a poor proxy for average weekly hours of work during the previous year. In particular, many individuals who did not work during the Census week did work during the previous year.
[7] Another common practice in the literature that we do not follow here is to limit the sample to "full-year" workers who worked at least 49 or 50 weeks during the previous year. Using this alternative wage measure has little impact on the results.
[8] The top codes in nominal dollars are $100,000 in 1980, $140,000 in 1985, and $200,000 in both 1990, 1995, and 2000. When expressed in constant dollars of 2000, these top-codes translate to $219,973 in 1980, $215,164 in 1985, $247,088 in 1990, and $217,689 in 1995.
[9] Since full-time workers work at least 30 hours a week, a full-time worker earning $75 a week makes at most $2.50 an hour. This represents less than half of the minimum wage in any province in 2000.

Table 1 shows the means of the key variables used in the analysis of immigrant and Canadian-born workers in 1981 and 2001. We only report these descriptive statistics for full-time males, our main sample of interest. The table shows that while immigrants used to earn seven percent more than Canadian-born workers in 1981 (difference of 0.07 log points), they now earn two percent less than Canadian-born workers in 2001. This broadly confirms the findings of recent studies like Green and Worswick (2004) and Aydemir and Skuterud (2005) who both document a large decline in the earnings of new cohorts of immigrants throughout the 1980s and 1990s.

Turning to standard human capital variables, the table first compares the level of experience of immigrants and the Canadian born. Since actual labour market experience is not available in the census, we compute years of potential experience as age minus years of schooling minus 6. Following Green and Worswick (2004), we further divide years of experience of immigrants into years of experience in Canada and years of foreign experience, which are presumably not valued as much as Canadian experience in the Canadian labour market. Table 1 shows that years of Canadian experience of immigrants increase from 16.1 to 16.8 between 1981 and 2001, which is three times less than the increase in two years of experience of Canadian born workers (for whom Canadian experience is the same as total potential experience). This large increase in years of experience of Canadian-born workers is a direct consequence of the aging of the baby-boom generation. We will later see that the growing experience gap between Canadian-born workers and immigrants is a surprisingly important source of change in the wage gap between these two groups of workers. By contrast, the foreign experience of immigrants remains constant over time and cannot directly contribute to the evolution of the relative wage of immigrants.

For education, we group workers into six education categories based on their highest degree or diploma. For both immigrants and Canadian-born workers, there is a clear increase in the level education. Most noticeably, the fraction of workers without a high school diploma declines from around 40 percent in 1981 to slightly above 20 percent in 2001. Education at the top end (university bachelors and above) also increases substantially for the Canadian born and especially immigrants. For instance, the fraction of immigrants with a post-graduate degree increases from 7.3 percent in 1981 to 13.5

percent in 2001, which is more than twice as large as the corresponding fraction for the Canadian born (5.6 percent). Looking more broadly at years of completed education confirms that immigrants are more educated than the Canadian born, and that the education gap is growing over time. Given the strong link between wages and education, the large education upgrading between 1981 and 2001 should increase the wages of the Canadian born and, in particular, immigrants.

The next figures in the table show that immigrants are more likely to be married (in part because they are older), and more likely to know only English or neither French nor English than the Canadian born. Essentially no Canadian born and very few immigrants respond that they neither know French nor English. Since this question about the knowledge of official languages may not measure the language abilities of immigrants very well, we also include information on mother tongue for immigrants. While the fraction of immigrants whose mother tongue is French is very small, the fraction of immigrants whose mother tongue is English is almost 40 percent in 1981 but less than 30 percent in 2001. This mostly reflects the well known changes in the distribution of country of origin described in the next set of figures in the table.

Country of origin is grouped into eight categories.[10] As is well known, there has been a steep decline in the fraction of immigrants coming from Europe over the last few decades. Table 1 shows that immigrants from Europe (and the United States) accounted for over 75 percent of immigrants in 1981, but only 44 percent in 2001. By contrast, the fraction of immigrants from Asia increased from 13 to 37 percent over the same period. The fraction of immigrants from Africa and South and Central America (including the Caribbean) also increased substantially. This change in the composition of immigrants has been shown to have a negative impact on the relative wage of immigrants. The rest of the table shows that immigrants are disproportionately concentrated in high wage provinces (Ontario and British Columbia) and in large cities (CMA). As a result, we expect that the relative location of immigrants should have a positive effect on their relative wages.

[10] It is difficult to use a much more detailed classification of country of origin because of the limited information available in public use files. For instance, there is only one category for Asia in the 1981 public use file. The need to use detailed information on the actual country of origin instead of these very broad groupings is the main reason why we plan to use the master files in the next version of the paper.

2.3 Changes in the distribution of wages

A simple way of characterizing the changes in the wage distribution of immigrants and the Canadian born is to compute wages differences between the two groups (and over time) at each wage percentile. Figure 1 shows the 1981-2001 change in real log wages for immigrants and the Canadian born considered separately. The solid line for the Canadian born shows a clear expansion in wage inequality over this period. While wages at the top-end of the distribution increased by close to 20 percent, wages at the bottom end declined by a comparable percentage. The changes are even more striking for immigrants. While immigrant wages at the top end of the distribution increased almost as much as for the Canadian born, immigrant wages at the bottom of the distribution declined by more than 30 percent in real terms. The figure thus clearly shows that inequality expanded more dramatically among immigrants than the Canadian born, and that immigrants at the low-end of the distribution lost considerable ground relative to the Canadian born.

Figure 2 shows instead the wage gap at each percentile between immigrants and the Canadian born in both 1981 and 2001. Consistent with Table 1, the figure confirms that immigrants earned substantially more than the Canadian born in 1981. Interestingly, however, the difference is mostly due to the fact that immigrants in lower percentiles of the wage distribution used to earn substantially more than the Canadian born. In contrast, in 2001, all immigrants except those in the very top percentiles of the wage distribution earn less than the Canadian born. The primary goal of the paper is to try to account for these dramatic changes in the relative wages of immigrants at different percentiles of the distribution using Firpo, Fortin, and Lemieux (2006) unconditional quantile regression method described in the next section of the paper.

