# What Happened to the Canada-United States Brain Drain of the 1990s? New Evidence from the 2000 US Census

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*This article uses the 2000 US Census to ascertain both quantitative and qualitative changes in Canadian immigrants to the United States through the 1990s, and compares these to earlier migration cohorts from census data in 1980 and 1990. Canadians in the United States continue to have higher relative salaries and education levels vis-à-vis their American counterparts, and this gap has widened in the 1990s, even when controlling for variety of labour market factors. A similar phenomenon occurred amongst immigrants from Britain and Ireland and suggests that US economic performance and immigration policy are the probable driving force behind this migration.*

*Cet article puise dans le recensement de l'an 2000 des États-Unis pour vérifier des changements quantitatifs et qualitatifs chez les immigrants canadiens aux États-Unis pendant les années 1990 et, par la suite, compare ces groupes aux cohortes d'immigrants représentés dans les données de recensement de 1980 et 1990. Les Canadiens aux États-Unis continuent à gagner des salaires plus élevés et à manifester des niveaux de scolarité supérieurs vis-à-vis de leurs homologues américains. Même si l'on contrôle pour divers facteurs liés au marché du travail, l'on constate que cet écart s'est creusé pendant les années 1990. Un phénomène similaire s'est produit parmi les immigrants de Grande-Bretagne et d'Irlande, ce qui permet de conclure que le rendement économique et la politique d'immigration des États-Unis constituent probablement les éléments moteurs de cette migration.*

## Introduction and Background

The so-called brain drain from Canada to the United States attracted much attention from the Canadian media, policy-makers, and the public at large in the late 1990s.[1] Some observers (DeVoretz & Laryea, 1998) argued that a large number of Canadians emigrated to the United States during this period largely because of the greater ease of entry in the post-free trade era.[2]

**Key words/Mots-clefs:** Canada; United States/Etats-Unis; Great Britain/Grande-Bretagne; Ireland/Irlande; Migration; Brain Drain/l'Egout de Cerveau.


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In addition, recent evidence (Frank & Bélair, 1999; Zhao Drew, & Murray, 2000) has shown that these individuals have been among the country's best and brightest and its highest income earners. Schwanen (2000) also noted this and added that the southward flow is especially worrisome because it includes knowledge workers in the sciences and engineering, people who are needed in Canada to spur productivity and incomes in the new information economy. Card (2003) and Mueller (1999, 2000) have argued that qualitative improvements in terms of education and earnings in Canadian migrants to the United States began as early as the 1980s owing to the relative spread of the distribution of earnings in the United States and the related increase in returns to education.[3] Much of this research has focused on domestic Canadian policies and economic performance, particularly relative marginal income tax rates and employment growth in key sectors, which have provided the impetus for migration south.

Others have noted that the loss of talent to the United States may not be problematic. Zhao et al. (2000) showed that permanent migration to the United States in the 1990s as a percentage of the Canadian population is at an historic low. They also found that temporary migration, although ostensibly increasing during the decade, is hard to measure accurately. Furthermore, Canada still attracts a large number of highly educated individuals from other countries, more than offsetting the emigration of educated Canadians. In a similar vein, Helliwell (1999) argued that the historically low migration in the 1990s was surprising given the high income and unemployment rate differentials between the countries, both of which favoured higher migration to the United States, especially among highly skilled people.[4] Globerman (1999) observed an increase in temporary migration, but said that this could be beneficial to the Canadian economy because it fosters economic integration with the United States and because people who return will do so with knowledge and experience that could benefit the country. Indeed, a recent article in the *Globe and Mail* (Valpy, 2004) argued that young Canadians living in the United States fully intend to return to Canada, in large part owing to diverging values between Canadians and Americans.

Until now, evidence of this immigration phenomenon has been hindered by data limitations. In the US inter-census periods (i.e., between 1980 and 1990, and 1990 and 2000), only two sources of data exist with the potential to analyse the foreign-born: the March supplement to the Current Population Survey (CPS) and administrative records from the Immigration and Naturalization Service (INS). Estimates from either of these sources, although informative, may not be accurate.[5] Now that the 2000

US census data are available, we can more accurately portray both the quantitative and qualitative aspects of Canadian emigration to the United States in the 1980s and 1990s. In particular, we address the number of individuals who were resident in the United States at the time of each census, when they initially entered the United States, and the earnings and educational attainment of these people. Although the 2000 census has been used before (McHale, 2003), the following is the most detailed analysis to date of Canadians living and working in the United States. We can compare Canadians with both Americans and other immigrant groups to determine if there have in fact been changes in the numbers and composition of Canadians in the United States. In sum, we can ascertain if there was a brain drain in the 1990s.

We find that there has been an increase in the number of Canadians residing in the United States as of the 2000 census relative to 1990, but that this total number is still lower than in 1980. Nevertheless, those who are in the labour market have higher salaries and levels of education than the US-born in the sample, and Canadians in the United States in 2000 had higher education and salaries compared than those in the two earlier censuses, even when controlling for a variety of other labour market variables. These results are consistent with a brain drain from Canada to the United States. However, a similar pattern of migration emerges when we address individuals entering the United States from Great Britain and Ireland, suggesting that US immigration policy has encouraged this movement of people.

## Data

We use data from the 1980, 1990, and 2000 US censuses.[6] Each of these is a 5% sample of the population. All Canadian-born as well as those born in both Great Britain and Ireland were retained, whereas a 1/100 subsample of the US-born was used.[7] Because the original data are a weighted sample of the population, and because we further subsample all groups but the Canadian-born, the use of unweighted statistics would bias our results. Thus in all calculations we use the inverse of the sampling proportions to weight individual observations and to infer population totals.

We assume that individuals who immigrate to the United States do so from their country of birth and not through a third country. Although this may misrepresent the migration patterns of some immigrants, there is no way to distinguish transmigrants in these data. For consistency, those who

were born outside the United States to American parents (and hence were US citizens) were also excluded from the sample.

The education variable was recoded in each case to be years of education, consistent with the highest level of education completed, or in some cases its mean. For example, a completed high school education was recoded as 12 years of education, completion of grades 1–4 was coded as 2.5 years of education, and four or more years of university were coded as 16 years of education.

Although we are interested in gaining an accurate count of the changes in the number of Canadian-born living in the United States at each census, we also wish to ascertain the success of these people in the US labour market. Therefore, we also limit the sample to include only those people between the ages of 25 and 64 who did not live in group quarters, were not attending school, were not self-employed, worked at least 40 weeks in the previous year, and had at least $1,000 (1989 dollars) in salary. This subsample is used for the bulk of the analysis in this article.

## Results

Table 1 shows the number in various groups captured by the census snapshot at each of the three decennial censuses, as well as the percentage changes between 1980 and 1990 and 1990 and 2000. The table shows that the number of Canadians living in the United States was 820,713 in 2000 compared with 844,351 in 1980 and 739,752 in 1990. Thus the number of Canadian-born living in the United States was lower in 2000 than it was in 1980, although this does represent an increase of about 11% since 1990. Still, compared with increases among the other foreign-born, the increase in the number of Canadians captured by the census is significantly less.

As a further comparison we separate those born in the Ireland and Great Britain from the foreign-born. This is because these English-speaking countries probably provide a better comparator for Canada than the group of all foreign countries.[8] The migration pattern is similar to that of migration from Canada: a reduction in the 1980s followed by an increase in the 1990s (albeit of lesser magnitude compared with Canada).

