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Brain Drain: Why Do Some Post-Secondary Graduates Choose to Work in the United States?[*]

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Abstract

In this study, we examine the phenomenon of the brain drain in Canada, specifically the loss of certain post-secondary graduates to the United States. Our analysis comprises three components: a descriptive analysis of the differences between graduates who stayed in Canada and those who moved to the United States; a multivariate analysis, to identify the determinant factors of the decision to move from Canada to the United States and the decision to return to Canada afterwards; and analysis to explain the wage differentials between stayers and movers. Using the data for the last three cohorts from the National Graduates Survey, we observe that the brain drain remains relatively marginal, affecting 2% of new graduates at most. We also note a slight decrease in the brain drain for the Class of 2005 compared with the Class of 2000 in the first two years after graduation. In addition, we identify a strong movement to return to Canada (some 48% of those who left between 2000 and 2005) or a strong intention to do so (61% of the graduates of 2000 still living in the United States in 2005). Striking differences emerge in connection with certain factors, however, including level of education and field of study. For example, PhDs are by far the most likely to move to the United States. That also holds true for graduates in the fields of mathematics, computer and information sciences and architecture, engineering and related technologies. The wage differences are also high, in the order of 27% to 40% higher for graduates working in the United States, of which only one third can be explained by a variety of observable factors. Finally, we find that the graduates of 2000 who returned to Canada after a stay in the United States earned, in 2005, up to 18% more on average than those who never left Canada, all other things being equal. Canada thus benefits from the brain drain when it is not permanent. Whatever the case, we do not believe that at current levels, the brain drain of post-secondary graduates to the United States requires specific intervention on the part of public policymakers. However, the phenomenon should be monitored on an ongoing basis, as it may evolve in the future.

Key Words: Canada, labour market, wages, employment, employment abroad, emigration, human capital, post-secondary education, economic analysis, economic statistics.

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Executive Summary

The phenomenon of the brain drain in Canada, i.e., the emigration of highly skilled workers to the United States or other countries, has long been food for much thought and debate. For one thing, losing the most productive elements of society can have a harmful effect on growth, by decreasing innovation and reducing potential synergies in such fields as leading-edge research and technology. For another, the federal and provincial governments allocate considerable resources to post-secondary education and training. In this case, the brain drain of graduates, especially the most qualified among them, can only reduce the return on that public investment. Finally, in the current context of an ageing population and a skilled labour shortage, governments are devoting considerable energy to attracting skilled foreign workers. In the circumstances, retaining our graduates should be among the top concerns of public policymakers, especially since workers trained here generally integrate much better into the Canadian labour market than foreign-trained workers. But should the brain drain really be a cause for alarm in Canada? Who are these brains, and why are they leaving?

This report tries to answer those pressing questions. In particular, we try to measure the extent of the brain drain to the United States among Canadian post-secondary graduates and to analyze its evolution over time based on the available survey data, and then to identify the main factors that influence the decision to move from Canada to the United States, as well as the decision to return to Canada after a stay abroad. We also examine the question of earnings: are individuals who move to the United States better paid than in Canada? We also seek to decompose the wage differentials between the two countries, using various explicative factors. We use the data from Statistics Canada's National Graduates Survey, conducted jointly with Human Resources and Skills Development Canada, and from its follow-up survey. Those data, which have been little used to date (Frank, Bélair and Seidle, 2000; Zarifa and Walters, 2008), are ideal for examining this phenomenon, as they make it possible to track post-secondary graduates, two years and five years after graduation. The three most recent cohorts will be examined, i.e., from 1995, 2000 and 2005. At this point, we should emphasize that these data do not paint an

exhaustive picture of the emigration of Canadian graduates, because they pertain only to new graduates, and those who move to regions other than the United States are not accounted for.

Our first finding is that the brain drain remains marginal, overall: for the three cohorts examined, no more than 2% of the graduates lived in the United States at the time of the survey. Moreover, that proportion seems to decrease over time. The latest available figures, for the Class of 2005 in 2007, indicate that only 1.07% of graduates lived south of the border. That rate is 0.62 percentage points lower than the rate observed in 2002 for the Class of 2000 (1.69%). In fact, although the number of college and university graduates increased by over 16% between 2000 and 2005, the number of graduates who emigrated to the United States in the first two years after graduation decreased by 26%, from 4,600 in 2002 to 3,400 in 2007. We also observed that many graduates move to the United States then return to Canada shortly afterwards. For example, between 2000 and 2005, we estimate that just over 10,000 graduates from the cohort of 2000 moved to the United States, but some 4,800 of them returned to Canada. Moreover, of the graduates still living in the United States in 2005, 61% intended to return to the country, 15% were undecided, and only 24% intended to settle permanently in their host country. The brain drain to the United States thus seems to be temporary for most graduates, for the time it takes to acquire international training or experience to beef up their résumés. Canada ultimately benefits from its graduates' international mobility.

Nevertheless, the overview masks some marked differences for some dimensions, including level of education and field of study. Indeed, the likelihood of a PhD moving to the United States is 7 to 16 percentage points higher than for a college graduate, all other things being equal. But that deviation is only 2 to 4 percentage points for graduates with a Master's, and 1 to 2 points for graduates with a Bachelor's. In fact, although the likelihood of moving to the United States increases with the level of education, the phenomenon essentially applies to PhDs. This may be because doctoral programs attract many more international students, and employment opportunities are relatively rare at the local or national level for those with highly specialized qualifications.

With regard to field of study, the fields of mathematics, computer and information sciences and architecture, engineering and related technologies consistently stand out as fields for which there is a strong likelihood of moving to the United States. The field of physical and life sciences, and technologies also stands out for the classes of 2000 and 2005.

A number of other factors have a statistically significant effect on the likelihood of moving to the United States, albeit less strong than level of education and field of study. Notably, having Canadian citizenship, being Francophone, and having a disability, are all factors that reduce mobility. The effect of the province is mitigated, at least in the econometric analyses: it seems that graduates from the Atlantic provinces are more inclined to leave the country, but the effect varies little for the other provinces. That holds true even for Quebec, which shows no significant difference from the non-Atlantic provinces, at least when the effect of mother tongue is controlled for.

For the cohort of 2000 in 2005, we modelled the return to Canada for those who had moved to the United States. Unfortunately, no factor emerged as statistically significant, as the model was computationally demanding. It did emerge, however, that graduates who left for schooling-related reasons are more likely to return to Canada than those who left for work-related reasons, while those with a high-level degree are less inclined to return to Canada.

Almost half of the graduates who moved to the United States for work-related reasons said they were attracted by higher salaries. The average hourly wage is indeed higher in the United States, in the order of 27% to 40%—depending on the year examined—after equalizing the purchasing power of the countries' currencies. Our multivariate analyses confirm that after controlling for a series of customary explicative factors, e.g., age, gender, occupation, industry, field of study and others, a differential remains varying between 0.196 and 0.266 log points, i.e., around one third of the difference can be explained. It is noteworthy that the graduates of 2000 who returned to Canada after a stay in the United States earned, in 2005, up to 18% more on average than those who never left Canada, all other things being equal. It thus seems that a stay south of the border helps graduates to acquire skills that are valued by Canadian employers. Canada ultimately

benefits from its graduates' international mobility, as long as they come back home eventually.

In conclusion, it seems that the brain drain is specific to high-level graduates and to some cutting-edge sectors, and that they earn substantially more in the United States than in Canada. But we also noticed that the Class of 2005 seemed less attracted to the United States, and that many of those who leave return after a short stay in the United States. In that sense, the loss of human capital moving south of the border is not permanent, but rather a temporary situation in many cases. Better yet, graduates' mobility enables them to acquire new skills which they put to good use in the Canadian labour market upon their return. In light of those results, we feel that the brain drain of post-secondary graduates to the United States is far from problematic, and thus does not require specific intervention on the part of public policymakers. However, we suggest monitoring the phenomenon as it might evolve in the coming years.

Our analysis does not allow us to qualify the effect that such flows of workers have on well-being. For example, since so many graduates return after just a few years, we may well ask whether that temporary emigration has a beneficial effect in the long term, in terms of creativity, innovation and networking, despite a temporary loss in productivity when the most high-performing elements of society leave the country for a few years' time.

Moreover, the brain drain of Canadian graduates should be analyzed within a broader framework that takes into account the mobility of workers in both directions. After all, American graduates are also attracted to Canada. For example, according to the 2006 Census data, an estimated 20,000 new immigrants who came to Canada between 2000 and 2005 had obtained their highest post-secondary diploma or degree in the United States. So it is important to continue to exert that attraction, so as to at least offset the departures in the other direction.

Finally, while the United States is clearly attractive to our graduates, by virtue of its geographic proximity, language, the size and level of development of its economy, the quality of its education system, and its trading relations with Canada, it is noteworthy that there are other destinations that can also attract our best and brightest. Apart from traditional destinations like European countries, these include China and India, two

emerging economic powers that may one day compete strongly for our talents, especially for those who have roots in those countries. The National Graduates Survey makes it possible to track Canadian graduates only to the United States. It will therefore remain difficult to quantify the brain drain to other regions of the world.

Table of Contents

List of Tables

1. Introduction

The phenomenon of the brain drain[1] in Canada, i.e., the emigration of highly skilled workers to the United States or other countries, has long been food for much thought and debate (Finnie, 2001). Losing the most productive elements of society can have a harmful effect on growth, by decreasing innovation and reducing potential synergies in such fields as leading-edge research and technology. In addition, if those local workers are trained by the Canadian education system, in which the federal and provincial governments invest heavily, then a portion of education funding goes to individuals who get their education at home and then spend their working lives in another country, depriving the State of the return on its investment in terms not only of productivity, but of tax dollars as well. Moreover, the ageing population and the skilled labour shortage are causing the federal and provincial governments to devote considerable energy to attracting foreign talent, preventing school drop-out and fostering investment in post-secondary education. In that context, retaining our graduates is crucial, especially since workers trained here generally integrate better into the labour market, and thus benefit Canada's economic development the most.

To be sure, this is not a new phenomenon. As long ago as 1965, Johnson wrote an academic article on the subject, clearly exposing the problem, especially for Canada. It is important not only to think of the negative consequences of the brain drain, but also to consider its positive effects, even for the region that loses its workers. For example, there are the transfers of money (remittances) from emigrants to their families who stayed behind. Those transfers can become a considerable source of wealth, especially for less developed countries. It must also be asked whether, in a general equilibrium model, the free movement of workers allows for higher levels of technological progress and quality of life for all, not only in the regions receiving the migrants, by making it possible to concentrate the resource required for innovation (Beine, Docquier and Rapoport, 2008; Gibson and McKenzie, 2011). Finally, there are not only Canadians leaving the country, but also, and in

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[1] Also referred to as human capital flight.

even greater numbers, highly skilled immigrants who choose to settle in Canada (Zhao, Drew and Murray, 2000).[2]

Despite the substantial passions and headlines that have been generated, it is worthwhile investigating the extent of the phenomenon, based on quantifiable data rather than anecdotal evidence. Finnie (2001) estimated that in the 90s, between 22,000 and 35,000 people moved from Canada to the United States every year, or 0.1% of the total population. In all, an estimated 601,000 Canadians by birth moved to the United States in 1998, or less than 2% of Canada's population that year (Helliwell, 1999). So the figures are relatively low (Frank and Bélair, 1999; Helliwell, 1999; Zhao, Drew and Murray, 2000). Even in the case of highly skilled workers, Helliwell (1999) feels that the brain drain toward the United States remains marginal and does not require "an exaggerated policy response." However, Finnie (2001) asserts that the phenomenon is very well in some sectors and occupations, such as specialized medicine, the health sector in general, leading-edge research, the high-technology sector, and for high-income individuals. The problem is also acute among highly educated workers. Desjardins and King (2011) found that PhDs are the most likely to leave Canada after graduation: 12% of doctoral graduates from the cohort of 2005 lived in the United States just two years after graduation, compared with 1.3% and 2.1% of graduates with Bachelor's and Master's degrees, respectively (Desjardins and King, 2011). Although some expatriates return to Canada after a stay abroad, the problem remains very real and may have an adverse effect on Canada.

We note that there is an alternative view of the issue, namely that the departures of qualified Canadian workers are mainly temporary and are in some way an investment in their human capital, which also benefits Canada in the long term once they return (Globerman, 1999). Consequently, it becomes important to find ways to help retain our best and brightest, and to bring back those who have left. It is thus necessary to quantify the brain drain and examine the characteristics of those who leave, in order to inform public policies aimed at curbing the phenomenon (Kesselman, 2001). Indeed, it is essential to

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[2] For example, in 2010, Canada received 280,681 new permanent residents. Among those 15 years and older (of which there were 220,031), 47% had a university degree, i.e., a Bachelor's degree or higher (Citizenship and Immigration Canada statistics).

properly understand what causes some people to emigrate, if we are to be able to design appropriate incentives to keep highly skilled workers in the country.

This report will try to identify the main factors that influence the decision to move from Canada to the United States. We will also examine the question of earnings: are individuals who move to the United States better paid than in Canada? The study will also allow us to measure the extent of the brain drain to the United States among Canadian post-secondary graduates, and to analyze its evolution over time based on the available survey data. We will use the data from Statistics Canada's National Graduate Survey (NGS), conducted jointly with Human Resources and Skills Development Canada, and from its follow-up survey. Those data are ideal for examining this phenomenon, as they make it possible to track post-secondary graduates, two years and five years after graduation. The three most recent cohorts will be examined, i.e., from 1995, 2000 and 2005.

The report comprises six sections. After the introduction, we present a review of relevant literature. We then explain the methodology used to answer the questions at hand, which comprises three components: first, a comparative descriptive analysis of the characteristics of graduates who stayed in Canada and the graduates who moved to the United States, then a regression analysis to identify the factors determining the decision to move from Canada to the United States, and finally a regression analysis to explain the differences in earnings (wages) between the graduates who stayed in Canada and those who moved south of the border. The data used in the empirical analysis, i.e., those from the NGS and its follow-up survey, are described in Section 4. In Section 5, we discuss the empirical results obtained, and then conclude the study.

2. Literature Review

As mentioned in the introduction, a number of authors have examined the question of the Canadian brain drain in recent years. In addition to the results presented in the introduction, here we report the findings from a number of selected studies. In this report, we focus on the Canadian perspective on the migration of skilled workers, and refer the reader to such sources as Commander *et al.* (2004) and Gibson and McKenzie (2011) for an international perspective on the phenomenon.

Helliwell (1999) notes a considerable decrease in the number of Canadians who emigrate to the United States expressed as a percentage of Canada's total population. That decreased from 16% in 1910 to 7% in 1950, then to less than 2% by the late 1990s. The author also notes that highly educated workers are generally more mobile than other workers, but that the volume of emigration to the United States among the former remains relatively low, especially in relation to the advantages provided by the American labour market. The same holds true for Zhao, Drew and Murray (2000), who note that even though, from an economic standpoint, Canada experienced a net loss of skilled workers to the United States in the 1990s in a number of important occupations, the volume of emigration to the United States can be deemed to be low from an historical standpoint and in terms of the population of the affected occupation. The authors find that for each university graduate who moves from Canada to the United States, Canada receives four from elsewhere in the world. Finally, Canadian emigrants are, on average, more educated and better paid compared to the overall population.

Among educated workers, PhDs are the most likely to leave Canada after graduation (Desjardins and King, 2011; Helliwell and Helliwell, 2001). This may be because doctoral programs attract students from throughout the world, and employment opportunities become relatively rare and (geographically) dispersed for those with highly specialized qualifications, leading graduates to extend their job search to other countries.

Zarifa and Walters (2008) focus on the graduates from the cohort of 2000 in the NGS in 2002, restricting their analysis to university graduates, from all fields for those with postgraduate degrees and from only the fields of engineering and computer science for those with undergraduate degrees. They model their annual employment earnings by contrasting income by country of residence and by country and field of study. They find that graduates living in the United States earned 22% to 25% more on average than those who stayed on Canada. Substantial differences emerge by field of study. The largest premium for moving to the United States is observed among graduates with a Bachelor's degree in engineering or computer science, a premium of some $20,000 a year, or nearly 50%.

DeVoretz and Coulombe (2005) present an overview of the literature in law and economics on the questions of the mobility of workers between Canada and the United

States and the integration of the labour markets between the two countries. They also conduct a counterfactual analysis to determine whether there is a bias for the country of origin among Canadians (i.e., a home bias). Their study focuses on workers who emigrate with a temporary status TN visa, issued pursuant to the North American Free Trade Agreement (NAFTA).[3] DeVoretz and Coulombe note that the TN visa, which has been available since 1995, has resulted in a substantial increase in emigration of skilled Canadian workers. They report an annual departure of an average 23,000 university graduates aged 25 to 64 between 1997 and 2002. Throughout their study, the authors note that the tightening of border controls post-9/11 likely considerably reduced the flow south of the border.