3. Estimation Method and decompositions

3.1 Standard decomposition

Before discussing how to decompose the wage gap between immigrants and the Canadian born at each percentile, it is useful to discuss the familiar case of the mean where the

standard Oaxaca-Blinder decomposition can easily be used. Consider a standard (log) wage equation for immigrants

$$W_{it} = X_{it}\beta_{It} + u_{it}\,, \tag{1a}$$

and for Canadian-born workers

$$W_{Ct} = X_{it}\beta_{Ct} + u_{it}\,, \tag{1b}$$

at time *t*. Under the usual assumption that the error term u_{it} has a conditional mean of zero, given the covariates X_{it} ($E(u_{it} \mid X_{it})=0$), β_{It} and β_{Ct} can be consistently estimated using OLS, and the mean wage gap between immigrants and the Canadian born can be decomposed as:

$$\Delta_t = \overline{W}_{It} - \overline{W}_{Ct} = \overline{X}_{It}\beta_{It} - \overline{X}_{Ct}\beta_{Ct} = (\overline{X}_{It} - \overline{X}_{Ct})\beta_{Ct} + \overline{X}_{Ct}(\beta_{It} - \beta_{Ct}), \tag{2}$$

where $\overline{W}_{Ct}$ and $\overline{W}_{It}$ are is the mean wages for Canadian-born workers and immigrants, respectively, while $\overline{X}_{Ct}$ and $\overline{X}_{It}$ are the corresponding mean values of the explanatory variables. Note that some variables specific to immigrants, such as years of foreign experience and country of origin, only appear in the wage equation for immigrants. One simple way of capturing this in our framework is to set the corresponding values of these variables and the regression parameters for the Canadian born to zero.

We also consider a restricted version of the wage equation where the regression coefficients (except the constant) are constrained to be the same for immigrants and the Canadian born. This results in the wage equation

$$W_{it} = \delta_t I_{it} + X_{it}\beta_t + u_{it}, \tag{3}$$

where I_{it} is a dichotomous variable indicating whether person *i* is an immigrant. Under this alternative assumption, the decomposition of the mean earnings gap can be written as:

$$\Delta_t = \overline{W}_{It} - \overline{W}_{Ct} = \delta_t + (\overline{X}_{It} - \overline{X}_{Ct})\beta_t\,, \tag{4}$$

where δ_t is the unexplained (or adjusted) part of the overall mean wage gap Δ_t, while $(\overline{X}_{It} - \overline{X}_{Ct})\beta_t$ is the part explained by differences in explanatory variables.

One advantage of this specification is that it makes it easier to decompose the evolution of the immigrant-Canadian born wage gap over time. For instance, the change in the wage gap from a base period *t*=0 to an end period *t*=1 is

$$\Delta_1 - \Delta_0 = (\delta_1 - \delta_0) + (\overline{X}_{I1} - \overline{X}_{C1})\beta_1 - (\overline{X}_{I0} - \overline{X}_{C0})\beta_0 \tag{5}$$

3.2 Unconditional quantile regressions.

We would now like to perform a similar decomposition for the different quantiles of the wage distribution. Consider the τ^{th} quantile of the wage distribution for the Canadian born, $q_{Ct}(\tau)$, and for immigrants, $q_{It}(\tau)$. The quantile wage gap, $\Delta_t(\tau)$, is defined as

$$\Delta_t(\tau) = q_{It}(\tau) - q_{Ct}(\tau),$$

and the change in the quantile wage gap between time t=0 and t=1 is

$$\Delta_1(\tau) - \Delta_0(\tau) = (q_{I1}(\tau) - q_{C1}(\tau)) - (q_{I0}(\tau) - q_{C0}(\tau)).$$

Firpo, Fortin, and Lemieux (2006) show that it is possible to decompose these quantile gaps by running regressions where the dependent variable W_{it} is replaced by the (recentered) influence function, which they call RIF_{it}. When the quantile of interest is $q(\tau)$, RIF_{it} is defined as

$$RIF_{it} = q(\tau) + [1(W_{it} \geq q(\tau)) - (1- \tau)] / f(q(\tau)), \quad (6)$$

Where 1(.) is the indicator function (equals 1 when $W_{it} \geq q(\tau)$), 0 otherwise), and $f(q(\tau))$ is the wage density evaluated at the τ^{th} quantile. Since $1(W_{it} \geq q(\tau))$ is simply a dummy variable indicating whether a wage observation is above a given quantile while all other terms in equation (6) are constants, running a regression of RIF_{it} on the X variables essentially amounts (up to a linear transformation) to running a linear probability model for whether the wage for a given observation is above or below the quantile. The coefficients from a regression of RIF_{it} on the X_{it} variables are, thus, the same as in the linear probability model except that they need to be divided by the density $f(q(\tau))$. By analogy with the case of the mean considered above, consider the regression model

$$RIF_{it} = \theta_t I_{it} + X_{it}\gamma_t + e_{it} . \quad (7)$$

The coefficients have the same interpretation as in the case of the mean. The coefficient θ_t captures the adjusted, or unexplained quantile difference between immigrants and the Canadian born, while γ_t indicates the effects of the other covariates on the unconditional quantile. As in the case of the mean, equation (7) can also be used to decompose the quantile gap as

$$\Delta_t(\tau) = \theta_t + (\overline{X}_{It} - \overline{X}_{Ct}) \gamma_t , \quad (8)$$

Firpo, Fortin, and Lemieux (2006) discuss in much more detail the interpretation of these unconditional quantile regressions. Re-explaining this in detail here would be beyond the

scope of this paper. We nonetheless provide some intuition for the decomposition method in Figure 3. The figure shows an example of two cumulative (log) wage distributions for immigrants and the Canadian born. In the example, we assume that log wages are normally distributed with a standard deviation of .5 for both immigrants and the Canadian born. We also set the mean for the Canadian born at 2, and the mean for immigrants at 2.2 (20 percent gap in favour of immigrants).

Now, consider a specific quantile, say the median (τ=.5). In the distribution for the Canadian born, the median corresponds to the case where the cumulative probability is P_C=.5. Thus, the median is q_C for the Canadian born. The corresponding median for immigrants is q_I. We are interested in decomposing the median gap q_I-q_C , but doing so cannot be done using conventional methods. In contrast, however, it is much easier to decompose the probability gap P_C-P_I , where P_I indicates the fraction of immigrants who earn less than the median wage for the Canadian born, q_C. We can indeed construct a dummy variable $1(W_{it} \geq q_C)$, and then run a simple linear probability model (or a logit or probit) to do a standard Oaxaca-Blinder decomposition of the probability gap.