Although these numbers are interesting, they do not necessarily capture any loss of Canadian human capital to the United States. In the context of the brain drain, the real issue is individuals who migrate to the United States and contribute to that economy instead of their home country's economy. In other words, the total number of immigrants provides an estimate of how *extensive* the movement of individuals is, but not how

## Table 1
## Weighted Sample Sizes in the United States Census, 1980, 1990, and 2000

| | Census Year | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1980 | | | 1990 | | | 2000 | | |
| | Males | Females | Total | Males | Females | Total | Males | Females | Total |
| Total Canadian-born | 351,463 | 492,888 | 844,351 | 303,100 | 436,472 | 739,572 | 358,641 | 462,072 | 820,713 |
| Total Foreign-Born | 5,746,925 | 6,595,675 | 12,342,600 | 9,286,100 | 9,500,600 | 18,786,700 | 15,171,675 | 15,239,350 | 30,411,025 |
| *Ireland and Britain only* | *329,240* | *536,565* | *865,805* | *324,782* | *484,200* | *808,982* | *364,104* | *467,263* | *831,367* |
| Total American-Born | 103,602,600 | 108,527,400 | 212,130,000 | 110,673,800 | 116,188,600 | 226,862,400 | 121,387,800 | 127,428,500 | 248,816,300 |
| Grand total | 109,700,988 | 115,615,963 | 225,316,951 | 120,263,000 | 126,125,672 | 246,388,672 | 136,918,116 | 143,129,922 | 280,048,038 |
| | | | | Percentage change from previous census | | | | | |
| Total Canadian-born | | | | −13.76 | −11.45 | −12.41 | 18.32 | 5.87 | 10.97 |
| Total Foreign-Born | | | | 61.58 | 44.04 | 52.21 | 63.38 | 60.40 | 61.88 |
| *Ireland and Britain only* | | | | *−1.35* | *−9.76* | *−6.56* | *12.11* | *−3.50* | *2.77* |
| Total American-Born | | | | 6.83 | 7.06 | 6.94 | 9.68 | 9.67 | 9.68 |
| Grand total | | | | 9.63 | 9.09 | 9.35 | 13.85 | 13.48 | 13.66 |

Note: The number of foreign-born excludes the Canadian-born.

*intensive* it is. As such, I now focus only on people who are active participants in the labour force in each of the censuses (as explained in the data section above).

Table 2 provides information comparable to that in Table 1, but with only active labour force participants included as well as immigration cohort (i.e., period of entry). In all cases, the decennial changes are higher among these groups of immigrants compared with the total sample in Table 1. For example, between 1990 and 2000, total Canadian immigration increased by almost 11%, but among those in the labour force the increase exceeded 25%. For immigrants from Ireland and Great Britain the pattern is similar, but still not as dramatic as in the case of Canadian immigration: a total increase of 17.29% between 1990 and 2000 for those in the labour force versus an increase of 2.77% for the total sample (Table 1). Similar patterns hold for other immigrants as well, as these increases are larger than for the native-born US population. Finally, for men in the labour force, these percentage increases are even more dramatic relative to those for comparable women. Thus it appears that immigrants, regardless of origin or sex, entered the United States in the 1990s largely to pursue economic opportunities. These increases, especially among Canadian men, are dramatic during the latter half of the 1990s. This is consistent with the findings of McHale (2003).

Thus for I show that there was a reduction in the number of Canadians living in the United States between 1980 and 1990, followed by an increase between 1990 and 2000. We also observe a similar, albeit less pronounced, pattern for people from Ireland and Great Britain. This supports the brain drain hypothesis not only from Canada, but also from Britain and Ireland.[9] Still, these data do not answer one major question: What is the composition of these changes in immigration flows? Do the people represented in each census have higher education levels and earn higher salaries than the comparator groups (i.e., native-born Americans and immigrants from Ireland and Britain)? Once again we have estimates of how *extensive* the movement of human capital has been over this period, but we are also interested in determining how *intensive* the transfer of human capital has been. To do this we first look at changes in salaries and years of education in our sample over time. Because there may be a secular change in these numbers that is not related to migration per se, we control for this by comparing Canadian immigrants with individuals born in both the United States and in Ireland and Great Britain.

Tables 3 and 4 contain information on comparisons of log real earnings of Canadians (men and women) in the United States as of the 1980, 1990,

## Table 2
## Weighted Sample Sizes of Active Labour Force Participants, 1980, 1990, and 2000

| | Census Year | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1980 | | | 1990 | | | 2000 | | |
| | Males | Females | Total | Males | Females | Total | Males | Females | Total |
| Total Canadian-born | 351,463 | 492,888 | 844,351 | 303,100 | 436,472 | 739,572 | 358,641 | 462,072 | 820,713 |
| Immigration Cohort | | | | | | | | | |
| Pre-1950 | 39,068 | 31,961 | 71,029 | 10,242 | 9,919 | 20,161 | 3,431 | 3,374 | 6,805 |
| 1950–59 | 35,182 | 31,502 | 66,684 | 24,365 | 27,778 | 52,143 | 17,224 | 17,812 | 35,036 |
| 1960–64 | 18,972 | 14,230 | 33,202 | 21,599 | 20,370 | 41,969 | 15,800 | 15,901 | 31,701 |
| 1965–69 | 12,169 | 9,765 | 21,934 | 13,963 | 14,708 | 28,671 | 13,832 | 15,810 | 29,642 |
| 1970–74 | 6,205 | 4,225 | 10,430 | 7,485 | 7,291 | 14,776 | 8,766 | 9,657 | 18,423 |
| 1975–79 | 10,126 | 5,005 | 15,131 | 8,467 | 7,915 | 16,382 | 10,718 | 10,510 | 21,228 |
| 1980–84 | | | | 8,972 | 7,234 | 16,206 | 11,038 | 8,973 | 20,011 |
| 1985–89 | | | | 12,219 | 6,919 | 19,138 | 11,405 | 8,939 | 20,344 |
| 1990–94 | | | | | | | 18,737 | 13,949 | 32,686 |
| 1995–2000 | | | | | | | 30,062 | 16,339 | 46,401 |
| Total Canadian-born | 121,722 | 96,688 | 218,410 | 107,312 | 102,134 | 209,446 | 141,013 | 121,264 | 262,277 |
| Total Foreign-born | 1,948,200 | 1,335,575 | 3,283,775 | 3,395,575 | 2,307,150 | 5,702,725 | 5,493,000 | 3,782,600 | 9,275,600 |
| *Ireland and Britain Only* | *125,075* | *106,550* | *231,625* | *139,800* | *116,600* | *256,400* | *171,350* | *129,375* | *300,725* |
| Total American-born | 31,240,000 | 19,577,900 | 50,817,900 | 34,999,300 | 27,676,500 | 62,675,800 | 37,779,000 | 32,602,900 | 70,381,900 |
| Grand total | 33,309,922 | 21,010,163 | 54,320,085 | 38,502,187 | 30,085,784 | 68,587,971 | 43,413,013 | 36,506,764 | 79,919,777 |
| | | | | Percentage change from previous census | | | | | |
| Total Canadian-born | | | | −11.84 | 5.63 | −4.10 | 31.40 | 18.73 | 25.22 |
| Total Foreign-born | | | | 74.29 | 72.75 | 73.66 | 138.09 | 63.95 | 62.65 |
| *Ireland and Britain Only* | | | | *11.77* | *9.43* | *10.70* | *22.57* | *10.96* | *17.29* |
| Total American-born | | | | 12.03 | 41.37 | 23.33 | 7.94 | 17.80 | 12.30 |
| Grand total | | | | 15.59 | 43.20 | 26.27 | 12.75 | 21.34 | 16.52 |

Note: The number of foreign-born excludes the Canadian-born.