Their counterfactual analysis poses the following question: would Canadians be more mobile within Canada than they would be between Canada and the United States under the same conditions? To answer that question, they use the results of other studies that estimated the likelihood of moving to the United States and moving within Canada. They find little evidence of a home bias among Canadians, which leads them to conclude that the North American employment market is well integrated.

DeVoretz and Laryea (1998) assess the cost of the brain drain to the United States at over CAN\$12 billion for the period 1989 to 1996. That amount corresponds to the cost of replacing departing skilled workers with new immigrants to Canada. It is noteworthy, however, that \$11.8 billion is attributed to quality-related differences between emigrants and immigrants. The authors arrive at that figure by using as a quality indicator the present-value difference between immigrants' earnings and those of Canadians who stayed in the country, which they calculate to be \$216,562. They then multiply that amount by 54,755, i.e., the number of workers who needed to be replaced during the reference period. The authors are not clear on the source of their data or the specific methodology applied to determine the difference in earnings, but their results are in line with a number of studies that found that the assimilation of immigrants to Canada in terms of income is weak or even negative (Baker and Benjamin, 1994). More recent studies confirm that phenomenon, and

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[3] The TN visa is available for qualified workers (generally university graduates) with a letter of employment in the United States for a specifically listed occupation. It is valid for one year but can be renewed indefinitely, and can be easily obtained at an American port of entry in 20 to 60 minutes if the file is in order.

document deterioration in earnings upon immigrants' arrival, as well as substantial sensitivity to macroeconomic conditions upon arrival (Aydemir and Skuterud, 2005). DeVoretz and Laryea's calculations omit an important element, however, which is the counterfactual income that Canadians would have earned by staying in the country. Their study is thus based on a strict replacement of departees by new immigrants, ignoring certain benefits that might be related to the population movement. It also ignores the likelihood of Canadians returning home, a very real phenomenon that we document in our study. Moreover, by comparing the projected career earnings of immigrants and of Canadians by with working in the high-technology sector, Zhao, Drew and Murray (2000) concluded that there is no quality-related difference between emigrants and immigrants in the sector.

DeVoretz and Laryea (1998) also note that workers who leave the country under the TN visa made possible under NAFTA are in fact in transition to a permanent departure to the United States (what the authors describe as the "back door to permanent emigration"). From that perspective, the TN visa would allow American employers to try out Canadian workers at little cost, and then be able to decide whether they are a good enough fit to justify spending the legal and administrative fees required for the Canadians to obtain permanent status in the United States.

DeVoretz and Laryea (1998) also present an econometric study estimating the income profiles by age separately for Canadians in Canada, Canadians in the United States, and Americans in Canada. They find a 5% difference (annually) between Canadian professionals who emigrate and those who stay in Canada, controlling for the effect of other variables like gender, education and number of weeks worked. They do not find such a difference for managers. That study is limited, however, by the small number of explicative variables (and thus the possibility of omitted-variable bias), including variables that potentially influence the decision to move to the United States, and by the use of a simple wage comparison between the two countries, without taking account of differences in the cost of living, tax systems or social benefits (health insurance and others) between the countries.

Iqbal (2000) and Wagner (2000) examined the importance of taxation-related differences in decisions to move. Wagner uses a two-stage methodology that he applies to Canadian and American data on households with at least one member who lives or previously lived in Canada. In the first stage, the author projects the salary that an individual would have earned in the other country by keeping the individual's place in income distribution constant, controlling for the effect of the individual's age, matrimonial and parental status and education. He then calculates the level of taxes paid or hypothetically paid in each country. With the real and hypothetical incomes and taxes, Wagner is then able to determine whether the people who moved to the United States are effectively those who had the most to gain, in terms of higher incomes and lower taxes. He finds that the people who moved effectively had a greater interest in doing so, which suggests that taxation is a factor in the decision to emigrate. Wagner concludes that the level of taxation is important, but its impact remains low: he calculates that the flow to the United States would be 5% lower if the rate of taxation were equalized between the two countries. His study does not take account, however, of government spending and services provided to citizens, notably in connection with health care.

Iqbal (2000) notes that a household earning $50,000 in Canada would pay 36.8% of its income in various taxes, compared with 31.7% for the same level of income in the United States. After presenting a number of facts on the brain drain and potential factors for emigration, Iqbal provides the results of an estimate of the likelihood to emigrate on the income deviation between the two countries, the taxation deviation and the unemployment rate deviation, based on domestic data. Like Wagner (2000), he finds that incomes and taxation are statistically significant.

In two studies based on the same methodology, Hunt and Mueller (2004, 2007) estimate migration models in Canada and the United States. They combine individual observations from both countries and model the choice of place of residence using a Roy model, in which the choice is based on a comparison of skill outcomes designed to maximize utility. Residence can be established in the ten Canadian provinces or in one of 48 American states (excluding Alaska and Hawaii). The economic model is a partially degenerated nested logit model. They find that the individuals at the top of the skill scale (as measured the

relative position in income distribution) tend to move to locations that reward skills more, which means moving to the United States for a Canadian. They also note that mobility decreases with age and is lower among native-born Canadians (compared with Americans) and Francophones. Finally, it seems that there are major costs involved with moving across the border. Hunt and Mueller (2007) essentially reprise the same work, but factor in differences in average taxation rates by level of income and differences in public spending in their analysis. This allows them to run a simulation in which they reduce the average taxation level in Canada to equal that of the United States, but proportionally reduce government spending so as to keep a balanced budget. They conclude that a tax cut would substantially reduce emigration to the United States, among men and women alike, and that the effect is more pronounced among the most highly skilled individuals.

3. Methodology

The methodology applied in the present study comprises three main components, which are described below in turn. We then set out some general methodological considerations.

Analytical Components

3.1. *Comparative analysis of characteristics of graduates who stayed in Canada and of graduates who moved to the United States*

The first component consists of an analysis comparing post-secondary graduates who stayed in Canada with those who moved to the United States. Several variables are examined, including level of education (college/CEGEP, Bachelor's, post-graduate studies), field of study, current occupation, gender, age, immigration status, and province or region of the educational institution. Other variables examined are labour market status (employed/unemployed/not in the labour force) and earnings for those employed. In addition to earnings, we also present other dimensions of quality of employment, such as access to skilled employment (i.e., corresponding to the studies completed), the full-time/part-time nature of the employment, and the number of hours worked. For each of those variables, we present the average (or the distribution by category for such categorical

values as field of study and level of education) for graduates in Canada and those in the United States, and for both groups combined.

At this point, we conducted significance tests on the relationship between country of residence (Canada versus the United States) and each of the variables analyzed. Almost all those tests revealed the existence of a statistically significant relationship. Consequently, and for readability purposes, the results of those tests are not presented.

We also note that it is possible to identify, among individuals living in Canada, those who previously moved to the United States and subsequently returned to Canada. Where appropriate, we thus separate statistics for residents of Canada between those who never moved to the United States and those who returned to Canada. More details on the identification of such individuals are found in Section 4 on the data.

A module of questions was specifically posed to graduates who moved to the United States.[4] We present the results for certain relevant questions to produce a profile of individuals who moved to the United States. The questions retained pertain to the major activity before moving and upon arriving in the United States, the main reason for moving (specifically whether it was because of higher salaries), and immigration status in Canada at the time of the move. Finally, we examine, for graduates who returned to Canada after a stay in the United States, the main reason for the return, and for those still living in the United States, whether they intend to eventually return to Canada.

3.2. Analysis of the decision to leave Canada and to return

To examine the decision to move from Canada to the United States, it is natural to use a probit or logit model in which the dependent variable (USA) is a dichotomous variable equal to 1 if the individual moved to the United States and 0 if not (Kodrzyski, 2001). In a probit model, the likelihood of having moved is modelled using the following equation:

$$\Pr\left(USA=1|X\right)=\Phi\left(\beta'\mathbf{X}\right), \tag{1}$$

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[4] As mentioned, graduates living in the United States were included in the NGS only beginning in 2000 (for the follow-up survey on the Class of 1995). For that initial experience, the question module was less developed than the one used with graduates of subsequent classes living in the United States.

where $\Phi(.)$ is the normal cumulative distribution function and **X** is a vector of explicative variables. We retained a variety of explicative variables reflecting the program of study completed and the socio-demographic context of the graduate. With regard to the program of studies, we considered level of education (college (reference), Bachelor's, Master's or doctorate), field of study (10 or 11 groups, depending on the class), the province of study (the Atlantic provinces and the three territories were combined into one category), and the time devoted to studies (full-time, part-time or a combination of the two).[5] The socio-demographic variables include gender, age, citizenship, mother tongue, marital status, parents' highest level of education, presence of dependent children, source of funding for education (government student loan, parents, employment income, scholarship, bank loan),[6] and the presence of a disability or handicap.

We also felt it worthwhile considering – to the extent possible – activities before studies and experience of geographic mobility. In that connection, the available data allow us to include in the regressions the major activity before enrolling in the program (studies (reference), working, working and going to school, taking care of family or household responsibilities, without work or looking for work, other), and an indicator of interprovincial mobility (i.e., whether the province of study is different from the province of principal residence before starting the program).

Once the probit β coefficients are estimated, we will report the marginal effects, which make it possible to say by how much the likelihood of moving to the United States would vary when each of the variables X (in turn) varies by one unit. In the case of a dichotomous variable, the marginal effect corresponds to the change in the likelihood when that variable moves from value 0 to value 1. There are notably two ways to report marginal effects: marginal effects at the mean, or MEM, which is the most common because it is traditionally easier to calculate, and average marginal effects, or AME, only adopted more recently as it requires greater computational power (Bartus, 2005). The MEM for an

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[5] We also considered using a question on the subjective ranking made by each graduate in terms of his or her academic results in comparison with other graduates in the same field of study. Unfortunately, that question was not posed to the graduates of the Class of 1995. In addition, graduates tend to rank themselves among the top of their class. For example, 37% of the graduates of 2000 rank themselves in the top 10%, and 36% rank themselves in the top 10% to 25%. In addition, 12% of graduates do not know their ranking.
[6] The categories are not mutually exclusive.

explicative variable X_j is calculated by taking the derivative of the equation (1) in relation to that variable, which gives an expression that depends on the value of the other explicative variables, given the non-linearity of the normal distribution function. So it must be chosen at which values to evaluate the marginal effect, and it is most often evaluated at the mean of the other explicative variables, hence the name marginal effect at the mean. However, that method is based on values that may be non-existent or meaningless, especially for dichotomous variables (no individual is 0.4 of a woman, for example).The AME corrects that problem by calculating the marginal effect (the derivative of (1)) *for each observation* and by subsequently taking the average of those effects. This avoids using implausible values. Those two methods are asymptotically similar and will thus give the same value in large samples. In small samples (as is the case for graduates who moved to the United States), the two methods are not identical and it is more appropriate (Greene, 2000, p. 816; Bartus, 2005) to use the AME. We will thus report the AME (as well as their standard errors).

We use two versions of the dependent variable *USA:* one which takes the value 1 if the respondent is living in the United States *at the time of the interview* and 0 if not, and the other that takes the value 1 if the respondent is living *or previously lived* in the United States since graduation and 0 if not. What makes the second definition interesting is that it allows us to estimate another probit model, which models the decision to return to Canada for those who previously moved to the United States. If we want to examine what influences the likelihood of returning to Canada after a stay in the United States (in other words, what would make it possible to reverse the brain drain), we must consider the fact that people considering returning are not drawn at random from the population of graduates: they are people who had previously decided to move to the United States. If that selection is not accounted for, the results of a separate estimate of the likelihood of returning may be subject to a selection bias. To remedy that situation, it suffices to use a probit model correcting for selection, i.e., we jointly estimate both the decision to move to the United States (the model described above) and the decision to return (where the dependent variable is equal to 1 for graduates who returned to Canada and 0 if not). Such a model is estimated by maximum likelihood (for the equation of the likelihood function, see Greene (2008, ch. 24)). The explicative variables of the likelihood of returning are the same as

those for the likelihood of moving, except that the province of the educational institution in Canada is omitted, and adding in the main reason for moving to the United States, the length of stay in the United States and the last province of residence in Canada. Also of note, we estimate the likelihood of returning to Canada only for the cohorts of 2000 in 2005. In fact, it seems to be premature to try to estimate the return two years after graduation, as people must be given the time not only to leave Canada but also to return. In addition, for the reasons we will highlight in Section 4 on the data, we prefer the Class of 2000 over the Class of 1995, as the follow-up on graduates in the United States was conducted more carefully and more variables are available. In addition, the graduates who returned to Canada after a stay in the United States are not identified in the database of the Class of 1995.

To sum up, the results from three models will be presented. First, the marginal effects of the estimate of the likelihood of moving to the United States at the time of the interview, for the years 2000 (Class of 1995), 2002 (Class of 2000), 2005 (Class of 2000), 2007 (Class of 2005) and finally for 2002 and 2007 combined (classes of 2000 and 2005), with the latter comprising an additional regressor, i.e., an indicator for the cohort of 2005. This allows us to measure the evolution of the brain drain between 2002 and 2007[7]. Then, the marginal effects of the estimate of the likelihood of living or having previously lived in the United States since graduation, for the years 2000, 2002, 2005 and 2007 separately (tracking the same classes as above). Finally, the marginal effects of the estimate (correcting for selection bias) of the likelihood of returning to Canada to live, only for the Class of 2000 in 2005.

3.3. Analysis of earning differences between graduates who stayed in Canada and those who moved to the United States

To analyze earning differences, we estimate a Mincer wage equation with the logarithm of the hourly wage as the dependent variable. The equation estimated by ordinary least squares (OLS) takes the following form:

$$Y = \beta'\mathbf{X} + \delta_1 \, Returned + \delta_2 \, USA + u, \tag{2}$$

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[7] For methodological reasons, we deemed it inappropriate to do the same by combining the data from 2000 (Class of 1995) and 2005 (Class of 2000). See Section 4.

where *Y* is the log of the hourly wage, **X** is a set of observable characteristics, *Returned* is a dichotomous variable that takes the value 1 for graduates who are living in Canada at the time of the survey but had previously moved to the United States since graduation, and value 0 if not, *USA* is a dichotomous variable equal to 1 for those living in the United States at the time of the survey and *u* is a random error term. The effect of living in the United States on wages, controlling for the variables contained in **X**, will thus be given by the estimate of the coefficient δ_2 and that of having lived in the United States by the coefficient δ_1. The independent variables contained in **X** – common to graduates living in both countries – are the following: level of education, field of study, a quadratic function of age, gender, a dichotomous variable of overqualification (subjective) in employment, an indicator variable of permanent employment, a variable of citizenship (Canadian by birth or not), mother tongue, province of the educational institution, occupation, industry, and marital status.

Naturally, wages can be observed only for individuals who are employed, so this analysis is based only on workers. Because the earnings of self-employed workers follow a different structure, we have decided to limit the analysis to employees, as is usually done in the literature. Those two restrictions are not a great impediment, because a vast majority of graduates are employed, and most of those are employees. The equation model (2) is estimated separately for the years 2000 (Class of 1995), 2002 (Class of 2000), 2005 (Class of 2000) and 2007 (Class of 2005), and for 2000, 2005 and 2007 combined, in which case dichotomous variables indicating the classes of 2000 and 2005 are added to the regression. For the year 2000, the variable *Returned* is excluded from the model, because the data do not make it possible to identify the graduates who returned to Canada after living in the United States.

We also point out a possible bias in estimating the equation (2) as described above, due to the endogenous nature of the decision to move to the United States (equation (1)). In fact, we may overestimate the wage differential between the two countries if the people who move to the United States are more skilled/productive/ambitious than those who stay in Canada. Indeed, that is the very essence of the mechanism we are trying to quantify, i.e., the brain drain: the most likely individuals may be the very ones who are the most attracted

to the United States, which offers better opportunities for advancement and a substantially lower marginal rate of taxation. Consequently, the estimated coefficients of the variables *Returned* and *USA* in equation (2) may be biased, and so the statistical inferences drawn from the model will be skewed.

One solution to that problem would be to consider a treatment effect model, which consists of jointly estimating the wage and place of residence equations, to account for the possible correlation between them (see Greene, 2000, pp. 933–934). However, the reliability of that exercise depends on the availability of reliable instruments, i.e., variables that can predict the choice of country of residence but without having a direct effect on wages. Although it is possible to identify and provide a valid justification for some instruments, it is not always possible for the econometrist to have them available in the survey data. Family background is deemed to be a good instrument for investment in education (Willis and Rosen, 1979), and we think it may also be for the decision to move to the United States, especially since a good portion of Canadians cross the border to pursue their studies (see Table 9 below). The data used in this study make it possible to capture a part of the family background, among others by parents' level of education, source of funding for education, and major activity before enrolling in the program.