Looking at Figure 3, we see that the probability gap P_C-P_I and the median gap q_I-q_C are closely linked. The ratio of P_C-P_I over q_I-q_C is simply the slope of the cumulative distribution, i.e. the probability density function. Roughly speaking, one can simply perform a probability decomposition and then translate it into a median decomposition by dividing everything by the density, f(.). This provides the rough intuition for why the unconditional quantile regressions consists of running a model for the dummy variable divided by the density, where the density can be readily estimated using kernel density estimation methods.

4. Estimation Results

4.1 Results for the mean wage gap

Before attempting to decompose the full distribution of wages at different quantiles, we start with the standard case of the mean. Table 2 shows standard OLS estimates of the wage equation for the Canadian born, immigrants, and both groups pooled together in 1981 and 2001. First note that while there are some differences in the estimated coefficients for immigrants and the Canadian born, these differences are not too

important qualitatively. We will thus focus the discussion on the case of the pooled models in columns 3 and 6.

Consistent with Boudarbat, Lemieux, and Riddell (2006), there is a large increase in the return to education over this period. For example, the wage gap between university graduates (with a bachelor's degree) and high school graduates (the base group) increases from 28 to 39 percent between 1981 and 2001. The return to Canadian experience also increases, but not as much as the return to education. Consistent with Green and Worswick (2004), we also find a dramatic decline in the return to foreign experience, which goes from half of the return to Canadian experience in 1981 to essentially zero in 2001. Note also, however, that the interaction term between Canadian and foreign experience also declines substantially. The fact that the interaction term is negative means that workers with more foreign experience have a lower return to Canadian experience, which is consistent with the two forms of experience being substitutes for each other. To see this, consider total effective experience, E, as the sum of Canadian experience, E_C, and a fraction γ of foreign experience, E_F. With a standard quadratic model for experience, we get a wage equation (ignoring other wage determinants):

$$W = b_1E - b_2E^2 = b_1(E_C + \gamma E_F) - b_2(E_C + \gamma E_F)^2$$
$$= b_1E_C + b_1\gamma E_F - b_2E_C^2 - b_2(\gamma E_F)^2 - 2b_2\gamma E_C E_F$$

The decline in the return to foreign experience is consistent with γ going from about .5 in 1981 to close to zero in 2001. As a result, we also expect to see the interaction term (with a coefficient of $2b_2\gamma$) going close to zero as well. We will see later in the decompositions that the decline in the interaction term offsets most of the decline in the return to foreign experience. In other words, immigrants make up for the much smaller return to foreign experience by getting a larger return to Canadian experience.

The other regression results are all similar to what has been found earlier in the literature. In particular, the effect of coming from countries other than Europe or the United States (US and UK are the base group) has a large and negative impact. So has the effect of having a mother tongue (for immigrants) other than French or English, especially in 2001. In fact, it is a little difficult to separate the effect of not coming from the United Kingdom or the United States from the effect of not having English as a

mother tongue, and we will tend to sum up these two factors as country of origin effect in most of the analysis.[11]

Returning to the top of the table, we see that, once we have controlled for all the explanatory factors, there is no longer a statistically significant difference between the immigrant-Canadian born wage gap in 1981 and 2001. In both years, the adjusted gap is about 6 percent. So the 9 percentage point decline between 1981 and 2001 can *all* be explained by the regression models. Note that the positive immigrant wage gap of 6 percent only applies to the base group of immigrants who come from the United Kingdom or the United States, have English as their mother tongue, and have zero years of foreign experience.

Table 3 shows a detailed decomposition of the change in the wage gap based on equation (5). The table first shows that two thirds of the change in the gap (.062 out of 0.092) can be explained by the effect Canadian experience. The factor driving this change is the aging of the baby boom generation discussed earlier. Because of this large demographic shift, the average experience of Canadian-born workers has increased substantially more than immigrants.

Interestingly, the contribution of foreign experience is large because of the steep decline in the return to foreign experience documented in Table 2. Most of this effect is offset, however, by the countervailing effect of the interaction term discussed above. Taken together, these two effects nonetheless explain another 2 percentage point change in the gap. Broadly speaking, experience effects alone go a long way towards explaining why the immigrant-Canadian born gap changed so much over time.

The other factors listed in the rest of the table more or less offset each other. Country of origin effects (place of birth plus mother tongue) account for a 0.063 decline while the educational upgrading of immigrants and the fact that immigrants tend to be located in places where wages are higher (CMA, Ontario and BC) has a reverse impact.

4.2 Results for the quantile gaps

[11] If we had a more detail breakdown of countries, we suspect that the effect of mother tongue would be much smaller as it mostly captures differences between english-speaking and non-english speaking countries, for example Jamaica vs. Mexico in our S-C America category.

The results of the unconditional quantile regressions for the 10th, 50th (median), and 90th quantile are reported in Table 4. Note first that the results for the median are very similar to those from standard mean regressions reported in Table 2. Since means tend to be very similar to medians in practice, this gives us a lot of confidence on the reliability of the unconditional quantile regression method.

Generally speaking, factors that we think matter most at the bottom of the distribution should have a larger impact on the 10th quantile than on the 90th quantile, and vice versa. This is indeed what we tend to find in the regression estimates. For instance, being a high school dropout has a much more negative impact on the 10th quantile than on the median or the 90th quantile, while the positive impact of a post-graduate degree is much larger at the 90th quantile. We then use the regression results to perform a decomposition of the changes in the quantile wage gaps. Table 5 provides results similar to those in Table 3 (mean) for the three quantiles analyzed in Table 4. We also estimate (but do not report) models for each quantile from the 5th to the 95th (5, 10, 15, 20,…,95) and report both the adjusted and unadjusted quantile gaps in Figure 4.

