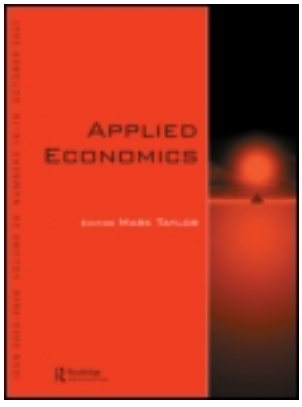

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A note on Canadian migration to the United States during the 1980s and 1990s

Richard E. Mueller [a]
[a] Department of Economics, University of Lethbridge, Lethbridge, Alberta T1K 3M4, Canada

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A note on Canadian migration to the United States during the 1980s and 1990s

Richard E. Mueller

Department of Economics, University of Lethbridge, Lethbridge, Alberta T1K 3M4, Canada
E-mail: richard.mueller@uleth.ca

Considerable media attention had been directed towards the flow of highly talented Canadians to the United States in the 1990s. There are firm theoretical reasons, however, to believe that qualitative differences in migration began as early as the 1980s, owing to the widening distribution of earnings and the related increased returns to education in the United States relative to Canada, both of which could result in qualitative improvements in the migration flow. US immigration policy remained essentially unchanged during the 1980s, but changed markedly in the 1990s owing to the implementation of the Canada–US Free Trade Agreement (CUFTA) and its successor, the North American Free Trade Agreement (NAFTA). We use a flexible empirical approach to document these changes in immigrant quality using 1980, 1990 and 2000 US census data. Our results suggest that improvements in Canadian immigrant quality occurred during the 1990s, but these also happened earlier, casting doubt on the hypothesis of improving Canadian immigrant quality in the 1990s. Quantile regressions also show that improvement in the entry quality of immigrants was not limited to the upper tail of the earnings distribution.

Keywords: migration; Canada; United States; income distribution

JEL Classification: J61

I. Introduction and Background

For the latter half of the last decade, the Canadian media was full of stories about the loss of talented Canadians south of the border. This southward migration or 'brain drain',[1] was blamed on high marginal taxes and/or lack of opportunities at home and/or excessive government regulation of the economy, etc. The labour mobility provisions in the Canada–US Free Trade Agreement (CUFTA) and its successor, the North American Free Trade Agreement (NAFTA), simply allowed the pent-up demand for Canadians wanting to enter the US to become realized. It was argued that the Canadian government had to change policy, sometimes radically, if the country were not be completely drained of its talent; talent that was largely paid for by the Canadian taxpayer.[2] That fact that highly skilled Canadians could have entered before the 1990s owing to factors that could not be controlled by the policy levers of the Canadian government rarely entered the debate. In fact, in the 1980s the United States were subject to two related phenomenon that theoretically could have changed the qualitative composition of Canadian immigration over that decade, before the 1990s debate over the 'brain drain' had even started. First, the distribution of earnings widened in the United States by a

[1] Ironically, the term 'brain drain' was coined by the British Royal Society and used to describe the outflow of British scientists and technologists to the Canada and the United States in the 1950s and early 1960s (Giannoccolo, 2009).
[2] Others (e.g. Helliwell, 1999) pointed out that the proportion of the Canadian-born leaving the country had been declining for a century and was at historic lows. As further evidence that Canada remained a desirable place to live and work, the ratio of Canadian emigrants to Canadian immigrants was about 0.20 in the early 1990s, its lowest ratio over a period of almost 150 years. Of course, these simple figures say nothing about any qualitative changes in the composition of emigration from Canada.

greater degree than it did in Canada (Blackburn and Bloom, 1993; Gottschalk and Smeeding, 1997; Richardson, 1997). Assuming a high correlation between earnings in the United States and Canada, Canadians of high ability (and thus ability to earn higher incomes) would be more likely to migrate. Second, and related to the first point, returns to education increased in the United States relative to Canada over this period (Burbridge *et al*., 2002). This provided another impetus for the migration of highly educated Canadians.

Evidence on these qualitative differences in migration from Canada to the United States is sparse. Borjas (1988) presented empirical evidence that supported his theory that the wider distribution of income in the United States resulted in highly skilled Canadian males self-selecting into the United States labour market. Mueller (1999) followed essentially the same methodology using updated data from the 1990 US Census and discovered that highly skilled Canadians of either gender continued to migrate to the United States in the 1980s.[3] Card (2003) too argued that these qualitative improvements occurred as early as the 1980s.

In what follows, we have little to say about the quantitative aspects of Canadian migration to the United States, these have been discussed elsewhere at length (Finnie, 2001; Mueller, 2006, as examples). Rather, we explicitly address the shortcomings of previous qualitative studies which have used two decennial censuses, which allowed for the identification of both assimilation and cohort effects,[4] but limited in that cohort effects were constrained to be equal across censuses, while the assimilation effect was constrained to be the same for all immigrants, irrespective of census year or entry cohort. As outlined by Borjas (1985), this can bias both cohort and assimilation effects. Works by LaLonde and Topel (1992), Baker and Benjamin (1994), and Grant (1999) have shown that these effects can in fact differ by entry cohort. The model estimated below does not impose these constraints on the estimation. Rather, as with these three related studies, we use a general model in which coefficient estimates can vary both between census years and between immigrants and the native-born, thus avoiding these potential estimation biases.[5] In addition, the analysis that follows will explicitly include females. In many studies of immigrant quality, it is only the earnings of male immigrants that are analysed. Furthermore, since estimates of these effects traditionally use common regression techniques, the conditional mean of the earnings variable is what is discussed. Recent work by Frenette and Morissette (2005) for Canada has shown that assimilation and cohort effects differ between entry cohorts at various locations in the earnings distribution. In the present work, we combine quantile regression techniques with the methodology outlined below in order to provide further evidence that Canadian immigrants to the United States are improving in quality and at what point in the earnings distribution this is occurring.

Although it is the 1990s that is generally considered the decade in which Canada most recently lost some of its most talented individuals, in some ways the 1980s provide a particular good decade to study this phenomenon since the US immigration policy remained relatively unchanged. Major changes in the US policy occurred with the Immigration Act of 1965, with the next major policy changes not occurring until 1989 and 1990. The former year is when the CUFTA came into effect. It included provisions for the temporary migration of skilled workers between the two countries.[6] The latter year is when the US Congress enacted the Immigration Act of 1990, which came into effect in 1992. This new act increased the overall number of permanent immigration slots, nearly tripled the number of employment-based admissions, increased the number of visas for temporary workers, and made the transition from temporary to permanent immigrant status much easier (Lowell, 2001). Since it is these policy changes that have been responsible for much of the debate since the late-1990s, especially regarding the interpretation of much of the data, the 1980s also provide a good period of analysis for our purposes, although the experiences of both decades will be discussed.

The next section of the article will discuss the methodology to be used in the empirical part of the article. Section III discusses the 1980, 1990 and 2000 United States Census data that were used in the analysis. Section IV presents the results from the estimation of model. The final section concludes.

II. Methodology

Following Borjas (1985), LaLonde and Topel (1992), and Baker and Benjamin (1994),[7] the standard earnings function in year t for immigrants who arrived in the host country in period i is

$$y_t = X_t'\beta_t + \sum_i C_{i,t} + \varepsilon_{i,t} \tag{1}$$

where y_t is a measure of earnings at time t, X_t is a vector of observable individual characteristics, β_t is the corresponding

[3] Studies by Schoeni (1997) and Cohen *et al*. (1997) have also addressed qualitative changes in immigration to the United States over the 1980s. Unfortunately, the Canadian-born in each of their samples is included with other immigrant source countries such as Australia and the United Kingdom.

[4] Qualitative aspects of immigrant cohorts are generally the result of two effects. First, the assimilation effect is a measure of the return to earnings for time spent in the host country. Second, there is cohort effect which means that successive groups of immigrants may be qualitatively different as a result of different levels of education, etc. The two of these works together determine the quality of immigrants in an economy.

[5] A series of Chow tests (not reported here) support rejection of these equality constraints. Testing for differences between census years, and between American-born and Canadian-born within each of these samples, for both males and females, we decidedly rejected the equality constraints.