## Table 3
## Relative Log Real Earnings of Canadians in the United States, 1980, 1990, and 2000 Censuses (standard errors are in parentheses)

| | | Males | | Females | |
|---|---|---|---|---|---|
| | | Canadians in the US | Americans in the US | Canadians in the US | Americans in the US |
| 1980 | Mean | 10.411 | 10.255 | 9.664 | 9.625 |
| | Difference with native-born | | 0.156*** | | 0.039*** |
| | | | (.0018) | | (.0020) |
| 1990 | Mean | 10.475 | 10.227 | 9.843 | 9.719 |
| | Difference with native-born | | 0.248*** | | 0.124*** |
| | | | (.0020) | | (.0021) |
| 2000 | Mean | 10.532 | 10.214 | 9.961 | 9.781 |
| | Difference with native-born | | 0.318*** | | 0.179*** |
| | | | (.0020) | | (.0021) |
| *Difference-in-difference* | | | | | |
| | 1980–1990 | | 0.092*** | | 0.085*** |
| | | | (.0027) | | (.0029) |
| | 1990–2000 | | 0.070*** | | 0.056*** |
| | | | (.0028) | | (.0030) |
| | 1980–2000 | | 0.162*** | | 0.140*** |
| | | | (.0027) | | (.0029) |

Note: The 1, 5, and 10 percent levels of significance are denoted by ***, **, and *, respectively.

and 2000 US censuses.[10] Comparable figures for the US-born are included as well as figures for immigrants from Ireland and Great Britain. Because the composition of immigrants can change over time, along with the composition of the US-born, addressing changes in immigrant cohorts without a comparison group might bias our conclusions. For example, in addressing the brain drain from Canada, the question is not how much has the education of immigrants changed in the inter-census period, but rather by how much has this changed relative to the change in educational attainment of the two comparator groups. Similarly, addressing the earnings growth of Canadians is meaningless without comparing this growth to that of some base group.

Table 3 shows that the mean of the log real earnings for Canadian men averaged 10.411 in 1980 compared with 10.255 for US-born men. Thus

## Table 4
## Relative Log Real Earnings of Canadians in the United States, 1980, 1990, and 2000 Censuses (standard errors are in parentheses)

| | | Males | | Females | |
|---|---|---|---|---|---|
| | | Canadians in the US | Irish & Britons in the US | Canadians in the US | Irish & Britons in the US |
| 1980 | Mean | 10.411 | 10.472 | 9.664 | 9.612 |
| | Difference with Ireland/Britain | | −0.061*** | | 0.051*** |
| | | | (.0024) | | (.0028) |
| 1990 | Mean | 10.475 | 10.559 | 9.843 | 9.788 |
| | Difference with Ireland/Britain | | −0.084*** | | 0.055*** |
| | | | (.0027) | | (.0029) |
| 2000 | Mean | 10.532 | 10.605 | 9.961 | 9.937 |
| | Difference with Ireland/Britain | | −0.073*** | | 0.024*** |
| | | | (.0027) | | (.0029) |
| *Difference-in-difference* | | | | | |
| | 1980–1990 | | −0.023*** | | 0.003 |
| | | | (.0036) | | (.0040) |
| | 1990–2000 | | 0.011*** | | −0.030*** |
| | | | (.0038) | | (.0041) |
| | 1980–2000 | | −0.012*** | | −0.027*** |
| | | | (.0037) | | (.0040) |

Note: The 1, 5, and 10 percent levels of significance are denoted by ***, **, and *, respectively.

Canadian men had a significant earnings advantage of about 15.6% in 1980. By 1990 this advantage had increased to about 25% and further increased to near 32% in 2000. The net increase in earnings or the earnings *difference-in-difference* (i.e., once the effect of changing US earnings is controlled for) is about 9 and 7 percentage points respectively over the two inter-census periods. To look at this somewhat differently, by 1990 Canadians in the United States had increased their earnings advantage over Americans by 9 percentage points relative to 1980 (i.e., 0.248 − 0.156 = 0.092). This earnings advantage increased a further 7 percentage points by the 2000 census. Over the entire period (1980–2000), Canadian immigrants' earnings increased by some 16 percentage points. Relative women's earnings increased by approximately 8.5 percentage points between 1980 and 1990, and 5.6 percentage points between 1990 and 2000, or a total of 14 per-

centage points between 1980 and 2000. All results are statistically significant at 99% confidence.

Comparisons with Ireland and Great Britain are more ambiguous (Table 4). Here Canadian men have a salary disadvantage of between 6 and 8 percentage points in each of the three years. Canadian women have salaries some 5 percentage points higher in both 1980 and 1990, and about 2.4 percentage points higher in 2000. In other words, Canadians in the United States have been increasing their salary advantage relative to the US-born and have had mixed results over the two decades relative to the Irish and Britons, who have themselves obviously seen their mean unadjusted earnings improve relative to those of the US-born.

From a Canadian public policy perspective, a key issue is whether the educational levels of these migrants have changed during this period. The issue is quite different if Canadians in the United States are being rewarded because they have higher levels of formal education (presumably obtained in the taxpayer-financed Canadian system of public education) or if they are simply being rewarded for unobservable characteristics (which the Canadian taxpayer has not financed).[11] Tables 5 and 6 address the net change in the educational attainment of Canadians as well as nationals of Ireland and Great Britain who have migrated to the United States.[12] Because returns to education in the United States increased dramatically in the 1980s and the 1990s, we would expect that the average Canadian in the United States would indeed have higher levels of educational attainment in 1990. The data do in fact support this hypothesis. As of the 1980 census, Canadian men in our sample had a mean educational attainment of 12.48 years, about the same as the US-born. By 1990 this relative differential had increased to 0.36 years of education, and by 2000 the difference was about 0.81 years. The net increase between 1980 and 2000 was also about 0.81 years. Relative to immigrants from Ireland and Great Britain (Table 6), the pattern is similar: a relative increase of 0.56 years over the period 1980 to 2000.

The experience of women is similar. In 1980 Canadians in the United States had slightly fewer years of education on average compared with their US-born counterparts. This educational advantage increased to 0.14 years in 1990 and 0.43 years in 2000. In other words, relative education increased by about 0.52 years over 1980–2000. Relative to female immigrants from Ireland and Great Britain (Table 6), the increase was a positive albeit less dramatic: an increase of 0.31 years between 1980 and 2000.[13]

In sum, the data in Tables 3–6 show two phenomena. First, on average, Canadians in the United States have improved their relative earnings posi-

## Table 5
## Relative Educational Attainment of Canadians in the United States, 1980, 1990, and 2000 Censuses (standard errors are in parentheses)

| | | Males | | Females | |
|---|---|---|---|---|---|
| | | Canadians in the US | Americans in the US | Canadians in the US | Americans in the US |
| 1980 | Mean | 12.479 | 12.475 | 12.280 | 12.366 |
| | Difference with native-born | | 0.004 | | −0.086*** |
| | | | (.0089) | | (.0080) |
| 1990 | Mean | 13.630 | 13.266 | 13.469 | 13.333 |
| | Difference with native-born | | 0.364*** | | 0.136*** |
| | | | (.0076) | | (.0067) |
| 2000 | Mean | 14.445 | 13.637 | 14.170 | 13.736 |
| | Difference with native-born | | 0.808*** | | 0.434*** |
| | | | (.0053) | | (.0055) |
| *Difference-in-difference* | | | | | |
| | 1980–1990 | | 0.360*** | | 0.222*** |
| | | | (.0110) | | (.0104) |
| | 1990–2000 | | 0.444*** | | 0.298*** |
| | | | (.0093) | | (.0086) |
| | 1980–2000 | | 0.805*** | | 0.520*** |
| | | | (.0012) | | (.0093) |

Note: The 1, 5, and 10 percent levels of significance are denoted by ***, **, and *, respectively.

tion, or at least held steady, both relative to the US-born and to those from Ireland and Great Britain over the 1980–2000 period. Second, the relative educational attainment of Canadian migrants has increased relative to these two comparators over the same period.

