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## ***Communiqué***

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### ***“Brain drain” real, costly, says C.D. Howe Institute study***

The “brain drain” of talented Canadians to the United States is both real and costly, finds a C.D. Howe Institute Commentary published today. The causes of this brain drain are not well established beyond anecdotal evidence, but they are likely complex, the study says. They involve the “push” factor of Canadian university graduates not finding suitable work in this country, the “pull” of higher after-tax earnings in the United States, and greater ease of movement between the two countries as a result of free trade and changes to US immigration regulations.

The study, *Canadian Human Capital Transfers: The United States and Beyond*, was written by Don DeVoretz, Co-Director, and Samuel A. Laryea, Senior Researcher, of the Centre for Research on Immigration and Integration in the Metropolis, Simon Fraser University.

DeVoretz and Laryea note that trends in Canadian emigration patterns in the 1990s suggest an increasing cause for concern. For example, the number of managers, doctors, scientists, and nurses emigrating from Canada to the United States in 1993/94 (net of comparably skilled US immigrants to Canada) represent the equivalent of 18, 14, 14, and 40 percent, respectively, of the 1991 Canadian graduating class in their disciplines. In addition, the authors point out, Canadian professionals and managers living in the United States tend to be more recent emigrants and to earn more than US immigrants in similar occupations living in Canada.

The cost to Canada of this outmigration can be severe, the authors say. They estimate the net value of the movement of Canadian professionals and managers to the United States (after subtracting for US immigrants to Canada) over the 1982–96 period, as measured by the total value of education embodied in these emigrants, to be \$6.6 billion (in 1993/94 dollars). This includes a net \$3.7 billion worth of publicly funded postsecondary education, which effectively represents a subsidy by Canadian taxpayers to the United States during that period.

Furthermore, the authors show, one cannot assume that the emigration of skilled and professional people to the United States can be replaced one for one without cost by immigrants to Canada from other countries. While a “balance-of-trade” approach to immigrants shows that Canada is actually a net recipient of skilled immigrants worldwide (that is, when countries other than the United States are included), this does not take into account the potential high “churning” costs for the Canadian economy of having to replace emigrants. These costs arise, the authors say, because the skilled Canadian emigrant to the United States typically almost

immediately begins to earn more in his or her new country, while the typical skilled immigrant to Canada takes years to attain his or her full earnings potential.

Indeed, the authors draw parallels between the Canadian experience of recent years and the well-documented 1896–1911 period, during which there was a similar apparently paradoxical situation of both high emigration from and high immigration to Canada, accompanied by little growth in domestic per capita income.

If a broad “balance-of-payments” approach to immigration flows is taken — one that includes the value of embodied education, administrative and settlement costs, and the notional churning costs that would arise if emigrants were simply being replaced by immigrants — then Canadians cannot take a benign view of outflows to the United States or elsewhere.

The authors note that there is no consensus on an explanation for the trend in skilled out-migration to the United States. But key factors consistent with the findings of this study, include the mismatch between Canada’s publicly subsidized education system and labor market opportunities in this country (a “push” factor) and the higher pre- and after-tax returns that skilled and professional emigrants earn on average in the United States (a “pull” factor). Furthermore, recent changes to US immigration rules and the easier movement of skilled personnel made possible by provisions of the Canada-US and North American Free Trade Agreements have accelerated the flow of Canadian managers and professionals to the United States in the 1990s.

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## **Communiqué**

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### ***L'exode des cerveaux est non seulement réel mais coûteux, affirme une étude de l'Institut C.D. Howe***

L'exode des cerveaux, soit l'expatriation de Canadiens pleins de talent vers les États-Unis, est non seulement réel mais coûteux, établit un Commentaire de l'Institut C.D. Howe publié aujourd'hui. Seules des données non scientifiques donnent les raisons de cet exode, mais ces dernières sont probablement complexes, indique l'étude. Elles comprennent entre autres, le facteur d'incitation des diplômés des universités canadiennes qui ne trouvent pas d'emploi approprié au pays, le facteur d'attraction de la rémunération nette d'impôt qui est plus élevée aux États-Unis, et une circulation plus libre entre les deux pays en raison du libre-échange et des modifications apportées à l'immigration aux États-Unis.

L'étude, intitulée *Transferts du capital humain au Canada : les États-Unis et au-delà*, est rédigée par Don DeVoretz, codirecteur, et Samuel A. Laryea, chercheur principal du Centre for Research on Immigration and Integration in the Metropolis, à l'Université Simon Fraser.

MM. DeVoretz et Laryea soulignent que les tendances observées par l'évolution de l'émigration au cours des années 90 soulèvent de plus en plus d'inquiétude. À titre d'exemple, le nombre de gestionnaires, de docteurs, de scientifiques et d'infirmières qui ont émigré du Canada vers les États-Unis en 1993-1994 (déduction faite des immigrants américains aux compétences comparables vers le Canada) représentait respectivement 18 %, 14 %, 14 %, et 40 % du nombre de nouveaux diplômés canadiens dans ces disciplines en 1991. De plus, ajoutent les auteurs, les professionnels et les gestionnaires canadiens qui vivent aux États-Unis sont des émigrants de plus fraîche date et qui gagnent plus que les immigrants américains exerçant des professions comparables au Canada.

Le coût de cette migration pourrait s'avérer élevé pour le Canada, affirment les auteurs. Ils estiment notamment que, au cours de la période de 1982 à 1996, la valeur nette du mouvement des professionnels et gestionnaires canadiens vers les États-Unis (déduction faite des immigrants américains au Canada) se montait à 6,6 milliards de dollars (en dollars de 1993-1994), calculée en fonction de la valeur totale de l'éducation dont étaient pourvus ces émigrants. Ce montant comprend une somme nette de 3,7 milliards de dollars d'éducation postsecondaire financée par les fonds publics, ce qui se traduit par une subvention des contribuables canadiens envers les États-Unis durant cette période.

De plus, indiquent MM. DeVoretz et Laryea, on ne peut présumer que l'émigration des travailleurs professionnels et qualifiés vers les États-Unis puisse être remplacée en quantités égales et sans coût par des immigrants provenant d'autres pays. Bien qu'une conception de la « balance commerciale » des immigrants démontre que le Canada est en fait un bénéficiaire net d'immigrants qualifiés du monde entier (c'est-à-dire lorsqu'on englobe les pays autres que les États-Unis), on ne tient pas compte des coûts probablement élevés de « barattage » que comporte pour l'économie canadienne le remplacement des émigrants. Selon les auteurs, ces coûts se produisent parce que l'émigrant canadien qualifié vers les États-Unis commence presque aussitôt à gagner plus dans son nouveau pays, tandis que l'immigrant qualifié moyen qui s'établit au Canada doit attendre plusieurs années avant d'atteindre sa pleine valeur de rémunération.