[6] These provisions have continued since 1994 under the NAFTA. See Globerman (2000) for an excellent discussion of the changes to US temporary and permanent visas under the CUFTA and the NAFTA. Globerman (p. 901) notes: 'If trade liberalization is a significant contributor to a new brain drain from Canada to the United States, it is a largely unintended and unanticipated consequence. The issue of immigration was inconsequential in the debate surrounding trade liberalisation between the United States and Canada. In the case of NAFTA, immigration considerations were a sidebar to the negotiations'.

[7] This section essentially follows the exposition of the model as outlined by Baker and Benjamin (1994).

parameter vector, $C_{i,t}$ are intercepts for i entry cohorts at time t. The error term for cohort i at time t, $\varepsilon_{i,t}$, can be written as the sum of three unobservable components

$$\varepsilon_{i,t} = a_{i,t} + b_{i,t} + u_i \tag{2}$$

where: (1) $a_{i,t}$, is a cohort-specific assimilation effect and reflects the rate at which the cohort accumulates country-specific human capital; (2) $b_{i,t}$ represents the cohort-specific unobserved time effect and is (usually) considered to be the result of macroeconomic conditions that can differ at the time of entry for each cohort; and, (3) u_i is a cohort-specific fixed effect representing other unobserved factors that affect productivity and hence earnings. This is the result of unobserved talent and is referred to as the 'quality' of the immigrant cohort.

The use of a single cross-section allows the estimation of the assimilation effect over k years as $(a_{i,t} - a_{i+k,t})$. Under the assumptions $E[b_{i,t} - b_{i+k,t}] = 0$, and $E[u_i - u_{i+k}] = 0$, the estimates to these returns can be estimated using the $C_{i,t}$. The first assumption states that the unobserved time effects have the same effect on each cohort (for example, macroeconomic conditions affect all entry cohorts the same). The second assumption states that cohort quality does not vary between immigrant groups. If there are qualitative differences between cohorts, then this could lead to either positive or negative bias in the cross-section estimates of assimilation.

Using two separate cross-sections that are k years apart, the assimilation effect free of this fixed-effect bias can be estimated as $(a_{i,t} - a_{i,t-k})$ by using $(C_{i,t} - C_{i,t-k})$ under the assumptions that the u_i are fixed over time, and that $E[b_{i,t} - b_{i,t-k}] = 0$. This latter effect says that unobserved time effects do not differ within a single cohort at different times. This assumption is likely to be unrealistic. Economic conditions are likely to have differential effects on different immigrant cohorts, thus biasing the assimilation estimate. For example, the unemployment rate in the United States in 1970 was 4.9%, compared to a rate of 7.1% in 1980. If we assume that this macroeconomic environment affects some base group in the same way, the remedy to this problem is relatively straightforward. The solution is to compare immigrant earnings to the growth in those of some base group n, which will be native-born Americans in our estimates.[8] This is accomplished by running an additional regression:

$$y_t = X'_{n,t}\beta_{n,t} + C_{n,t} + \varepsilon_{n,t} \tag{3}$$

where $\varepsilon_{n,t} = b_{n,t} + u_n$. Equation 3 is the analog to Equation 2 for the native-born control group n, but with no assimilation effect. Thus, using two cross sections the difference $(C_{i,t} - C_{i,t-k}) - (C_{n,t} - C_{n,t-k})$ will be equal to $(a_{i,t} - a_{i,t-k})$, as long as $E[b_{i,t} - b_{i,t-k}] - E[b_{n,t} - b_{n,t-k}] = 0$. In other words, as long as time effects for natives and immigrants change equally for both, these effects will not bias our estimate of immigrant assimilation using the two cross sections.

The relationship between the quasi-panel and cross-section approaches can be expressed as follows. The predicted average level of earnings of cohort i in period t can be expressed as

$$\hat{y}_{i,t} = \bar{X}'_{i,t}\hat{\beta}_t + \hat{C}_{i,t} \tag{4}$$

and the predicted average level of earnings for this same cohort in year $t-k$ using the average level of observables of cohort i at time t is

$$\hat{y}_{i,t-k} = \bar{X}'_{i,t}\beta_{t-k} + \hat{C}_{i,t-k} \tag{5}$$

Similarly, the predicted earnings for a cohort that has the same number of years in the United States as those of cohort i in year $t-k$ (using the average level of observables of cohort i) is

$$\hat{y}_{i+k,t} = \bar{X}'_{i,t}\hat{\beta}_t + \hat{C}_{i+k,t} \tag{6}$$

Thus, in year t, cohort $i+k$ has the same number of years since migration as cohort i does is year $t-k$.

Finally, the predicted earnings for the native-born base group n in year t, using the average level of observables for immigrant cohort i, is

$$\hat{y}_{n,t} = \bar{X}'_{i,t}\hat{\beta}_{n,t} + \hat{C}_{n,t} \tag{7}$$

By using Equations 4 and 6, the cross-section estimate of assimilation $(a_{i,t} - a_{i+k,t})$ is equal to $(\hat{y}_{i,t} - \hat{y}_{i+k,t})$ and this may be expressed as the sum of two components

$$\begin{aligned}\hat{y}_{i,t} - \hat{y}_{i+k,t} = &\left[(\hat{y}_{i,t} - \hat{y}_{i,t-k}) - (\hat{y}_{n,t} - \hat{y}_{n,t-k})\right] \\ &+ \left[(\hat{y}_{i,t-k} - \hat{y}_{i+k,t}) - (\hat{y}_{n,t-k} - \hat{y}_{n,t})\right]\end{aligned} \tag{8}$$

The first term on the right-hand side of this equation measures the 'within cohort' growth of the earnings of cohort i across the two data sets. It follows the same cohort across the two census periods and is the quasi-panel measure of assimilation. If we substitute from the equations above, we get

$$\begin{aligned}&(\hat{y}_{i,t} - \hat{y}_{i,t-k}) - (\hat{y}_{n,t} - \hat{y}_{n,t-k}) \\ &\quad = \bar{X}_{i,t}\left[(\hat{\beta}_t - \hat{\beta}_{t-k}) - (\hat{C}_t - \hat{C}_{t-k})\right] \\ &\qquad + (a_{i,t} - a_{i,t-k}) + (b_{i,t} - b_{i,t-k}) - (b_{n,t} - b_{n,t-k})\end{aligned} \tag{9}$$

If we have common net time effects on immigrant and native-born group (as we have assumed), this measure of assimilation contains: (1) a component which captures the net change in the 'prices' of observables across immigrants and the base group between periods $t-k$ and t; and, (2) a component capturing the change in intercept due to assimilation $(a_{i,t} - a_{i,t-k})$. Thus, within this cohort growth is the measure of assimilation of cohort i over the 10-year period between censuses.

The second term in Equation 8 measures the change in earnings for a cohort with a fixed number of years in the

[8] LaLonde and Topel (1992) use a number of base groups in their analysis including the native born, earlier immigrant cohorts and, for comparisons with Mexican and Latin American immigrants, American-born Hispanics. They find that their inferences are not sensitive to the choice of base group. Using Canadian census data, Baker and Benjamin (1994) also try a number of different 'base groups' arguing that there is no strong argument for a 'natural' base group. They, however, investigate immigrants from a number of source countries making the choice of an appropriate base group more complex. Similarly, Grant (1999) finds that her results are not sensitive to the choice of natives as the base group. Given the intentions of this article, it seems reasonable to assume that the American-born are the natural base group in our analysis given the similarities between the two countries. Selected estimations were also conducted using the British and Irish as the comparator group. The results suggest that the experiences of this group in the United States were similar to the results of Canadians presented below over the timeframe examined.