As illuminating as these results are, they are simply averages and really tell us little about the underlying dynamics of the immigration flow from Canada to the United States. In other words, we are interested in looking at how various immigrant groups have changed over time. The concern about the brain drain is that young, educated Canadians with high earnings potential are leaving Canada for the United States. The simple intercensus comparisons presented here could be evidence of a brain drain, but they may also represent a bias in return or onward migration flows. For example, perhaps individuals with lower levels of education and earnings returned to Canada during the 1990s. This would bias the 2000 census re-

## Table 6
## Relative Educational Attainment of Canadians in the United States, 1980, 1990, and 2000 Censuses (standard errors are in parentheses)

| | | Males | | Females | |
|---|---|---|---|---|---|
| | | Canadians in the US | Irish & Britons in the US | Canadians in the US | Irish & Britons in the US |
| 1980 | Mean | 12.479 | 13.173 | 12.280 | 12.419 |
| | Difference with Ireland/Britain | | −0.695*** | | −0.139*** |
| | | | (.0117) | | (.0104) |
| 1990 | Mean | 13.630 | 14.040 | 13.469 | 13.274 |
| | Difference with Ireland/Britain | | −0.411*** | | 0.195*** |
| | | | (.0095) | | (.0088) |
| 2000 | Mean | 14.445 | 14.576 | 14.170 | 13.996 |
| | Difference with Ireland/Britain | | −0.131*** | | 0.174*** |
| | | | (.0069) | | (.0073) |
| *Difference-in-difference* | | | | | |
| | 1980–1990 | | 0.284*** | | 0.334*** |
| | | | (.0152) | | (.0136) |
| | 1990–2000 | | 0.279*** | | −0.021* |
| | | | (.0120) | | (.0114) |
| | 1980–2000 | | 0.564*** | | 0.313*** |
| | | | (.0136) | | (.0127) |

Note: The 1, 5, and 10 percent levels of significance are denoted by ***, **, and *, respectively.

sults and could lead one to believe that a brain drain had occurred in the 1990s when in fact we simply had witnessed selective return migration to Canada. Similarly, the remigration of Canadians from the United States to a third country, or selective job loss or retirement patterns, would also result in bias because people who were represented in the 1990 census would not be included in the 2000 sample. The same holds for those captured in the 1980 census who were not captured again in 1990.

To overcome this potential problem, we disaggregate Canadian immigrants by entry cohort. In these data, we can uniquely identify immigrants by five-year entry cohorts since 1960, a 10-year entry cohort for those who entered in the 1950s, and a single cohort for all who entered before 1950. The expatriate Canadians are disaggregated into entry cohorts, and these values are then compared with the mean value of the variable for Americans in the sample. In each panel are estimates with and without controls for income-generating personal characteristics. I again use a difference-in-

difference approach whereby the relative characteristics of immigrant cohorts in the 1990 (2000) census are compared with those cohorts at the same stage of their assimilation experience in the 1980 (1990) census. For example, we look at the relative difference in men's earnings for those in the 1990 census with one to five years of US labour market experience (the 1985–1990 cohort) and compare their average earnings with those from the 1980 census with the same number of years in the United States (the 1975–1980 cohort). We do this for the four most recent cohorts in each of the two census years 1990 and 2000.[14] These results are shown in Tables 7 and 8, and the full results of these estimates can be found in Appendix Tables A-1 and A-2.[15]

In terms of earnings, Table 7 reflects the results in Table 3 in that Canadian men have significantly higher earnings than their US counterparts. This holds in the estimates with and without controls. Two important points emerge from this breakdown of the data. First, these higher earnings are not limited to the most-recent-entry cohorts. The estimates in all cases are positive and significant at the 1% level. Second, there is a definite trend in these data where newer-entry cohorts have relatively higher earnings than earlier entrants. This result holds in the men's data across all censuses. For example, in the estimates without (with) controls, the newest entry cohort in 2000 had log earnings some 43(28)% higher than the average American, whereas the newest cohort had about 32(26)% higher earnings in the 1990 census and 29(22)% in 1980.

Table 8 presents the difference-in-difference results by comparing the relative position of each cohort in each census, adjusting for equivalent assimilation profiles. In other words, we ask how the earnings of Canadians relative to Americans compare with those of the other groups of Canadians with the same number of years in the United States. For example, we look at the relative earnings differential of Canadians in 2000 who entered between six and 10 years before the census (i.e., 1990–1995) and compare this group with those in the 1990 census who entered between 1980 and 1985, and those in the 1980 census who arrived during the five-year period beginning in 1970. Canadian men on average show a 6–9 percentage point improvement in their earnings (relative to the US-born) in 1990 relative to 1980 and a further earnings advantage of 2–7 percentage points in 2000 (see the final column of Table 8). In other words, the average earnings of Canadian males have increased over and above those experienced by the US-born. Furthermore, Table 8 shows that this relative earnings advantage for those with between 0 and 10 years in the United States continued to increase. Those who entered in the five-year period before the 2000 census,

## Table 7
## Differential Log Real Earnings of Canadians in the United States, by Immigration Cohort, 1980, 1990 and 2000 US Censuses (p-values are in parentheses)

| | | Males | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **1995–00** | **1990–94** | **1985–89** | **1980–84** | **1975–79** | **1970–74** | **1965–69** | **1960–64** | **1950–59** | **Before 1950** | **All cohorts** |
| Without controls | 1980 | | | | | 0.285*** | 0.098*** | 0.180*** | 0.153*** | 0.155*** | 0.128*** | 0.156*** |
| | | | | | | (.007) | (.009) | (.005) | (.004) | (.003) | (.003) | (.002) |
| | 1990 | | | 0.323*** | 0.276*** | 0.344*** | 0.273*** | 0.212*** | 0.179*** | 0.240*** | 0.247*** | 0.248*** |
| | | | | (.006) | (.008) | (.008) | (.008) | (.005) | (.004) | (.004) | (.006) | (.002) |
| | 2000 | 0.434*** | 0.383*** | 0.362*** | 0.380** | 0.281*** | 0.251*** | 0.227*** | 0.187*** | 0.227*** | 0.317*** | 0.318*** |
| | | (.004) | (.006) | (.007) | (.008) | (.007) | (.009) | (.006) | (.006) | (.005) | (.013) | (.002) |
| With controls | 1980 | | | | | 0.222*** | 0.054** | 0.160*** | 0.121*** | 0.122*** | 0.039*** | 0.104*** |
| | | | | | | (.006) | (.008) | (.005) | (.004) | (.003) | (.003) | (.002) |
| | 1990 | | | 0.257*** | 0.197*** | 0.220*** | 0.201*** | 0.196*** | 0.155*** | 0.101*** | 0.094*** | 0.166*** |
| | | | | (.006) | (.007) | (.007) | (.007) | (.005) | (.004) | (.003) | (.005) | (.002) |
| | 2000 | 0.283*** | 0.220*** | 0.192*** | 0.228*** | 0.176*** | 0.163*** | 0.144*** | 0.124*** | 0.072*** | 0.118*** | 0.186*** |
| | | (.004) | (.005) | (.006) | (.007) | (.006) | (.007) | (.005) | (.005) | (.005) | (.011) | (.002) |

| | | Females | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1995–00 | 1990–94 | 1985–89 | 1980–84 | 1975–79 | 1970–74 | 1965–69 | 1960–64 | 1950–59 | Before 1950 | All cohorts |
| Without controls | 1980 | | | | | 0.106*** | −0.030*** | 0.089*** | 0.030*** | 0.051*** | 0.015*** | 0.039*** |
| | | | | | | (.009) | (.010) | (.006) | (.006) | (.003) | (.004) | (.002) |
| | 1990 | | | 0.199*** | 0.167*** | 0.164*** | 0.103*** | 0.141*** | 0.129*** | 0.103*** | 0.044*** | 0.124*** |
| | | | | (.008) | (.008) | (.008) | (.008) | (.005) | (.005) | (.004) | (.007) | (.002) |
| | 2000 | 0.355*** | 0.263*** | 0.162*** | 0.205*** | 0.187*** | 0.143*** | 0.124*** | 0.117*** | 0.098*** | 0.033*** | 0.179*** |
| | | (.006) | (.006) | (.007) | (.008) | (.007) | (.007) | (.005) | (.006) | (.005) | (.013) | (.002) |
| With controls | 1980 | | | | | 0.032*** | −0.020*** | 0.101*** | 0.067*** | 0.065*** | 0.048*** | 0.060*** |
| | | | | | | (.007) | (.007) | (.005) | (.004) | (.003) | (.003) | (.002) |
| | 1990 | | | 0.087*** | 0.131*** | 0.114*** | 0.074*** | 0.092*** | 0.122*** | 0.126*** | 0.066*** | 0.107*** |
| | | | | (.006) | (.006) | (.006) | (.006) | (.004) | (.004) | (.003) | (.005) | (.002) |
| | 2000 | 0.187*** | 0.146*** | 0.134*** | 0.116*** | 0.132*** | 0.077*** | 0.092*** | 0.122*** | 0.067*** | 0.062*** | 0.117*** |
| | | (.000) | (.005) | (.005) | (.006) | (.006) | (.006) | (.004) | (.004) | (.004) | (.009) | (.002) |

Note: The 1, 5, and 10 percent levels of significance are denoted by ***, **, and *, respectively. See Tables A–1 and A-2 for full results.