En fait, les auteurs établissent un parallèle entre l'expérience canadienne de ces dernières années et la période bien documentée de 1896 à 1911, durant laquelle on a constaté une situation similaire et paradoxale d'émigration et d'immigration élevées, conjuguée à une croissance presque inexistante du revenu par habitant au pays.

Si l'on adopte une optique large de la « balance commerciale » pour ce qui est des flux d'immigration — c'est-à-dire une optique qui tient compte de la valeur des coûts incorporés d'éducation, d'administration et d'établissement, et les coûts théoriques de barattage qui découlent d'un simple remplacement des émigrants par des immigrants — on parvient à la conclusion que les Canadiens ne peuvent se permettre d'être indifférents à l'égard de l'exode vers les États-Unis ou ailleurs.

Les auteurs soulignent qu'il n'existe pas de consensus quant à une explication pour la tendance de la migration des personnes hautement qualifiées vers les États-Unis. Mais parmi les facteurs clés qui sont conformes aux constatations de l'étude, figurent notamment les suivants : l'inégalité qui existe entre le système d'éducation subventionné par l'État et les débouchés du marché de l'emploi au pays (un facteur d'incitation), et les rémunérations plus élevées tant avant qu'après impôt que les émigrants professionnels et qualifiés touchent en moyenne aux États-Unis (un facteur d'attraction). De plus, les récentes modifications apportées aux règles d'immigration aux États-Unis et la circulation plus libre du personnel qualifié qui a été rendue possible grâce aux dispositions de l'Accord de libre-échange entre le Canada et les États-Unis et de l'Accord de libre-échange nord-américain ont accéléré le flux des gestionnaires et des professionnels canadiens vers les États-Unis au cours des années 90.

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## Canadian Human Capital Transfers:

### The United States and Beyond

by

*Don DeVoretz  
and Samuel A. Laryea*

Today many groups, including the media, often discuss a brain drain from Canada to the United States.

The particular concern is the migration of highly skilled individuals who embody many years of education, mostly at the expense of their home country. Although differences in US and Canadian data-keeping categories make accounting difficult, the net annual outflow of Canadian managers and professionals to the United States between 1990 and 1996 increased by 50 percent compared with annual flows between 1982 and 1989.

The cost of this bilateral flow can be measured in several ways. The most extensive — and perhaps fairest — takes account of society's replacement costs: the taxpayer subsidy embedded in human capital, mostly from education. For 1994 alone, the net loss from emigrating managers, scientists, teachers, and other

professionals was \$651 million.

Bilateral flows between Canada and the United States do not, however, provide a complete picture since Canada is a net recipient from other countries. But to the extent that the outflow of highly skilled Canadians needs to be replaced by immigrants from the rest of the world, this rotation is not costless. Its price to Canadian society comprises administrative and settlement costs plus a deadweight productivity loss (because the earnings of foreign-born workers average less than those of their Canadian counterparts). The "churning costs" of replacing all the managers, scientists, and health sciences professionals who left from 1989 to 1996 could have totaled \$11.5 billion. Adding in the net educational transfer of \$0.3 billion for the corresponding group of emigrants to the United States, the brain drain is real and costly.

## *Main Findings of the Commentary*

- Migration between Canada and the United States has been occurring since colonial days. Concerns about this flow arise only when it likely has detrimental effects — when, for example, the flow of highly skilled individuals is mostly one-way and the cost of replacing their embedded human capital (mostly education) is high.
- For about a quarter-century starting in 1965, heavy net immigration to Canada, first from the United States and then from the rest of the world, resulted in a substantial brain gain for Canada in the form of highly educated individuals.
- In the 1990s, however, structural changes in the Canada-US economic relationship have increased the net outflow to the United States. The 1990–96 period saw rises in every general category of southbound emigrants (managers, professionals, and both skilled and unskilled workers). Almost two-thirds of the increase was in managers and professionals, the most highly trained groups and the ones on which this paper focuses.
- Some people claim that most of this rise merely reflects an increase in intra-company temporary transfers under the North American Free Trade Agreement. But changes in US immigration rules make such transfers a back door to permanent emigration for many Canadians.
- Because the concern is loss of value to the Canadian economy, the paper emphasizes a “balance-of-payments” approach to analyzing the bilateral flow of human capital. For the most part, that capital is measured in terms of embodied higher education, provided largely at taxpayers’ expense, although some consideration is also given to basic (primary and secondary) education. Data limitations preclude attention to other kinds of training.
- For managers and professionals in fiscal year 1993/94 alone, the bilateral flows meant a net loss to Canadian taxpayers of \$651 million. That amount included \$414 million worth of postsecondary education, the equivalent of Simon Fraser University’s operating budget for two and a half years.
- For managers and professionals during the entire 1982–96 period, the net loss to Canadian society was \$6.7 billion.
- In head counts, immigrants to Canada do, of course, replace the loss of emigrants to the United States. But new immigrants, as well as contributing their human capital, impose administrative and settlement costs for themselves and their families, and deadweight productivity losses (because the earnings of foreign-born workers average less than those of their Canadian counterparts). If all the managers, scientists, and health science professionals who left for the United States between 1989 and 1996 had to be replaced, these “churning costs” for the Canadian economy could have totaled \$11.8 billion.



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**T**he movement of Canadians to the United States and of Americans to Canada has a long history. Loyalists and blacks moved north of the border to avoid persecution in the eighteenth and nine-teenth centuries. In the early twentieth century, large-scale Canadian emigration to the northeastern United States occurred as a byproduct of that period's large European immigrant inflows to Canada; smaller, countervailing flows of Americans came to the Canadian prairies and British Columbia. In the 1930s, both countries closed their borders by immigration legislation, reflecting the poor economic conditions of the time.

No substantial crossborder movement occurred until the mid-1950s. This time it was largely one way — from Canada to the United States. This decade-long movement earned the sobriquet *brain drain* since it consisted largely of highly skilled Canadians emigrating to the United States. US legislation effectively halted this flow in 1965. But almost immediately, a robust Canadian economy, unpopular US military adventures, and a Canadian policy of tax rebates to skilled immigrants rekindled a one-way northward flow of highly skilled Americans between 1965 and 1972. Then, the two countries entered another nearly 20-year period of quiescence with no substantial crossborder movement. In the interim, Canada fine-tuned its immigration policy, searched the world with its much-imitated points system, and experienced a substantial brain *gain* from Europe and the Third World. Thus, for about a quarter-century, Canadians were not worried about losing workers since the movement was one-way.