United States across the two data sets. If the quality of cohorts has been declining (improving) over time, then this term will be positive (negative). Substituting from the above, this equals

$$\begin{aligned}(\hat{y}_{i,t-k} - \hat{y}_{i+k,t}) - (\hat{y}_{n,t-k} - \hat{y}_{n,t}) \\ = \bar{X}_{i,t}\left[(\hat{\beta}_{t-k} - \hat{\beta}_t) - (\hat{C}_{n,t-k} - \hat{C}_t)\right] \\ + (a_{i,t-k} - a_{i+k,t}) + (b_{i,t-k} - b_{i+k,t}) \\ - (b_{n,t-k} - b_{n,t}) + (\mu_i - \mu_{i+k}) \qquad (10)\end{aligned}$$

Given the assumptions made about the unobserved time effects, Equation 10 has three parts: (1) the net effect of changes in the prices of observables; (2) $(a_{i,t-k} - a_{i+k,t})$, the difference across time in the labour market outcomes of two cohorts at similar stages of assimilation; and, (3) $(\mu_i - \mu_{i+k})$, the difference in the fixed effect across cohorts. Again, if there has been a decline in immigrant quality over time, this term will be positive. By contrast, if there has been an increase in immigrant quality, the term will be negative.

In sum, this methodology allows us to differentiate within cohort effects (which reflect the earnings assimilation of a single entry cohort) from across cohort effects (which reflect qualitative changes in different entry cohorts). This is done with a flexible estimation procedure which does not constrain coefficient estimates for immigrants and natives to be equal, nor are these constrained to be equal within each of these groups across census years. For example, given the increased returns to education in the United States during the 1980s and 1990s, constraining coefficients to be equal across census years could introduce biases into coefficient estimates and lead us to erroneous inferences.[9]

III. Data

The data are obtained by merging the 5% individual records of the 1980, 1990 and 2000 US censuses.[10] A 1/100 subsample of the American-born was randomly generated for all years while all Canadian-born individuals were retained.[11] Our sample was further limited to include only noninstitutionalized individuals between the ages of 25 and 64 who worked at least 40 weeks in the year prior to the census, were not self-employed, did not attend school, and had at least $1000 in real salary (in 1989 dollars) in the reference calendar year. The income variable is the natural logarithm of real annual wage and salary income in the year preceding the respective census year (i.e. 1979, 1989 and 1999).[12]

The years of education variable was coded to equal the number of years corresponding to the highest level of education. For example, some post-secondary education or an associate degree was coded as 14 years of education, while a bachelor's degree or higher was coded as 16. This methodology ensured consistency across the three censuses. Experience was calculated using the familiar Mincer proxy (i.e. age – years of education – 6).[13]

A marriage variable was coded to one if the respondent said that he or she was married, and zero otherwise. The number of hours per week the individual normally worked were also included both directly and squared. For Canadian immigrants, entry cohorts are 5-year periods beginning with 1960–1964, a 10-year cohort for those who entered between 1950 and 1959, and a single cohort for those entering before 1950.

The final unweighted sample contains 17 857 Canadian-born and 51 591 American-born males, and 15 644 Canadian-born and 39 784 American-born females. Together these represent close to 185 million individuals over the three census years. In the Appendix, Table A1 provides a detailed disaggregation of sample sizes by place of birth, gender and entry cohort.

Tables 1 and 2 contain the summary statistics for American-born and Canadian-born males and females, respectively, in each of the three censuses. In all years and for both genders, Canadians have higher real annual salaries compared to their American counterparts and this salary gap has increased between census years. In 1980, Canadian males had salaries that were about 16% higher, 10 years later the gap increased to about 25%, and in 2000 it was 32%. For females, the salary advantage increased from about 4% to 12% to 18% over the same period.

Of course these are unadjusted salary differentials and the introduction of control variables may eliminate any salary difference between the two groups. Indeed, there are important differences in these characteristics. The average Canadian-born male had only slightly more education than his average American-born counterpart in 1980 and Canadian-born females had slightly less than the American-born. By 2000, Canadian males had 0.80 more years of education, while the average Canadian female had 0.43 more years. Given rates of return to education in 1990 and 2000 in the 5%–9% range (see Tables A2 and A3), these educational attainment differences

[9] As mentioned above, Chow tests allowed us to reject the restrictions on coefficients. See footnote 5.

[10] The limitation of using census data is that they are cross-sectional, not longitudinal, and decennial rather than annual. Ideally, longitudinal data should be used since this would allow us to follow the same individuals over time, reducing the potential bias using the quasi-panel data methodology. Some annual data are available from the Current Population Survey (CPS), also conducted by the US Census Bureau, but these data are not useful in the types of analysis presented here since the numbers of Canadian-born are too small to provide reliable results.

[11] While the analysis here is limited to the Canadian-born, there is evidence (King and Newbold, 2007) that the foreign-born in Canada who migrated to the United States in the late-1990s may constitute a parallel 'brain drain' since they tend to be better educated and earn higher incomes compared to both the Canadian-born who entered the United States over the same period as well as those who remained in Canada.

[12] Although we include only those with 40 plus weeks worked in the current work, in accord with some of the recent immigration literature (Baker and Benjamin, 1994; Grant, 1999), we also did estimates relaxing this restriction in an earlier version of this article, as well as using the logs of the real annual earnings and real weekly earnings as the dependent variable. There were no substantial changes in the results. Chiswick *et al*. (2006) use both wages and annual earnings and find essentially no difference in the pattern of the wage/earnings pattern of males from English-speaking countries with native-born American males throughout the wage/earnings distribution.

[13] In the original data, the age variable is continuous, but since the years of education variable was not coded as a continuous variable, experience was marginally negative in a few cases and was therefore bottom-coded to zero.

Table 1. Summary statistics, Canadian and American males, 1980, 1990 and 2000 US Census (SDs are in parentheses)