## Table 8
## Difference-in-Difference of Relative Log Real Earnings of Canadians, by Time in the United States (standard errors are in parentheses)

**1980–1990**

| | Males | | | | |
|---|---|---|---|---|---|
| | **1–5 years** | **6–10 years** | **11–15 years** | **16–20 years** | **All years** |
| Without controls | 0.038*** | 0.178*** | 0.165*** | 0.121*** | 0.092*** |
| | (.010) | (.012) | (.010) | (.009) | (.003) |
| With controls | 0.035*** | 0.143*** | 0.061*** | 0.080*** | 0.062*** |
| | (.008) | (.010) | (.009) | (.008) | (.002) |

| | Females | | | | |
|---|---|---|---|---|---|
| | **1–5 years** | **6–10 years** | **11–15 years** | **16–20 years** | **All years** |
| Without controls | 0.093*** | 0.198*** | 0.075*** | 0.073*** | 0.085*** |
| | (.012) | (.012) | (.010) | (.009) | (.003) |
| With controls | 0.056*** | 0.151*** | 0.013 | 0.007 | 0.047*** |
| | (.009) | (.010) | (.008) | (.007) | (.002) |

**1990–2000**

| | Males | | | | |
|---|---|---|---|---|---|
| | **1–5 years** | **6–10 years** | **11–15 years** | **16–20 years** | **All years** |
| Without controls | 0.111*** | 0.107*** | 0.017 | 0.107*** | 0.070*** |
| | (.008) | (.010) | (.011) | (.011) | (.003) |
| With controls | 0.027*** | 0.023*** | −0.028*** | 0.027*** | 0.021*** |
| | (.007) | (.009) | (.009) | (.010) | (.002) |

| | Females | | | | |
|---|---|---|---|---|---|
| | **1–5 years** | **6–10 years** | **11–15 years** | **16–20 years** | **All years** |
| Without controls | 0.156*** | 0.095*** | −0.002 | 0.102*** | 0.056*** |
| | (.010) | (.010) | (.011) | (.011) | (.003) |
| With controls | 0.100*** | 0.015* | 0.020** | 0.042*** | 0.010*** |
| | (.008) | (.008) | (.008) | (.008) | (.002) |

Note: The 1, 5, and 10 percent levels of significance are denoted by ***, **, and *, respectively.

for example, had earnings advantages of between 3 and 11 percentage points compared with the immigrant group with the same assimilation profile in the preceding census. Thus these results support a brain drain from Canada to the United States as the relative earnings differential continues to widen.

For women the pattern outlined above for men is also apparent in these data: relative women's earnings among those in the United States between 0 and 5 years continued to increase between the two inter-census periods.

In sum, we discover in these estimates that the average Canadian of either sex in the United States had higher earnings compared with those of the average American of the same sex in 1980, 1990, and 2000. Furthermore, this relative earnings advantage has been increasing over time, regardless of sex or the inclusion of control variables. The most recent cohort of immigrants in each case (i.e., those with between 0 and 10 years in the United States) are unambiguously improving their positions.

In the above estimates, the fact that the relative Canadian wage differentials without controls are generally larger than the estimates with controls suggests that the observable characteristics of Canadians in the United States have also changed over the inter-census periods. Perhaps the greatest public policy issue in Canada is that highly educated Canadians are migrating south and taking their Canadian-taxpayer-subsidized educations with them. This in essence provides the federal and provincial levels of government a poor rate of return on investment, as migrants are not paying taxes in the jurisdiction where they received their education.

Recently, the Government of Canada has responded to this problem by introducing programs such as Canadian Research Chairs to stem (indeed to reverse) this flow of university faculty moving to the United States. As outlined in Table 5, the average level of education of Canadians in the United States increased between 1980 and 1990, further increasing by 2000. Again we are interested in knowing the source of these mean differences. Is it the result of high levels of education of recent cohorts of Canadian immigrants? Or is it the result of earlier cohorts who have attained more education in response to the higher rates of return to education in the United States? The former issue is of concern to Canadian policy-makers whereas the latter is not.

To address this issue, we perform an analysis similar to that above for years of education. These results are contained in Tables 9 and 10. Estimates both with and without age controls are included.[16] With few exceptions educational attainment is significantly higher among Canadian immigrants than among those born in the United States regardless of census year or sex.

In addition, in each census the difference generally increases as the time since immigration decreases: newer immigrants have more education than past immigrants. Adjusting for age tends to reduce the relative difference, as we might expect given the relative young age of recent immigrants. For example, in the estimates with age controls, men who arrived in the five-year period before the 1990 census had 1.07 more years of education, but 1.27 more years in 2000 (Table 9) for a difference-in-difference of about 0.20 years (Table 10). This pattern is generally repeated between census years and within sex groups. Thus there has been an increase in relative years of education among Canadians in both the 1990 and 2000 data. Some of this increase has come from newer cohorts being better educated, but it has also been the result of an increase in the levels of education of older cohorts.

## Summary, Conclusions, and Discussion

The migration of highly skilled Canadians to the United States was a topic of extensive debate in Canada in the 1990s, with passionate views being expressed about its existence, magnitude, and causes by many commentators, but fewer researchers. Despite some reasonably firm theoretical reasons supporting the brain-drain hypothesis, no adequate data were available to test the hypothesis (at least until now). The release of the 2000 US census microdata files presents researchers with the first opportunity to investigate if the brain drain was real, the magnitude of the migration flows, and the qualitative aspects of this migration.

By using US census data from 1980, 1990, and 2000, we were able to consider the changing nature of Canadian migration to the United States. We were interested in addressing the actual numbers of the Canadian-born who resided in the United States at the time of each census. We find that the number of Canadians in the United States decreased between 1980 and 1990, but increased again by 2000. Still, by 2000 there were only an estimated 820,713 Canadians in the United States compared with 844,351 some 20 years earlier. The same pattern in these data is observed for nationals of Ireland and Great Britain, although the changes for this group have shown less variance over the same time period. Among those actively engaged in the labour force, these increases have been even more dramatic.

Numbers alone, however, do not support the brain-drain hypothesis. Although the increase in the number of individuals during the 1990s supports the notion of an *extensive* migration, it does not necessarily support the existence of an *intensive* migration. In other words, have these individuals migrating to the United States been among Canada's best and brightest?