The unadjusted gaps in Figure 4 are very similar to those reported in Figure 2. Once the gaps are adjusted using the unconditional quantile regressions, however, the resulting adjusted gaps for 1981 and 2001 are very close to each other, except perhaps at the very top of the distribution. As in the case of the mean, the large changes in the immigrant-Canadian born quantile wage gaps between 1981 and 2001 can, thus, essentially be all explained by the regression models. Figure 5 plots the changes in the adjusted and unadjusted gaps, which clearly illustrates how well our models explain the dramatic changes in the relative wages of immigrants throughout the wage distribution. For instance, the models explain essentially all the 15-20 percent decline in the wage of immigrants at the bottom end of the distribution.

The detailed decomposition results in Table 5 for the 10th, 50th, and 90th quantiles are qualitatively similar to those for the mean only presented in Table 3. Recall from Figures 4 and 5 that the explained change in the gap is much larger at the bottom end than at the top end of the wage distribution. Table 5 shows that, once again, Canadian experience explains well the changes, this time at the different quantiles. The effect of experience is indeed largest at the bottom end. The reason is that there was a large

concentration of young Canadian born workers with very low values of experience in 1981, which is precisely the place where returns to experience are the largest.

Looking at place of birth alone does not explain the observed changes very well, as it has a larger impact on changes at the top end than at the lower end. Even adding in the effect of language, however, we get an effect of -.055 at the bottom end compared to -.085 at the top end. So while country of origin explains well the mean decline in immigrant wages, it cannot account for the observed distributional changes. One factor that works better in this regard is education which has a larger positive impact at the top end, because returns to university education increased a lot over this period, and immigrant are relatively more likely to hold university degrees.

5. Conclusion

In this paper, we show that the decline in the relative wages of immigrants in Canada is far from homogenous at different points of the wage distribution. The 9 percent decline in the immigrant-Canadian born mean wage gap hides a much larger decline at the low end of the wage distribution, while the gap hardly changed at the top end of the distribution. Using standard OLS regressions and new unconditional quantile regressions, we show that both the changes in the mean wage gap and in the gap at different quantiles are well explained by standard factors such as experience, education, and country of origin of immigrants. Interestingly, the most important source of change in the wages of immigrants relative to the Canadian born is the aging of the baby boom generation that has resulted in a relative increase in the labour market experience, and thus in the wages, of Canadian born workers relative to immigrants.

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Figure 1: Change in Log Wage of Full-time Males
By Percentile from 1981 to 2001

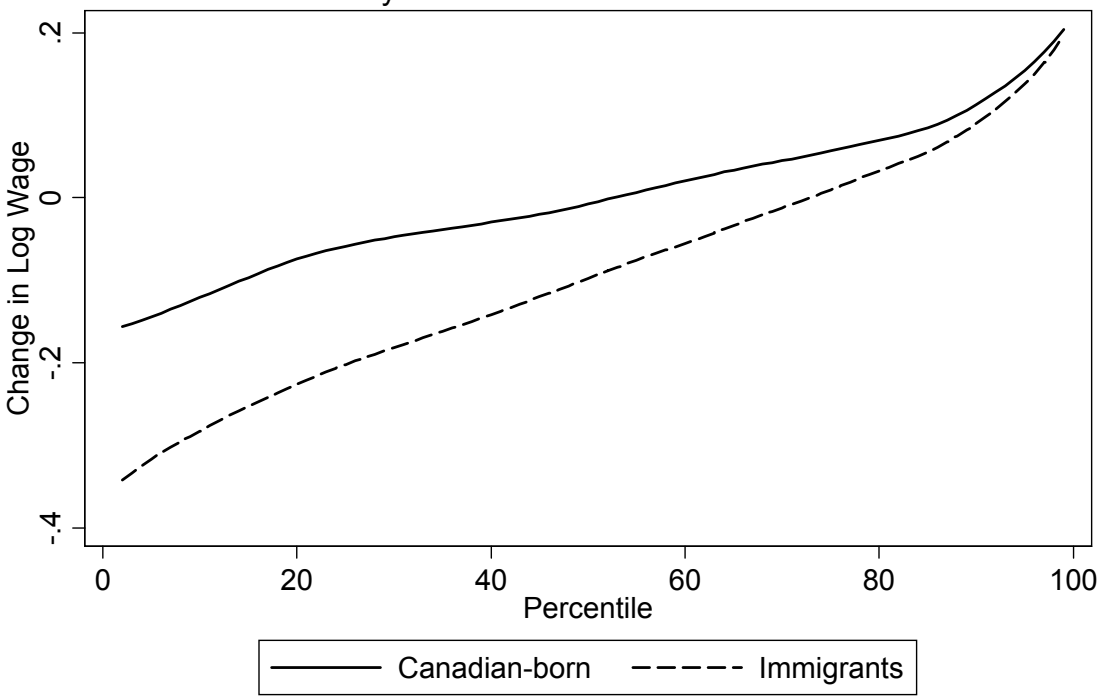

Figure 2: Immigrant-Canadian Born Wage Gap for Full-time Males
By Percentile in 1981 and 2001