For all the years of our sample, we will first present the results from the wage equation estimate as is (i.e., ignoring the endogenous nature of the decision to move to the United States). Then, we will show the results for a treatment effect model where the treatment is binary (living in Canada versus living in the United States at the time of the survey), thus estimated by probit. For the Class of 2000 in 2005, we can estimate a multiple treatment, i.e., we will differentiate among those who never moved to the United States, those who previously did but returned to Canada to live, and those who are still living in the United States. In that model, the treatment is estimated by par multinomial logit.[8] This is only possible for 2005, as there are enough observations for each treatment category. For the other years, the model does not converge. This method is certainly not perfect, but it corresponds to what it is possible to do with the available data. The idea is similar to that of

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[8] Those models are estimated by the Stata commands treatreg and mtreatreg, respectively.

a model with instrumental variables, except that here the variable to be instrumented is a binary (or three-category) variable, hence the choice of a treatment effect model.

Another interesting approach consists in pushing the regression analysis further and decomposing the wage differential between graduates living in Canada and those residing in the United States at the time of the survey by using an Oaxaca-Blinder decomposition (Oaxaca, 1973; Blinder, 1973). When we ask what part of the wage differential is explained by different variables, a standard approach consists in applying the following methodology. Let us consider the following linear wage equation estimated by OLS separately for graduates living in Canada and those living in the United States (where the variables are defined as in the preceding model)[9]:

$Y_C = \beta'_C \mathbf{X}_C + u_C$ for residents of Canada and

$Y_{US} = \beta'_{US} \mathbf{X}_{US} + u_{US}$ for residents of the United States $\qquad\qquad$ (3)

The Oaxaca-Blinder decomposition of the average wage differential between the two groups is:

$$\bar{Y}_{US} - \bar{Y}_C = \left(\bar{X}_{US} - \bar{X}_C\right)\ddot{\beta}_{US} + \bar{X}_C\left(\ddot{\beta}_{US} - \ddot{\beta}_C\right) \qquad\qquad (4)$$

Thus, the observed wage differential between the two countries is decomposed into one part called explained $\left(\bar{X}_{US} - \bar{X}_C\right)\ddot{\beta}_{US}$, attributed to differences in characteristics $\mathbf{X}$, and one part called unexplained $\bar{X}_C\left(\ddot{\beta}_{US} - \ddot{\beta}_C\right)$, resulting from differences in the coefficients β and thus from the treatment on the labour market.

It is noteworthy that when posed thusly, the classic decomposition presents two problems in its application (Neumark, 1988; Jann, 2008; Fortin, 2008). First of all, the model in (4) uses as counterfactual (base) wage the average wage that a graduate in Canada

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[9] Given that the Oaxaca-Blinder decomposition makes it possible to consider only two groups at a time, and to simplify matters, the first group includes graduates living in Canada at the time of the survey regardless of whether or not they previously lived in the United States. It is noteworthy, however, that the percentage of graduates from that group who previously lived in the United States is very low (1.84% in 2005 for the Class of 2000). Consequently, the results of the decomposition would change only little if those graduates were excluded.

would have received when subject to American treatments: $\overline{X}_C \ddot{\beta}_{US}$. It is possible to do the decomposition using a counterfactual wage for a graduate in the United States with Canadian treatments: $\overline{X}_{US} \ddot{\beta}_C$. The choice of base wage generally changes the results somewhat. To get around the problem of the choice of counterfactual wage, we propose applying the method of Neumark (1988), using the coefficients from a regression where the Canadian and American residents are pooled (pooled regression), but adding in a dichotomous group variable (here, for place of residence) in the pooled regression. This approach, which is in line with the one advocated by Fortin (2008), involves the following decomposition:

$$\overline{Y}_{US} - \overline{Y}_C = \left(\overline{X}_{US} - \overline{X}_C\right)\hat{\beta}_R + \overline{X}_{US}\left(\hat{\beta}_{US} - \hat{\beta}_R\right) + \overline{X}_C\left(\hat{\beta}_R - \hat{\beta}_C\right) \tag{5}$$

where $\hat{\beta}_R$ is the vector of the estimated coefficients of **X** in the sample combining both groups examined (pooled model).

The second problem lies in identifying the contribution of categorical variables with more than two categories (level of education, field of study, occupation, etc.). In practice, those variables are transformed into dichotomous variables, each one representing one category. For reasons of colinearity, one of those categories must be omitted. Accordingly, the choice of that reference category affects the results of the decomposition. To counter that problem, we will adopt the solution applied by the Stata procedure of Jann (2008). The idea is to restrict the coefficients of the dichotomous variables so that they sum to zero, which means expressing them in terms of deviations in relation to the average for the category. This is applied by transforming the coefficients thusly then adding the base category (Jann, 2008; Yun, 2005).

With the decomposition in (5), it is possible to evaluate the contribution of each characteristic in the vector **X** to the explained difference and to the unexplained difference. It is thus also possible to express the wage differential once the available observable values are accounted for, which comes down to the unexplained or adjusted differential

$$\overline{X}_{US}\left(\hat{\beta}_{US} - \hat{\beta}_R\right) + \overline{X}_C\left(\hat{\beta}_R - \hat{\beta}_C\right).$$

Finally, it is noteworthy that for all the analyses described above, we use the sample weights developed by Statistics Canada, as well as the standard errors robust to heteroskedasticity.

Methodological Considerations

A fundamental problem makes any study on international immigration decisions difficult: the fact that the vast majority of surveys are conducted at the national level, so that once an individual has left the country, he or she is no longer in the sampled population or cannot be reached, and thus is not observable. There are numerous studies on migration within a country, for example among states in the United States (Kodrzycki, 2001) or among provinces in Canada (Finnie, 2004; Andres and Licker, 2005), but few on migration between countries. One solution is to use administrative databases, such as taxation data, as did Finnie (2001, 2005, 2006, 2007). However, those data contain only limited information. Since 2000 (Class of 1995), the NGS makes it possible to track individuals who moved to the United States. Through that survey, which is a gold mine of information, we can observe graduates who stayed in the country and others who moved to the United States, which allows us to analyze the phenomenon of the brain drain.

Finally, like any other survey, the NGS is subject to a non-response problem. For example, the overall response rate to the NGS 2005 was 68% (Statistics Canada, 2007), which means that one out of three graduates sampled could not be reached. This raises the question of the possible link between non-response and the brain drain. If the graduates who leave Canada are less likely to be reached in connection with the NGS or its follow-up survey, then the extent of the brain drain may be underestimated in the data collected. Unfortunately, the available data do not make it possible to verify whether non-response and the brain drain are correlated, nor to correct the resulting potential bias. It is noteworthy, however, that Statistics Canada continually evaluates the quality of its survey data and developed improved methodologies, including sample weights, to improve the reliability of the estimates.

4. Data

This study is based on the most recent data from the National Graduates Survey (NGS) and its follow-up survey. The NGS "was designed to determine such factors as: the extent to which graduates of postsecondary programs had been successful in obtaining employment since graduation; the relationship between the graduates' programs of study and the employment subsequently obtained; the graduates' job and career satisfaction; the rates of under-employment and unemployment; the type of employment obtained related to career expectations and qualification requirements; and the influence of postsecondary education on occupational achievement." (Statistics Canada, 2008)

The NGS is conducted two years after graduation, and the follow-up survey is conducted three years after the NGS. The cohorts we use here are those of 1995 (NGS and follow-up), 2000 (NGS and follow-up) and 2005 (NGS only). We thus have five samples: The Class of 1995 surveyed in 1997 and in 2000, the Class of 2000 surveyed in 2002 and 2005, and finally the Class of 2005 surveyed 2007 (the follow-up for the cohort of 2005 has not been conducted).

It is noteworthy that Statistics Canada did not follow up on the graduates of trade schools and vocational training in 2000 who responded to the 2002 NGS. Accordingly, it becomes impossible to compare those graduates over time. That is why, like Zarifa and Walters (2008), we decided to exclude those graduates from our analyses, and focus on college and university graduates, who are in any event much more likely to move to the United States (Finnie, 2001; Desjardins and King, 2011).[10]

We also note that the number of respondents living in the United States for the year 1997 is extremely low. That is because in 1997, graduates who were not living in Canada at the time of the survey were excluded from the NGS target population (Statistics Canada, 1998). This makes the comparison with the other classes unreliable, if not impossible.

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[10] The sample from 2002 (Class of 2000), contains only 8 trade school and vocational training graduates who had moved to the United States. Weighted, that number represents barely 0.17% of all graduates for that level of education. In 2007 (Class of 2005), that percentage was still low, i.e., 0.04% for 5 observations only in the overall sample.

Table 1 below shows the sample sizes for the different surveys used with respect to the number of individuals living in the United States at the time of the interview.

Table 1: Sample sizes, National Graduates Survey and Follow-up Survey

	1997 (Class of 1995)	2000 (Class of 1995)	2002 (Class of 2000)	2005 (Class of 2000)	2007 (Class of 2005)
Number of respondents living in the United States at the time of the interview	46	382	830	628	578
Total number of respondents	34,189	22,895	34,834	23,488	34,663
Proportion of respondents living in the United States at the time of the interview (not weighted)[a]	0.13%	1.67%	2.38%	2.67%	1.67%

Note:

[a] Gross figures

Source: National Graduates Survey and Follow-up Survey, Statistics Canada, Code books for the classes of 1995, 2000 and 2005. Trade school graduates are excluded.

Of immediate note is the small number of respondents living in the United States. In 1997 for the cohort of 1995, there were only 46 respondents living in the United States. That number is too small to produce conclusive results from the descriptive and regression analyses. Even the largest number in absolute terms, i.e., 830 respondents for the year 2002, is still relatively low when we begin to consider a number of explicative factors such as age, gender, level of education, field of study or region of the educational institution. In other words, it is possible that only a few individuals, if any, remain for a given combination, such as a 30-year-old woman with a B.Sc. from an educational institution in British Columbia.

In connection with our comment above, we also need to ask why the samples are so small. Is it because there are really so few of our graduates who emigrate to the United States, or is it because their non-response rate is so high? It is understandable that it is much more difficult for Statistics Canada to track graduates who have moved to the United States. In the same vein, there is a substantial attrition between the NGS and its Follow-up Survey for the cohorts of 1995 and 2000 (as mentioned above, no follow-up was conducted on the Class of 2005). Indeed, only 67% of respondents to the NGS could be re-interviewed

during the follow-up on the cohorts of 1995 and 2000. We may well ask whether the attrition is even greater for graduates living in the United States. Nevertheless, there is limited recourse in such a situation. So it is possible that our results are biased or relatively unreliable because of a small sample and a relatively greater attrition problem among respondents in the United States.

In view of the small sample size for the 1997 with regard to graduates living in the United States, we are forced to exclude that year from our analyses, so that we are presenting the results only for the years 2000, 2002, 2005 and 2007. It is also noteworthy that starting with the Follow-up Survey for the year 2000, Statistics Canada exerted considerable efforts to try to reach individuals who had moved to the United States. We are thus more confident that the post-2000 data are relatively well representative of the phenomenon of the brain drain south of the border. That said, we do have a reservation regarding the year 2000. For that survey, even though it is true that those who moved to the United States out of those who had responded to the initial survey in 1997 were better tracked, the fact remains that the graduates of the cohort of 1995 who moved before 1997 and were not targeted in 1997 were not covered by the 2000 Survey. Consequently, when we present the results of the descriptive analysis specifically on the graduates who moved to the United States, we focus solely on the Class of 2000 in 2005. In our opinion, that survey is the most indicative, as it is not prone to the follow-up problems for the cohort of 1995 and its Follow-up Survey is available (unlike the Class of 2005), making it possible to observe the graduates five years after they completed their studies, giving them more time to make such decisions as whether to move to, and/or return from, the United States.

It is noteworthy that the country of residence is known at the time of the interview, as is the country of work, the two not necessarily the same for some graduates. Someone may in fact live in Canada and work in the United States, or vice versa. To simplify matters, are analyses are all based on the country of residence. Among other things, residence determines taxation status and eligibility for provincial health insurance plans and other benefits.

For the hourly wage, we naturally had to convert all amounts into hourly wages for the some 60% of respondents who did not report their earnings by the hour, by using the

information on the number of hours worked per week and the number of weeks worked per year. We also had to convert from American dollars into Canadian dollars wages and benefits for graduates living in the United States who indicated amounts in American currency. We converted at purchasing power parity (PPP).[11] As indicated in Table A1 in the Appendix, the PPP rates were relatively constant during the review period (between 1.21 and 1.22), while the (market) exchange rates fluctuated considerably, not necessarily in connection with current price levels. Accordingly for each dollar spent in the United States, between $1.21 and $1.22 will have to be spent in Canada to purchase the same quantity and quality of goods.

All the amounts remain in current dollars, except when the analysis is based on several years at the same time, in which case constant dollars are used.

It is also noteworthy that the codification and categories of certain variables changed for the year 2002 (class of 2000) and subsequent years compared with 2000 (class of 1995). This necessitated harmonization for the purposes of multivariate analyses. The harmonized values are field of study, occupation, and industry.

Finally, throughout all the analyses, the sample weights developed by Statistics Canada are used to make the results representative of Canada's graduate population.

5. Results

The results are presented here in order of presentation of the methodology stages.

Descriptive Analysis

After the manipulations described above, we obtained sample sizes varying between 22,895 and 34,834 per survey (see Table 1). Those samples were the ones used for all subsequent analyses.[12] Table 2 indicates that a maximum of 2% of graduates lived in the United States for a given year. That peak was reached in 2005 for the class of 2000, and is

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[11] Currency conversion rates that eliminate the price level differences between the countries.

[12] Note that for multivariate analyses, the sample size may be reduced due to missing observations for certain variables.

greater than the one observed after a same lapse of time for the class of 1995, i.e., 1.24%. It should be borne in mind, however, that the graduates who left between 1995 and 1997 are under-represented to a large extent, which would skew our rate downwards. As previously mentioned, the graduates living outside Canada were not considered in the NGS in 1997. As we will see below, graduates are more likely to move to the United States in the first two years after graduation (Table 3). That being said, the rates of residency in the United States two years after studies appear to be going down, from 1.69% for 2002 to 1.07% for 2007. In absolute terms, that percentage difference corresponds to 1,960 2005 graduates who chose to stay in Canada, which is substantial.

Table 2: Country of residence at the time of the survey and number of graduates

	2000 (Class of 1995)	2002 (Class of 2000)	2005 (Class of 2000)	2007 (Class of 2005)
Country of residence (percentage)				
Canada (never moved to the U.S.)[a]	98.76	97.23	96.17	98.12
Canada (had moved to the U.S.)	—	1.08	1.8	0.81
Currently living in the U.S.	1.24	1.69	2.02	1.07
Canada (total)	98.76	98.31	97.97	98.93
United States (living or previously lived)	1.24	2.77	3.82	1.88
Number of graduates in the class (weighted)	244,354	271,831	267,273	315,804
Estimated number of graduates living in the U.S. (weighted)	3,030	4,594	5,400	3,380

Note:

The data exclude trade school graduates.

[a] For the class of 1995 it is not possible to identify the respondents living in Canada but who had gone to the United States.

Table 2 also indicates the proportion of graduates living in Canada who previously lived in the United States. That proportion also decreased between 2002 and 2007. It is worthwhile examining the total proportion of graduates living or who previously lived in the United States, i.e., all the people who decided to leave Canada since graduating. That rate was 2.77% in 2002, 3.82% in 2005 and 1.88% in 2007. There again, we can see a decrease in the drain rate during the 2000s: for the cohort of 2000, just over one percent of graduates went to the United States in 2002 and 2005, compared with almost 3% in the two first years after graduation; for the cohort of 2005, the drain rate decreased by almost one

percentage point, or nearly one third, compared with the previous cohort, for a comparable period of time.