	1980 Census				1990 Census				2000 Census			
	Canadian		American		Canadian		American		Canadian		American	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Log of salary	10.41	(0.61)	10.25	(0.59)	10.48	(0.66)	10.23	(0.61)	10.53	(0.75)	10.21	(0.68)
Years of education	12.48	(3.12)	12.47	(2.91)	13.63	(2.50)	13.27	(2.37)	14.44	(2.00)	13.64	(2.08)
Experience	33.37	(12.08)	28.88	(11.58)	29.65	(11.06)	27.69	(10.50)	29.55	(10.06)	29.12	(10.06)
Married	0.82	(0.38)	0.80	(0.40)	0.74	(0.44)	0.72	(0.45)	0.71	(0.46)	0.68	(0.47)
Number of children	1.12	(1.26)	1.24	(1.33)	0.96	(1.16)	1.03	(1.15)	0.11	(0.46)	0.13	(0.51)
Hours worked per week	43.47	(8.82)	43.05	(8.80)	45.15	(9.52)	44.18	(9.20)	46.73	(10.30)	44.94	(9.44)
Speaks English	0.81	(0.39)	0.94	(0.23)	0.83	(0.37)	0.94	(0.23)	0.82	(0.39)	0.94	(0.24)
White	0.99	(0.12)	0.89	(0.31)	0.99	(0.12)	0.89	(0.31)	0.94	(0.23)	0.86	(0.34)
Industry												
Farming, forestry, fishing, mining	0.02	(0.15)	0.03	(0.18)	0.02	(0.14)	0.03	(0.17)	0.01	(0.11)	0.02	(0.14)
Construction	0.09	(0.29)	0.08	(0.27)	0.10	(0.30)	0.09	(0.29)	0.08	(0.27)	0.10	(0.31)
Manufacturing, durables	0.24	(0.43)	0.21	(0.41)	0.17	(0.37)	0.17	(0.38)	0.15	(0.36)	0.16	(0.36)
Manufacturing, nondurables	0.10	(0.30)	0.10	(0.30)	0.08	(0.27)	0.09	(0.29)	0.07	(0.25)	0.07	(0.26)
Transport, communication, other utilities	0.08	(0.28)	0.11	(0.31)	0.08	(0.27)	0.10	(0.30)	0.07	(0.26)	0.09	(0.29)
Wholesale and retail trade	0.14	(0.35)	0.15	(0.35)	0.16	(0.37)	0.17	(0.38)	0.15	(0.35)	0.17	(0.38)
Finance, insurance, real estate	0.06	(0.23)	0.05	(0.22)	0.07	(0.26)	0.05	(0.22)	0.06	(0.24)	0.05	(0.22)
Business and repair services	0.20	(0.40)	0.16	(0.37)	0.26	(0.44)	0.20	(0.40)	0.36	(0.48)	0.24	(0.43)
Public administration	0.07	(0.25)	0.11	(0.31)	0.06	(0.23)	0.10	(0.30)	0.05	(0.22)	0.09	(0.29)
Occupation												
Professional, technical	0.22	(0.41)	0.17	(0.38)	0.28	(0.45)	0.19	(0.39)	0.37	(0.48)	0.21	(0.41)
Farmers	0.00	(0.03)	0.00	(0.04)	0.00	(0.03)	0.00	(0.04)	0.00	(0.03)	0.00	(0.03)
Managers, officials, proprietors	0.18	(0.39)	0.14	(0.35)	0.23	(0.42)	0.17	(0.37)	0.26	(0.44)	0.19	(0.39)
Clerical and kindred	0.06	(0.24)	0.08	(0.27)	0.06	(0.23)	0.08	(0.27)	0.04	(0.20)	0.07	(0.26)
Sales workers	0.08	(0.26)	0.06	(0.25)	0.08	(0.27)	0.06	(0.24)	0.08	(0.26)	0.06	(0.24)
Craftsmen	0.23	(0.42)	0.23	(0.42)	0.18	(0.39)	0.21	(0.41)	0.12	(0.32)	0.19	(0.39)
Operatives	0.14	(0.35)	0.19	(0.39)	0.10	(0.30)	0.16	(0.36)	0.07	(0.25)	0.15	(0.36)
Service workers	0.06	(0.24)	0.07	(0.26)	0.05	(0.21)	0.08	(0.27)	0.04	(0.21)	0.07	(0.26)
Labourers	0.03	(0.18)	0.05	(0.22)	0.03	(0.18)	0.06	(0.23)	0.02	(0.14)	0.05	(0.21)
Entry cohort												
Before 1950	0.32	(0.47)			0.10	(0.29)			0.02	(0.15)		
1950–1959	0.29	(0.45)			0.23	(0.42)			0.12	(0.33)		
1960–1964	0.16	(0.36)			0.20	(0.40)			0.11	(0.32)		
1965–1969	0.10	(0.30)			0.13	(0.34)			0.10	(0.30)		
1970–1974	0.05	(0.22)			0.07	(0.25)			0.06	(0.24)		
1975–1979	0.08	(0.28)			0.08	(0.27)			0.08	(0.27)		
1980–1984					0.08	(0.28)			0.08	(0.27)		
1985–1989					0.11	(0.32)			0.08	(0.27)		
1990–1994									0.13	(0.34)		
1995–2000									0.21	(0.41)		
N (weighted)	1 21 722		3 12 40 000		1 07 312		3 49 99 300		1 41 013		3 77 79 000	

are expected, but alone cannot account for the entire salary differential between Canadians and Americans.

We now turn our attention to the multivariate estimates.

IV. Multivariate Estimation Results

Table 3 presents the estimates of Equation 1 and the in-sample predictions of Equations 9 and 10 for the 10-year period ending in 1990 and 2000, respectively.[14] The upper panel is for males, and the lower panel is for females. The cross-section estimates of immigrant assimilation for various immigrant cohorts in both 1990 and 2000 are presented. These estimates are constructed from the full regression results (Tables A2 and A3) by subtracting the intercept coefficient for one entry cohort from the intercept coefficient for the cohort with 10 fewer years in the United States. This gives the cross-section estimate of 10 years of assimilation. The estimate for the male

[14] An alternative specification of the model including only nonminorities was conducted in an earlier version of this article and there were only minor changes in the results.

Table 2. Summary statistics, Canadian and American females, 1980, 1990 and 2000 US Census (SDs are in parentheses)

	1980 Census				1990 Census				2000 Census			
	Canadian		American		Canadian		American		Canadian		American	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Log of salary	9.66	(0.62)	9.62	(0.62)	9.84	(0.68)	9.72	(0.64)	9.96	(0.71)	9.78	(0.67)
Years of education	12.28	(2.48)	12.37	(2.51)	13.47	(2.14)	13.33	(2.06)	14.17	(1.90)	13.74	(1.94)
Experience	33.88	(11.70)	29.15	(11.77)	31.11	(11.05)	27.76	(10.61)	31.15	(10.50)	29.40	(10.10)
Married	0.65	(0.48)	0.63	(0.48)	0.65	(0.48)	0.61	(0.49)	0.62	(0.49)	0.60	(0.49)
Number of children	0.90	(1.14)	1.05	(1.23)	0.79	(1.01)	0.95	(1.08)	0.68	(1.00)	0.89	(1.09)
Hours worked per week	36.50	(9.49)	37.46	(9.05)	38.23	(10.31)	38.70	(9.67)	39.75	(10.51)	39.45	(9.51)
Speaks English	0.80	(0.40)	0.94	(0.24)	0.82	(0.38)	0.95	(0.22)	0.80	(0.40)	0.94	(0.24)
White	0.98	(0.14)	0.86	(0.35)	0.97	(0.16)	0.87	(0.34)	0.95	(0.22)	0.83	(0.37)
Industry												
Farming, forestry, fishing, mining	0.01	(0.08)	0.01	(0.10)	0.01	(0.09)	0.01	(0.11)	0.01	(0.10)	0.01	(0.09)
Construction	0.01	(0.10)	0.01	(0.12)	0.02	(0.13)	0.01	(0.12)	0.02	(0.13)	0.02	(0.13)
Manufacturing, durables	0.11	(0.32)	0.11	(0.31)	0.08	(0.27)	0.08	(0.27)	0.06	(0.24)	0.07	(0.25)
Manufacturing, nondurables	0.07	(0.26)	0.10	(0.29)	0.05	(0.22)	0.07	(0.26)	0.04	(0.20)	0.05	(0.22)
Transport, communication, other utilities	0.04	(0.20)	0.05	(0.21)	0.04	(0.19)	0.04	(0.20)	0.04	(0.19)	0.04	(0.20)
Wholesale and retail trade	0.19	(0.40)	0.18	(0.38)	0.18	(0.38)	0.18	(0.38)	0.15	(0.36)	0.17	(0.38)
Finance, insurance, real estate	0.10	(0.31)	0.09	(0.29)	0.11	(0.31)	0.11	Tab	0.10	(0.30)	0.09	(0.29)
Business and repair services	0.42	(0.49)	0.38	(0.49)	0.47	(0.50)	0.43	(0.50)	0.55	(0.50)	0.48	(0.50)
Public administration	0.04	(0.20)	0.07	(0.26)	0.04	(0.20)	0.07	(0.26)	0.04	(0.20)	0.07	(0.26)
Occupation												
Professional, technical	0.21	(0.41)	0.19	(0.39)	0.31	(0.46)	0.24	(0.43)	0.41	(0.49)	0.30	(0.46)
Farmers	0.00	(0.00)	0.00	(0.02)	0.00	(0.00)	0.00	(0.01)	0.00	(0.02)	0.00	(0.02)
Managers, officials, proprietors	0.09	(0.29)	0.08	(0.26)	0.14	(0.35)	0.12	(0.33)	0.15	(0.36)	0.14	(0.35)
Clerical and kindred	0.37	(0.48)	0.37	(0.48)	0.31	(0.46)	0.33	(0.47)	0.24	(0.43)	0.30	(0.46)
Sales workers	0.08	(0.27)	0.06	(0.23)	0.07	(0.25)	0.06	(0.24)	0.07	(0.25)	0.06	(0.23)
Craftsmen	0.02	(0.13)	0.02	(0.15)	0.02	(0.13)	0.02	(0.14)	0.01	(0.11)	0.02	(0.14)
Operatives	0.10	(0.30)	0.12	(0.33)	0.05	(0.22)	0.08	(0.27)	0.03	(0.17)	0.06	(0.23)
Service workers	0.12	(0.33)	0.14	(0.34)	0.09	(0.29)	0.12	(0.33)	0.08	(0.27)	0.11	(0.32)
Labourers	0.01	(0.09)	0.01	(0.12)	0.01	(0.10)	0.02	(0.13)	0.01	(0.08)	0.01	(0.10)
Entry cohort												
Before 1950	0.33	(0.47)			0.10	(0.30)			0.03	(0.16)		
1950–1959	0.33	(0.47)			0.27	(0.44)			0.15	(0.35)		
1960–1964	0.15	(0.35)			0.20	(0.40)			0.13	(0.34)		
1965–1969	0.10	(0.30)			0.14	(0.35)			0.13	(0.34)		
1970–1974	0.04	(0.20)			0.07	(0.26)			0.08	(0.27)		
1975–1979	0.05	(0.22)			0.08	(0.27)			0.09	(0.28)		
1980–1984					0.07	(0.26)			0.07	(0.26)		
1985–1989					0.07	(0.25)			0.07	(0.26)		
1990–1994									0.12	(0.32)		
1995–2000									0.13	(0.34)		
N (weighted)	96 688		1 95 77 900		1 02 134		2 76 76 500		1 21 264		3 26 02 900	