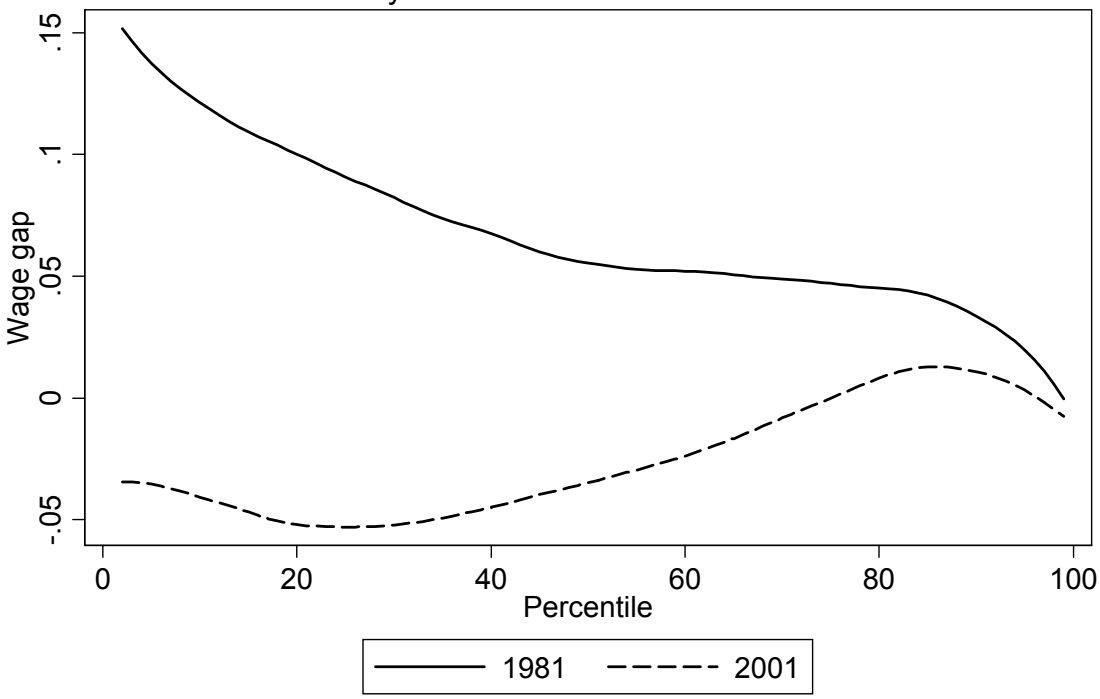

Figure 3: Relationship Between Differences in Wage Quantiles and Probabilities

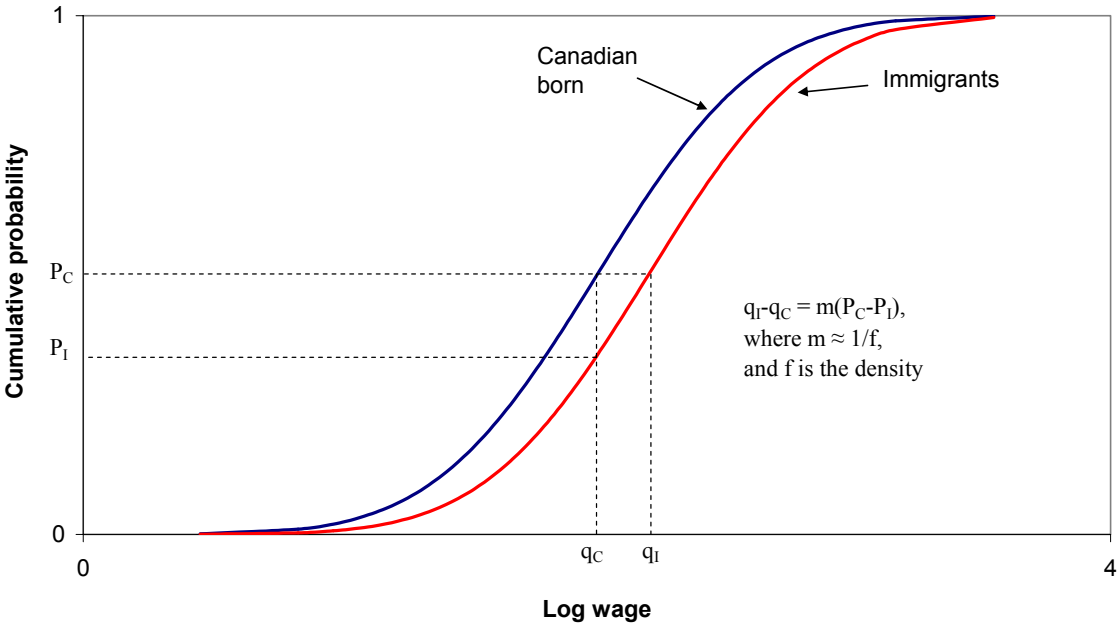

Figure 4: Unadjusted and Adjusted (using Unconditional Quantile Regressions) Immigrant-Canadian Born Wage Gap by Percentile

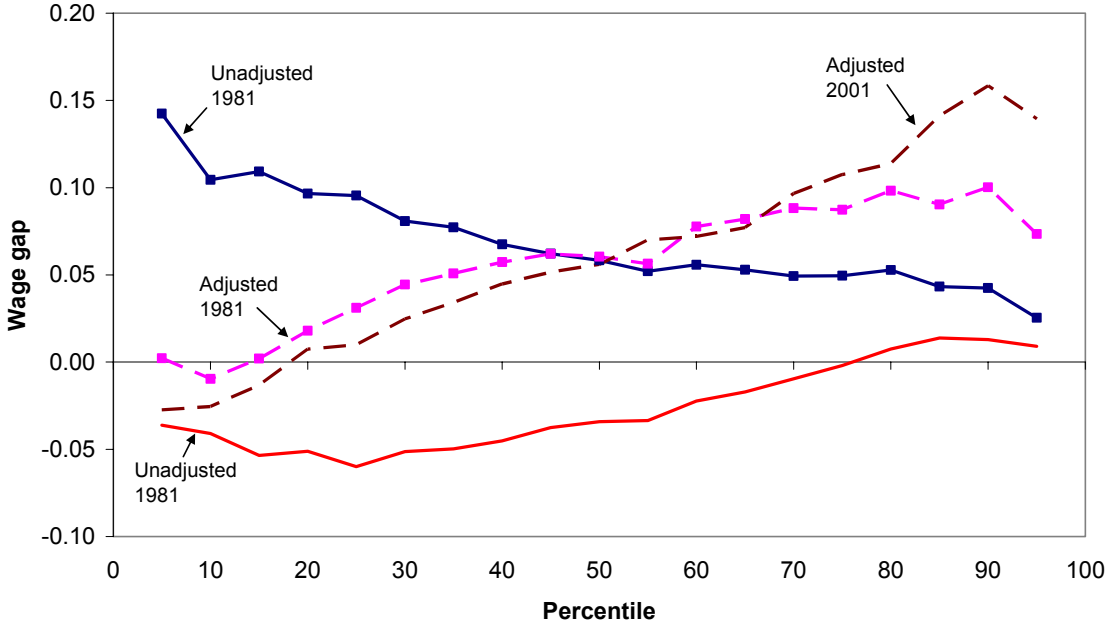

Figure 5: Unadjusted and Adjusted Change in the Immigrant-Canadian Born Wage Gap by Percentile