Table 3: Year of move to the United States (distribution as percentage)

	2000 (Class of 1995)	2002 (Class of 2000)			2005 (Class of 2000)			2007 (Class of 2005)		
Year	Total	Lived in the U.S. but returned to Canada	Living in the U.S.	Total	Lived in the U.S. but returned to Canada	Living in the U.S.	Total	Lived in the U.S. but returned to Canada	Living in the U.S.	Total
1995	5.94	—	—	—	—	—	—	—	—	—
1996	3.44	—	—	—	—	—	—	—	—	—
1997	16.16	—	—	—	—	—	—	—	—	—
1998	24.52	—	—	—	—	—	—	—	—	—
1999	30.41	2.47	3.53	3.15	2.8	3.25	3.04	—	—	—
2000	19.53	68.64	62.82	64.94	53.26	39.97	46.11	—	—	—
2001	—	26.27	26.66	26.52	13.92	17.2	15.69	—	—	—
2002	—	2.62	6.99	5.39	11.8	14.94	13.49	—	—	—
2003	—	—	—	—	10.22	8.93	9.52	—	—	—
2004	—	—	—	—	7.17	9.32	8.32	3.18	7.06	5.38
2005	—	—	—	—	0.83	6.39	3.83	46.95	54.27	51.1
2006	—	—	—	—	—	—	—	36.99	29.49	32.74
2007	—	—	—	—	—	—	—	12.89	9.18	10.79

Table 3 gives us a better understanding of the dynamic of graduates moving to the United States. It reveals that those who leave Canada do so very early, i.e., in the year they graduate or the year after. If we look at the cohort of 2000 in 2005, we see that over 60% of those who moved, whether or not they returned to Canada, did so in the first two years (i.e., in 2000 and 2001). Almost half of all those who left (46%) did so in 2000. We see that the departure rates decrease from year to year: it would seem that once a graduate is settled in Canada, he or she stays put. The greatest incentives to leave would seem to be right at the end of their studies, when graduates are more mobile and are seeking opportunities. It is also possible that graduates hatch their emigration plans during their studies, then execute them once their studies are completed. Another finding is that even though we see again that half of the graduates of 2005 who left did so in 2005, the departure rate was slightly slower for the cohort of 1995. That may be due to the different economic conditions in the

United States during the second half of the 1990s compared with the first half of the 2000s, but it is still in line with our previous findings that fewer and fewer graduates are heading south: not only are fewer of them leaving, but those who do take more time, either of decreased interest on their part, few opportunities in the United States, or a mix of the two.

Table 4a: Province of educational institution by country of residence (%)

I - 2000 (Class of 1995)	Canada	United States		Total
Atlantic/Territories	7.35	9.92		7.39
Quebec	28.84	13.79		28.65
Ontario	40.12	42.94		40.15
Manitoba	3.32	5.01		3.34
Saskatchewan	2.76	3.96		2.77
Alberta	8.31	13.63		8.37
British Columbia	9.31	10.75		9.33
Total	100	100		100

II - 2002 (Class of 2000)	Canada	United States	United States (including return)	Total
Atlantic/Territories	8.2	10.17	12.73	8.23
Quebec	22.9	14.87	15.46	22.77
Ontario	43.42	48.24	45.26	43.5
Manitoba	2.84	2.78	2.61	2.84
Saskatchewan	2.92	2.55	2.33	2.91
Alberta	7.03	7	7.17	7.03
British Columbia	12.69	14.38	14.46	12.72
Total	100	100	100	100

III - 2005 (Class of 2000)	Canada	United States	United States (including return)	Total
Atlantic/Territories	8.31	9	11	8.32
Quebec	22.23	16.04	17.65	22.11
Ontario	43.87	43.91	43.33	43.87
Manitoba	2.85	3.47	3.1	2.87
Saskatchewan	2.95	2.95	3.01	2.95
Alberta	7.08	8	7.16	7.1
British Columbia	12.71	16.64	14.74	12.79
Total	100	100	100	100

IV - 2007 (Class of 2005)	Canada	United States	United States (including return)	Total
Atlantic/Territories	7.63	7.13	10.26	7.63
Quebec	26.45	16.87	13.03	26.35
Ontario	39.89	45.19	48.36	39.95
Manitoba	3.06	3.45	3.64	3.07
Saskatchewan	2.5	2.08	2.33	2.5
Alberta	9.24	11.16	11.06	9.26
British Columbia	11.22	14.13	11.34	11.25
Total	100	100	100	100

Table 4b: Country of residence by province of the educational institution (%)

I - 2000 (Class of 1995)	Canada	United States		Total
Atlantic/Territories	98.34	1.66		100
Quebec	99.4	0.6		100
Ontario	98.68	1.32		100
Manitoba	98.14	1.86		100
Saskatchewan	98.23	1.77		100
Alberta	97.99	2.01		100
British Columbia	98.57	1.43		100
Total	98.76	1.24		100

II - 2002 (Class of 2000)	Canada	United States	United States including return	Total
Atlantic/Territories	97.91	2.09	4.28	100
Quebec	98.9	1.1	1.88	100
Ontario	98.13	1.87	2.88	100
Manitoba	98.35	1.65	2.54	100
Saskatchewan	98.52	1.48	2.21	100
Alberta	98.32	1.68	2.82	100
British Columbia	98.09	1.91	3.15	100
Total	98.31	1.69	2.77	100

III - 2005 (Class of 2000)	Canada	United States	United States (including return)	Total
Atlantic/Territories	97.81	2.19	5.06	100
Quebec	98.53	1.47	3.06	100
Ontario	97.97	2.03	3.78	100
Manitoba	97.55	2.45	4.14	100
Saskatchewan	97.97	2.03	3.91	100
Alberta	97.72	2.28	3.86	100
British Columbia	97.37	2.63	4.41	100
Total	97.98	2.02	3.82	100

IV - 2007 (Class of 2005)	Canada	United States	United States (including return)	Total
Atlantic/Territories	99.00	1.00	2.52	100
Quebec	99.32	0.68	0.93	100
Ontario	98.79	1.21	2.27	100
Manitoba	98.8	1.2	2.23	100
Saskatchewan	99.11	0.89	1.75	100
Alberta	98.71	1.29	2.24	100
British Columbia	98.66	1.34	1.89	100
Total	98.93	1.07	1.88	100

Tables 4a and 4b reveal where the graduates who leave for the United States come from in terms of province of educational institution, as well as on which province the United States seem to exert more attraction. The tables are divided into four panels, one for each

survey year. The same information is presented from two angles: Table 4a shows the distribution of the provinces by country of residence, where the total equals 100% for all provinces; Table 4b shows the distribution of the country of residence by province, where the total is based on the country of residence. The distribution of the provinces in the total seems relatively stable, with 43% to 48% of graduates coming from an institution in Ontario, which is in line with that province's weight in the Canadian post-secondary education system.

Table 5: Last province of residence before moving to the United States (%)

I - 2000 and 2002	2000 (Class of 1995)		2002 (Class of 2000)		
	Total		Lived in the U.S. but returned to Canada	Living in the U.S.	Total
Atlantic/Territories	8.05		17.1	9.26	12.4
Quebec	11.54		15.52	12.88	13.94
Ontario	49.44		41.9	48.41	45.8
Manitoba	5.06		2.61	2.94	2.81
Saskatchewan	2.29		1.63	2.75	2.3
Alberta	11.33		6.8	7.73	7.36
British Columbia	12.27		14.43	16.03	15.39
Total	100		100	100	100
II - 2005 and 2007	2005 (Class of 2000)			2007 (Class of 2005)		
	Lived in the U.S. but returned to Canada	Living in the U.S.	Total	Lived in the U.S. but returned to Canada	Living in the U.S.	Total
Atlantic/Territories	11.92	8.76	10.28	12.89	8.6	10.47
Quebec	18.13	12.47	15.19	7.26	14.88	11.55
Ontario	45.48	45.72	45.61	54.58	42.38	47.7
Manitoba	2.72	3.44	3.1	3.83	4.76	4.35
Saskatchewan	2.49	2.77	2.64	3.12	3.21	3.18
Alberta	5.79	8.03	6.95	10.92	10.61	10.74
British Columbia	13.47	18.8	16.24	7.39	15.57	12
Total	100	100	100	100	100	100

Table 4b indicates that Quebec graduates were by far, and consistently, the least mobile, for all years. This is probably linked to an issue of language and/or culture. In 2002, the graduates most likely to move to the United States came from the Atlantic provinces or

the territories, followed by British Columbia and Ontario. In 2005, the order was reversed, with British Columbia in the lead, followed by Manitoba and Alberta. In 2007, it was British Columbia, Alberta and Ontario.

Table 5 also refers to the provinces, this time to the last province of residence before moving to the United States, thus pertaining only to graduates who moved. The table separately presents the figures for those who moved to the United States, those who are still there, and the total. The results are similar to those in Table 4a, although one fact is noteworthy: there seems to be a greater difference between those who moved and those who stayed in the United States among residents of the Atlantic provinces and the territories, who had a higher rate of return. In contrast, more British Columbians seem to stay in the United States.

Table 6a: Highest diploma or degree by country of residence (excluding trades)

I - 2000 and 2002	2000 (Class of 1995)			2002 (Class of 2000)		
	Canada	United States	Total	Canada	United States	Total
College	35.53	14.08	35.27	37.6	8.12	37.1
Bachelor's	47.75	53.27	47.82	47.03	59.03	47.23
Master's	15.1	23.45	15.2	13.78	22.78	13.93
Doctorate	1.62	9.21	1.72	1.59	10.08	1.73
Total	100	100	100	100	100	100
II - 2005 and 2007	2005 (Class of 2000)			2007 (Class of 2005)		
	Canada	United States	Total	Canada	United States	Total
College	34.39	6.23	33.82	35.38	7.06	35.07
Bachelor's	45.7	53.12	45.85	48.77	50.06	48.79
Master's	17.76	27.99	17.97	14.67	30.11	14.83
Doctorate	2.15	12.65	2.36	1.18	12.76	1.31
Total	100	100	100	100	100	100

Table 6b: Country of residence by highest diploma or degree

I - 2000 and 2002	2000 (Class of 1995)			2002 (Class of 2000)		
	Canada	United States	Total	Canada	United States	Total
College	99.51	0.49	100	99.63	0.37	100
Bachelor's	98.62	1.38	100	97.88	2.12	100
Master's	98.09	1.91	100	97.23	2.77	100
Doctorate	93.36	6.64	100	90.15	9.85	100
Total	98.31	1.69	100	98.31	1.69	100
II - 2005 and 2007	2005 (Class of 2000)			2007 (Class of 2005)		
	Canada	United States	Total	Canada	United States	Total
College	99.63	0.37	100	99.79	0.21	100
Bachelor's	97.65	2.35	100	98.9	1.1	100
Master's	96.85	3.15	100	97.83	2.17	100
Doctorate	89.15	10.85	100	89.58	10.42	100
Total	97.98	2.02	100	98.93	1.07	100

Tables 6a and 6b refer to level of education. They clearly show that the higher the diploma or degree an individual has, the more likely he or she is to move to the United States. For example, for 2005, some 11% of PhDs lived in the United States, compared with 3.15% of graduates with a Master's degree, 2.35% with a Bachelor's, and only 0.37% of college graduates. That trend can be seen in all survey years. Thus, while PhDs only accounted for just over 2% of total graduates in 2005, they made up almost 13% of those who lived in the United States. Conversely, college graduates accounted for some 34% of total graduates but only some 6% of those living in the United States. It thus seems certain that although the brain drain to the United States remains a marginal phenomenon, with no more than 2% of graduates living south of the border, it nevertheless affects the best and brightest Canadian scientists and researchers. In that regard, we might wonder whether Canada offers attractive prospects and working conditions not only for its own graduates, but also for foreign PhDs, who are generally recruited at the international level. It is also noteworthy that the proportion of PhDs moving to the United States seemed to increase, albeit slightly, during the 2000s, from 9.85% in 2002 to 10.42% in 2007. For the three other education levels examined, the trend was downward instead, especially for Bachelor's

degree holders, for whom the drain rate in 2007 (1.1%) was half that in 2002 (2.12%). Overall, college graduates are less likely to relocate to the United States, and that behaviour seems to become reinforced over time: the proportion of them living in the United States dropped from 0.37% in 2002 to 0.21% in 2007.

Table 7a: Field of study by country of residence, Class of 1995

	2000 (Class of 1995)		
	Canada	United States	Total
Educational, recreational and counselling services	14.54	6.01	14.44
Fine and applied arts	3.84	2.82	3.83
Humanities and related fields	8.95	7.62	8.94
Social science and related fields	19.31	19.4	19.31
Commerce, management and business administration	18.81	11.48	18.72
Agricultural and biological sciences and technology	5.09	8.3	5.13
Engineering and applied sciences	4.5	13.65	4.61
Engineering and applied science technologies and trades	8.75	6.1	8.72
Health professions, science and technology	10.27	12.69	10.3
Mathematics and physical sciences	3.8	10.72	3.88
Interdisciplinary field/no specialization/undetermined	2.14	1.21	2.13
Total	100	100	100

Tables 7a to 7d indicate distributions by fields of study. As noted in the section on the data, the field classification changed between the classes of 1995 and the classes of 2000 and 2005. We are therefore presenting the results separately, for the classes of 1995 on the one hand and for 2002 and 2005 on the other. This makes an intertemporal comparison between the Class of 1995 and the following classes difficult. It is noteworthy that the two fields most affected by the brain drain in 2000 were cutting-edge sciences, i.e., "engineering and applied science," with 3.65% of graduates living in the United States, and "mathematics and physical sciences," with 3.4%. The same finding applied to the Class of 2000 in 2002, with physical and life sciences, and technologies on top with 4.01% of graduates leaving, followed by architecture, engineering and related technologies with 3.16%. In 2005, however, although both those fields were still out in front, the humanities came up the middle, with a United States residency rate of 4.1%. In 2007, "physical and life sciences, and technologies" was still in first place, but "mathematics, computer and

information sciences" was in second. It is noteworthy that over 1.43% of engineers reported living in the United States. Education and management are among the notable fields that export fewer graduates. We conducted Chi-Square tests to determine whether the distributions by field of study among graduates living in the United States are comparable from one year to another. Those tests suggest that the distributions are statistically different at a significance level of 1%, regardless of the years compared.

Table 7b: Field of study by country of residence, Classes of 2000 and 2005

I - 2002 and 2005	2002 (Class of 2000)			2005 (Class of 2000)		
	Canada	United States	Total	Canada	United States	Total
Education	10.03	2.2	9.9	10.52	3.73	10.38
Visual and performing arts, and communications technologies	4.94	5.25	4.94	5.17	4.82	5.16
Humanities	7.05	9.28	7.09	7.02	14.51	7.17
Social and behavioural sciences, and law	15.18	15.45	15.18	15.39	18.85	15.46
Business, management and public administration	21.59	9.05	21.37	21.92	7.28	21.62
Physical and life sciences, and technologies	5.58	13.55	5.72	5.7	14.29	5.87
Mathematics, computer and information sciences	5.88	7.36	5.9	5.73	6.58	5.74
Architecture, engineering and related technologies	11.81	22.37	11.98	11.63	18.77	11.78
Agriculture, renewable natural resources and conservation	2.89	1.63	2.87	2.83	1.46	2.8
Health, parks, recreation and fitness	12.25	12.67	12.26	12.11	9.63	12.06
Personal, protective and transportation services	2.8	1.21	2.78	—	—	—
Total	100	100	100	100	100	100

II - 2007	2007 (Class of 2005)		
	Canada	United States	Total
Education	8.77	2.07	8.7
Visual and performing arts, and communications technologies	4.98	4.01	4.97
Humanities	7.08	7.07	7.08
Social and behavioural sciences, and law	16.45	11.08	16.39
Business, management and public administration	22.2	17.29	22.15
Physical and life sciences, and technologies	4.98	14.72	5.09
Mathematics, computer and information sciences	4.74	9.05	4.78
Architecture, engineering and related technologies	11.75	15.71	11.79
Agriculture, renewable natural resources and conservation	1.84	2.46	1.85
Health, parks, recreation and fitness	13.9	15.34	13.92
Personal, protective and transportation services	3.3	1.19	3.28
Total	100	100	100

Note:

The cells left empty contain fewer than 5 observations of graduates living in the United States.

Table 7c: Country of residence by field of study, Class of 1995

	2000 (Class of 1995)		
	Canada	United States	Total
Educational, recreational and counselling services	99.49	0.51	100
Fine and applied arts	99.09	0.91	100
Humanities and related fields	98.95	1.05	100
Social science and related fields	98.76	1.24	100
Commerce, management and business administration	99.24	0.76	100
Agricultural and biological sciences and technology	98.01	1.99	100
Engineering and applied sciences	96.35	3.65	100
Engineering and applied science technologies and trades	99.14	0.86	100
Health professions, science and technology	98.48	1.52	100
Mathematics and physical sciences	96.6	3.4	100
Interdisciplinary field/no specialization/undetermined	99.3	0.7	100
Total	98.77	1.23	100

Table 7d: Country of residence by field of study, Classes of 2000 and 2005

I - 2002 and 2005	2002 (Class of 2000			2005 (Class of 2000)		
	Canada	U.S.	Total	Canada	U.S.	Total
Education	99.62	0.38	100	99.27	0.73	100
Visual and performing arts, and communications tech.	98.2	1.8	100	98.11	1.89	100
Humanities	97.79	2.21	100	95.9	4.1	100
Social and behavioural sciences, and law	98.28	1.72	100	97.53	2.47	100
Business, management and public administration	99.28	0.72	100	99.32	0.68	100
Physical and life sciences, and technologies	95.99	4.01	100	95.07	4.93	100
Mathematics, computer and information sciences	97.89	2.11	100	97.68	2.32	100
Architecture, engineering and related technologies	96.84	3.16	100	96.77	3.23	100
Agriculture, renewable natural resources and conservation	99.04	0.96	100	98.94	1.06	100
Health, parks, recreation and fitness	98.25	1.75	100	98.38	1.62	100
Personal, protective and transportation services	99.27	0.73	100	—	—	—
Total	98.31	1.69	100	97.98	2.02	100

II - 2007	2007 (Class of 2005)		
	Canada	U.S.	Total
Education	99.74	0.26	100
Visual and performing arts, and communications tech.	99.13	0.87	100
Humanities	98.93	1.07	100
Social and behavioural sciences, and law	99.27	0.73	100
Business, management and public administration	99.16	0.84	100
Physical and life sciences, and technologies	96.9	3.1	100
Mathematics, computer and information sciences	97.97	2.03	100
Architecture, engineering and related technologies	98.57	1.43	100
Agriculture, renewable natural resources and conservation	98.57	1.43	100
Health, parks, recreation and fitness	98.82	1.18	100
Personal, protective and transportation services	99.61	0.39	100
Total	98.93	1.07	100

Note: The cells left empty contain fewer than 5 observations of graduates living in the United States.