1975–1979 cohort in 1990 (upper left hand figure in Table 3), for example, is obtained by subtracting the intercept for the 1985–1990 cohort (the most recent immigrant cohort in the 1990 census) from the intercept for the 1975–1980 cohort in Table A2 (i.e. 7.340–7.369 = −0.029). Positive coefficients suggest that the immigrant cohort has positive economic assimilation over the 10-year period while negative coefficients are suggestive of declining relative earnings – or negative assimilation – over the same time period. Of course, these results using the cross-section can be misestimated if there are change in cohort quality and/or changes in the macroeconomic conditions of entrants. Both these are controlled for in the within and between cohort estimates in this table.

In the cross-sectional estimates for males, only the 1970–1974 entry cohort in the 1990 census displays positive economic assimilation as evidenced by the positive coefficient which differs significantly from zero at the 1% level. All other coefficients in both 1990 and 2000 are either significantly negative, or insignificantly different from zero. For females, the cross-sectional estimates suggest that only two of the four entry cohorts in 1990 experienced significant positive assimilation over the decade, while the 1970–1974 cohort had significantly negative assimilation. In the 2000 data, three of the six cohorts had significantly negative assimilation and only one significantly positive. Thus, the cross-sectional results are mixed for different entry cohorts. But these are precisely the

Table 3. Estimates of the effects of 10 years in the United States for Canadians, by immigration cohort, using 1980, 1990 and 2000 Censuses, males and females (SEs are in parentheses)

	1990			2000		
	Cross-section	Within cohort	Across cohort	Cross-section	Within cohort	Across cohort
Males						
1985–1989				−0.071***	−0.037***	−0.034***
				(0.0071)	(0.0006)	(0.0006)
1980–1984				0.009	0.052***	−0.043***
				(0.0081)	(0.0007)	(0.0007)
1975–1979	−0.029***	−0.010***	−0.020***	−0.003	−0.017***	0.014***
	(0.0085)	(0.0009)	(0.0009)	(0.0084)	(0.0008)	(0.0008)
1970–1974	0.023***	0.139***	−0.115***	−0.043***	−0.024***	−0.019***
	(0.0090)	(0.0010)	(0.0010)	(0.0091)	(0.0007)	(0.0007)
1965–1969	−0.020**	0.035***	−0.055***	−0.032***	−0.036***	0.004***
	(0.0081)	(0.0007)	(0.0007)	(0.0078)	(0.0006)	(0.0006)
1960–1964	−0.042***	0.045***	−0.087***	−0.058***	−0.039***	−0.019***
	(0.0074)	(0.0006)	(0.0006)	(0.0084)	(0.0006)	(0.0006)
Females						
1985–1989				−0.003	0.077***	−0.080***
				(0.0069)	(0.0007)	(0.0007)
1980–1984				−0.008	0.015***	−0.023***
				(0.0074)	(0.0005)	(0.0005)
1975–1979	0.029***	0.043***	−0.013***	−0.020***	0.041***	−0.062***
	(0.0083)	(0.0008)	(0.0008)	(0.0074)	(0.0005)	(0.0005)
1970–1974	−0.023***	0.090***	−0.114***	−0.024***	0.015***	−0.039***
	(0.0082)	(0.0008)	(0.0008)	(0.0078)	(0.0006)	(0.0006)
1965–1969	0.005	0.002***	0.002***	−0.012*	0.023***	−0.035***
	(0.0071)	(0.0006)	(0.0006)	(0.0068)	(0.0005)	(0.0005)
1960–1964	0.036***	0.048***	−0.012***	0.027***	0.017***	0.010***
	(0.0065)	(0.0005)	(0.0005)	(0.0070)	(0.0005)	(0.0005)

Notes: Wald tests between 1980/1990 and 1990/2000 for both males and females reject pooling the data.
Wald tests in each year between Americans and Canadians, for both males and females, also reject pooling the data.
*, ** and *** denote significance at 10, 5 and 1% levels, respectively.

types of biases we expect to see in the cross-section if there has been a change in immigrant quality over time. More specifically, any negative assimilation effect in the cross-section could be due to a general improvement in the earnings capacities of new Canadian immigrants in the US economy relative to earlier immigrant cohorts. It is these changes in immigrant quality over successive entry cohorts that are of primary interest to us in this article.

As discussed above, these cross-sectional cohort estimates of assimilation can be broken down into components within and across cohorts, both with and without native comparisons (the first and second terms in Equation 8). The cross-section estimates can be suggestive of economic assimilation, but can be biased upwards as a result of declining immigrant quality over time. Conversely, they may be biased downwards if immigrant quality improves. The within cohort estimate will reflect the actual assimilation of the immigrant cohort, whereas the across cohort component will reflect any qualitative changes in the average individual between cohorts. Table 3 presents these estimates including implicit comparisons with the earnings experiences of the American-born over the same period. Again, the rationale for this comparison is that it allows for the control of changing macroeconomic conditions that (by assumption) equally affect both Canadians and Americans in the US economy.[15]

The within cohort estimates generally differ from the cross-section estimates and are significantly different from zero for both males and females in all cases. In almost all cases, these assimilation estimates are larger (i.e. more positive or less negative) compared to those in the cross section, indicating that the cross-section estimates tend to be downward biased. In other words, assimilation rates are higher than the cross-section estimates suggest when controlling for changes in cohort quality. For example, the estimate of assimilation for the 1985–1989 male entry cohort is about −7.1% over the 10-year period from 1990 to 2000 in the cross-section, and −3.7% in the disaggregated estimate of assimilation.

Since our main focus is the 'quality' of newer Canadians in the United States, the across cohort estimates is what we will discuss. Here there is evidence of qualitative cohort changes for all of entry cohorts as evidenced by the significant coefficients throughout, and most of these are negative which suggests that the individuals who entered the US 10 years after the cohort in question were qualitatively better

[15] Estimates without American-born comparisons were also conducted. The results are similar to those in Table 3 in direction if not magnitude. Comparisons of estimates with and without native controls do suggest that it is important to control for changes in macroeconomic conditions when estimating assimilation effects.

upon entry to the US. For example, the 1985–1989 male entry cohort had salary entries about 3.4% less than their counterparts who entered in 1995–1999, while those in the 1980–1984 cohort had earnings about 4.3 less than those who entered in 1990–1994. For females, the results are similar in direction and significance, at least for the two-1980s cohorts.