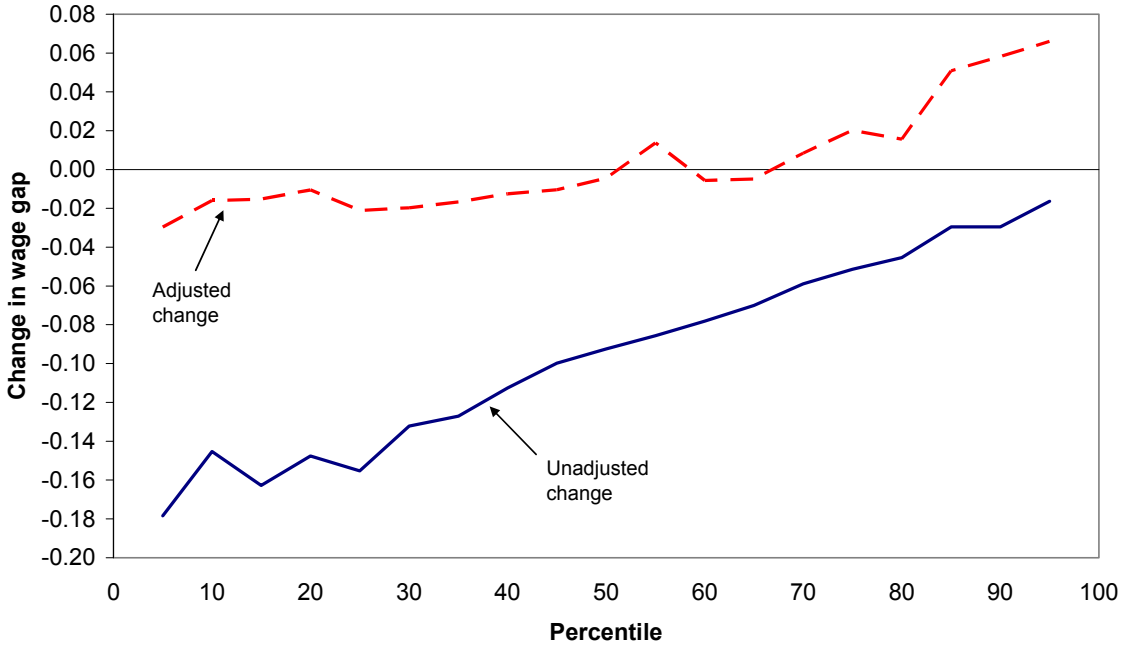

Table 1: Sample Means

	1981		2001	
	Cdn born	Immigrant	Cdn born	Immigrant
Log weekly wage	6.66	6.73	6.66	6.64
Canadian experience	17.7	16.1	19.7	16.8
Foreign experience		6.4		6.4
Age	35.9	41.3	39.3	43.4
Schooling				
Less than HS	0.403	0.371	0.222	0.212
High School degree	0.215	0.130	0.247	0.189
Trade Certificate	0.159	0.204	0.171	0.139
Post-secondary	0.106	0.137	0.185	0.180
Bachelors' degree	0.075	0.084	0.118	0.157
Post-graduate	0.040	0.073	0.056	0.123
Years of schooling	11.8	12.2	13.5	14.0
Married	0.688	0.807	0.669	0.776
Language				
English only	0.617	0.804	0.634	0.816
French only	0.159	0.027	0.136	0.023
Bilingual	0.224	0.142	0.230	0.135
Neither fr. nor eng.	0.000	0.027	0.000	0.025
Mother tongue				
English		0.379		0.275
French		0.037		0.031
Country of Origin				
UK and US		0.258		0.147
FR,IT,GER,NET,POR,GRE		0.326		0.171
"USSR", POL, CZE		0.088		0.072
Other Europe		0.087		0.054
Asia		0.129		0.368
Africa		0.029		0.058
S-C America		0.071		0.119
Rest of world		0.011		0.010
CMA	0.509	0.772	0.616	0.894
Province				
Quebec	0.318	0.144	0.296	0.125
Ontario	0.360	0.557	0.368	0.583
Manitoba	0.046	0.032	0.043	0.026
Saskatchewan	0.042	0.013	0.037	0.008
Alberta	0.115	0.095	0.128	0.092
British Columbia	0.120	0.159	0.126	0.167
Number of Observations	82218	20678	124620	30615

Table 2: OLS regressions, log weekly wage for full-time males

	1981			2001		
	Cdn born	Immigrant	Pooled	Cdn born	Immigrant	Pooled
	(1)	(2)	(3)	(4)	(5)	(6)
Immigrant			0.055**			0.062**
			(0.008)			(0.010)
Cdn experience	0.036**	0.040**	0.037**	0.041**	0.035**	0.040**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Cdn exper squared	-0.064**	-0.072**	-0.065**	-0.069**	-0.059**	-0.068**
	(0.001)	(0.003)	(0.001)	(0.001)	(0.003)	(0.001)
Foreign exper.		0.020**	0.019**		0.001	0.003*
		(0.002)	(0.002)		(0.002)	(0.002)
For exper squared		-0.045**	-0.044**		-0.011*	-0.012*
		(0.006)	(0.006)		(0.005)	(0.005)
Cdn-for experience		-0.090**	-0.080**		-0.024**	-0.038**
interaction		(0.006)	(0.005)		(0.006)	(0.005)
HS dropout	-0.129**	-0.077**	-0.122**	-0.091**	-0.030**	-0.080**
	(0.005)	(0.011)	(0.004)	(0.005)	(0.011)	(0.004)
Trade certif.	0.012*	0.056**	0.019**	0.076**	0.108**	0.082**
	(0.006)	(0.012)	(0.005)	(0.005)	(0.012)	(0.005)
Some Post-sec.	0.102**	0.146**	0.110**	0.163**	0.163**	0.162**
	(0.006)	(0.013)	(0.006)	(0.005)	(0.011)	(0.004)
Bachelors degree	0.285**	0.277**	0.281**	0.395**	0.355**	0.385**
	(0.007)	(0.015)	(0.006)	(0.006)	(0.012)	(0.005)
Post-graduate	0.402**	0.410**	0.399**	0.491**	0.476**	0.485**
	(0.010)	(0.016)	(0.008)	(0.008)	(0.013)	(0.007)
Single	-0.127**	-0.127**	-0.127**	-0.126**	-0.074**	-0.120**
	(0.010)	(0.020)	(0.009)	(0.007)	(0.017)	(0.007)
Married	0.103**	0.081**	0.099**	0.094**	0.079**	0.091**
	(0.009)	(0.016)	(0.008)	(0.006)	(0.014)	(0.006)
Bilingual	0.015*	0.027*	0.018**	0.009	0.042**	0.017**
	(0.007)	(0.013)	(0.006)	(0.006)	(0.014)	(0.006)
French only	-0.046**	-0.069**	-0.042**	-0.056**	-0.063*	-0.048**
	(0.009)	(0.025)	(0.008)	(0.008)	(0.026)	(0.008)
Neither	-0.313*	-0.050*	-0.056*	-0.207	-0.145**	-0.126**
	(0.129)	(0.022)	(0.022)	(0.163)	(0.023)	(0.023)
Mother tongue		-0.027*	-0.029*		-0.090**	-0.092**
Neither fr or eng		(0.012)	(0.012)		(0.011)	(0.011)
Mother tongue		0.006	-0.027		-0.017	-0.051*
French		(0.022)	(0.020)		(0.023)	(0.021)
Born in FR,IT,GER,		-0.070**	-0.061**		-0.011	-0.002
NET,POR,GRE		(0.014)	(0.014)		(0.016)	(0.016)
Born in USSR, POL,		-0.034*	-0.024		-0.039*	-0.020
CZE		(0.017)	(0.017)		(0.019)	(0.019)
Born elsewhere in		-0.034*	-0.030		0.033	0.040*