## Table 9
## Relative Educational Attainment of Canadians in the United States, by Immigration Cohort, 1980, 1990 and 2000 US Censuses (p-values are in parentheses)

| | | Males | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1995–00 | 1990–94 | 1985–89 | 1980–84 | 1975–79 | 1970–74 | 1965–69 | 1960–64 | 1950–59 | Before 1950 | All cohorts |
| Without age controls | 1980 | | | | | 1.351*** | 0.514*** | −0.337*** | −0.176*** | 0.113*** | −0.333*** | 0.004 |
| | | | | | | (.026) | (.039) | (.031) | (.023) | (.016) | (.016) | (.009) |
| | 1990 | | | 1.179*** | 0.802*** | 0.873*** | 0.481*** | 0.189*** | −0.026 | 0.239*** | −0.144*** | 0.364*** |
| | | | | (.019) | (.024) | (.023) | (.029) | (.021) | (.018) | (.016) | (.027) | (.008) |
| | 2000 | 1.415*** | 1.258*** | 1.009*** | 1.033*** | 0.905*** | 0.600*** | 0.170*** | −0.074*** | 0.407*** | 0.523*** | 0.808*** |
| | | (.009) | (.011) | (.017) | (.017) | (.020) | (.022) | (.020) | (.019) | (.015) | (.037) | (.005) |
| With age controls | 1980 | | | | | 1.250*** | 0.474** | −0.327*** | −0.142*** | 0.161*** | 0.034** | 0.131*** |
| | | | | | | (.026) | (.038) | (.031) | (.022) | (.016) | (.016) | (.009) |
| | 1990 | | | 1.070*** | 0.742*** | 0.880*** | 0.466*** | 0.189*** | 0.007 | 0.399*** | 0.231*** | 0.425*** |
| | | | | (.018) | (.024) | (.023) | (.029) | (.021) | (.017) | (.016) | (.027) | (.008) |
| | 2000 | 1.267*** | 1.178*** | 0.999*** | 1.039*** | 0.879*** | 0.620*** | 0.250*** | 0.087*** | 0.659*** | 0.969*** | 0.832*** |
| | | (.009) | (.011) | (.017) | (.017) | (.020) | (.022) | (.020) | (.019) | (.015) | (.037) | (.005) |

(*continued*)

## Table 9
## (*Continued*)

| | | Females | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **1995–00** | **1990–94** | **1985–89** | **1980–84** | **1975–79** | **1970–74** | **1965–69** | **1960–64** | **1950–59** | **Before 1950** | **All cohorts** |
| Without age controls | 1980 | | | | | 0.941*** | 0.588*** | 0.068*** | −0.213*** | 0.097*** | −0.506*** | −0.086*** |
| | | | | | | (.029) | (.038) | (.025) | (.020) | (.014) | (.014) | (.008) |
| | 1990 | | | 1.013*** | 0.684*** | 0.466*** | 0.352*** | 0.134*** | 0.029* | −0.118*** | −0.367*** | 0.136*** |
| | | | | (.021) | (.022) | (.020) | (.024) | (.018) | (.015) | (.013) | (.023) | (.007) |
| | 2000 | 1.211*** | 0.858*** | 0.513*** | 0.648*** | 0.457*** | 0.469*** | 0.158*** | −0.134*** | 0.036** | 0.036 | 0.434*** |
| | | (.011) | (.013) | (.021) | (.019) | (.018) | (.019) | (.016) | (.016) | (.015) | (.035) | (.005) |
| With age controls | 1980 | | | | | 0.663*** | 0.392*** | 0.010 | −0.201*** | 0.219*** | −0.017 | 0.089*** |
| | | | | | | (.029) | (.037) | (.025) | (.020) | (.013) | (.014) | (.008) |
| | 1990 | | | 0.785*** | 0.554*** | 0.410*** | 0.348*** | 0.168*** | 0.145*** | 0.181*** | 0.130*** | 0.264*** |
| | | | | (.021) | (.021) | (.020) | (.023) | (.018) | (.015) | (.013) | (.022) | (.006) |
| | 2000 | 0.946*** | 0.694*** | 0.429*** | 0.643*** | 0.511*** | 0.504*** | 0.335*** | 0.149*** | 0.389*** | 0.598*** | 0.508*** |
| | | (.011) | (.013) | (.021) | (.019) | (.017) | (.019) | (.016) | (.016) | (.014) | (.034) | (.005) |

Notes: The 1, 5, and 10 percent levels of significance are denoted by ***, **, and *, respectively. The control variable used is the individual's age in years.

## Table 10
## Difference-in-Difference of Relative Educational Attainment of Canadians, by Time in the United States (p-values are in parentheses)

1980–1990

| | Males | | | | |
|---|---|---|---|---|---|
| | 1–5 years | 6–10 years | 11–15 years | 16–20 years | All years |
| Without age controls | −0.173*** | 0.288*** | 1.210*** | 0.657*** | 0.360*** |
| | (.032) | (.046) | (.039) | (.037) | (.012) |
| With age controls | −0.180*** | 0.267*** | 1.207*** | 0.608*** | 0.294*** |
| | (.032) | (.045) | (.039) | (.037) | (.012) |

| | Females | | | | |
|---|---|---|---|---|---|
| | 1–5 years | 6–10 years | 11–15 years | 16–20 years | All years |
| Without age controls | 0.072** | 0.096** | 0.398*** | 0.565*** | 0.222*** |
| | (.036) | (.043) | (.032) | (.031) | (.010) |
| With age controls | 0.122*** | 0.161*** | 0.400*** | 0.549*** | 0.175*** |
| | (.035) | (.042) | (.032) | (.031) | (.010) |

1990–2000

| | Males | | | | |
|---|---|---|---|---|---|
| | 1–5 years | 6–10 years | 11–15 years | 16–20 years | All years |
| Without age controls | 0.236*** | 0.456*** | 0.136*** | 0.552*** | 0.444*** |
| | (.021) | (.027) | (.029) | (.034) | (.009) |
| With age controls | 0.197*** | 0.436*** | 0.118*** | 0.573*** | 0.408*** |
| | (.021) | (.027) | (.029) | (.034) | (.009) |

| | Females | | | | |
|---|---|---|---|---|---|
| | 1–5 years | 6–10 years | 11–15 years | 16–20 years | All years |
| Without age controls | 0.198*** | 0.174*** | 0.048 | 0.296*** | 0.298*** |
| | (.024) | (.025) | (.029) | (.031) | (.009) |
| With age controls | 0.161*** | 0.141*** | 0.019 | 0.295*** | 0.244*** |
| | (.023) | (.025) | (.029) | (.030) | (.008) |

Note: The 1, 5, and 10 percent levels of significance are denoted by ***, **, and *, respectively.

To answer this question, we first look at the relative earnings and educational attainment of Canadians who work in the United States vis-à-vis the US-born as well as nationals of Ireland and Great Britain living and working in the United States. This is to control for secular changes in the labour market in the United States that are assumed to affect both immigrants and Americans equally. The rationale here is that if highly skilled Canadians are in fact leaving the country, their contribution to the US economy is (arguably) equal to the loss to the Canadian economy. For example, if individuals choose to retire to the United States, the loss to the Canadian economy (although positive) is less than if they are working in and thus contributing to the US economy. Our results tend to support the brain-drain hypothesis, both in terms of earnings and education and using estimates with and without control variables. In all three censuses, Canadian men and women had higher earnings and levels of education relative to Americans. Furthermore, these advantages continued to increase census over census. Compared with nationals of Ireland and Great Britain, both measures also tended to increase, albeit not as dramatically (which also indicates a relative improvement of this group vis-à-vis Americans).

The fact that relative immigrant earnings differentials continue to exist even when controlling for other earnings-generating characteristics suggests that the abilities of the immigrants continue to improve. The most recent immigrant cohorts tend have the highest earnings premium relative to the US-born as well as the largest education difference. Perhaps the greatest public policy issue in Canada is that young, highly educated Canadians are migrating south, taking with them their taxpayer-subsidized educations. This in essence provides the federal and provincial governments a poor rate of return on investment, as migrants are not paying taxes in the jurisdiction where they received their education. Our results suggest that this may be more problematic because Canadians in the United States have earnings above what can be explained by observable characteristics alone. In other words, the loss of tax revenue is probably even greater because these are the people who would probably be earning higher than average salaries in Canada and hence paying more in taxes.