What is interesting in the cases of both males and females is that there is a qualitative improvement in entry cohorts, not only in the 1990s, but in the 1980s as well, especially for females, suggesting that there has been either qualitative improvements in immigrant quality over the timeframe considered, or a positive selective out migration of Canadians from the United States, or both. Thus, the qualitative improvement in immigrant quality witnessed may be due to the improvement in successful cohorts or the migration of high quality Canadian-born individuals from the United States (presumably back to Canada). However, given the evidence that the number of Canadians to the US increased in the 1980s and 1990s (Table A1), as well as the widening returns to skill distribution in the US, suggests that the former explanation is the most plausible.[16]

The results presented thus far are simply means for the various entry cohorts, and say nothing about the distribution of individuals entering the United States. Since the concern in Canada has been about the loss of the country's 'best and brightest', it is important to ascertain where in the earnings distribution any qualitative changes to Canadian immigrants exist. To investigate this, we employ quantile regressions similar to the recent work by Frenette and Morissette (2005), but add a new twist by decomposing the results using the methodology outlined above. In particular, quantile regressions were simultaneously estimated for the 5th, 25th, 50th, 75th and 95th quantiles, separately for both males and females and each census year. The mean values for the Canadian individuals at each quantile level where then used to predict the values in the cross-section, and with and across cohorts (i.e. Equations 1, 9 and 10). These results are presented in Tables 4 and 5 for males and females, respectively.[17]

For males, the negative numbers for the 1980s cohorts in the across-cohort estimates for 2000 indicate that there has been a qualitative improvement in the 1990s cohorts, at least at the time of entry into the US. We know this already from the results in Table 3. What is interesting here is that these qualitative improvements have occurred at each of the five deciles levels estimated, with only one exception (the 1990–1994 cohort at the 5th quantile as evidenced by the positive coefficient on the 1980–1984 cohort). In fact, the largest increases in cohort quality have occurred between the 25th and 75th income quantiles, not at the top of the income distribution as is often assumed. Similar results hold for the 1990 data, again indicating the qualitative improvements in Canadians entering the United States occurred before the 1990s, which coincides with the widening distribution of income in the United States *vis-à-vis* Canada. Again, these improvements in the quality of the most recent cohorts are mainly concentrated in the middle quantiles.

For females (Table 5) the results are more uniform throughout the earnings distribution, and the negative estimates across cohorts for 1980s cohorts indicate a qualitative improvement of the 1990s cohorts at the time of entry, especially for the most recent entry cohort at the time of the 2000 census. Like males, however, the results for 1990 indicate that the improvement in quality began before the 1990s, at least at the median and above, again implying the importance of the change in the earnings distribution in the United States in the 1980s.

In sum, these results are mixed regarding the qualitative changes in the flow of Canadians to the United States during the 1980s and 1990s. Immigrants of either gender do show significantly larger relative entry salaries compared to those who entered 10 years earlier, but so do those who entered during earlier periods. The quantile regressions suggest that the improvement in quality has been throughout the income distribution for women, but has been more concentrated in the middle income ranges for males.

V. Conclusions

Our results suggest that the much-discussed 'brain drain' from Canada to the United States of the 1990s may have in fact begun much earlier, at least qualitatively. The widening distribution of income and higher returns into education in the United States relative to Canada provided the motives necessary for an improvement in the quality of this migration, but there is little evidence suggesting that qualitative differences amongst immigrant cohorts in the 1980s and 1990s are different than those of earlier immigrant cohorts. After controlling for individual income generating characteristics and macroeconomic conditions in the United States, we find that the most recent entry cohort of Canadians of either gender displayed significant qualitative improvements as measured by salaries relative to those who entered 10 years earlier, but so did earlier entry cohorts of Canadians. This suggests that the much discussed widening of the income distribution in the US (Juhn, 1999; Juhn *et al.*, 1993) may not have increased the quality of immigrants from Canada. In other words, our results do suggest that *intensive* immigration (in terms of

[16] Other evidence for a qualitative shift is also provided in this article and shows that the mean years of education of the Canadian-born relative to the American-born (i.e. the difference-in-difference) increased by 0.81 years for males and 0.52 years for females between 1980 and 2000. The unadjusted difference-in-difference in mean real log earnings over this period also increased by 0.162 for males and 0.140 for females. More recently, Zafira and Walters (2008) show that the members of the 2000 cohort of Canadian university graduates who migrated to the United States – although not great in number – were better quality (as measured by scholarships awarded while in university), were concentrated in a few fields such as computer science and engineering, and had higher salaries compared to those graduates who remained in Canada.

[17] It should be noted that the results in Tables 4 and 5 were conducted using unweighted data, a limitation in STATA when estimating simultaneous-quantile regressions (i.e. the 'sqreg' command). The upside is that the significance tests conducted in Tables 4 and 5 could be conducted efficiently using this command. In separate estimates, the cross-section estimates were conducted using weighted data (i.e. the 'qreg' command in STATA). These coefficient estimates were comparable and always statistically significant (likely owing to the larger sample sizes). The calculations are available from the author upon request.

Table 4. Estimates of the effects of 10 years in the United States for Canadian males at various points in the earnings distribution by immigration cohort, 1980, 1990 and 2000 Censuses

	$q=0.05$			$q=0.25$			$q=0.50$			$q=0.75$			$q=0.95$		
	Cross-section	Within	Across	Cross-section	Within	Across	Cross-section	Within	Across	Cross-section	Within	Across	Cross-section	Within	Across
1990															
1975–1979	0.081	0.261**	−0.181**	−0.043	0.273**	−0.316**	−0.044	0.180**	−0.224**	−0.037	0.159**	−0.196**	0.111	0.177**	−0.067**
1970–1974	0.166	0.172**	−0.006	0.067	0.159**	−0.092**	0.012	0.211**	−0.198**	−0.032	0.244**	−0.276**	0.109	0.216**	−0.107**
1965–1969	0.093	0.099**	−0.006	0.023	0.068**	−0.045**	−0.023	0.083**	−0.107**	−0.063**	0.074**	−0.137**	−0.189**	0.049**	−0.238**
1960–1964	−0.006	0.031**	−0.038**	−0.023	0.030**	−0.053**	−0.053	0.051**	−0.104**	−0.059	0.042**	−0.101**	−0.136	0.065**	−0.201**
2000															
1985–1989	−0.091	0.015**	−0.106**	−0.112**	0.082**	−0.195**	−0.058	0.071**	−0.129**	−0.049	0.024**	−0.073**	0.009	0.035**	−0.026**
1980–1984	0.035	0.020**	0.015**	0.013	0.057**	−0.045**	−0.054	0.148**	−0.202**	−0.002	0.138**	−0.140**	0.041	0.109**	−0.069**
1975–1979	0.049	−0.044**	0.093**	0.037	0.029**	0.008	−0.026	−0.013**	−0.013**	−0.046	0.021**	−0.067**	0.011	0.007**	0.004
1970–1974	0.011	−0.108**	0.119**	−0.063**	0.011	−0.074**	−0.021	−0.007	−0.014**	−0.065	−0.047**	−0.017**	−0.110	−0.036**	−0.074**
1965–1969	−0.023	−0.148**	0.125**	0.002	−0.091**	0.092**	−0.029	−0.094**	0.065**	−0.021	−0.126**	0.105**	−0.009	−0.130**	0.121**
1960–1964	−0.098	−0.166**	0.068**	−0.004	−0.142**	0.138**	−0.008	−0.167**	0.159**	−0.035	−0.138**	0.104**	−0.064	−0.154**	0.089**

Note: **Denotes significance at 5% level.

Table 5. Estimates of the effects of 10 years in the United States for Canadian females at various points in the earnings distribution by immigration cohort, 1980, 1990 and 2000 Censuses