Europe		(0.017)	(0.017)		(0.019)	(0.019)
Born in Asia		-0.160**	-0.175**		-0.159**	-0.147**
		(0.016)	(0.015)		(0.015)	(0.015)
Born in Africa		-0.101**	-0.115**		-0.107**	-0.101**
		(0.022)	(0.022)		(0.019)	(0.019)
Born in SC America		-0.194**	-0.194**		-0.182**	-0.160**
		(0.015)	(0.015)		(0.014)	(0.014)
Born in the rest		-0.071*	-0.088*		-0.001	-0.005
of the world		(0.035)	(0.035)		(0.033)	(0.033)
CMA	0.041**	0.026**	0.040**	0.074**	0.043**	0.072**
	(0.004)	(0.009)	(0.003)	(0.003)	(0.012)	(0.003)
Quebec	-0.014	-0.076**	-0.027**	-0.107**	-0.210**	-0.126**
	(0.007)	(0.013)	(0.006)	(0.007)	(0.015)	(0.006)
Manitoba	-0.069**	-0.096**	-0.076**	-0.189**	-0.190**	-0.194**
	(0.009)	(0.019)	(0.008)	(0.008)	(0.020)	(0.008)
Saskatchewan	-0.005	-0.042	-0.014	-0.176**	-0.135**	-0.181**
	(0.010)	(0.035)	(0.010)	(0.009)	(0.039)	(0.009)
Alberta	0.127**	0.087**	0.117**	-0.004	-0.075**	-0.018**
	(0.006)	(0.013)	(0.006)	(0.005)	(0.013)	(0.005)
BC	0.164**	0.093**	0.146**	-0.007	-0.067**	-0.022**
	(0.006)	(0.010)	(0.005)	(0.005)	(0.010)	(0.005)
Observations	82218	20678	102896	124620	30615	155235
R-squared	0.23	0.21	0.23	0.22	0.19	0.22

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

Table 3: Decomposition of the Mean Wage Gap between Immigrant and Canadian-born Full-time Males

	1981	2001	Change
Raw (unadjusted) gap	0.067	-0.025	-0.092
Unexplained (adjusted) gap	0.055	0.062	0.007
Gap explained by:			
Canadian experience	0.024	-0.038	-0.062
Foreign experience	0.078	0.009	-0.069
Cnd*foreign experience	-0.081	-0.031	0.050
Education	0.024	0.045	0.021
Marital status	0.027	0.022	-0.005
Language	-0.016	-0.064	-0.048
Place of birth	-0.065	-0.080	-0.015
Location	0.020	0.050	0.030
Total explained	0.012	-0.087	-0.099

Note: Decomposition based on the regression models in columns 3 and 6 of Table 2.