Of course, our results also show that Canada is not alone in losing these productive people to the United States; migrants from Great Britain and Ireland also display a similar pattern of earnings premiums vis-à-vis the Americans in our sample. This result points to the likelihood that the pull of the US labour market, coupled with favourable US immigration policies, is responsible for this migration rather than the domestic policies

of Canada (or Great Britain and Ireland). The fact that earlier research has shown similar patterns for other countries bolsters this probability.

In sum, we do see qualitative improvements for Canadians in the US labour market between 1980 and 2000 in terms of both relative educational attainment and relative earnings. For policy purposes this analysis suggests that this migration began before the 1990s, possibly as early as the 1980s. The 1990s, of course, are when much attention was paid to this issue. If indeed this is a problem, there are two major reasons for optimism. The Canadian economy has outperformed the US economy recently, and following the cutbacks of the 1990s, federal and provincial government spending has increased, including increased funding for education and health care, two of the sectors that experienced large losses of human capital to the United States in the 1990s. Unfortunately, the slowdown of the US economy began shortly before the 2000 US census, meaning that much of the probable return migration to Canada was not captured by the census. However, here we agree with DeVoretz and Iturralde (2001) in their analysis of Canadians migrating to the United States.

> the brain drain that is causing the departure of many of Canada's high income earners remains a by-product, not mainly of Canadian conditions, but of the state of the US economy and the immigration policies of the US government. Changes in either have the potential of slowing the southward movement faster than any Canadian policies could (p. 63).

In fact, this surge in both the quantity and quality of Canadians entering the United States in the 1990s may be waning; the Canadian economy has performed well relative to its US counterpart since 2000. In addition, changes in US immigration policy post-9/11 have tightened the US border, making the country much less hospitable to immigration. McHale (2003) estimates that the number of Canadians in the United States declined in 2002 after climbing steadily between 1998 and 2001.[15] Whether this short-term decline will turn into a trend awaits a similar analysis on the 2010 US census.

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## Table A-1
## OLS Estimates of Log Real Earnings Equations, 1980, 1990 and 2000 US Census, Males (absolute values of t-statistics are in parentheses)

| | 1980 Census | | | | 1990 Census | | | | 2000 Census | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Without controls | | With controls | | Without controls | | With controls | | Without controls | | With controls | |
| Years of education | | | 0.071 | (1688.13) | | | 0.098 | (2232.17) | | | 0.118 | (2253.87) |
| Experience | | | 0.037 | (921.43) | | | 0.038 | (1008.23) | | | 0.029 | (718.75) |
| Experience squared | | | −0.001 | (652.04) | | | 0.000 | (643.47) | | | 0.000 | (477.50) |
| Married | | | 0.138 | (493.70) | | | 0.128 | (546.67) | | | 0.205 | (1012.22) |
| Number of childen | | | 0.027 | (324.20) | | | 0.019 | (215.89) | | | −0.004 | (21.74) |
| Hours worked per week | | | 0.022 | (378.15) | | | 0.064 | (984.48) | | | 0.070 | (965.59) |
| Hours per week squared | | | 0.000 | (267.28) | | | 0.000 | (832.50) | | | −0.001 | (754.55) |
| Speaks English | | | 0.063 | (159.76) | | | 0.060 | (163.46) | | | 0.059 | (155.60) |
| White | | | 0.194 | (562.55) | | | 0.176 | (611.54) | | | 0.132 | (505.96) |
| Entry Cohort: | | | | | | | | | | | | |
| Before 1950 | 10.383 | (3233.11) | 7.873 | (2336.66) | 10.474 | (1707.53) | 6.327 | (1100.28) | 10.531 | (800.19) | 5.978 | (529.65) |
| 1950–59 | 10.410 | (3615.78) | 7.955 | (2621.98) | 10.468 | (2825.34) | 6.333 | (1652.78) | 10.441 | (2035.16) | 5.933 | (1202.44) |
| 1960–64 | 10.407 | (2341.12) | 7.954 | (1847.98) | 10.406 | (2459.78) | 6.387 | (1516.56) | 10.401 | (1818.47) | 5.985 | (1059.29) |
| 1965–69 | 10.434 | (1899.85) | 7.993 | (1568.71) | 10.440 | (1913.57) | 6.428 | (1306.38) | 10.441 | (1775.94) | 6.005 | (1065.72) |
| 1970–74 | 10.353 | (1209.42) | 7.887 | (979.53) | 10.500 | (1290.17) | 6.433 | (910.09) | 10.465 | (1215.31) | 6.024 | (834.60) |
| 1975–79 | 10.540 | (1475.47) | 8.055 | (1245.94) | 10.572 | (1277.01) | 6.453 | (890.36) | 10.495 | (1409.83) | 6.037 | (940.57) |
| 1980–84 | | | | | 10.503 | (1660.83) | 6.430 | (918.79) | 10.594 | (1354.70) | 6.089 | (855.95) |
| 1985–89 | | | | | 10.550 | (1660.83) | 6.489 | (1117.86) | 10.576 | (1466.10) | 6.053 | (906.60) |
| 1990–94 | | | | | | | | | 10.597 | (1790.55) | 6.081 | (1096.52) |
| 1995–2000 | | | | | | | | | 10.647 | (2563.46) | 6.144 | (1511.43) |
| Natives | 10.255 | (97202.84) | 7.833 | (4737.72) | 10.227 | (98434.65) | 6.232 | (3442.59) | 10.214 | (93021.77) | 5.861 | (2984.79) |
| *N* | 31,361,722 | | 31,361,722 | | 35,106,612 | | 35,106,612 | | 37,920,013 | | 37,661,213 | |

Notes: Two equations were jointly estimated, one each with and without controls. R-squared values are not noted since regressions did not include constant terms.Controls for industry and occupation were also included but are not reported above.

## Table A-2
## OLS Estimates of Log Real Earnings Equations, 1980, 1990 and 2000 US Census, Females
## (absolute values of t-statistics are in parentheses)

| | 1980 Census | | | | 1990 Census | | | | 2000 Census | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Without controls | | With controls | | Without controls | | With controls | | Without controls | | With controls | |
| Years of education | | | 0.065 | (1092.63) | | | 0.109 | (1811.41) | | | 0.123 | (1876.75) |
| Experience | | | 0.016 | (329.37) | | | 0.018 | (451.43) | | | 0.025 | (585.49) |
| Experience squared | | | 0.000 | −(280.82) | | | 0.000 | −(329.03) | | | 0.000 | −(458.85) |
| Married | | | −0.042 | −(168.30) | | | −0.009 | −(46.08) | | | 0.007 | (33.38) |
| Number of childen | | | −0.047 | −(422.97) | | | −0.035 | −(352.68) | | | −0.030 | −(313.25) |
| Hours worked per week | | | 0.060 | (969.74) | | | 0.077 | (2027.37) | | | 0.077 | (1629.50) |
| Hours per week squared | | | 0.000 | −(537.26) | | | −0.001 | −(1393.11) | | | −0.001 | −(1080.02) |
| Speaks English | | | −0.023 | −(46.68) | | | −0.029 | −(66.09) | | | 0.009 | (21.94) |
| White | | | −0.006 | −(15.39) | | | 0.010 | (34.69) | | | 0.024 | (91.84) |
| Entry Cohort | | | | | | | | | | | | |
| Before 1950 | 9.639 | (2712.96) | 7.172 | (2125.68) | 9.763 | (1430.89) | 6.089 | (1149.15) | 9.814 | (768.74) | 5.782 | (601.75) |
| 1950–59 | 9.676 | (2851.70) | 7.189 | (2123.96) | 9.822 | (2359.65) | 6.148 | (1800.97) | 9.879 | (1897.03) | 5.787 | (1338.43) |
| 1960–64 | 9.654 | (1755.66) | 7.191 | (1512.12) | 9.849 | (2122.77) | 6.145 | (1627.28) | 9.898 | (1767.69) | 5.841 | (1254.13) |
| 1965–69 | 9.714 | (1629.59) | 7.225 | (1332.75) | 9.861 | (1886.11) | 6.115 | (1342.85) | 9.905 | (1852.85) | 5.811 | (1259.53) |
| 1970–74 | 9.594 | (984.43) | 7.104 | (943.67) | 9.822 | (1280.41) | 6.096 | (1022.81) | 9.924 | (1434.49) | 5.796 | (978.24) |
| 1975–79 | 9.730 | (1088.38) | 7.155 | (980.11) | 9.884 | (1202.87) | 6.137 | (968.59) | 9.968 | (1345.99) | 5.852 | (1022.01) |
| 1980–84 | | | | | 9.886 | (1272.87) | 6.154 | (963.60) | 9.986 | (1298.80) | 5.835 | (939.41) |
| 1985–89 | | | | | 9.918 | (1193.66) | 6.110 | (976.17) | 9.943 | (1400.70) | 5.853 | (1056.05) |
| 1990–94 | | | | | | | | | 10.044 | (1653.28) | 5.866 | (1154.52) |
| 1995–2000 | | | | | | | | | 10.136 | (1752.75) | 5.907 | (1211.13) |
| Natives | 9.625 | (69092.33) | 7.124 | (4100.40) | 9.719 | (79535.30) | 6.023 | (4250.80) | 9.781 | (83032.08) | 5.719 | (3618.50) |
| *N* | 19,674,588 | | 19,674,588 | | 27,778,634 | | 27,778,634 | | 32,724,164 | | 32,724,164 | |