	$q=0.05$			$q=0.25$			$q=0.50$			$q=0.75$			$q=0.95$		
	Cross-section	Within	Across	Cross-section	Within	Across	Cross-section	Within	Across	Cross-section	Within	Across	Cross-section	Within	Across
1990															
1975–1979	−0.010	−0.162**	0.152**	0.050	−0.045**	0.095**	0.047	0.085**	−0.038**	0.008	0.049**	−0.041**	0.011	0.079**	−0.068**
1970–1974	0.026	−0.073**	0.099**	0.031	0.127**	−0.097**	−0.033	0.124**	−0.158**	−0.061	0.181**	−0.242**	−0.026	0.172**	−0.197**
1965–1969	0.060	−0.179**	0.239**	0.031	−0.052**	0.083**	0.022	0.036**	−0.014**	−0.044	0.058**	−0.101**	0.071	0.074**	−0.003
1960–1964	−0.033	−0.076**	0.043**	0.039	0.005	0.034**	0.032	0.040**	−0.008	0.041	0.123**	−0.082**	−0.031	0.113**	−0.144**
2000															
1985–1989	0.108	0.226**	−0.118**	0.004	0.160**	−0.157**	−0.046	0.124**	−0.170**	−0.065	0.107**	−0.172**	−0.062	0.103**	−0.165**
1980–1984	0.083	0.131**	−0.048**	0.044	0.086**	−0.042**	0.008	0.066**	−0.058**	−0.024	0.011**	−0.035**	−0.041	0.024**	−0.065**
1975–1979	−0.116**	0.134**	−0.250**	−0.028	0.088**	−0.116**	0.038	0.051**	−0.013**	0.031	0.002	0.029**	−0.012	0.045**	−0.057**
1970–1974	−0.031	0.035**	−0.066**	−0.058	0.012**	−0.070**	−0.007	0.013**	−0.020**	0.002	−0.001	0.004	0.013	−0.031**	0.044**
1965–1969	−0.014	0.061**	−0.074**	0.024	0.028**	−0.004	−0.052	−0.038**	−0.015**	−0.020	−0.030**	0.010**	0.033	−0.019**	0.052**
1960–1964	0.003	0.137**	−0.133**	0.050	0.117**	−0.067**	0.002	0.007	−0.005	0.018	0.032**	−0.014**	0.019	0.046**	−0.027**

Note: **Denotes significance at 5% level.

quality) may not have changed, but *extensive* migration (in terms of numbers) may have increased total flow of Canadians entering the United States (Mueller, 2006). Finally, it is not only those at the upper tails of the earnings distribution that experienced earnings gains relative to the American-born. The largest gain for men tend to be in the middle of the distribution, while for women the gains were more uniformly distributed.

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Appendix

Table A1. Number of Canadian-born in the US data, by census year, gender and entry cohort

	1980 Census		1990 Census		2000 Census		All Censuses	
	Males	Females	Males	Females	Males	Females	Males	Females
1995–1999					1316	738	1316	738
1990–1994					856	658	856	658
1985–1989			568	336	547	412	1115	748
1980–1984			421	338	522	445	943	783
1975–1979	506	250	421	388	511	503	1438	1141
1970–1974	310	211	360	365	424	484	1094	1060
1965–1969	608	488	662	710	667	782	1937	1980
1960–1964	948	711	1022	991	757	784	2727	2486
1950–1959	1758	1574	1214	1371	837	860	3809	3805
Before 1950	1952	1597	508	485	162	163	2622	2245
Total Canadians	6082	4831	5176	4984	6599	5829	17 857	15 644
Total Americans	15 609	9782	17 299	13 758	18 683	16 244	51 591	39 784
Total (unweighted)	21 691	14 613	22 475	18 742	25 282	22 073	69 448	55 428
Total Canadians (weighted)	1 21 722	96 688	1 07 312	1 02 134	1 41 013	1 21 264	3 70 047	3 20 086
Total Americans (weighted)	3 12 40 000	1 95 77 900	3 49 99 300	2 76 76 500	3 77 79 000	3 26 02 900	10 40 18 300	7 98 57 300
Total (weighted)	3 13 61 722	1 96 74 588	3 51 06 612	2 77 78 634	3 79 20 013	3 27 24 164	10 43 88 347	8 01 77 386

Table A2. Cross-section regressions, Canadian and American males, 1980, 1990 and 2000 US Census (SEs are in parentheses)

	1980 Census				1990 Census				2000 Census			
	Canadian		American		Canadian		American		Canadian		American	
Years of education	0.050	(0.0007)***	0.054	(0.0000)***	0.054	(0.0010)***	0.070	(0.0000)***	0.079	(0.0011)***	0.081	(0.0001)***
Experience	0.061	(0.0008)***	0.046	(0.0001)***	0.044	(0.0009)***	0.047	(0.0000)***	0.049	(0.0010)***	0.037	(0.0001)***
Experience squared	−0.001	(0.0000)***	−0.001	(0.0000)***	0.000	(0.0000)***	−0.001	(0.0000)***	−0.001	(0.0000)***	0.000	(0.0000)***
Married	0.153	(0.0044)***	0.111	(0.0003)***	0.104	(0.0044)***	0.108	(0.0002)***	0.156	(0.0036)***	0.174	(0.0002)***
Number of children	0.003	(0.0013)**	0.024	(0.0001)***	0.032	(0.0017)***	0.017	(0.0001)***	−0.043	(0.0038)***	−0.001	(0.0002)***
Hours worked per week	0.030	(0.0011)***	0.021	(0.0001)***	0.053	(0.0011)***	0.059	(0.0001)***	0.056	(0.0013)***	0.064	(0.0001)***
Hours worked per week squared	0.000	(0.0000)***	0.000	(0.0000)***	0.000	(0.0000)***	0.000	(0.0000)***	0.000	(0.0000)***	0.000	(0.0000)***
Speaks English	0.062	(0.0041)***	0.048	(0.0004)***	0.008	(0.0046)*	0.054	(0.0004)***	0.005	(0.0043)	0.055	(0.0004)***
White	0.164	(0.0154)***	0.152	(0.0003)***	0.115	(0.0131)***	0.140	(0.0003)***	0.118	(0.0064)***	0.097	(0.0003)***
Construction	0.018	(0.0123)	−0.030	(0.0006)***	−0.081	(0.0136)***	0.058	(0.0007)***	−0.015	(0.0157)	0.045	(0.0007)***
Manufacturing, durables	0.046	(0.0116)***	0.041	(0.0006)***	0.029	(0.0129)**	0.154	(0.0006)***	0.071	(0.0152)***	0.105	(0.0007)***
Manufacturing, nondurables	0.016	(0.0120)	0.006	(0.0006)***	0.011	(0.0137)	0.137	(0.0006)***	0.124	(0.0158)***	0.144	(0.0007)***
Transport, communication, other utilities	0.069	(0.0123)***	0.094	(0.0006)***	0.058	(0.0138)***	0.179	(0.0007)***	0.130	(0.0157)***	0.133	(0.0007)***
Wholesale and retail trade	−0.158	(0.0121)***	−0.124	(0.0006)***	−0.151	(0.0133)***	−0.045	(0.0006)***	−0.158	(0.0155)***	−0.106	(0.0007)***
Finance, insurance, real estate	−0.092	(0.0134)***	−0.055	(0.0007)***	0.117	(0.0145)***	0.165	(0.0008)***	0.181	(0.0170)***	0.162	(0.0008)***
Business and repair services	−0.208	(0.0118)***	−0.195	(0.0006)***	−0.161	(0.0131)***	−0.026	(0.0006)***	−0.075	(0.0151)***	−0.038	(0.0007)***
Public administration	−0.114	(0.0129)***	−0.025	(0.0006)***	−0.059	(0.0139)***	0.096	(0.0007)***	−0.032	(0.0158)***	0.062	(0.0007)***
Farmers	−0.766	(0.0724)***	−0.591	(0.0020)***	−0.486	(0.0351)***	−0.504	(0.0028)***	−0.846	(0.0263)***	−0.513	(0.0021)***
Managers, officials, proprietors	0.069	(0.0055)***	0.034	(0.0003)***	0.077	(0.0051)***	0.036	(0.0003)***	0.131	(0.0050)***	0.034	(0.0003)***
Clerical and kindred	−0.268	(0.0070)***	−0.175	(0.0004)***	−0.303	(0.0076)***	−0.265	(0.0004)***	−0.342	(0.0079)***	−0.339	(0.0004)***
Sales workers	−0.060	(0.0077)***	−0.087	(0.0005)***	−0.148	(0.0080)***	−0.072	(0.0005)***	−0.011	(0.0079)***	−0.062	(0.0005)***
Craftsmen	−0.163	(0.0052)***	−0.135	(0.0003)***	−0.203	(0.0056)***	−0.170	(0.0003)***	−0.247	(0.0057)***	−0.216	(0.0003)***
Operatives	−0.258	(0.0061)***	−0.228	(0.0004)***	−0.374	(0.0066)***	−0.271	(0.0003)***	−0.397	(0.0069)***	−0.325	(0.0003)***
Service workers	−0.368	(0.0076)***	−0.316	(0.0004)***	−0.443	(0.0084)***	−0.340	(0.0004)***	−0.411	(0.0075)***	−0.363	(0.0004)***
Labourers	−0.442	(0.0090)***	−0.389	(0.0005)***	−0.408	(0.0097)***	−0.345	(0.0004)***	−0.415	(0.0113)***	−0.400	(0.0005)***
Before 1950	7.692	(0.0379)***			7.228	(0.0403)***			6.560	(0.0418)***		
1950–1959	7.765	(0.0374)***			7.235	(0.0399)***			6.531	(0.0405)***		
1960–1964	7.747	(0.0376)***			7.294	(0.0393)***			6.561	(0.0405)***		
1965–1969	7.781	(0.0376)***			7.320	(0.0395)***			6.594	(0.0404)***		
1970–1974	7.689	(0.0381)***			7.336	(0.0398)***			6.619	(0.0400)***		
1975–1979	7.831	(0.0374)***			7.340	(0.0393)***			6.626	(0.0403)***		
1980–1984					7.313	(0.0400)***			6.662	(0.0402)***		
1985–1989					7.369	(0.0394)***			6.629	(0.0402)***		
1990–1994									6.653	(0.0401)***		
1995–2000									6.699	(0.0397)***		
Constant (Americans only)			8.088	(0.0018)***			6.622	(0.0020)***			6.514	(0.0021)***
N (weighted)	1 21 722		3 12 40 000		1 07 312		3 49 99 300		1 41 013		3 77 79 000	