Recently, however, the debate on a brain drain has re-emerged. Is it much ado about nothing? Is it media hype? Do the numbers justify the term *brain drain*? Does the outflow of skilled workers indicate fundamental dis-equilibrium in the Canadian labor market? Is this country losing its competitive edge in

knowledge-intensive industries because of its tax structure, slow job growth, ill-conceived educational policies, or for all of these reasons? Much research is still needed, and this study attempts only to provide some pieces of the puzzle.

Nevertheless, coalitions are already forming on the incipient debate. Some schools — such as Sheridan College, the University of Waterloo, and Simon Fraser University — and many knowledge-based firms report a substantial exodus of recent graduates, faculty, and other skilled workers to the United States. High-technology industries often argue not only that they are losing the highly skilled but that Canada's current immigration policy is not providing them with skilled replacements. Positions have been staked out in what we term *the politics of the brain drain*.

Other Canadian firms, especially those that are major participants in trade related to the North American Free Trade Agreement (NAFTA), see the crossborder movement to the United States as either benign or beneficent. That highly skilled Canadians go south at the behest of these outward-looking firms seems a small part of a larger puzzle. These temporary movers are expected to return to Toronto, Vancouver, or Dorval with new skills to make their firms more efficient competitors in the global economy. And these NAFTA-oriented firms add another part to the puzzle when they import their US employees to the Canadian home office, on a short-term basis, for training in the Canadian context. Thus, the crossborder movement appears to be an almost seamless web that benefits all employees with higher pay and both economies with more culturally sensitive and productive employees. Hence, this vision includes no brain drain (if the Canadians return), just a mutually beneficial human capital transfer.

What of the other, less benign views? For Canadian taxpayers and some university presidents, the movement of postsecondary gradu-



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ates has become an irksome problem since the flow of resources is largely one-way. Canadian scholars and recent graduates surf the Internet and listen to glowing reports from colleagues and friends who have recently emigrated to the United States. Lack of entry-level jobs, inadequate research facilities, and lower income in their own country allegedly induce Canadian engineers, scientists, and young scholars to leave, and the cost of this movement is only partially compensated by returns.

The vision here is not the world of the seamless web of intracompany transfers. In fact, the losers are Canadian taxpayers. They subsidize each highly skilled mover during his or her education period in Canada under the implicit contract that graduates will remain in the country to pay for the next generation. This chain of financing education is broken each time a highly skilled Canadian disappears to Houston, New York, or Tucson.

Canadian taxpayers are, of course, a diffuse group and university presidents are largely reticent. Hence, this coalition is under-represented in the debate.

Other critics of the brain drain fill the vacuum. They range from those who claim that Canada's high marginal tax rates accelerate the outflow of Canadians, to academics with more complex arguments. Many of the latter are economic growth theorists who have argued in the past ten years that the collapse in Canada's productivity can be partially attributed to the country's inability to gain a strategic and early advantage in the high-tech field. The ingredients in a growth-advantage recipe include an expansion of higher education, retention of skilled graduates, and importation of the highly skilled from abroad. According to this view, Canada in the 1990s is losing these strategic components; recent graduates are leaving, leading scholars are moving, and the country's ability to attract qualified replacements through immigration has been eroded.

In sum, the resurgence of Canadian-US bilateral movement is a complex issue with both short-term (public finance) and long-term (economic growth) consequences. It is not, as some suggest, just a simple matter of a cross-border head count. Rather, it is the underlying short- and long-run economic costs of this transfer that concern us in this paper.

This *Commentary* is divided into three main sections. The first looks at the brain trade from what we call a balance-of-trade perspective: the raw migration numbers between Canada and the United States. The second section takes a balance-of-payments approach, which entails valuing the private and public costs of migration. The final section looks at some of the economic motivations for Canadians' moving to the United States, paying particular attention to the subsidy that movers receive in the form of subsidized education.

Note that, unless otherwise specified, all data are Canada-US flows — they do not account for immigration from or to other countries.

## Balance of Trade

What we term the *balance-of-trade approach* is simply an accounting of the inflows and outflows from a country. But even simple head counts raise several definitional and conceptual problems.

The first is to rigorously define a skilled migrant. Grubel and Scott define a skilled migrant as "a person who has the intention of holding permanent employment in a country other than the one in which he was educated up to a specified high level."<sup>1</sup> We too define a *permanent mover* or *immigrant* as a person who has the "intention of holding permanent employment." But many Canadian emigrants to the United States do not actually know *ex ante* whether they intend to stay there, given the ease of return (see Box 1).

In addition, any analysis of the brain drain issue is handicapped by the absence of com-

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**Box 1: *Canadian Movers to the United States: Temporary or Permanent?***

Specifying whether Canadians who move to the United States have left the country temporarily or permanently is difficult for two reasons.

First, individuals may maintain Canadian citizenship while resident in the United States, thus easing their return to Canada.

Second, many US temporary residence permits can be easily converted to permanent status. Indeed, as we demonstrate later in the text, changes in the rules for these permits have almost certainly increased Canadian migration southward.

Before 1990, Canadian professionals could be granted temporary admission to the United States only under what is known as an H1-B permit, which is good for three years with a three-year extension available. After this period, the individual has to remain outside the United States for at least one year before re-applying.

The H1-B rules define a profession as an occupation that requires critical and practical application of a body of highly specialized knowledge; in practice, an individual who holds a bachelor's degree satisfies this definition. Most important — and time consuming — both the employee and the US employer must complete complex documentation proving, for example, that the ensuing employment will be temporary, that the em-

ployer has a need for a high-level employee, and, via a “labor condition application” approved by the Department of Labor, that hiring this professional employee will not adversely affect the wages or employment opportunities of US workers.

With the signing of the Canada-US Free Trade Agreement and the NAFTA, the United States has made a new temporary worker status (the TN-1 category) available to many Canadians. The application procedure for this classification under the NAFTA is much less cumbersome than that for the H1-B. The main advantage is that no labor certification application is required, which implies that neither the employer nor the employee must prove that the worker will not adversely affect a US worker. Some documentation is necessary, but no formal application from either employer or employee is required, and if the paperwork is presented in person at the border, TN-1 status may be granted within an hour.

ATN-1 is granted for one year, but it may be renewed indefinitely for one-year periods.

Some people who do not qualify for H1-B status are eligible to qualify for TN-1 status and vice-versa. In general, a person with a required bachelor's degree or license on the list of occupations covered by TN-1 is eligible for both statuses.

plete records of the movements of people into and out of Canada. Although the Canadian authorities record the number of immigrants into the country, they do not record emigrants from it. Furthermore, estimates of the return migration of Canadian citizens to their homeland are not accurate.