Finally, before turning to the questions specifically pertaining to graduates who moved to the United States, let us examine the distribution of graduates by occupation by country of residence (Table 8a), and country of residence by occupation (Table 8b). In line with the results for fields of study, the natural and applied sciences and related occupations are clearly the most exportable. The proportion of graduates in those sectors is two to three times higher in the United States than in Canada. Sales and service and business, finance and administration are the least exportable occupations (mainly the latter group for the Class of 2000).

Table 8a: Occupations by country of residence

I - 2000 and 2002	2000 (Class of 1995)			2002 (Class of 2000)		
	Canada	United States	Total	Canada	United States	Total
Management	10.06	8.17	10.03	6.04	3.67	6.0
Business, finance and administrative	17.72	18.02	17.73	19.09	4.31	18.87
Natural and applied sciences and related occupations	13.51	30.88	13.71	14.08	36.32	14.41
Health	11.19	9.87	11.17	10.62	12.45	10.65
Social science, education, government service and religion	23.84	26.43	23.87	23.79	30.29	23.89
Art, culture, recreation and sport	4.75	3.1	4.74	5.13	6.41	5.15
Sales and service	—	—	—	13.44	3.01	13.28
Other	18.94	3.53	18.76	7.81	3.54	7.75
Total	100	100	100	100	100	100
II - 2005 and 2007	2005 (Class of 2000)			2007 (Class of 2005)		
	Canada	United States	Total	Canada	United States	Total
Management	9.03	9.22	9.03	7.79	4.7	7.76
Business, finance and administrative	17.31	7.14	17.13	19.02	16.75	19
Natural and applied sciences and related occupations	13.5	27.8	13.75	12.37	31.66	12.54
Health	11.13	14.05	11.18	11.93	12.87	11.94
Social science, education, government service and religion	28.2	31.32	28.25	24.06	26.63	24.08
Art, culture, recreation and sport	5.31	5.7	5.32	5.38	2.86	5.36
Sales and service	9.36	4.16	9.26	12.79	3.38	12.71
Other	6.17	0.63	6.07	6.66	1.15	6.61
Total	100	100	100	100	100	100

Note:
The cells left empty contain fewer than 5 observations of graduates living in the United States.

Table 8b: Country of residence by occupation

	2000	2002

I - 2000 and 2002	(Class of 1995)			(Class of 2000)		
	Canada	United States	Total	Canada	United States	Total
Management	99.04	0.96	100	99.08	0.92	100
Business, finance and administrative	98.81	1.19	100	99.65	0.35	100
Natural and applied sciences and related occupations	97.35	2.65	100	96.19	3.81	100
Health	98.96	1.04	100	98.23	1.77	100
Social science, education, government service and religion	98.7	1.3	100	98.09	1.91	100
Art, culture, recreation and sport	99.23	0.77	100	98.12	1.88	100
Sales and service	—	—	—	99.66	0.34	100
Other	—	—	—	99.31	0.69	100
Total	98.83	1.17	100	98.49	1.51	100
II - 2005 and 2007	2005 (Class of 2000)			2007 (Class of 2005)		
	Canada	United States	Total	Canada	United States	Total
Management	98.19	1.81	100	99.47	0.53	100
Business, finance and administrative	99.26	0.74	100	99.23	0.77	100
Natural and applied sciences and related occupations	96.41	3.59	100	97.8	2.2	100
Health	97.77	2.23	100	99.06	0.94	100
Social science, education, government service and religion	98.03	1.97	100	99.04	0.96	100
Art, culture, recreation and sport	98.09	1.91	100	99.53	0.47	100
Sales and service	99.2	0.8	100	99.77	0.23	100
Other	99.82	0.18	100	99.85	0.15	100
Total	98.22	1.78	100	99.13	0.87	100

Note:

The cells left empty contain fewer than 10 observations of graduates living in the United States.

One of the most pronounced changes we noted in the years examined was a decrease in the percentage of workers in business, finance and administrative occupations for the Class of 2000 compared with the classes of 1995 and 2005: for the last two classes, the percentage of graduates living in the United States and working in that field was 18% and 17%, respectively, compared with 4% and 7% for graduates in the cohort of 2000 in 2002 and 2005, respectively. The situation was reversed for social science and education workers: more graduates in the cohort of 2000 working in those occupations moved to the United States than those in the other classes, with percentages of 30% and 31% in 2002 and 2005, respectively, compared with 26% and 27% in 2000 (Class of 1995) and 2007 (Class of 2005). Generally speaking, more graduates working in the management field live in the United States five years after graduation than two years after, with rates of 8% and 9% in 2000 and 2005 (classes of 1995 and 2000), compared with 4% and 5% in 2002 and 2007

(classes of 2000 and 2005). We also noted a slight increase for workers in the health sector. Their share of graduates living in the United States rose from 10% in 2000 to 12% in 2002, 14% in 2005, and 13% in 2007. As we did for fields of study, we conducted Chi-Square tests to determine the equality of distributions by occupation from year to year. We concluded that the distributions are statistically different from one year to another at a significance level of 1%.

Table 9 contains the responses to a variety of questions posed only to graduates who moved to the United States, including those who returned to Canada. Those responses are presented only for the Class of 2000 in 2005, i.e., during its Follow-up Survey. The two major activities in the six months preceding the move to the United States were schooling and work. That was to be expected, in light of the findings from Table 3 regarding the year of move to the United States, as most emigrants leave the year they graduate. The major activity upon arriving in the United States was work, for some 43% of respondents, followed by schooling for 25%. Those percentages are similar to those observed for the main reasons for moving, i.e., work- and schooling-related reasons. The third reason, in order of importance, was for a marriage or relationship, followed by other family-related reasons. Of note in comparing the reasons for moving of graduates who returned to Canada and those who stayed in the United States: 9% of those who returned gave marriage as the reason for moving, compared with 19% of those who stayed. So it seems that graduates who leave for work-related reasons, and especially for schooling-related reasons, return to Canada after a certain lapse of time, whereas those who leave because of a relationship or for family-related reasons are more likely to stay in the United States. Money seems to be a strong reason to leave among those who moved for work-related reasons, but perhaps not the major reason. Only 47% of graduates who left for work-related reasons said they were attracted by higher salaries. Of those who returned to Canada, 31% said they did so for work-related reasons, 20% for schooling-related reasons, and 14% for a marriage. We noted that a high proportion of graduates said they returned for family-related reasons, i.e., 19%. That could reflect a desire to be closer to their family or a need to look after an ageing parent.

Table 9: Various statistics on graduates who moved to the United States, 2005 (Class of 2000)

	Country of residence		
	Lived in the U.S, but returned to Canada	Currently living in the U.S.	Total
a. Major activity in the 6 months preceding the move to the United States			
Schooling	45.78	35.84	40.6
Work	36.97	45.25	41.29
Work and schooling	4.27	5.34	4.83
Other	12.98	13.57	13.29
Total	100	100	100
b. Major activity upon arriving in the United States for the first time			
Work	46.06	40.35	43.08
Schooling	25.77	24.43	25.07
Other	2.19	5.1	3.71
Not stated	25.98	30.12	28.14
Total	100	100	100
c. Main reason for moving to the United States			
Work-related reasons	48.82	51.28	50.09
Schooling-related reasons	30.21	24.11	27.05
Marriage[a]	9.48	19.34	14.58
Other family-related reasons	3.82	4.14	3.98
Other	7.67	1.13	4.29
Total	100	100	100
d. Graduates attracted to the United States by higher salaries (among those who moved for work-related reasons)			
Yes	48.79	46.05	47.35
No	51.21	53.95	52.65
Total	100	100	100
e. Main reason for returning to Canada after moving to the United States			
Work-related reasons	31.02	—	
Schooling-related reasons	20.21	—	
Marriage[a]	13.81	—	
Other family-related reasons	18.84	—	
Other	16.13	—	
Total	100	—	
f. Do you intend to return to Canada to live?			
Yes	—	61.32	
No	—	23.89	
Don't know	—	14.78	
Total	—	100	
g. When do you intend to return to Canada to live?			
In less than 1 year	—	11.4	
1-2 years	—	13.5	
3-5 years	—	36.26	
6-10 years	—	13.06	
More than 10 years	—	12.53	
Don't know	—	13.26	
Total	—	100	

h. Status in Canada when you moved to the United States

Canadian, by birth	84.21	78.6	80.47
Canadian, by naturalization	14.52	18.12	16.92
Landed immigrant/Other	1.27	3.27	2.6
Total	100	100	100

Note:

[a] Or a relationship with a significant other

The NGS asked respondents who were still living in the United States at the time of the survey whether they intended to return to Canada to live, and if so, when. 61% responded that they wanted to return, compared with 24% who did not intend to and 15% who had still not decided. The brain drain to the United States thus seems to be temporary for most graduates, perhaps for the time it takes to acquire a degree and/or professional experience that will beef up their résumés when they apply for good jobs in Canada.

Among those who wanted to return, the preferred time horizon seemed to be to return in three to five years, for 36% of respondents. This may reflect term contracts or the time needed to complete their studies. Of final note is the immigration status in Canada when they moved to the United States. In all, 80% of the graduates who left were Canadians by birth, 17% Canadian by naturalization, and some 3% were landed immigrants or others. It is also noteworthy that Canadians by birth seem more inclined to return to Canada, as indicated by comparing the proportions among the graduates who stayed in the United States and those who returned.

Table 10: Demographic statistics by country of residence, 2005 (Class of 2000)

	Country of residence		
	Canada	**United States**	**Total**
a. Age			
Average	32.1	30.1	32.1
Standard deviation	7.9	4.3	7.9
Median	29	29	29
b. Gender by country of residence			
Men	40.7	48.6	40.86
Women	59.3	51.4	59.14
Total	100	100	100
c. Country of residence by gender			
Men	97.59	2.41	100
Women	98.24	1.76	100
Total	97.98	2.02	100

d. Marital status by country of residence

Living as a couple	53.05	46.22	52.91
Single, never married	42.4	52.32	42.59
Other	4.56	1.46	4.5
Total	100	100	100

e. Country of residence by marital status

Living as a couple	98.27	1.73	100
Single, never married	97.57	2.43	100
Other	99.36	0.64	100
Total	98.02	1.98	100

f. Language first learned in childhood and still understood

English	61.63	67.07	61.74
French	21.59	7.74	21.32
English and French	0.79	0.52	0.78
Neither English nor French	15.99	24.67	16.16
Total	100	100	100

g. Country of residence by language first learned in childhood and still understood

English	97.81	2.19	100
French	99.27	0.73	100
English and French	98.66	1.34	100
Neither English nor French	96.93	3.07	100

h. Language proficiency upon graduation[a]

English	61.29	58.82	61.24
French	7.74	0.63	7.59
English and French	30.97	40.55	31.17
Total	100	100	100

i. Country of residence by language proficiency upon graduation[a]

English	98.05	1.95	100
French	99.83	0.17	100
English and French	97.35	2.65	100

j. Current status in Canada by country of residence

Canadian citizen, by birth	84.56	79.22	84.45
Canadian citizen, by naturalization	12.13	18.28	12.25
Permanent resident/Other	3.31	2.5	3.3
Total	100	100	100

k. Country of residence by current status in Canada

Canadian citizen, by birth	98.13	1.87	100
Canadian citizen, by naturalization	97.02	2.98	100
Permanent resident/Other	98.49	1.51	100
Total	98	2	100

Note: [a] Well enough to carry on a conversation in that language

Table 10 presents a series of demographic statistics by country of residence for the cohort of 2000 in 2005. The average age was 32 for those living in Canada and 30 for those living in the United States; the median age for both was 29. The graduates in the United

States are thus slightly younger on average. With regard to gender differences, men seem more inclined to leave for the United States: 2.4% of male respondents lived in the United States, compared with 1.8% of women. Marital status also appears to be linked to the decision to leave: 2.4% of single respondents lived in the United States, compared with only 1.7% of those living as a couple.

Language also emerges as a factor influencing the choice to leave for the United States. It appears that unilingual Anglophones and Allophones (according to the language first learned in childhood and still understood) are the most inclined to leave. Indeed, 2.2% of Anglophones and 3.1% of Allophones lived in the United States at the time of the survey, compared with only 0.7% de Francophones and 1.3% of bilingual graduates. Those results are consistent with those of the province of study, which indicate that Quebec graduates were far less likely to leave Canada. A similar question was asked in relation not to mother tongue, but to language proficiency upon graduation. Here, more English-French bilingual graduates lived in the United States, for a total of 2.7%. In comparison, only 0.2% of unilingual Francophones lived in the United States, compared with 2.0% of unilingual Anglophones. It thus appears that only a very small proportion of Francophones, either by mother tongue or by language proficiency, move to the United States. This is not surprising, considering that language is a factor that can facilitate or hinder workers' mobility, and that English is the language of use in the United States. The NGS only tracks graduates who move abroad when they live in the United States. While a portion of Francophone graduates may move to France or other Francophone countries, that phenomenon is not captured by the survey. In any event, excluding from the survey graduates not living in Canada or the United States at the time of the survey make it difficult to obtain an accurate idea of the size of our brain drain.

Finally, with respect to citizenship status, Canadian citizens by naturalization are the most inclined to move to the United States, in a proportion of 3% compared with a rate of 2% for all graduates. It would thus seem, as was to be expected, that children of immigrants or young immigrants who obtained their citizenship are more mobile.

Summing up, the graduates most likely to move to the United States are younger, male, single, Anglophone or Allophone by birth, proficient in French and English and

citizens by naturalization. In the next section, we shall see whether these descriptive trends are confirmed in the analysis of the decision to leave.

Table 11: Labour force status and conditions of employment by country of residence, 2005 (Class of 2000)

	Country of residence		
	Canada	United States	Total
a. Labour force status during the survey reference week			
Working	91.19	80.56	90.98
Unemployed	4.07	6.15	4.12
Not in the labour force	4.74	13.29	4.91
Total	100	100	100
b. Working as employee			
No	7.13	3.97	7.08
Yes	92.87	96.03	92.92
Total	100	100	100
c. Full-time work			
No	8.89	7.08	8.86
Yes	91.11	92.92	91.14
Total	100	100	100
d. Permanent employment (employees only)			
No	11.34	14.45	11.4
Yes	88.66	85.55	88.6
Total	100	100	100
e. Number of hours worked per week			
Average	38.23	42.24	38.3
Standard deviation	9.51	11.64	9.57
Median	38.0	40.0	39.0
f. Overqualified for position (employees only)			
No	75.35	83.21	75.5
Yes	24.65	16.79	24.5
Total	100	100	100

The last three descriptive analysis tables, Tables 11, 12 and 13, present statistics on employment, labour force status and earnings. The question of earnings is examined in detail in the third part of the analysis using regressions and decompositions, but for now we present a descriptive overview by country of residence, still for the cohort of 2000 in 2005. Let's begin with labour force status during the survey reference week. A higher proportion of graduates living in the United States were not in the labour force, with a non-participation rate of 13% compared with 5%, perhaps reflecting students or graduates who

had moved because of marriage and had not yet received a work permit or permanent residency in the United States. In fact, there is a strong associative link between the non-participation rate and the main reason for moving to the United States: 30.8% among graduates who moved to the United States for marriage-related reasons, 20.1% among those who did so to continue their studies, and only 3.9% among those who left for work-related reasons.

The proportion of unemployed graduates was also slightly higher in the United States. As a result of those two phenomena combined, over 91% of graduates living Canada were employed, compared with just over 80% of those in the United States. Here again, the employment rate of graduates living in the U.S. correlates strongly with the main reason for moving: 95.2% if the reason is work-related, 67.9% if it is schooling-related, and 55.4% in the case of a marriage-related move.