Notes: See notes to Table A–1.

## Notes

1. Finnie (2001) provides a good review of the literature and evaluates some alternative policy options to stem the flow of talented individuals from Canada to the United States.

2. Following the Canada-US Free Trade Agreement in 1989, TC visas became available to skilled Canadians (generally those with at least a bachelor's degree) wishing to enter the United States. These were replaced with TN visas under the North American Free Trade Agreement in 1994. In either case, the one-year visas are unlimited in number, can be issued immediately with the appropriate paperwork, and can be renewed indefinitely. The most popular alternative method for similarly skilled workers is the H–1B visa, which has numerical limitations, is renewable only for two three-year terms, and requires a much more cumbersome and time-consuming application process. See McHale (2003) for an account of the increased use of these visas among Canadians entering the United States in the 1990s.

3. Card also notes that mean real wages in the United States increased for almost all age-education groups in the United States while remaining constant in Canada. This means that many Canadians, not only the highly skilled, may have increased their real wages by migrating to the United States over this period.

4. Da Vanzo (1978) for one has shown the positive relationship between unemployment and migration in the United States.

5. The CPS data contain only a small number of Canadians, so statistical inferences are subject to a wide margin of error. The INS administrative data count the number of admittances into the United States, not the number of individuals. Still, as Riddell (2003) points out, "It is important, however, to remember that researchers are a bit like the drunk who is looking for his lost keys under the lamp post because that is where the light is, not where the keys were dropped. Researchers look where the data are, and there are often important issues that are not being addressed because we do have suitable data available to examine them" (pp. 622–623). The 2000 US census provides suitable data for this work.

6. All data were obtained from the Integrated Public Use Microdata Series (IPUMS), Minnesota Population Center, University of Minnesota. The 2000 census data are from the beta version.

7. For the estimates of Total Foreign-Born in Tables 1 and 2, a 1/25 subsample was used. All subsampling was done owing to the large size of the US census micro data files coupled with statistical software limitations.

8. Including other immigrant groups would confound the effects of language, cultural differences, and foreign education in our analysis. Immigrants from Ireland and Great Britain seem to be the most natural comparator group.

9. This finding is reflected by Mueller (2001) who shows that migration flows to the United States from other G-7 countries (which includes the United Kingdom but not Ireland) mirrored those of Canada throughout much of the 1980s and 1990s.

10. Because these data are for earnings in 1979, 1989, and 1999 (i.e., the year prior to the actual census year), 1979 and 1999 earnings data are converted to 1989 dollars. Results were obtained by regressing the dependent variable (i.e., log real earnings) on two separate dummy variables: one representing Canadians in the United States in the appropriate census year, and one representing the US-born in the same census year. The same methodology is followed in Table 4. For readers not familiar with this methodology, natural logarithms of log real earnings are used in this article simply because they facilitate comparisons of earnings figures in two ways. First, they provide a simple way to compute percentage differences in wages between two groups. For example, in Table 3, the log real earnings figures for Canadian men in the United States in the 1980 and 1990 censuses are 10.411 and 10.475, and the difference (0.064) is roughly equal to a 6.4 percentage point real earnings increase during the inter-census period. The second way is that these approximations always represent the same percentage change regardless of the size of the underlying real earnings. For example, a log change of 0.05 is always approximately equal to a 5% change in the underlying earnings variable, regardless of whether this is an increase from $10,000 to $10,500, or a change from $100,000 to $105,000; in either case, the increase is 5%, but the absolute increase is $500 in the former case and $5,000 in the latter.

11. Unobservable characteristics are factors such as natural talent, motivation, and so forth that are not measured in standard data sets.

12. The methodology is identical to that followed in Tables 3 and 4 with years of education substituted for log earnings as the variable of interest.

13. It should be noted that the figures presented here are almost certainly underestimates of the true years of education differentials between the Canadian-born and the US-born. This is because 16 years of education (representing a bachelor's degree) is the top code in our data set. Card (2003) has shown that Canadians in the United States are much more likely to hold advanced de-

grees (i.e., postgraduate and professional degrees) compared with both Americans in the United States and Canadians in Canada. Indeed, in performing using this broader definition of education in the US census on a selection of the estimates in Table 5, we also found that the education advantage of Canadians tended to increase, but the patterns presented here did not.

14. For example, we do this by calculating the statistic $(\bar{x}_{i,2000} - \bar{x}_{n,2000}) - (\bar{x}_{i-10,1990} - \bar{x}_{n,1990})$ where $\bar{x}$ is the mean of the group-specific statistic in which we are interested, $i$ is one of the four most recent cohorts in 2000 (i.e., 1980–1984, 1985–1989, 1990–1994 and 1995–2000), $i$–10 is for the four matching cohorts in the 1990 census (i.e., 1970–74, etc.), and $n$ is for natives (i.e., the US-born) in the sample. The first term in the above equation is the first difference obtained from the 2000 cross-section estimates in Table A-1, whereas the second is the first difference from the corresponding 1990 estimates. For example, using the estimates without controls in Table 7, the 1990–1994 male entry cohort (which had 6–10 years of experience in the United States) had log real earnings that were 0.383 log points higher than those of natives in 2000. In 1990, those in the 1980–1984 entry cohort (also with 6–10 years of US experience) had relative earnings some 0.276 log points higher. Thus the difference-in-difference is 0.107, the statistic reported in Table 8.

15. To investigate the robustness of the results presented, the 2000 data (without controls) were also estimated using log weekly wages (i.e., the log of annual earnings divided by the number of weeks worked) and also using the log of annual earnings with the restriction of 40 or more weeks worked removed. The results did not change markedly.

16. Estimates with age controls are included to compensate for the changing age structure of the sample over the 20-year period studied. Estimates using the 2000 census and a slightly different definition of years of education were attempted (where masters and postgraduate professional degrees were coded to 18 years of education, and doctorates were coded to 20 years of education). Doing this resulted in higher years-of-education differentials in 2000 for the Canadians in Table 9, but the pattern of the differentials by cohort remained the same (i.e., more recent cohorts having more education than their US-born counterparts). We also used the 2001 Canadian census data as well as the results presented here and in Mueller (1999) to compare the education attainment of Canadians in the United States with the Canadian-born in Canada. Both men and women in the United States had more years of education in each of the three census year pairs (1980, 1990, and 2000 in the United States compared with 1981, 1991, and 2001 in Canada respectively), and this gap tended to widen over time.

17. These estimates, however, are less than reliable because they use the CPS. See above for comments on use of the CPS in inferring population totals.

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