Table 4: Unconditional quantile regressions, log weekly wage for full-time males

	1981			2001		
	10th	50th	90th	10th	50th	90th
	(1)	(2)	(3)	(4)	(5)	(6)
Immigrant	-0.010	0.060**	0.100**	-0.025	0.056**	0.158**
	(0.016)	(0.007)	(0.016)	(0.019)	(0.010)	(0.020)
Cdn experience	0.045**	0.034**	0.037**	0.075**	0.037**	0.023**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Cdn exper squared	-0.081**	-0.061**	-0.062**	-0.140**	-0.061**	-0.030**
	(0.003)	(0.001)	(0.002)	(0.003)	(0.001)	(0.002)
Foreign exper.	0.024**	0.016**	0.022**	0.031**	-0.003*	-0.005*
	(0.004)	(0.002)	(0.003)	(0.004)	(0.001)	(0.002)
For exper squared	-0.073**	-0.042**	-0.030**	-0.103**	0.007	0.022**
	(0.013)	(0.004)	(0.007)	(0.015)	(0.004)	(0.006)
Cdn-for experience	-0.055**	-0.075**	-0.108**	-0.112**	-0.027**	-0.011
interaction	(0.011)	(0.005)	(0.008)	(0.014)	(0.005)	(0.008)
HS dropout	-0.189**	-0.105**	-0.092**	-0.103**	-0.078**	-0.058**
	(0.011)	(0.004)	(0.007)	(0.013)	(0.005)	(0.006)
Trade certif.	0.010	0.040**	-0.037**	0.173**	0.092**	-0.004
	(0.011)	(0.005)	(0.009)	(0.012)	(0.005)	(0.007)
Some Post-sec.	0.117**	0.119**	0.080**	0.226**	0.171**	0.101**
	(0.012)	(0.006)	(0.010)	(0.011)	(0.005)	(0.007)
Bachelors degree	0.183**	0.258**	0.423**	0.358**	0.369**	0.459**
	(0.013)	(0.006)	(0.014)	(0.012)	(0.005)	(0.010)
Post-graduate	0.119**	0.327**	0.871**	0.313**	0.453**	0.718**
	(0.015)	(0.007)	(0.021)	(0.014)	(0.006)	(0.015)
Single	-0.312**	-0.086**	0.015	-0.246**	-0.112**	-0.011
	(0.019)	(0.008)	(0.014)	(0.017)	(0.007)	(0.011)
Married	0.173**	0.097**	0.042**	0.111**	0.088**	0.110**
	(0.016)	(0.007)	(0.013)	(0.013)	(0.006)	(0.010)
Bilingual	0.025*	0.008	0.046**	0.018	0.011	0.018
	(0.013)	(0.005)	(0.011)	(0.014)	(0.006)	(0.011)
French only	0.002	-0.077**	(0.025)	0.047*	-0.079**	-0.077**
	(0.018)	(0.007)	(0.013)	(0.020)	(0.008)	(0.013)
Neither fr nor eng	(0.109)	-0.059**	-0.046*	-0.403**	-0.094**	0.016
	(0.060)	(0.021)	(0.023)	(0.080)	(0.020)	(0.022)
Mother tongue	-0.05	-0.006	-0.045*	-0.126**	-0.083**	-0.075**
not fr or eng	(0.028)	(0.012)	(0.020)	(0.028)	(0.012)	(0.019)
Mother tongue	-0.117*	0.015	-0.016	-0.132*	-0.029	0.005
french	(0.049)	(0.020)	(0.035)	(0.054)	(0.022)	(0.038)
Born in FR,IT,GER,	0.033	-0.084**	-0.110**	0.131**	0.006	-0.167**
NET,POR,GRE	(0.031)	(0.014)	(0.025)	(0.035)	(0.016)	(0.029)

Born in USSR, POL, CZE	0.065	-0.044*	-0.107**	0.137**	0.007	-0.215**
	(0.036)	(0.017)	(0.032)	(0.044)	(0.020)	(0.033)
Born elsewhere in Europe	0.001	-0.044**	-0.036	0.149**	0.050*	-0.074
	(0.034)	(0.017)	(0.032)	(0.041)	(0.020)	(0.038)
Born in Asia	-0.076*	-0.183**	-0.273**	-0.075*	-0.144**	-0.243**
	(0.034)	(0.015)	(0.028)	(0.034)	(0.015)	(0.027)
Born in Africa	-0.040	-0.112**	-0.216**	-0.042	-0.109**	-0.165**
	(0.052)	(0.022)	(0.040)	(0.045)	(0.019)	(0.036)
Born in SC America	-0.167**	-0.206**	-0.241**	-0.044	-0.151**	-0.247**
	(0.037)	(0.015)	(0.024)	(0.033)	(0.014)	(0.025)
Born in the rest of the world	-0.134	-0.086**	-0.040	0.148*	-0.005	-0.091
	(0.079)	(0.032)	(0.066)	(0.074)	(0.036)	(0.063)
CMA	0.074**	0.022**	0.036**	0.110**	0.048**	0.085**
	(0.008)	(0.003)	(0.006)	(0.008)	(0.004)	(0.005)
Quebec	-0.042**	-0.029**	-0.029*	-0.137**	-0.125**	-0.126**
	(0.014)	(0.006)	(0.012)	(0.016)	(0.007)	(0.012)
Manitoba	-0.090**	-0.084**	-0.065**	-0.256**	-0.187**	-0.169**
	(0.020)	(0.008)	(0.012)	(0.022)	(0.008)	(0.011)
Saskatchewan	-0.052*	-0.027**	0.041**	-0.350**	-0.145**	-0.110**
	(0.023)	(0.009)	(0.015)	(0.026)	(0.009)	(0.013)
Alberta	0.111**	0.090**	0.179**	-0.097**	-0.018**	0.063**
	(0.012)	(0.005)	(0.010)	(0.012)	(0.005)	(0.009)
BC	0.132**	0.146**	0.150**	-0.065**	0.005	-0.027**
	(0.011)	(0.005)	(0.010)	(0.012)	(0.005)	(0.008)
Observations	102896	102896	102896	155235	155235	155235

Robust standard errors in parentheses
* significant at 5%; ** significant at 1%

Table 5: Decomposition of Quantile Wage Gap between Immigrant and Canadian-born Full-time Males

	1981	2001	Change
A. 10th quantile			
Raw (unadjusted) gap	0.104	-0.041	-0.145
Unexplained (adjusted) gap	-0.010	-0.025	-0.016
Gap explained by:			
Canadian experience	0.032	-0.055	-0.087
Foreign experience	0.078	0.095	0.017
Cnd*foreign experience	-0.056	-0.090	-0.033
Education	0.015	0.029	0.014
Marital status	0.058	0.037	-0.021
Language	-0.039	-0.106	-0.067
Place of birth	-0.007	0.004	0.012
Location	0.032	0.070	0.037
Total explained	0.114	-0.015	-0.129
B. 50th quantile			
Raw (unadjusted) gap	0.058	-0.034	-0.092
Unexplained (adjusted) gap	0.060	0.056	-0.004
Gap explained by:			
Canadian experience	0.024	-0.036	-0.060
Foreign experience	0.062	-0.012	-0.074
Cnd*foreign experience	-0.076	-0.022	0.055
Education	0.022	0.041	0.020
Marital status	0.022	0.021	-0.001
Language	0.005	-0.052	-0.057
Place of birth	-0.077	-0.074	0.003
Location	0.017	0.043	0.027
Total explained	-0.002	-0.090	-0.088
C. 90th quantile			
Unexplained (adjusted) gap	0.100	0.158	0.058
Gap explained by:			
Canadian experience	0.020	-0.032	-0.052
Foreign experience	0.112	-0.009	-0.122
Cnd*foreign experience	-0.110	-0.009	0.101
Education	0.036	0.066	0.030
Marital status	0.003	0.013	0.010

Language	-0.029	-0.043	-0.014
Place of birth	-0.107	-0.179	-0.071
Location	0.016	0.048	0.031
Total explained	-0.058	-0.145	-0.088