Of those graduates who had a job, the vast majority were working as employees, some 93% in all. A similar percentage, i.e., 91%, worked full time. That was also reflected in the number of hours worked per week, which was 38.2 on average for graduates in Canada and 42.2 for those in the United States, a difference of 4 hours between the two countries. That works out to around one hour more of work per day (in a five-day week), confirming the trend of longer hours of work in the United States. Focussing on employees, we find that those living in the United States are slightly less often in permanent employment (a 3-percentage-point difference), possibly because some of them want to return to Canada in the medium term and thus find term employment. It is also true that work contracts are most often "at will" in the United States, i.e., at the will of the employer (and the employee), and so are less often permanent with job security. Finally, we noted a substantial difference in the overqualification rate by country residence. Indeed, only 17% of graduates in the United States describe themselves as overqualified for their position, compared with 25% in Canada. This reflects the fact that most graduates who moved to the United States said they did so to find a job, and thus probably a better job, more in line with the qualifications, than the opportunities available in Canada.

Tables 12 and 13 present some statistics on earnings by country of residence for employees. The two tables are identical, except that Table 12 presents the hourly wage and

Table 13 presents the gross annual earnings from employment held during the reference week. Wages are still higher in the United States. It should be borne in mind that the purchasing power parity rate was used to convert American dollars into Canadian dollars for purposes of comparison. Accordingly, in 2005, the average wage in Canada was $23.56 an hour, compared with $34.51 in the United States, a difference of over $10, or 46%. Those percentage deviations hold true in all years, for both the average and the median wage. One detail of note pertains to wage differences between graduates living in Canada who never moved to the United States and those who returned to Canada to live. The latter seem to enjoy a higher wage, but only if we observe them five years after graduation. This seems to jibe with the idea that they benefit from their American work experience or degree: those who spent enough time in the United States (less than two years is not enough) enjoy higher earnings in the Canadian labour market.

Table 12: Hourly wage in Canadian dollars by country of residence (employees only)

	2000 (Class of 1995)		2002 (Class of 2000)		2005 (Class of 2000)		2007 (Class of 2007)	
	Average	Median	Average	Median	Average	Median	Average	Median
Canada	19.86	18.63	18.72	17.31	23.56	21.9	21.62	20
	(20.54)		(9.56)		(13.04)		(10.61)	
Never moved to the United States			18.72	17.31	23.51	21.77	21.62	20
			(9.53)		(12.99)		(10.58)	
Returned to Canada to live			18.87	16.24	26.35	25.4	20.75	16.48
			(12.20)		(15.88)		(14.22)	
United States	27.33	25.46	28.55	24.79	34.51	29.92	33.9	32.39
	(15.04)		(15.10)		(17.95)		(18.21)	
Total	19.95	18.7	18.87	17.31	23.76	21.98	21.73	20
	(20.5)		(9.74)		(13.24)		(10.77)	

Note:

American wages converted into Canadian dollars at purchasing power parity for the year in question.
Standard deviations are in parentheses.

Table 13 reflects the same trends, in connection with annual earnings. The main difference in comparison with Table 12 pertains to the size of the differentials observed: the

annual earnings of respondents in the United States are up to double those of Canada. Annual earnings combine the hourly wage and work intensity, so the differences are even greater since the hours and weeks worked are longer in the United States. Part of the observed differential can be explained by the fact that graduates who moved to the United States are, on average, more educated and come from more lucrative fields of study. Later on (Table 17), we control for the effect of the main characteristics associated with earnings to produce an estimate of the adjusted wage differential between the groups examined.

Table 13: Estimated gross annual earnings from employment held during the reference week in Canadian dollars (employees only)

	2000 Class of 1995)		2002 (Class of 2000)		2005 (Class of 2000)		2007 (Class of 2007)	
	Average	Median	Average	Median	Average	Median	Average	Median
Canada	40,441	38,000	36,102	34,000	44,973	42,484	41,535	39,000
	(20,248)		(19,102)		(24,518)		(22,900)	
Never moved to the United States			36,077	34,000	44,859	42,000	41,540	39,000
			(19,024)		(24,508)		(22,837)	
Returned to Canada to live			38,680	31,200	51,473	50,000	40,800	35,360
			(25,782)		(24,219)		(30,916)	
United States	65,483	57,888	71,161	60,397	90,840	73,340	71,082	68,487
	(44,378)		(43,934)		(57,536)		(38,522)	
Total	40,750	38,220	36,636	34,398	45,820	43,000	41,805	39,000
	(20,900)		(20,177)		(26,251)		(23,261)	

Note:

American wages converted into Canadian dollars at purchasing power parity for the year in question.
Standard deviations are in parentheses.

Analysis of the decision to move to the United States and return to Canada

In our descriptive analysis, a number of factors emerged that were correlated with the country of residence. Modelling the likelihood of living in the United States, first at the time of the interview and then at any time after graduation, will enable us to determine whether those trends are robust to the inclusion of several variables at the same time. We also present our estimate of the likelihood of returning to Canada.

The first estimated model is the simple probit model of the likelihood of living in the United States at the time of the interview. The marginal effects of that model are presented in Table 14. Most of the factors raised in the descriptive analysis are confirmed by the

observation of the results. As described in section 3 on methodology, the estimate is made separately for our four survey years, then jointly for the classes of 2000 and 2005 by using the NGS data, i.e., two years after graduation. Each column in Table 14 thus corresponds to a distinct regression.

Level of education emerges as a highly significant factor for all years examined: the higher an individual's diploma or degree, the greater the likelihood that that individual will decide to live in the United States. PhDs are the most likely to live in the United States: compared with college graduates, they have a 0.07 to 0.10 greater likelihood of living south of the border, all other things being equal. For graduates with a Master's degree, those likelihood deviations, still positive, are on the order of 0.02 to 0.03, and 0.01 to 0.02 for those with a Bachelor's degree. The brain drain thus still mainly affects the most highly educated individuals. We also note an upward trend for the drain brain for PhDs (compared with college graduates), with the marginal effects increasing from 0.07 to 0.10 between 2000 and 2007.

Table 14: Marginal effects, Likelihood of living in the United States at the time of the survey (probit model)

Likelihood of living in the U.S.	2000 (Class of 1995)	2002 (Class of 2000)	2005 (Class of 2000)	2007 (Class of 2005)	2002 and 2007 (Classes of 2000 and 2005)
Level of education					
College (Ref.)	—	—	—	—	—
Bachelor's	0.008***	0.014***	0.016***	0.007***	0.011***
	(0.003)	(0.002)	(0.002)	(0.002)	(0.001)
Master's	0.018***	0.026***	0.026***	0.021***	0.023***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
Doctorate	0.070***	0.087***	0.081***	0.101***	0.089***
	(0.016)	(0.012)	(0.015)	(0.015)	(0.009)
Field of study					
Education (Ref.)	—	—	—	—	—
Visual and performing arts, and communications technologies	0.002	0.015**	0.011	0.008**	0.011***
	(0.005)	(0.006)	(0.007)	(0.003)	(0.003)
Humanities	0.001	0.010***	0.016**	0.006**	0.008***
	(0.004)	(0.004)	(0.008)	(0.003)	(0.002)
Social and behavioural sciences, and law	0.004	0.008***	0.009*	0.003	0.005***
	(0.004)	(0.003)	(0.006)	(0.002)	(0.002)

Business, management and public administration	0.003	0.005*	-0.001	0.007**	0.007***
	(0.004)	(0.003)	(0.004)	(0.003)	(0.002)
Physical and life sciences, and technologies	0.004	0.015***	0.014***	0.012***	0.014***
	(0.004)	(0.003)	(0.006)	(0.003)	(0.002)
Mathematics, computer and information sciences	0.024***	0.018***	0.020***	0.015***	0.016***
	(0.008)	(0.005)	(0.008)	(0.004)	(0.003)
Architecture, engineering and related technologies	0.014***	0.033***	0.028***	0.011***	0.021***
	(0.005)	(0.005)	(0.007)	(0.003)	(0.003)
Agriculture, renewable natural resources and conservation	0.006	0.004	0.001	0.012***	0.007***
	(0.009)	(0.003)	(0.006)	(0.004)	(0.002)
Health, parks, recreation and fitness	0.009*	0.016***	0.006	0.010***	0.013***
	(0.005)	(0.003)	(0.004)	(0.004)	(0.003)
Personal, protective and transportation services	—	0.018	-0.005	0.008	0.012*
		(0.015)	(0.006)	(0.006)	(0.007)
Woman	-0.002	0.000	-0.002	0.001	0.001
	(0.003)	(0.002)	(0.003)	(0.002)	(0.001)
Age	-0.001*	0.000	0.001	0.000	0.000
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Canadian, by birth	0.003	-0.003	-0.002	-0.013***	-0.008***
	(0.002)	(0.004)	(0.005)	(0.004)	(0.003)
Mother tongue					
English (Ref.)	—	—	—	—	—
French	-0.012***	-0.013***	-0.016***	-0.009***	-0.010***
	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)
English and French	-0.004	-0.006	-0.012**	-0.011***	-0.008**
	(0.004)	(0.007)	(0.006)	(0.002)	(0.003)
Neither English nor French	0.000	0.000	-0.002	-0.006**	-0.003
	(0.006)	(0.004)	(0.005)	(0.003)	(0.002)
Province of study					
Atlantic (Ref.)	—	—	—	—	—
Quebec	-0.002	-0.005	-0.001	0.000	-0.002
	(0.004)	(0.003)	(0.005)	(0.003)	(0.002)
Ontario	-0.001	-0.004	-0.005	0.000	-0.002
	(0.003)	(0.003)	(0.004)	(0.002)	(0.002)
Manitoba	0.002	-0.004	0.002	0.003	0.000
	(0.003)	(0.003)	(0.005)	(0.003)	(0.002)
Saskatchewan	0.004	-0.006*	-0.001	-0.001	-0.004*
	(0.004)	(0.003)	(0.005)	(0.003)	(0.002)
Alberta	0.006	-0.008***	-0.003	0.002	-0.002
	(0.004)	(0.003)	(0.004)	(0.003)	(0.002)
British Columbia	0.000	-0.002	0.001	0.004	0.001
	(0.0030	(0.003)	(0.005)	(0.003)	(0.002)
Marital status					
Living as a couple (Ref.)	—	—	—	—	—
Single	0.000	-0.001	0.003	-0.002	-0.001
	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
Other	-0.006*	-0.005	-0.004	-0.010***	-0.008***
	(0.003)	(0.006)	(0.006)	(0.002)	(0.003)
Parents' highest level of education					
Secondary or less (Ref.)	—	—	—	—	—
Vocational training	0.009	-0.005	-0.004	0.006	0.000

	(0.007)	(0.003)	(0.004)	(0.007)	(0.003)
College	-0.002	0.004	-0.004	-0.002	0.001
	(0.003)	(0.003)	(0.004)	(0.002)	(0.002)
University	0.002	0.007***	0.007*	0.002	0.005***
	(0.003)	(0.002)	(0.004)	(0.002)	(0.002)
Unknown/no response	0.001	-0.001	-0.009**	-0.002	-0.002
	(0.007)	(0.004)	(0.004)	(0.004)	(0.003)
Presence of dependent children	-0.006***	-0.004	0.002	0.000	-0.002
	(0.002)	(0.003)	(0.004)	(0.003)	(0.002)
Source of funding for education					
Government student loan	-0.001	0.000	0.003	-0.003	-0.002
	(0.003)	(0.002)	(0.004)	(0.002)	(0.002)
Parents	0.001	0.005*	0.009**	0.003	0.004**
	(0.004)	(0.003)	(0.004)	(0.002)	(0.002)
Employment income	0.001	-0.001	-0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Scholarship	0.005	0.007	0.008*	0.000	0.003
	(0.004)	(0.004)	(0.005)	(0.002)	(0.002)
Bank loan	-0.004	0.011	0.014	0.000	0.004
	(0.003)	(0.009)	(0.010)	(0.004)	(0.005)
Full-/part-time studies					
Full-time only (Ref.)	—	—	—	—	—
Part-time only	-0.006**	-0.006	-0.004	0.001	0.000
	(0.003)	(0.004)	(0.005)	(0.003)	(0.003)
Some full-time and	-0.002	-0.004	-0.005	-0.004**	-0.004**
some part-time	(0.003)	(0.003)	(0.005)	(0.002)	(0.002)
Major activity before enrolling in the program					
Studies (Ref.)	—	—	—	—	—
Working	-0.001	-0.005**	-0.008***	-0.002	-0.003**
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
Working and going to school	0.006	0.001	-0.012***	-0.003	-0.001
	(0.007)	(0.004)	(0.003)	(0.003)	(0.003)
Taking care of family or household responsibilities	-0.003	-0.011***	-0.019***	-0.005	-0.008**
	(0.005)	(0.003)	(0.003)	(0.005)	(0.003)
Without work and looking for work	0.006	-0.011***	-0.015***	-0.008***	-0.009***
	(0.008)	(0.003)	(0.004)	(0.003)	(0.002)
Other	0.008	-0.001	0.002	-0.004	-0.003
	(0.008)	(0.007)	(0.010)	(0.003)	(0.003)
Province of study different from province of principal residence before starting the program					
No (Ref.)	—	—	—	—	—
Yes, moved for studies	0.008**	0.009**	0.005	0.005*	0.007***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.002)
Yes, moved for a reason	0.019	0.021**	0.039**	0.012*	0.016***
other than studies	(0.012)	(0.010)	(0.017)	(0.007)	(0.006)
Long-term disabilities or handicaps[a]	-0.005	-0.010***	-0.008**	-0.007***	-0.008***
	(0.004)	(0.003)	(0.004)	(0.002)	(0.0020)
Class of 2005	—	—	—	—	-0.007***
					(0.001)
n	22,499	34,384	23,271	33,460	67,844

Pseudo R2		0.119	0.153	0.173	0.154	0.145

Note:

The table presents the average individual marginal effects calculated using probit coefficients. Their robust standard errors are in parentheses.

[a] i.e., disabilities that have lasted or are expected to last six months or longer

* p<0.10, ** p<0.05, *** p<0.01

With respect to field of study, the scope of the effects is lesser than for level of education, but numerous estimated coefficients are highly statistically significant. Education graduates are the reference group here. The fields of mathematics, computer and information sciences and architecture, engineering and related technologies consistently stand out as fields for which there is a strong likelihood of moving to the United States. Accordingly, compared with education graduates, a mathematics or computer sciences graduate has a 0.015 to 0.024 greater likelihood, on average, of moving to the United States, depending on the year observed. For the architecture and engineering field, those deviations are in the order of 0.011 to 0.033. The field of physical and life sciences, and technologies also stands out for the classes of 2000 and 2005, with a higher predicted likelihood in the education field of 0.012 to 0.015.

Being a woman has no statistically significant effect, as is the case with age, apart from a small negative effect for the Class of 1995 in 2000. Canadians by birth are less inclined to live in the United States (except for the cohort of 1995), with an observed likelihood lower by 1 percentage point in 2007. With regard to mother tongue, Anglophones are still more likely to move to the United States. Being Francophone (or bilingual, although it should be borne in mind that less than one percent of graduates reported being bilingual since childhood) reduces the statistically significant likelihood of living in the United States by 0.9 to 1.6 percentage points depending on the year. Allophones seem to be slightly less likely than Anglophones to live in the United States, but the difference between the two groups was statistically significant only in 2007.

The effect of province of study is more mitigated than indicated in Tables 4a to 4d. Table 14 indicates that graduates of an institution located in the Atlantic provinces are generally more inclined to live in the United States, but the differences are most often small or not statistically significant. The year 2002 was a little different, as we observed that two

provinces (Saskatchewan and Alberta) had a marginal effect statistically different from zero, but which was relatively of the same size as the effects for the other provinces, which would suggest that the Atlantic region was well ahead of the others, but that in the rest of the country the differences among provinces remained low. One important element regarding province of study is that now Quebec graduates do not seem to stand out for their low mobility, unlike what had been indicated in the descriptive analysis. This suggests that language is the most important factor, because when the two are combined in the regression, the Francophone mother tongue effect clearly stands out, while the Quebec effect is mitigated.

Marital status has a small effect, not statistically different from zero, contrary to what might have been expected from the descriptive analysis. Graduates whose parents have a university education are more inclined to live in the United States than those whose parents have a high school education. The presence of dependent children did not seem to have a statistically significant effect in 2000, which had the effect of reducing the likelihood by 0.6 percentage points. Among the variables pertaining to source of funding for education, only funding from parents or scholarships is significant, and only for the cohort of 2000. For that cohort, receiving funding from parents increased the likelihood of living in the United States by 0.5 or 0.9 percentage points (two or five years after graduation), and obtaining a scholarship increased it by 0.8 points in 2005. Pursuing part-time or some part-time studies decreases the likelihood of living in the United States, but the effect is non-significant more often than not.