For these reasons, we used US administrative data to estimate gross flows of Canadian emigrants to the United States and Canadian data to estimate the flow of US immigrants to Canada. By subtracting the latter from the former, we estimated net bilateral flows.

Having to use US administrative data did, however, lead to further measurement prob-

lems in examining occupational categories. Since the United States compiles its data to meet legal requirements, it often fails to follow economists' definitions of the professions. In addition, US occupational definitions do not match those of Canada, making net bilateral comparisons by occupations difficult. Moreover, professions vary widely in their educational requirements, and the US data do not report them for each occupation. Thus, we adapted Canadian educational requirements for the relevant professions.

Finally, the place of education is often ambiguous since the data do not indicate where the education was acquired.

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## Canadian-US Human Capital Transfers, 1982–95

Several structural changes in the economic relationship between Canada and the United States during the late 1980s and in this decade have potentially increased pressures for the crossborder movement of skilled workers. First, the implementation of the Canada-US Free Trade Agreement (FTA) in 1989 and the NAFTA in 1994 facilitated trade in goods and services and opened reciprocal short-term crossborder immigration in a variety of business and professional classes. A 1997 study by Papademetriou also demonstrates that the US employment-based entry class was expanded under the 1990 *Immigration Act* to a level of 140,000, increasing the potential for more permanent Canadian emigration to the United States. In fact, he reports, an excess of openings existed in the United States for these employment-based slots, probably easing access for highly trained Canadians after 1990.<sup>2</sup> Table 1 summarizes the trends in Canadian emigration flows to the United States after 1981. For the pre-FTA period (1982–89), the average annual gross flow works out to 1,743 professionals, 985 managers, 369 skilled workers, and 1,013 unskilled workers.

The average annual flows from 1990 to 1996 increased in all four categories. The number of professionals rose by 54 percent to 2,689 per year and the number of managers jumped by 78 percent to 1,756 per year. There was a modest rise in the skilled category and a surprising doubling in the unskilled category per year.

The sharp rise in the share of unskilled Canadian immigrants in the 1990–96 period is easy to rationalize once one looks at the data for individual years. There was a massive increase in 1990, which tailed off back to the pre-1990 level by 1996. Papademetriou notes that the 1990 US *Immigration Act* explicitly reserved a fixed number of employment visas for the unskilled. Unskilled Canadians could now en-

ter through this gate.<sup>3</sup> Others suggest that the jump was a lagged flow arising from the 1988 amnesty accorded to undocumented persons (Canadians and others) living in the United States. These two legislative changes, in addition to labor market conditions in Canada *vis-à-vis* the United States, provide an intuitive explanation for the flows of unskilled Canadian emigrants southward.

Nevertheless, the key point to emphasize from Table 1 is that more than half (64 percent) of post-1990 Canadian emigrants to the United States were in either the managerial or professional categories. Since managers and professionals come closest to the definition of a skilled migrant, most of our subsequent analysis focuses on these two categories.

How do these Canadian outflow numbers compare with the pre-1965 brain drain? The number of Canadian professionals going to the United States in the 1982–96 period considerably exceeded that of 1950–63. Using the definitions and data reported in a 1965 study by Parai, we see that the emigrant outflow rose from a total of 36,147 in the 1950–63 period (an average annual flow of 2,582) to 58,611 in the 1982–96 period (an average annual flow of 3,907).<sup>4</sup> In contrast, if we compare the post-1982 flow not to the total base population but to the stock of existing technical, managerial, and skilled workers, the recent outflow is very modest. As a percentage of the professional manpower stock, Canadian emigrants in the professional and managerial categories averaged 1 percent of the 1989–96 supply, or approximately one-tenth of the ratio circa 1950–63.<sup>5</sup>

### Net Outflows

To more accurately reflect the ultimate economic impact of this crossborder movement, we calculated Table 2 to net for US immigrant movement to Canada.

Table 1: *Canadian Emigration to the United States, by Occupational Group, 1982–96*

	Professionals	Managerial	Skilled <sup>a</sup>	Unskilled <sup>b</sup>
1982	1,690	831	264	664
1983	1,627	914	343	900
1984	1,628	996	368	933
1985	1,757	928	378	1,097
1986	1,751	971	336	1,127
1987	1,848	1,122	383	1,143
1988	1,867	934	380	1,111
1989	1,772	1,187	499	1,129
1990	2,493	1,751	752	3,571
1991	2,080	1,327	539	2,709
1992	2,384	1,853	322	2,082
1993	2,916	2,022	318	2,092
1994	2,929	1,861	262	1,798
1995	2,440	1,415	176	1,512
1996	3,581	2,065	351	1,000
1982–89				
Total flow <sup>c</sup>	13,940	7,883	2,951	8,104
Yearly average	1,743	985	369	1,013
1990–96				
Total flow <sup>c</sup>	18,823	12,294	2,720	14,764
Yearly average	2,689	1,756	389	2,109
Total	32,763	20,177	5,671	22,868

<sup>a</sup> Includes workers in precision production, craft, and repair occupations.

<sup>b</sup> Includes operators, fabricators, laborers, sales, administrative support, farming, forestry, fishing, and service occupations.

<sup>c</sup> Cumulative flow for the years shown.

Source: United States, Department of Justice, Immigration and Naturalization Service, *Statistical Yearbook of the Immigration and Naturalization Service* (Washington, DC: Immigration and Naturalization Service, Office of Policy and Planning, Statistics Branch), various years.

A comparison of the gross to net numbers is revealing. The net Canadian emigrant flows for the professional and managerial categories between 1982 and 1989 were almost 6,000 and just over 4,000, respectively. In fact, for the early 1980s, the net flows for each of these groups averaged less than 1,000 per year. A dramatic shift in the net flows occurred after 1989 as US inflows declined and Canadian outflows increased markedly. The average annual net migration number nearly tripled for both professionals and managers. Net flows of skilled migrants increased more modestly.

The ratios of net to gross emigration flows for the pre- and post-1990 periods reveal even

more pronounced trends. Between 1982 and 1989, net flows from Canada to the United States for professionals and managers were only 40 percent and 52 percent, respectively, of gross flows to the United States. In other words, during this period, Canada was being substantially compensated for the crossborder movement of these people to the United States. After 1990, these ratios were 76 percent and 86 percent, respectively, indicating that little US counterflow occurred.

