WAGE GAP MODEL METHODOLOGY

To identify wage differences between immigrant and Canadian-born workers, it is essential to control for the characteristics of each group. By doing so "the effects of discrimination and the effect of differences in individual characteristics" can be identified.[70]

Identifying explained and unexplained components of the immigrant wage gap can be achieved by employing the Blinder-Oaxaca decomposition method originally developed in 1973.[71] The Blinder-Oaxaca methodology decomposes regression results between two different groups – in this case, Canadian-born workers (*A*) and immigrant workers (*B*) – into the differential that can be explained by differing characteristics (*E*) and the differential that reflects different outcomes for the same characteristic across groups (*U*). The second portion (*U*) is often interpreted as discrimination but it should be noted that a portion of the effect may be comprised of unobserved variables.[72]

$$\text{Explained: } E = \{E(X_A) - E(X_B)\}\beta^*$$

$$\text{Unexplained: } U = E(X_A)\,(\beta_A - \beta^*) + E(X_B)'(\beta^* - \beta_B)$$

Note: β^* represents the coefficients from the pooled Canadian-born and immigrant regression.

The Blinder-Oaxaca decomposition is applied to a public use microdata file of the 2011 National Household Survey (NHS) dataset, which substituted for the long-form census in that census cycle. Ideally the analysis should be conducted using the official census, which should have greater accuracy given its universal coverage and mandatory response requirements. The Institute recognizes that there are sampling and survey limitations associated with the NHS but Statistics Canada uses the 2011 immigration numbers captured by the federal government in its calculations.

The cleaned dataset covers 270,672 respondents across Canada and 105,088 specifically in Ontario. The unweighted respondent breakdown between Canadian-born and immigrants in Ontario are 69,540 and 35,548, respectively (Exhibit A).

EXHIBIT A Wage gap model sample size

Total	Unweighted		Weighted
	Number	Percent (%)	Percent (%)
Ontario	105,088		
Canadian born	69,540	66.2%	67.1%
Immigrant	35,548	33.8%	32.9%

Full-time workers	Unweighted		Weighted
	Number	Percent (%)	Percent (%)
Ontario	37,288		
Canadian born	25,185	67.5%	68.6%
Immigrant	12,103	32.5%	31.4%

Note: Workers are only considered between the age of 25-64, if employed at a full-time job with more than 30 hours a week.
Source: Institute for Competitiveness & Prosperity analysis based on data from Statistics Canada, *National Household Survey*, 2011.

The regressions were restricted to those between 25 and 64 years old. Additionally, those who are self-employed were omitted from the study as potential discrimination is unlikely to affect them in the same way. The regressions were run as follows:

$$\begin{aligned}\ln(weeklywage) &= \beta_0 + \beta_1 i.highesteducation + \beta_2\, yearsofPotentialCanadianWorkExperience \\ &+ \beta_3\, yearsofPotentialCanadianWorkExperience^2 \\ &+ \beta_4\, yearsofPotentialForeignWorkExperience \\ &+ \beta_5\, yearsofPotentialForeignWorkExperience^2 + \beta_6 visibleMinority \\ &+ \beta_7 motherTongueOther + \beta_8 i.placeofBirth + \beta_9\, gender \\ &+ \beta_{10}\, i.foreignEducation + \beta_{11} i.location + \beta_{12} i.maritalStatus \\ &+ \beta_{13}\, i.hoursPerWeek + \beta_{14} i.NAICS + \beta_{15} i.NOCS + \varepsilon\end{aligned}$$

The standard Oaxaca decomposition produces arbitrary results depending on the category omitted from the dummy variables.[73] This can be overcome by summing all the coefficients of each dummy variable set, which turns out to be invariant to the omitted grouping.[74] In doing so the variable's effect can be accurately observed, but the specific effect each category contributes cannot be. For example, the overall effect of education can be observed, but not the effect of each specific education level.

Immigrant income gain calculations

Canadian-born specific variables are denoted with a subscript *c*.
Immigrant specific variables are denoted with a subscript *i*.

W&S = Wages and salaries — *Er = Employment rate*

E = Employees — *D = Immigrant discount*

W = Average wage — *Pr = Portion of working age population*

P = Working age population

(1) $W\&S = (2)W\&S_I + (3)W\&S_C$
(4) $W\&S = (5)E * W$
(5) $E = P * Er$
(4+5) → (6) $W\&S = P * Er * W$

(2) $W\&S_I = (7)P_I * Er_I * (8)W_I$
(7) $P_I = P * Pr_I$
(8) $W_I = W_C * D$
(2 + 7,8) → (9) $W\&S_I = P * Pr_I * Er_I * W_C * D$

(3) $W\&S_C = (10)P_C * Er_C * W_C$
(10) $P_C = P * Pr_C$
(3+10) → (11) $W\&S_C = P * Pr_C * Er_C * W_C$

(1+9,11) → (12) $W\&S = (P * Pr_I * Er_I * W_C * D) + (P * Pr_C * Er_C * W_C)$
(12) → (13) $W\&S = (14)(P * W_C) * [(Pr_I * Er_I * D) + (Pr_C * Er_C)]$
(14) $P * W_C = X$
(13+14) → (15) $W\&S = X * [(Pr_I * Er_I * D) + (Pr_C * Er_C)]$

Using real world data the equation is solved to create the wages and salaries component of GDP that immigrants are responsible for (Exhibit B).