The major activity before enrolling in the program of studies emerges as a factor that greatly influences future mobility toward the United States, at least for the cohort of 2000. For 2000 graduates, we observed that those who were pursuing studies before their last program of studies were more mobile, suggesting that young people who pursue an uninterrupted course of studies may be more capable or motivated. This is also reflected in the effect of mobility for studies: if a graduate had previously moved, i.e., if the province of study was different from the province of principal residence before studies, that graduate will be more inclined to move to the United States. Not surprisingly, a long-term disability

or handicap is a factor that reduces mobility, and thus the likelihood of moving to the United States, in the order of 0.5 to 1 percentage point.

Finally, when the estimate is made by combining the cohorts of 2000 and 2005, the likelihood of a graduate of the Class of 2005 moving to the United States is 0.7 percentage point lower than for a graduate of the Class of 2000, all other things being equal, and that difference is statistically different from zero. Surprisingly, that difference is almost the same as the one observed between the two classes with respect to the percentage of graduates who moved to the United States, which was 0.62 points (Table 3). This suggests that the brain drain to the United States decreased slightly between 2000 and 2005, at least for the two-year period following graduation, and that trend has nothing to do with the observable characteristics of the graduates.

Table 15: Marginal effects, Likelihood of living or having previously lived in the United States since graduation

Likelihood of moving to the U.S.	2000 (Class of 1995)	2002 (Class of 2000)	2005 (Class of 2000)	2007 (Class of 2005)
Level of education				
College (Ref.)	—	—	—	—
Bachelor's	0.008***	0.017***	0.019***	0.012***
	(0.003)	(0.003)	(0.004)	(0.002)
Master's	0.018***	0.030***	0.037***	0.035***
	(0.004)	(0.005)	(0.007)	(0.006)
Doctorate	0.073***	0.109***	0.107***	0.159***
	(0.016)	(0.013)	(0.017)	(0.019)
Field of study				
Education (Ref.)	—	—	—	—
Visual and performing arts,	0.002	0.029***	0.036***	0.021***
and communications technologies	(0.005)	(0.008)	(0.012)	(0.006)
Humanities	0.001	0.020***	0.033***	0.011***
	(0.004)	(0.006)	(0.010)	(0.004)
Social and behavioural	0.003	0.014***	0.018***	0.006*
sciences, and law	(0.004)	(0.004)	(0.007)	(0.004)
Business, management and	0.003	0.008**	0.008	0.011**
public administration	(0.004)	(0.004)	(0.006)	(0.004)
Physical and life sciences,	0.004	0.027***	0.036***	0.017***
and technologies	(0.004)	(0.005)	(0.009)	(0.004)
Mathematics, computer and	0.024***	0.024***	0.026***	0.019***
information sciences	(0.008)	(0.006)	(0.009)	(0.005)
Architecture, engineering and	0.014***	0.036***	0.042***	0.018***
related technologies	(0.005)	(0.006)	(0.008)	(0.005)

Agriculture, renewable natural resources and conservation	0.005	0.012**	0.013	0.019***
	(0.009)	(0.005)	(0.008)	(0.005)
Health, parks, recreation and fitness	0.010**	0.026***	0.017***	0.010**
	(0.005)	(0.005)	(0.006)	(0.005)
Personal, protective and transportation services	—	0.013	0.014	0.008
		(0.012)	(0.021)	(0.007)
Woman	-0.002	-0.004	-0.004	0.001
	(0.003)	(0.003)	(0.004)	(0.002)
Age	-0.001*	0.000	0.001	-0.001
	(0.000)	(0.000)	(0.001)	(0.000)
Canadian, by birth	0.003	-0.007	-0.009	-0.013*
	(0.002)	(0.005)	(0.009)	(0.005)
Mother tongue				
English (Ref.)	—	—	—	—
French	-0.012***	-0.019***	-0.028***	-0.015***
	(0.003)	(0.003)	(0.006)	(0.004)
English and French	-0.003	-0.014**	-0.021**	-0.011
	(0.004)	(0.007)	(0.009)	(0.007)
Neither English nor French	0.001	-0.006	-0.009	-0.010***
	(0.006)	(0.005)	(0.008)	(0.004)
Province of study				
Atlantic (Ref.)	—	—	—	—
Quebec	-0.003	-0.014***	-0.008	-0.009*
	(0.004)	(0.005)	(0.009)	(0.005)
Ontario	-0.001	-0.016***	-0.019***	-0.006*
	(0.003)	(0.004)	(0.006)	(0.003)
Manitoba	0.004	-0.018***	-0.013*	-0.001
	(0.004)	(0.004)	(0.007)	(0.004)
Saskatchewan	0.005	-0.020***	-0.011	-0.007*
	(0.004)	(0.004)	(0.007)	(0.004)
Alberta	0.006*	-0.020***	-0.019***	-0.003
	(0.004)	(0.004)	(0.006)	(0.004)
British Columbia	0.000	-0.011**	-0.011	-0.005
	(0.003)	(0.005)	(0.007)	(0.004)
Marital status				
Living as a couple (Ref.)	—	—	—	—
Single	0.000	0.001	0.003	0.001
	(0.002)	(0.003)	(0.005)	(0.003)
Other	-0.006**	-0.012**	0.001	-0.013***
	(0.003)	(0.006)	(0.009)	(0.003)
Parents' highest level of education				
Secondary or less (Ref.)	—	—	—	—
Vocational training	0.009	-0.006	-0.007	0.003
	(0.007)	(0.004)	(0.006)	(0.008)
College	-0.002	0.001	-0.001	0.005
	(0.003)	(0.004)	(0.006)	(0.004)
University	0.002	0.012***	0.015***	0.006**
	(0.003)	(0.003)	(0.005)	(0.003)
Unknown/no response	0.001	-0.004	-0.010*	-0.002
	(0.007)	(0.005)	(0.006)	(0.004)
Presence of dependent children	-0.006***	-0.011***	-0.006	-0.003

	(0.002)	(0.004)	(0.005)	(0.004)
Source of funding for education				
Government student loan	0.000	-0.004	0.000	-0.004
	(0.003)	(0.003)	(0.005)	(0.003)
Parents	0.000	0.003	0.010*	0.003
	(0.004)	(0.004)	(0.006)	(0.003)
Employment income	0.001	-0.004	0.000	-0.003
	(0.002)	(0.003)	(0.005)	(0.003)
Scholarship	0.005	0.007	0.014*	0.002
	(0.004)	(0.005)	(0.007)	(0.003)
Bank loan	-0.005	0.017*	0.018	0.015*
	(0.003)	(0.010)	(0.012)	(0.008)
Full-/part-time studies				
Full-time only (Ref.)	—	—	—	—
Part-time only	-0.007**	-0.012***	-0.013**	0.007
	(0.003)	(0.004)	(0.006)	(0.007)
Some full-time and	-0.003	0.000	-0.008	-0.003
some part-time	(0.003)	(0.005)	(0.007)	(0.004)
Major activity before enrolling in the program				
Studies (Ref.)	—	—	—	—
Working	-0.001	-0.009***	-0.017***	-0.004*
	(0.002)	(0.003)	(0.005)	(0.003)
Working and going to school	0.006	0.000	-0.008	-0.006
	(0.007)	(0.005)	(0.007)	(0.004)
Taking care of family or household responsibilities	-0.003	-0.010	-0.032***	-0.008
	(0.005)	(0.010)	(0.005)	(0.008)
Without work and looking for work	0.006	-0.009	-0.026***	-0.003
	(0.008)	(0.008)	(0.006)	(0.007)
Other	0.008	0.032*	0.044	-0.007**
	(0.008)	(0.018)	(0.029)	(0.004)
Province of study different from province of principal residence before starting the program				
No (Ref.)	—	—	—	—
Yes, moved for studies	0.008*	0.011**	0.006	0.005
	(0.004)	(0.004)	(0.006)	(0.003)
Yes, moved for a reason	0.019*	0.046***	0.035*	0.019*
other than studies	(0.011)	(0.016)	(0.018)	(0.011)
Long-term disabilities or handicaps[a]	-0.005	-0.017***	-0.020***	-0.010***
	(0.004)	(0.004)	(0.005)	(0.003)
n	22,499	34,383	23,271	33,460
Pseudo R2	0.1194	0.1386	0.1341	0.1319

Note:
The table presents the average individual marginal effects calculated using probit coefficients. Their robust standard errors are given in parentheses.

[a] i.e., disabilities that have lasted or are expected to last six months or longer
* $p<0.10$, ** $p<0.05$, *** $p<0.01$

Table 15 presents the results of estimates where we modelled the likelihood of living or having previously lived in the United States. By construction, the results are thus very

close to those in Table 14, as the only difference is that the graduates who moved to the United States are now included in the category "United States" rather than "Canada." The only differences are found in the year 2005, which was expected. In fact, for the cohort of 1995, the graduates who returned to Canada were not identified in the survey, and for 2002 and 2007, the survey covered only two years after graduation, which leaves very little time for a graduate to leave then return to the country. For the class of 2000 in 2005, the results are slightly different, but remain within the same size range, and the same conclusions are drawn.

Table 16 presents the marginal effects of the likelihood of returning to Canada, which we did only for the cohort of 2000 in 2005. It is also noteworthy that the estimate for that probit model was made taking into account selection, i.e., the fact that returning to Canada pertains only to those who previously decided to move to the United States. Initial finding: no marginal effect is statistically different from zero. This is explained by the high standard errors, which are likely due to the fact that the number of observations at our disposal on graduates who returned is low, and that the joint estimate with the likelihood of leaving the country increases the estimation difficulty. In addition, the estimated standard errors are robust to heteroskedasticity. Some factors have a sign effect inverse to their effect on the likelihood of leaving, as reported in Tables 14 and 15. In other words, what causes an individual to move to the United States is the same thing as what causes that individual to stay there. This is the case with level of education, which has the strongest effect, albeit still not statistically different from zero. PhDs are the least likely to return to Canada. Because the estimate is made only on graduates who had left the country, two new variables are introduced: the effect of the main reason for moving to the United States and the length of stay. Compared with graduates who left for work-related reasons, leaving for schooling-related reasons increased the likelihood of returning by 3.4 percentage points on average, while leaving for marriage-related reasons makes one less mobile, reducing the likelihood of returning by 0.8 points.

Table 16: Marginal effects, Likelihood of returning to Canada

Likelihood of returning to Canada[a]	2005 (Class of 2000)
Level of education	
College (Ref.)	—
Bachelor's	-0.134
	(0.216)
Master's	-0.138
	(0.242)
Doctorate	-0.164
	(0.306)
Field of study	
Education (Ref.)	—
Visual and performing arts, and communications technologies	0.105
	(0.091)
Humanities	0.107
	(0.108)
Social and behavioural sciences, and law	0.054
	(0.056)
Business, management and public administration	0.106
	(0.128)
Physical and life sciences, and technologies	0.119
	(0.088)
Mathematics, computer and information sciences	0.034
	(0.046)
Architecture, engineering and related technologies	0.052
	(0.041)
Agriculture, renewable natural resources and conservation	0.251
	(0.245)
Health, parks, recreation and fitness	0.073
	(0.073)
Personal, protective and transportation services	0.191
	(0.277)
Woman	0.031
	(0.046)
Age	-0.001
	(0.005)
Main reason for moving to the United States	
Work-related reasons (Ref.)	—
Schooling-related reasons	0.034
	(0.038)
Marriage or a relationship with a significant other	-0.081
	(0.097)
Other reasons	0.048
	(0.070)
Length of stay in the United States (in years)	0.024
	(0.024)
Canadian, by birth	-0.049

	(0.067)
Mother tongue	
English (Ref.)	—
French	-0.025
	(0.052)
English and French	-0.005
	(0.088)
Neither English nor French	-0.049
	(0.058)
Last province of residence in Canada	
Atlantic (Ref.)	—
Quebec	0.049
	(0.065)
Ontario	-0.016
	(0.038)
Manitoba	-0.066
	(0.067)
Saskatchewan	-0.060
	(0.063)
Alberta	-0.059
	(0.058)
British Columbia	-0.051
	(0.057)
Marital status	
Living as a couple (Ref.)	—
Single	-0.004
	(0.030)
Other	0.034
	(0.085)
n	1,068

Note:

The table presents the average individual marginal effects calculated using probit coefficients. Their robust standard errors are given in parentheses.

[a] Estimated using a probit model with sample selection, as the decision to return to Canada to live applies only to graduates who chose to move to the U.S.

No marginal effect is statistically significant.

Analysis of earnings differences between Canada and the United States

The last part of our analysis pertains to earnings differences by place of residence. Table 17 presents the results of the estimate of the model presented in equation (2) in the section on methodology, i.e., wage equations where the dependent variable is the log of the hourly wage. Columns (1) to (4) show the results when the equations are estimated separately by year, and in Column (5) the estimate is made by combining all cohorts, i.e. the Class of 1995 in 2000, the Class of 2000 in 2005, and the Class of 2005 in 2007.

Table 17: OLS regression results – dependent variable = hourly log wage

	2000 (Class of 1995) (1)	2002 (Class of 2000) (2)	2005 (Class of 2000) (3)	2007 (Class of 2005) (4)	(1), (3) and (4) combined[a] (5)
Current country of residence					
Canada, never lived in the United States (Ref.)	—	—	—	—	—
Canada, previously lived in the United States	—	0.012 (0.054)	0.115*** (0.025)	-0.018 (0.045)	0.073** (0.024)
United States	0.196*** (0.05)	0.266*** (0.041)	0.259*** (0.043)	0.266*** (0.062)	0.245*** (0.03)
Level of education					
College (Ref.)	—	—	—	—	—
Bachelor's	0.169*** (0.012)	0.181*** (0.009)	0.213*** (0.012)	0.177*** (0.009)	0.188*** (0.006)
Master's	0.279*** (0.016)	0.331*** (0.012)	0.327*** (0.015)	0.328*** (0.014)	0.315*** (0.009)
Doctorate	0.270*** (0.023)	0.364*** (0.021)	0.375*** (0.026)	0.395*** (0.025)	0.356*** (0.015)
Age	0.026*** (0.005)	0.035*** (0.004)	0.041*** (0.006)	0.028*** (0.004)	0.033*** (0.003)
$Age^2/100$	-0.025*** (0.007)	-0.035*** (0.005)	-0.043*** (0.009)	-0.027*** (0.005)	-0.033*** (0.004)
Woman	-0.113*** (0.012)	-0.049*** (0.009)	-0.059*** (0.011)	-0.060*** (0.009)	-0.074*** (0.006)
Overqualified for position	-0.100*** (0.012)	-0.127*** (0.009)	-0.179*** (0.012)	-0.150*** (0.009)	-0.148*** (0.006)
Permanent employment	0.143*** (0.02)	0.130*** (0.012)	0.118*** (0.015)	0.112*** (0.01)	0.120*** (0.008)
Canadian, by birth	0.049** (0.016)	0.027 (0.014)	0.059** (0.018)	0.059*** (0.016)	0.061*** (0.01)
Mother tongue					
English and French (Ref.)	—	—	—	—	—
English	-0.009 (0.017)	0.006 (0.042)	-0.056 (0.048)	-0.002 (0.032)	-0.015 (0.013)
French	-0.027 (0.019)	0.024 (0.042)	-0.029 (0.049)	0.011 (0.033)	-0.009 (0.013)
Other	0.015 (0.022)	-0.006 (0.043)	-0.044 (0.051)	-0.013 (0.035)	-0.015 (0.015)
Province of educational institution					
Ontario (Ref.)	—	—	—	—	—
Atlantic	-0.121***	-0.160***	-0.129***	-0.121***	-0.127***

	(0.015)	(0.01)	(0.012)	(0.01)	(0.007)
Quebec	-0.005	-0.038**	-0.038*	-0.071***	-0.042***
	(0.02)	(0.013)	(0.017)	(0.015)	(0.01)
Manitoba	-0.127***	-0.138***	-0.078***	-0.107***	-0.108***
	(0.017)	(0.011)	(0.015)	(0.012)	(0.008)
Saskatchewan	-0.065***	-0.118***	-0.047**	-0.047***	-0.057***
	(0.018)	(0.014)	(0.016)	(0.012)	(0.009)
Alberta	-0.035*	-0.047***	0.043**	0.060***	0.028***
	(0.016)	(0.013)	(0.014)	(0.012)	(0.008)
British Columbia	0.03	0.003	0.004	0.007	0.009
	(0.017)	(0.011)	(0.014)	(0.012)	(0.008)
Class of 2000	—	—	—	—	0.060***
					(0.008)
Class of 2005	—	—	—	—	0.024**
					(0.008)
Constant	2.231***	2.156***	2.288***	2.564***	2.370***
	(0.106)	(0.082)	(0.134)	(0.085)	(0.06)
Other controls:					
Field of study, occupation, industry and marital status					
R^2	0.26	0.378	0.37	0.388	0.341
Number of observations	16,457	25,714	17,776	25,359	59,592

Note :

Employees only. Robust standard errors are in parentheses.

[a] In this model, the wage is expressed in 2007 constant dollars.