One can draw two conclusions from these numbers. First, aggregating gross or net flows over the 1980s and 1990s is clearly misleading since it misses the fundamental post-1988 shift

Table 2: Canadian Emigration to the United States, Gross and Net of US Immigration to Canada, by Occupational Groups, 1982-96

	Professionals <sup>a</sup>			Managers			Skilled <sup>b</sup>			Unskilled <sup>c</sup>		
	Canadian Flows to US (1)	US Flows to Canada (2)	Net Flows (3) = (1) - (2)	Canadian Flows to US (4)	US Flows to Canada (5)	Net Flows (6) = (4) - (5)	Canadian Flows to US (7)	US Flows to Canada (8)	Net Flows (9) = (7) - (8)	Canadian Flows to US (10)	US Flows to Canada (11)	Net Flows (12) = (10) - (11)
1982	1,690	1,576	114	831	616	215	264	325	-61	664	1,191	-527
1983	1,627	1,043	584	914	438	476	343	215	128	900	954	-54
1984	1,628	876	752	996	397	599	368	205	163	933	882	51
1985	1,757	797	960	928	383	545	378	195	183	1,097	908	189
1986	1,751	980	771	971	474	497	336	197	139	1,127	894	233
1987	1,848	1,067	781	1,122	542	580	383	243	140	1,143	972	171
1988	1,867	910	957	934	457	477	380	190	190	1,111	743	368
1989	1,772	927	845	1,187	476	711	499	245	254	1,129	797	332
1990	2,493	d	2,493	1,751	d	1,751	752	d	752	3,571	d	3,571
1991	2,080	834	1,246	1,327	351	976	539	182	357	2,709	659	2,050
1992	2,384	980	1,404	1,853	360	1,493	322	149	173	2,082	574	1,508
1993	2,916	999	1,917	2,022	370	1,652	318	147	171	2,092	600	1,492
1994	2,929	877	2,052	1,861	374	1,487	262	123	139	1,798	522	1,276
1995	2,440	676	1,764	1,415	332	1,083	176	72	104	1,512	245	1,267
1996	3,581	641	2,940	2,065	302	1,763	351	50	301	1,000	319	681
1982-89												
Total flow <sup>f</sup>	13,940	8,176	5,764	7,883	3,783	4,100	2,951	1,815	1,136	8,104	7,341	763
Yearly ave.	1,743	1,022	721	985	473	513	369	227	142	1,013	918	95
1990-96												
Total flow <sup>f</sup>	18,823	5,007	13,816	12,294	2,089	10,205	2,720	723	1,997	14,764	2,919	11,845
Yearly ave.	2,689	715	1,974	1,756	298	1,458	389	103	285	2,109	417	1,692
Total	32,763	13,183	19,580	20,177	5,872	14,305	5,671	2,538	3,133	22,868	10,260	12,608

<sup>a</sup> Includes professionals in the natural and social sciences, teaching, medicine and health, and the performing arts.

<sup>b</sup> Includes workers in precision production, machining, crafts, and repair and construction occupations.

<sup>c</sup> Includes operators, fabricators, laborers, sales, clerical, farming, forestry, mining, fishing, and service occupations.

<sup>d</sup> Data not available.

<sup>e</sup> Cumulative flows for the years shown.

Sources: United States, Department of Justice, Immigration and Naturalization Service, Statistical Yearbook of the Immigration and Naturalization Service (Washington, DC: Immigration and Naturalization Service, Office of Policy and Planning, Statistics Branch), various years; Canada, Department of Citizenship and Immigration, Immigration Statistics (Ottawa: Supply and Services Canada), various years; plus special tabulations.



Table 3: *Flow of Canadian Non-Immigrant Professionals and Their Families to the United States under the FTA and the NAFTA, 1989–96*

	1989	1990	1991	1992	1993	1994	1995	1996
	<i>FTA</i>							
Professionals	2,677	5,293	8,123	12,531	16,610			
Spouses and children	140	594	777	1,271	2,386			
	<i>NAFTA</i>							
Professionals						19,806	23,904	26,987
Spouses and children						5,535	7,202	7,694

Note: Admissions under the FTA began January 1989 and ended December 31, 1993. Admissions under the NAFTA began January 1, 1994.

Source: United States, Department of Justice, Immigration and Naturalization Service, *Statistical Yearbook of the Immigration and Naturalization Service* (Washington, DC: Immigration and Naturalization Service, Office of Policy and Planning, Statistics Branch), various years.

in trends. Second, both push and pull forces were operating, simultaneously lowering US immigration to Canada and increasing Canadian emigration to the United States after 1988.

#### The Economy and NAFTA “Temporary Workers”

One motivating factor for movement was the difference in US and Canadian economic conditions in this decade, which undoubtedly played a role in the fall in the number of US immigrants to Canada in all categories and which tempted Canadians to look southward.

Another important pull factor was the change in US immigration law as a result of the FTA and the NAFTA. According to conventional trade theory, the increased movement of goods and services under free trade should substitute for the movement of factors (in this case, people). But we contend that free trade has actually *increased* migration among Mexico, Canada, and the United States.<sup>6</sup>

In addition to making temporary status in the United States much simpler and quicker for people in many occupations to obtain (see Box 1), the new US law’s TN-1 admission status makes it easier for temporary movers to become permanent emigrants. Grasmick notes that the flexibility of the new rule affords a US

employer the opportunity to assess a Canadian employee’s performance and adaptability to the organization; if both parties are satisfied and want the arrangement to be long term, a permanent residence visa can then be obtained.<sup>7</sup>

This point is key in our analysis. It is now possible that, under TN-1 status, temporary emigration has become a back door to permanent emigration into the United States. Tables 3 and 4 shed light on this phenomenon. The number of Canadian professionals granted temporary worker status under trade agreements grew tenfold between 1989 and 1996. The numbers in Table 3 reflect nothing more than the yearly number of approvals under TN-1, but some of the rates of conversion from temporary to permanent status (Table 4) are high. For example, more than 37 percent of intracompany transfers result in permanent movement. This picture is strikingly different from the one sometimes suggested by the press or interviews of the firms themselves, which argue that NAFTA-induced movement is primarily intracompany temporary transfers.