EXHIBIT B Model input values

Variable	Value
Wages and salaries in Ontario	$344,728 M
Ontario GDP 2015	$763,276 M
Portion of working age population I	33.6%
Portion of working age population C	66.4%
Employment rate I	72.3%
Employment rate C	77.0%
Immigrant discount	84.2%

Note: Non-permanent residents make up 1.1 percent of the potential labour force but are omitted from the calculation.
Source: Institute for Competitiveness & Prosperity analysis based on data from Statistics Canada, *National Household Survey*, 2011.

(15) → (16) $\$344{,}728 = X * (0.336 * 0.723 * 0.842 + 0.664 * 0.770)$

(16) → (17) $X = \$481{,}627$

The current wages and salaries earned by immigrants is found by:

(9 + 14) → (17) $W\&S_I = X * Pr_I * Er_I * D$

(17) → (18) $W\&S_{I-Base} = \$481{,}627 * 0.336 * 0.723 * 0.842 = \$98{,}665$ million

Wage

After correcting for the 7.1 percent unexplained immigrant gap the immigrant discount will be reduced from 0.842 to (0.842+0.071)=0.913

(17) → (19) $W\&S_{I-W\ correction} = \$481{,}627 * 0.336 * 0.723 * (0.842+0.071) = \$106{,}984$ million

(20) $\Delta W\&S_{I-W\ correction} = W\&S_{I-W\ correction} - W\&S_{I-Base}$

(20) → (21) $\Delta W\&S_{I-W\ correction} = \$106{,}984 - \$98{,}665 = \$8{,}320$ million

(22) $$\frac{\Delta W\&S_{I-W\ correction}}{GDP_{Ontario2015}} = \frac{\$8{,}320 \text{ million}}{\$763{,}276 \text{ million}} = 1.09\%$$

Employment

After correcting for the 4.6 percent immigrant employment gap the employment rate will shift to 77.0 percent (72.3+4.6=77.0).

(17) → (23) $W\&S_{I-E\ correction} = \$481{,}627 * 0.336 * (0.723 + 0.046) * 0.842 = \$104{,}981$ million

(24) $\Delta W\&S_{I-E\ correction} = W\&S_{I-Employment\ correction} - W\&S_{I-Base}$

(24) → (25) $\Delta W\&S_{I-E\ correction} = \$104{,}981 - \$98{,}665 = \$6{,}316$ million

(26) $$\frac{\Delta W\&S_{I-E\ correction}}{GDP_{Ontario2015}} = \frac{\$6{,}316 \text{ million}}{\$763{,}276 \text{ million}} = 0.83\%$$

Combination

Correcting both employment and wage outcomes at the same time results in benefits greater than the sum of their parts. This is because immigrants who were previously unemployed will now be able to enter the labour market at a higher wage than they otherwise would have been able to.

(17) → (27) $W\&S_{I-W\ and\ E\ correction} = \$481{,}627 * 0.336 * (0.723 + 0.046) * (0.842 + 0.071) = \$113{,}833$ million

(28) $\Delta W\&S_{I-W\ and\ E\ correction} = W\&S_{I-W\ and\ E\ correction} - W\&S_{I-Base}$

(28) → (29) $\Delta W\&S_{I-W\ and\ E\ correction} = \$113{,}833 - \$98{,}665 = \$15{,}169$ million

(30) $$\frac{\Delta W\&S_{I-W\ and\ E\ correction}}{GDP_{Ontario2015}} = \frac{\$15{,}169 \text{ million}}{\$763{,}276 \text{ million}} = 1.99\%$$

Case study

(17) → (31) $$W\&S_{I\text{–}W\ and\ E\ ⅓\ correction} = \$481{,}627 * 0.336 * \left(0.723 + \left(\frac{0.046}{3}\right)\right) * \left(0.842 + \left(\frac{0.071}{3}\right)\right) = \$103{,}475\ \text{million}$$

(31) $$\Delta W\&S_{I\text{–}W\ and\ E\ ⅓\ correction} = W\&S_{I\text{–}W\ and\ E\ ⅓\ correction} - W\&S_{I\text{–}Base}$$

(31) → (32) $$\Delta W\&S_{I\text{–}W\ and\ E\ ⅓\ correction} = \$103{,}603 - \$98{,}665 = \$4{,}938\ \text{million}$$

(33) $$\frac{\Delta W\&S_{I\text{–}W\ and\ E\ ⅓\ correction}}{GDP_{Ontario2015}} = \frac{\$4{,}938\ \text{million}}{\$763{,}276\ \text{million}} = 0.65\%$$