* $p<0.10$, ** $p<0.05$, *** $p<0.01$

The results at the top of Table 17, i.e., the effect of country of residence, are the ones of greatest interest. For example, compared with a graduate living in Canada who never lived in the United States, a graduate living in the United States earns an additional 0.196 to 0.266 log points on average, equivalent to a positive differential of 20% to 27%, all other things being equal. The effect of having lived in the United States is more mitigated, as indicated in Tables 12 and 13. In the short term, i.e., two years after graduation, having lived in the United States and returned to the country has no significant effect compared with having stayed in Canada. In the medium term however, i.e., five years after graduation, a positive and statistically significant effect of 0.115 log points is observed, or some 12%. This jibes with a scenario where experience acquired in the United States or an additional degree from the U.S. are highly valued upon returning to Canada, even for a stay outside the country of five years or less, and is in line with Globerman's findings (1999).

Incidentally, the 20% to 27% wage premium enjoyed by graduates living in the United States, compared with graduates who stayed in Canada, is comparable in size to the

purchasing power parity of the American dollar compared with the Canadian dollar, which is approximately 1.22 (See Table A1 in the Appendix). In other words, if the amounts in American dollars had not been converted into Canadians dollars, the adjusted differential between the two groups would be almost nil, or very small.

The other variables of the model are of less interest, and present the standard results from the labour economics literature: a premium for level of education and for having permanent employment, a quadratic form in age, a difference between men and women, and so on. We note that mother tongue does not seem to have any significant effect.

However, as discussed in the section on methodology, the estimated effect of the country of residence may be skewed. To remedy that situation, we endeavour to estimate a treatment effect model, i.e., a model where the decision to emigrate is estimated jointly with wage equation. In Table 18, sections a and b, we present the results on the effects of country of residence in the wage equation estimated thusly. Sections c and d indicate the results obtained when the wage equation is estimated separately, for purposes of comparison. For the Class of 1995, the estimated coefficient becomes negative and not statistically significant, likely because of the low number of observations and because of the model, which is relatively computationally demanding. For the other classes, the coefficients decrease slightly, from a range of 0.255 to 0.266 to one of 0.231 to 0.236. Those new coefficients are all statistically different from zero. However, they are not statistically different from the coefficients stemming from the equation estimated separately. We believe that there may still be a bias in the estimate as presented, as our method was only an imperfect attempt to correct the introduced bias. For lack of better data or natural experience to help us identify the true causal effect of country of residence on earnings, we cannot provide better estimates than those presented in Table 18.

For the Class of 2000 in 2005, the results in section b of Table 18 indicate that the wage premiums for graduates who previously lived in the United States and those who are still living there increase by 6 to 7 percentage points compared with when the endogeneity of the decision to move to the United States is ignored. Accordingly, a graduate who previously lived in the United States earns on average 0.178 more hourly wage log points, compared with 0.115 points previously. Similarly, for graduates still living in the United

States, the wage premium in comparison with the reference group increases from 0.259 log points to 0.326 points.

Table 18: Results of simultaneous estimation of wage equation and decision to live in the United States at the time of the survey

	2000 (Class of 1995) (1)	2002 (Class of 2000) (2)	2005 (Class of 2000) (3)	2007 (Class of 2005) (4)
a. Without taking into consideration return to Canada				
Current country of residence				
Canada (Ref.)	—	—	—	—
United States	-0.083	0.231***	0.235**	0.236*
	(0.228)	(0.059)	(0.096)	(0.124)
b. Taking into consideration return to Canada				
Current country of residence				
Canada, never lived in the United States (Ref.)	—	—	—	—
Canada, previously lived in the United States	—	—	0.178***	—
			(0.032)	
United States	—	—	0.326***	—
			(0.060)	
c. For comparison, wage equation estimated independently (with control variables)				
Current country of residence				
Canada (Ref.)	—	—	—	—
United States	0.196***	0.265***	0.255***	0.266***
	(0.05)	(0.041)	(0.043)	(0.062)
d. For comparison, results of Table 17				
Current country of residence				
Canada, never lived in the United States (Ref.)	—	—	—	—
Canada, previously lived in the United States	—	0.012	0.115***	-0.018
		(0.054)	(0.025)	(0.045)
United States	0.196***	0.266***	0.259***	0.266***
	(0.05)	(0.041)	(0.043)	(0.062)

Note:
The other variables included in the models are those indicated in Table 17 for wage equation and in Table 14 for decision to live in the United States. Employees only. Robust standard errors are in parentheses.
* $p<0.10$, ** $p<0.05$, *** $p<0.01$

The results of the decomposition exercise are of greater interest. In Table 17, we established that there is a substantial difference in earnings between graduates living in the United States and those living in Canada. An Oaxaca-Blinder decomposition enables us to determine whether the different observable characteristics of the graduates can help explain a part of that difference. The decomposition results are presented in Table 19.

The observed differentials between Canada and the United States vary from 27% to 40% (although the approximation of a log difference by one percent becomes less good when the deviation is high). The explicative variables of our model explain from 27% to 34% of that differential, or about one third. The rest cannot be explained by the different variables of the model and is due to differences in returns to those variables, i.e., to factors that cannot be explained by our regressions. The remaining differential, the so-called unexplained differential, thus remains in the order of 0.196 to 0.266 log points. It is difficult to distinguish any progression between the cohorts, except perhaps that the differentials seem to be slightly higher after two years than after five years (0.391 and 0.404 versus 0.269 and 0.360 in the total differentials, the same finding for the explained and unexplained differentials).

The factors explaining the differential include level of education, which explains up to 11 percentage points of differential; occupation, which explains from 2 to 4 points of differential; and overqualification, which explains from 1 to 2 points. Field of study had a negative effect, albeit small, for the cohorts of 2000 and 2005. That negative effect means that graduates in Canada are overrepresented in fields with higher earnings. The same holds true for permanent employment: that characteristic works in Canadians' favour, which is not surprising considering the nature of jobs in the United States.

Few clear findings emerge for the unexplained differential, i.e., differences in returns, apart from the role of industry, which would appear to have a strong, significant effect. That would indicate that workers in Canada obtain better returns from their industries.

Table 19: Decomposition of hourly wage differentials between graduates living in the United States at the time of the survey and those living in Canada – Oaxaca-Blinder method

	2000 (Class of 1995) (1)	2002 (Class of 2000) (2)	2005 (Class of 2000) (3)	2007 (Class of 2005) (4)	(1), (3) and (4) combined[a] (5)
Average hourly wage					
United States	3.163*** (0.031)	3.223*** (0.022)	3.431*** (0.024)	3.379*** (0.024)	3.342*** (0.017)
Canada	2.894*** (0.006)	2.832*** (0.004)	3.071*** (0.005)	2.975*** (0.004)	2.983*** (0.003)
Observed differential	0.269*** (0.031)	0.391*** (0.022)	0.360*** (0.024)	0.404*** (0.025)	0.359*** (0.017)
Explained differential	0.073*** (0.015)	0.126*** (0.011)	0.106*** (0.013)	0.137*** (0.014)	0.116*** (0.008)
Unexplained differential	0.196*** (0.027)	0.265*** (0.022)	0.255*** (0.024)	0.266*** (0.026)	0.243*** (0.017)
Explained differential					
Level of education	0.053*** (0.006)	0.089*** (0.005)	0.099*** (0.006)	0.113*** (0.007)	0.089*** (0.004)
Field of study	0.014** (0.005)	-0.009* (0.004)	-0.019*** (0.006)	-0.009 (0.005)	-0.009** (0.003)
Age	-0.017*** (0.003)	-0.006* (0.003)	-0.004 (0.003)	0.007* (0.003)	-0.001 (0.002)
Woman	0.017*** (0.004)	0.007*** (0.002)	0.011*** (0.002)	0.006*** (0.002)	0.011*** (0.001)
Occupation	0.019*** (0.005)	0.039*** (0.005)	0.025*** (0.005)	0.018*** (0.004)	0.022*** (0.003)
Industry	0.011 (0.006)	0.008* (0.004)	-0.003 (0.005)	0.004 (0.005)	0.003 (0.003)
Overqualified	0.006* (0.003)	0.021*** (0.002)	0.012*** (0.003)	0.021*** (0.003)	0.014*** (0.002)
Permanent employment	-0.020*** (0.005)	-0.012*** (0.003)	-0.005* (0.002)	-0.017*** (0.003)	-0.010*** (0.002)
Canadian, by birth	0 (0.001)	-0.003 (0.002)	-0.003 (0.001)	-0.012*** (0.004)	-0.004*** (0.001)
Mother tongue	0.003 (0.004)	-0.004 (0.002)	-0.003 (0.002)	-0.003 (0.003)	-0.001 (0.002)
Province of educational institution	-0.009* (0.004)	-0.003 (0.003)	0.002 (0.003)	0.008** (0.003)	0.003 (0.002)

Marital status	-0.006* (0.003)	-0.003* (0.001)	-0.005* (0.002)	0.001 (0.001)	-0.003** (0.001)
Class (cohort)					0.002 (0.002)
Unexplained differential					
Level of education	-0.003 (0.017)	-0.02 (0.018)	-0.022 (0.022)	0.040** (0.014)	0.009 (0.01)
Field of study	0.014 (0.03)	0.033 (0.023)	0.002 (0.019)	0.025 (0.018)	0.015 (0.013)
Age	0.82 (0.572)	-0.629 (0.464)	0.247 (0.551)	-1.900*** (0.352)	-0.261 (0.344)
Woman	-0.008 (0.021)	0.002 (0.017)	-0.014 (0.019)	0.029 (0.015)	-0.019 (0.014)
Occupation	0.085* (0.036)	-0.027 (0.024)	0.013 (0.025)	0.016 (0.027)	0.006 (0.017)
Industry	-0.007 (0.036)	-0.103*** (0.028)	-0.123*** (0.035)	-0.149*** (0.029)	-0.066*** (0.02)
Overqualified	0.029 (0.016)	0.016* (0.007)	-0.004 (0.008)	-0.01 (0.007)	0.0 (0.007)
Permanent employment	0.02 (0.047)	-0.016 (0.035)	0.072 (0.04)	0.034 (0.018)	0.055* (0.024)
Canadian, by birth	0.167* (0.078)	-0.046 (0.041)	0.046 (0.05)	0.039 (0.03)	0.079** (0.03)
Mother tongue	0.001 (0.041)	0.124* (0.054)	0.158** (0.054)	0.196*** (0.048)	0.033* (0.016)
Province of educational institution	-0.028 (0.019)	-0.054*** (0.016)	0.009 (0.017)	-0.024 (0.015)	-0.003 (0.01)
Marital status	-0.041 (0.027)	0.065 (0.04)	0.037 (0.059)	0.037 (0.04)	0.025 (0.028)
Class (cohort)					0.004 (0.003)
Constant	-0.853 (0.591)	0.92 (0.489)	-0.166 (0.539)	1.933*** (0.37)	0.367 (0.35)

Note:

Employees only. Robust standard errors are in parentheses.

[a] In this model, the wage is expressed in 2007 constant dollars.

* p<0.10, ** p<0.05, *** p<0.01

6. Conclusion

In this study, we examined the problem of the brain drain from Canada, i.e., the emigration of the most highly educated and most productive individuals to the United States, possibly seeking better work opportunities and/or higher salaries. We tried to answer three main questions based on the data from the National Graduates Survey. First, we sought to provide a descriptive overview of the situation among Canadians post-secondary graduates of the classes of 1995, 2000 and 2005. Second, we modelled the decision to live in the United States, and the decision to leave and then return to Canada. Finally, we examined the wage determinants among post-secondary graduates, both those living in the United States and those living in Canada. We also sought to decompose the wage gap between the two countries using various explicative factors.

Our first finding is that the brain drain remains marginal, overall: for the three cohorts examined, at most 2% of the graduates lived in the United States at the time of the survey. Moreover, that proportion seems to decrease over time. The latest available figures indicate that only 1.07% of graduates of the Class of 2005 lived south of the border in 2007. We also observed that many of the graduates who moved to the United States return or have the intention to return to Canada shortly afterwards. For example, between 2000 and 2005, we estimate that just over 10,000 graduates from the cohort of 2000 moved to the United States, but some 4,800 of them returned to Canada. Moreover, 61% of the graduates of 2000 living in the United States in 2005 intended to return to the country.

Nevertheless, the overview masks some important differences for some dimensions, including level of education and field of study. Indeed, the likelihood of a PhD moving to the United States is 7 to 16 percentage points higher than for a college graduate. The higher an individual's level of education, the more likely that individual is to move to the United States. With regard to field of study, the fields of Mathematics, computer and information sciences and architecture, engineering and related technologies consistently stand out as fields for which there is a strong likelihood of moving to the United States. The field of physical and life sciences, and technologies also stands out for the classes of 2000 and 2005.

A number of other factors have a statistically significant effect on the likelihood of moving to the United States, albeit less strong than level of education and field of study. Notably, having Canadian citizenship, being Francophone, and having a disability, are all factors that reduce mobility. The effect of the province is mitigated, at least in the econometric analyses: it seems that graduates from the Atlantic provinces are more inclined to leave the country, but the effect varies little for the other provinces. That holds true even for Quebec, which shows no significant difference from the non-Atlantic provinces, at least when the effect of mother tongue is controlled for.

For the cohort of 2000 in 2005, we modelled the return to Canada for those who had moved to the United States. Unfortunately, no factor emerged as statistically significant. The model was computationally demanding, and the number of graduates (in our samples) who returned to Canada was relatively low. It did emerge, however, that graduates who left for schooling-related reasons are more likely to return to Canada than those who left for work-related reasons, while those with a high-level degree are less inclined to return to Canada.

Almost half of the graduates who moved to the United States for work-related reasons said they were attracted by higher salaries. The average hourly wage is indeed higher in the United States, in the order of 27% to 40%, depending on the year examined. Our multivariate analysis confirms that after controlling for a series of customary explicative factors, e.g., age, gender, occupation, industry, field of study and others, a differential remains varying between 0.196 and 0.266 log points, i.e., around one third of the differential can be explained. We also found that graduates who returned to Canada after living in the United States earn on average up to an 18% higher hourly wage than those who stayed at home. This means that their stay in the United States makes Canadian workers more productive. As a result, Canada benefits from its graduates' mobility. However, it is not known whether that benefit offsets the loss associated with the permanent or extended departure of other graduates.

What can we conclude from such an analysis? It seems that the brain drain is specific to high-level graduates and to some cutting-edge sectors, and that they earn substantially more in the United States than in Canada. But we also noticed that the Class of 2005 seemed less attracted to the United States, and that many of those who leave return after a short

stay in the United States. In that sense, the loss of human capital to south of the border is not permanent, but rather a temporary situation, at least in part. Our analysis does not allow us to qualify the effect that such flows of workers have on well-being. For example, since so many graduates return after just a few years, we may well ask whether that would not have had a beneficial effect in the long term, in terms of creativity, innovation and networking, despite a temporary loss in productivity when the most high-performing elements of society leave the country for a few years' time.

In examining the earnings differences between Canada and the United States, we used the concept of purchasing power parity between the two countries to compare amounts in American dollars with those in Canadian dollars. A more advanced study might focus more directly on the effect of taxation, as raised in Iqbal (2000), Wagner (2000), and Hunt and Mueller (2007), which we mentioned in our literature review. In fact, rather than just comparing what a dollar earned in the United States can buy versus a dollar earned in Canada, one would need to determine what a dollar after taxes can do for an individual on both sides of the border. However, using after-tax income gives one part of the equation: to compare financial well-being in both countries, one would also need to find a way to account for differences in public services provided, notably health care, and to determine how services and taxation affect people differently at various points of income distribution. The situation is complex, and a future study that sought to incorporate those elements would be of great interest for guiding public policy. It is also noteworthy that the NGS data do not contain any information on after-tax income. It might be worthwhile for Statistics Canada to add a question in that connection.

Finally, while the United States is clearly attractive to our graduates, by virtue of its geographic proximity, language, size of economy and trading relations with Canada, it is noteworthy that there are other destinations that can attract our best and brightest. Apart from traditional destinations like European countries, these include China and India, two emerging economic powers that may one day compete strongly for our talents, especially for those who have roots in those countries. The National Graduates Survey makes it possible to track Canadian graduates only to the United States. It will therefore remain difficult to quantify the brain drain when it does not flow due south.

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APPENDIX

Table A1: Purchasing power parity and Canada/United States exchange rates

	2000	2002	2005	2007
Purchasing Power Parity[*]	1.210976	1.222309	1.210105	1.224487
$U.S./$CAN Exchange Rates[**]	1.485202	1.570360	1.211632	1.074781

Sources:

(*) OECD – PPP for actual individual consumption

(http://stats.oecd.org/Index.aspx?datasetcode=SNA_TABLE4).

(**) Bank of Canada – Annual average exchange rates

(http://www.bankofcanada.ca/rates/exchange/exchange-rates-in-pdf/)