#### *The Graduate Pool*

So far, we have not disaggregated our data by age or educational status. But to prepare for



Table 4: *Changes of Temporary Status to Permanent Residence, Canadian Non-Immigrants in the United States, 1989–96*

Category	1989	1990	1991	1992	1993	1994	1995	1996
				(percentage change)				
Exchange visitors	2.01	1.94	1.25	1.90	1.78	1.50	0.88	2.24
Intracompany transferees	13.68	12.92	7.72	30.72	31.63	27.78	22.84	37.05
Temporary workers	4.89	5.30	6.20	13.32	13.37	9.28	7.74	11.59
Students	3.02	4.09	2.78	3.16	4.16	3.81	3.94	5.82
Visitors for business	0.23	0.37	0.46	0.31	0.37	0.30	0.26	0.62
Visitors for pleasure	24.50	20.54	11.21	14.92	21.22	24.35	24.20	31.63
Fiancées	94.89	98.54	88.19	95.18	83.83	94.18	99.52	83.05

Source: United States, Department of Justice, Immigration and Naturalization Service, *Statistical Yearbook of the Immigration and Naturalization Service* (Washington, DC: Immigration and Naturalization Service, Office of Policy and Planning, Statistics Branch), various years.

our later evaluation of the role of Canada's education policy in fostering this human capital transfer, it is useful to compare the number of recent graduates relative to the number of emigrants in the various occupational categories that we have specified. Assuming a two-year time lag between the date of degree confirmation and the date of emigration — the average lead time required to actually emigrate to the United States after the graduation date — we report in Table 5 the 1991 graduates by degree and the subsequent 1993 emigration flows to the United States in order to compute ratios of the leakage.

The first point to note is that the average leakage rate is 14 percent, and the rate for managers is less than 19 percent. But these are gross leakages that do not take into account any recent US graduates who may have entered Canada. If we net for the managerial inflow in 1993, the corrected leakage for this group is now 16 percent.

In sum, for professions reported in Table 5, the net leakages range from 40 percent for nurses to 2 percent for teachers.

## Balance of Payments

Although interesting and the material of good headlines, raw migration numbers, whether

gross or not, are misleading since they offer little economic insight. Ultimately, what is important is the *value* of the transfers embodied in migrants, so we now turn to this valuation in what we term the *balance-of-payments approach*.

## The Concept

On arrival in their new country, all immigrants embody taxpayer subsidies from their country of origin in the form of education. Canada's post-1967 immigration policy encouraged skilled immigration in that it evaluated a portion of its yearly immigrant inflow based on the points system, which particularly valued education.<sup>8</sup> As Grubel and Scott note, this human capital movement does not appear in Canada's national accounts and represents an unaccounted transfer of resources from the immigrant-sending country to Canada.<sup>9</sup> Given a few assumptions, one can argue that at least the marginal cost of providing postsecondary education is a subsidy from taxpayers in migrants' home countries to taxpayers in the receiving country.<sup>10</sup> (Admittedly, human capital comes in many forms — from on-the-job training to formal schooling. Because of data limitations, this study focuses only on the for-

Table 5: *Supply of Selected Canadian Graduates, 1991, and Number of Emigrants, fiscal year 1993/94*

Field of Study	Degrees Conferred (1991)	Emigrants (1993/94)	Implicit Portion of Graduates Emigrating
		(number)	(%)
Management	14,486	2,689	18.6
Engineering	7,124	452	6.3
Science <sup>a</sup>	2,017	293	14.5
Professorial	2,947	251	8.5
Teaching	16,631	318	1.9
Medicine <sup>b</sup>	2,194	319	14.5
Nursing	2,657	1,068	40.2
Medical technicians	c	42	c
Other professionals	c	1,504	c
Total	48,056	5,390	11.2

<sup>a</sup> Includes agriculture and biological sciences, mathematics, and physical sciences.

<sup>b</sup> Excludes dental studies and research, pharmacy, and rehabilitation medicine.

<sup>c</sup> Not available.

Sources: United States, Department of Justice, Immigration and Naturalization Service, *1994 Statistical Yearbook of the Immigration and Naturalization Service* (Washington, DC: Immigration and Naturalization Service, Office of Policy and Planning, Statistics Branch); Statistics Canada, *Education in Canada, 1991-92*, cat. 81-229 (Ottawa).

mal education component of the human capital transfer.)

The key assumption to ensure the validity of these human capital measures is the presence of contemporaneous skilled-job vacancies in the receiving country. For Canada, the dominance of the points system between 1967 and 1973 ensured that jobs were available to match these human capital transfers. However, the 1976 *Immigration Act*, by easing entry requirements for the family reunification class, reduced the possibility of the job match.

Using the balance-of-payments approach, we widen our perspective by noting that replacement costs (the embodied subsidy) can be valued from the viewpoint of either society or the individual. The standard literature defines the value of human capital as either the total social costs or the total private costs. Total social costs include:

- school costs incurred by society (teachers' salaries, supplies, interest, and depreciation on capital);

- the opportunity costs incurred by individuals (that is, income foregone while in school — see Box 2); and
- incidental school-related costs (books, fees, subsistence, and so on) incurred by individuals.

Total private resource costs include the same three components except that, in the first, tuition fees paid by individuals are substituted for society's costs. Direct costs, social or private, are simply netted for forgone income.

Table 6 uses these concepts to report human capital transfers to Canada over the 1967-87 period from *all* source countries for immigrants who had obtained at least one post-secondary degree. Several patterns emerge. First, although the total human capital transfer of postsecondary education valued at social total cost was large (almost \$42 billion in 1994 dollars), more than half of this flow occurred in the first period shown (1967-73), when the dominant immigrant-screening device was the

points system. In the last period (1980–87), Canada received only \$9.5 billion of human capital (at social total cost).

Moreover, this large decline between the first and last periods is repeated for each cost concept. This timing difference is important to keep in mind.

### *The Value of the Brain Drain to the United States*

Our insistence on using a human-capital approach to consider migration flows has a long standing tradition among analysts (see Box 3). To address properly the many economic issues alluded to earlier, emigrant numbers must be converted to a valuation measure that reflects the resources embodied in the flow.

Following Coulson and DeVoretz,<sup>11</sup> we first calculated the value of the human capital transfers by the replacement-cost method for only the postsecondary portion of the emigrants' education. The rationale for this narrow definition is clear in the literature. Training for literacy or entry-level job skills confers little economic gain on the receiving country. Hence, we initially excluded lower levels of education. (Later, however, we valued all the education embodied in all Canadian emigrants regardless of schooling level to reflect more accurately the taxpayers' total subsidy.)

#### **Box 2: *The Calculation of Forgone Earnings***

In our calculations, we figured forgone earnings as follows.

First, we determined each profession's post-secondary degree requirements. For professions that require only a BA, we assumed four years of forgone earnings at the average amount for full-time, full-year high school graduates between ages 18 and 22 (as reported by Statistics Canada in the Public Use Sample Tape Individual Files, 1991 Census).

If the occupation requires an advanced degree, we followed a similar procedure except that we calculated the forgone income for the number of years required to obtain the assigned post-BA degree level.