Note: *, ** and *** denote significance at 10, 5 and 1% levels, respectively.

Table A3. Cross-section regressions, Canadian and American females, 1980, 1990 and 2000 US Census (SEs are in parentheses)

	1980 Census				1990 Census				2000 Census			
	Canadian		American		Canadian		American		Canadian		American	
Years of education	0.032	(0.0009)***	0.037	(0.0001)***	0.050	(0.0010)***	0.069	(0.0001)***	0.072	(0.0011)***	0.086	(0.0001)***
Experience	0.016	(0.0009)***	0.020	(0.0001)***	0.017	(0.0008)***	0.024	(0.0000)***	0.020	(0.0009)***	0.031	(0.0001)***
Experience squared	0.000	(0.0000)***	0.000	(0.0000)***	0.000	(0.0000)***	0.000	(0.0000)***	0.000	(0.0000)***	0.000	(0.0000)***
Married	−0.065	(0.0035)***	−0.047	(0.0002)***	−0.063	(0.0033)***	−0.029	(0.0002)***	−0.042	(0.0033)***	−0.013	(0.0002)***
Number of children	−0.039	(0.0016)**	−0.040	(0.0001)***	−0.036	(0.0017)***	−0.033	(0.0001)***	−0.005	(0.0017)***	−0.029	(0.0001)***
Hours worked per week	0.050	(0.0008)***	0.056	(0.0001)***	0.075	(0.0006)***	0.070	(0.0000)***	0.073	(0.0007)***	0.071	(0.0000)***
Hours worked per week squared	0.000	(0.0000)***	0.000	(0.0000)***	−0.001	(0.0000)***	−0.001	(0.0000)***	−0.001	(0.0000)***	−0.001	(0.0000)***
Speaks english	0.026	(0.0042)***	−0.008	(0.0005)***	−0.028	(0.0041)***	−0.020	(0.0004)***	−0.012	(0.0039)***	0.019	(0.0004)***
White	−0.039	(0.0137)***	−0.029	(0.0004)***	0.087	(0.0090)***	0.004	(0.0003)***	0.044	(0.0074)***	0.012	(0.0002)***
Construction	−0.057	(0.0215)***	0.035	(0.0017)***	0.027	(0.0229)	0.104	(0.0013)***	0.043	(0.0193)**	0.109	(0.0012)***
Manufacturing, durables	0.016	(0.0184)	0.171	(0.0015)***	0.145	(0.0189)***	0.179	(0.0011)***	0.252	(0.0171)***	0.257	(0.0010)***
Manufacturing, nondurables	−0.082	(0.0184)***	0.037	(0.0016)***	0.033	(0.0193)*	0.053	(0.0011)***	0.302	(0.0182)***	0.202	(0.0010)***
Transport, communication, other utilities	0.133	(0.0197)***	0.246	(0.0016)***	0.137	(0.0199)***	0.260	(0.0011)***	0.221	(0.0178)***	0.297	(0.0010)***
Wholesale and retail trade	−0.266	(0.0182)***	−0.141	(0.0015)***	−0.161	(0.0186)***	−0.125	(0.0011)***	−0.050	(0.0165)***	−0.041	(0.0010)***
Finance, insurance, real estate	−0.056	(0.0183)***	0.048	(0.0015)***	0.072	(0.0186)***	0.096	(0.0011)***	0.196	(0.0169)***	0.215	(0.0010)***
Business and repair services	−0.159	(0.0179)***	−0.026	(0.0015)***	0.021	(0.0183)	−0.012	(0.0011)***	0.079	(0.0161)***	0.072	(0.0009)***
Public administration	−0.054	(0.0193)***	0.157	(0.0016)***	0.072	(0.0191)***	0.168	(0.0011)***	0.188	(0.0171)***	0.235	(0.0010)***
Farmers			−0.631	(0.0047)***			−1.407	(0.0032)***	0.342	(0.0307)***	−0.391	(0.0034)***
Managers, officials, proprietors	−0.067	(0.0074)***	−0.027	(0.0005)***	−0.028	(0.0056)***	−0.050	(0.0003)***	0.018	(0.0053)***	0.012	(0.0003)***
Clerical and kindred	−0.269	(0.0049)***	−0.226	(0.0003)***	−0.274	(0.0043)***	−0.272	−(0.0003)***	−0.298	(0.0042)***	−0.276	(0.0003)***
Sales workers	−0.342	(0.0085)***	−0.254	(0.0006)***	−0.191	(0.0076)***	−0.204	(0.0005)***	−0.157	(0.0081)***	−0.123	(0.0005)***
Craftsmen	−0.260	(0.0139)***	−0.169	(0.0008)***	−0.175	(0.0116)***	−0.182	(0.0007)***	−0.314	(0.0163)***	−0.142	(0.0007)***
Operatives	−0.386	(0.0078)***	−0.380	(0.0005)***	−0.407	(0.0082)***	−0.381	(0.0004)***	−0.393	(0.0105)***	−0.366	(0.0005)***
Service workers	−0.446	(0.0067)***	−0.458	(0.0005)***	−0.438	(0.0072)***	−0.428	−(0.0004)***	−0.424	(0.0064)***	−0.362	(0.0004)***
Labourers	−0.417	(0.0202)***	−0.297	(0.0011)***	−0.441	(0.0160)***	−0.336	(0.0008)***	−0.531	(0.0212)***	−0.375	(0.0011)***
Before 1950	8.038	(0.0350)***	7.686	(0.0024)***	7.060	(0.0318)***			6.555	(0.0326)***		
1950–1959	8.072	(0.0347)***			7.107	(0.0317)***			6.567	(0.0315)***		
1960–1964	8.072	(0.0348)***			7.089	(0.0313)***			6.602	(0.0313)***		
1965–1969	8.110	(0.0348)***			7.067	(0.0313)***			6.593	(0.0314)***		
1970–1974	8.002	(0.0346)***			7.053	(0.0317)***			6.576	(0.0316)***		
1975–1979	8.062	(0.0344)***			7.062	(0.0316)***			6.605	(0.0313)***		
1980–1984					7.076	(0.0312)***			6.599	(0.0312)***		
1985–1989					7.033	(0.0312)***			6.626	(0.0310)***		
1990–1994									6.607	(0.0306)***		
1995–2000									6.629	(0.0309)***		
Constant (Americans only)			7.686	(0.0024)***			6.784	(0.0019)***			6.287	(0.0019)***
N (weighted)	96 688		1 95 77 900		1 02 134		2 76 76 500		1 21 264		3 26 02 900	

Note: *, ** and *** denote significance at 10, 5 and 1% levels, respectively.