Table 7 reports in detail the replacement-cost estimates for the 1993/94 Canadian immigration flow to the United States for nine broad occupational groups. (As noted in the table, the United States collects immigrant numbers on a fiscal-year basis; hence, we used overlapping years, expressed as 1993/94.)

Columns 2 and 3 set out the replacement values of the transferred human capital from the individual's (private direct) and society's (social direct) viewpoints. As the popular literature suggests, physicians generated the

**Table 6: *Human Capital Inflows from All Countries to Canada, 1967–87***

	Private Direct Costs	Social Direct Costs	Private Total Costs	Social Total Costs
	<i>(1981 \$ millions)</i>			
1967–73	825	6,946	7,559	12,879
1974–79	355	2,472	3,075	5,789
1980–87	341	2,343	2,986	5,552
Total	1,521	11,761	13,619	24,220
Total in 1994 \$ millions <sup>a</sup>	2,632	20,360	23,577	41,928

<sup>a</sup> Price inflated by consumer price index (all items) to 1994 Canadian dollars.

Source: R.G. Coulson and D. DeVoretz, "Human Capital Content of Canadian Immigration 1967–1987," *Canadian Public Policy* 19 (December 1993): 360.

### Box 3: *Earlier Studies of Canadian Migration to the United States*

The economist's concern over the movement of highly skilled Canadians to the United States has a long historical tradition. Dales's interpretation of Canada's first growth period (1896–1911)<sup>a</sup> relies fundamentally on the concept that European immigration to Canada pushed Canadian-born workers to the United States in search of higher wages. The major economic consequence of this first brain drain was extensive Canadian economic growth without a rise in GDP per capita income as skilled workers left for the United States and were replaced by a large number of lower-paid immigrants.

Thus, Dales points to a modern-day paradigm under which Canadian emigration to the United States may be part of a worldwide exchange of human capital for which Canada receives less-than-compensatory flows from the rest of the world. (We later refer to this productivity loss as a *churning effect*.)

Parai provides the first systematic analysis of the Canada–US brain drain circa 1950–63.<sup>b</sup> He measured the magnitude of the movement in two ways: by estimating the actual numbers and types of workers involved and by valuing professional and skilled manpower in terms of the replacement costs of the specialized education and training these workers embodied.

Parai finds that, over the 1950–63 period, a yearly average of about 9,800 professional and skilled Canadians emigrated to the United States. Nevertheless, he notes, these losses were more than offset by worldwide average annual immigration of 26,000 highly skilled workers, so Canada experienced a net brain gain. We keep in mind this lesson of calculating net flow when analyzing more modern data.

Parai also calculates the replacement costs of the human capital embodied in the form of university education. The value he estimates for all immigrants to Canada is \$391 million in 1961 dollars.<sup>c</sup> In 1994 dollars, that amount is \$2.08 billion.

Grubel and Scott examine the same period (1950–65) but from the point of view of the United States as a receiving country.<sup>d</sup> They conclude that Canada was the largest source country for the US brain gain, with engineers and scientists representing the largest share (29.8 percent) of the intake in these occupations.

They also detect a substantial bilateral flow of other skilled groups. For example, they find that there were approximately as many US-born and -trained economists teaching in Canada as there were Canadian-born and -trained economists teaching in the United States. This point again emphasizes the need to correct for bilateral flows, especially by occupation.

The 1965 US *Immigration Act*, with its hemispheric quotas and reduced skilled-entry classes, coupled with an expanding Canadian economy, effectively halted the human capital flow from Canada to the United States for the next 25 years, ending scholarly interest in this field until now.

a J. Dales, "The Cost of Protectionism with High International Mobility of Factors," *Canadian Journal of Economics and Political Science* 30 (1964): 512–525.

b L. Parai, *Immigration and Emigration of Professional and Skilled Manpower during the Post War Period*, Economic Council of Canada Special Study 1 (Ottawa: Queen's Printer, 1965).

c The estimated value of the additional university instruction, books, and facilities required to duplicate within Canada the education and training these immigrants possessed. See the notes to Table 7 for a complete definition of education costs.

d Herbert B. Grubel and Anthony D. Scott, *The Brain Drain: Determinants, Measurement and Welfare Effects* (Waterloo, Ont.: Wilfrid Laurier University Press, 1977).

greatest direct costs, both private and social. Professors and natural scientists were a close second. Nurses, medical technicians, and managers absorbed the lowest direct costs per leaver because their education cost the least.

Turning to the aggregate cost figures for the 1993/94 flow, one can see that total private direct costs or the resources paid out by individuals who subsequently emigrated to the United States totaled \$854 million for all occu-

**Table 7: Gross Human Capital Outflow to the United States at Replacement Cost, by Occupation, fiscal year 1993/94**

Occupation	Immigrants <sup>a</sup> (1)	Private Direct Cost per Student <sup>b</sup> (2)	Social Direct Cost per Student <sup>c</sup> (3)	Taxpayers' Subsidy per Student (4) = (3) - (2)	Private Total Cost per Student <sup>d</sup> (5)	Social Total Cost per Student <sup>e</sup> (6)	Aggregate Private Total Cost (7) = (1) × (5)	Aggregate Social Total Cost (8) = (1) × (6)	Aggregate Taxpayers' Subsidy (9) = (8) - (7)
	(number)	(1993/94 Canadian \$ thousands)							
Managers	2,689	62	139	77	103	180	276,440	483,192	206,752
Engineers	452	83	179	96	134	230	60,435	103,876	43,442
Natural scientists <sup>f</sup>	293	94	209	116	153	288	44,975	84,359	39,384
Professors	251	94	248	154	170	365	42,767	91,495	48,728
Teachers <sup>g</sup>	318	68	164	96	146	242	46,535	77,098	30,563
Physicians	319	119	273	154	236	390	75,299	124,354	49,055
Nurses	1,068	50	127	77	90	167	96,563	178,680	82,117
Medical technicians	42	50	127	77	90	167	3,797	7,027	3,230
Other professionals	1,504	87	164	77	127	204	191,331	306,971	115,640
Skilled laborers	318	31	70	38	51	90	16,345	28,571	12,226
Total	7,254	h	h	h	h	h	854,488	1,485,623	631,136

Note: Discrepancies in addition, down and across columns, are due to rounding.

<sup>a</sup> As reported for fiscal year October 1, 1993, to September 30, 1994, by the United States Immigration and Naturalization Service.

<sup>b</sup> Tuition plus books, fees, lodging, and food, as reported by Statistics Canada, Tuition and Living Accommodation, cat. 81-219 (Ottawa, YEAR).

<sup>c</sup> Private direct costs plus federal and provincial government expenditure per student per year.

<sup>d</sup> Private direct costs plus forgone earnings for the relevant time spent in school. All occupations require four years of postsecondary education except for engineers (five years), scientists and teachers (six years), and physicians and professors (eight years). Forgone earnings are defined as \$9,248.21 per year for those occupations requiring four years of schooling and \$17,491.29 per year beyond those four years for those occupations that require a post-BA, BBA, or BSc. Earnings are calculated from Statistics Canada, Public Use Sample Tape Individual Files, 1991 Census. To convert 1990 earnings to 1993/94 dollars, we inflated earnings using consumer price indexes for 1991 and 1993, taken from Statistics Canada, Consumer Prices and Price Indexes, cat. 62-010-XPP (Ottawa), quarterly.

<sup>e</sup> Direct costs plus forgone earnings.

<sup>f</sup> Includes natural scientists, engineers, and architects.

<sup>g</sup> Based on a two-year, post-BA education program.

<sup>h</sup> Not applicable.



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pations. More interesting than this yearly total figure is the distribution of replacement values by occupation under the private-cost concept. Managers dominated the flow of outgoing resources: more than \$276 million valued at private direct replacement costs. This high amount indicates that the relatively large number of managerial emigrants outweighed their relatively low endowment in the calculation of private total cost per student. This pattern is repeated for managers under the social total cost concept, with \$483 million of embodied educational costs flowing to the United States in 1994.

The total private or social direct costs embodied in physicians and engineers who emigrated to the United States were substantially less because there were relatively fewer movers in these categories. In fact, nurses, owing to the large volume of their emigrant outflow, sent more endowed capital to the United States in 1993/94 than either physicians or engineers. In contrast, medical technicians appear incidental in the overall valuations.

### Taxpayer Subsidies

Two important public finance conclusions can be derived from Table 7. First, the range of the estimated taxpayers' direct subsidies for 1994 (column 4) was wide: from \$154,000 for physicians and professors to only \$77,000 for managers, nurses, medical technicians, and "other" professional categories.

Second, it is apparent from a comparison of columns 3 and 4 that managers paid more of the direct costs of their postsecondary education than any other professional group. The range of taxpayers' subsidies as a percentage of the total direct costs of postsecondary education in the remaining professions varied from 39 percent for physicians and professors to 42 percent for teachers and engineers.

Column 9 reports the total taxpayer subsidy for each occupational group's total flow to

the United States in 1993/94. Given the large number of managers in that outflow, the total taxpayer subsidy was the largest for this group. Again, although nurses had one of the smallest absolute taxpayer-subsidy levels per student, they represented the second-largest number of movers in 1994; these countervailing forces resulted in a substantial taxpayer transfer to the United States of \$82 million that year. In contrast, engineers and physicians, two frequently cited categories of the brain drain, represented only 11 percent of the 1994 emigrant flow to the United States, and the dollar value of the embodied taxpayer subsidy was correspondingly low at only 15 percent of the total.

### Net Flows

Human capital flows should be based on a net concept for accurate measurement of both the public finance and productivity impacts on the economy. Table 8 reports values netted for US immigrants to Canada before we did the calculations. (Due to differing definitions of immigrant occupational groups between US and Canadian data sources, we report individually only the comparable groups. The rest of the transfer is assigned to a residual category of "professionals.")

Column 9 sets out the taxpayer subsidies for the net flows. For managers, the amount was \$178 million — 86 percent of the taxpayer subsidy based on the gross flow as reported in Table 7. For teachers and natural scientists alike, the corresponding percentages were 37 percent and 64 percent, respectively. The residual professional category provided a net transfer of human capital to the United States of \$381 million with a \$170 million subsidy from Canadian taxpayers.

In sum, the total taxpayer subsidy for all these occupations was 67 percent of the gross flow circa 1993/94 reported in Table 7. To put the value of the net flow in perspective, this



**Table 8: Net Human Capital Outflow to the United States  
at Replacement Cost, by Occupation, fiscal year 1993/94**

Occupation	Net Flow of Emigrants <sup>a</sup> (1)	Private Direct Cost per Student (2)	Social Direct Cost per Student (3)	Taxpayers' Subsidy per Student (4) = (3) - (2)	Private Total Cost per Student (5)	Social Total Cost per Student (6)	Aggregate Private Total Cost (7) = (1) × (5)	Aggregate Social Total Cost (8) = (1) × (6)	Aggregate Taxpayers' Subsidy (9) = (8) - (7)
	(number)	(1993/94 Canadian \$ thousands)							
Managers	2,315	62	139	77	103	180	237,991	415,987	177,996
Natural scientists	465	89	194	106	144	259	65,483	120,372	54,889
Professors and teachers	116	68	164	96	146	242	16,975	28,124	11,149
Professionals	1,471	89	194	106	144	259	211,239	380,789	169,550
Subtotal	4,367	b	b	b	b	b	531,687	945,271	413,584
Basic schooling	4,367	b	b	16,523	b	16,523	b	237,600 <sup>c</sup>	237,600 <sup>c</sup>
Total	4,367	b	b	b	b	b	b	1,183,871	651,184

Notes: See notes to Table 7.

<sup>a</sup> Constructed from Table 7, column 1, minus the inflow of US immigrants to Canada, by occupation.

<sup>b</sup> Not applicable.

<sup>c</sup> Calculated at 12 years of elementary and secondary schooling at the fiscal year cost of \$16,523.

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one-year outflow of taxpayer-financed human capital is the equivalent of 2.5 years of Simon Fraser University's 1996/97 operating budget, which covers an enrollment of 15,000 students.

### Elementary and Secondary School Costs

Some analysts argue that social direct costs of elementary and secondary school should be added to the cost measures since it implies a delayed but consequential taxpayer subsidy.

To calculate the amount of the taxpayer subsidy for this education (labeled "basic schooling" in the tables), we started with \$6,523, the average amount per student for fiscal year 1993/94,<sup>12</sup> and multiplied by the 12 years of elementary and secondary schooling usually required for an individual to move on to university. (Clearly, this estimate is a conservative one, as we used no compounding of the secondary and elementary costs by the real rate of interest to inflate the dollar value over the 12-year period.)

Using this estimate, we calculated that, in 1993/94, the US-bound net emigrant flow took with it a total taxpayer subsidy of approximately \$238 million in the form of elementary and secondary social direct costs, which raised the 1994 net Canadian taxpayers subsidy to \$651 million (see Table 8, column 9).

### Managers and Professionals

Managers and professionals are key to economic growth and are often mentioned in discussions of the brain drain. Thus, we looked at these two groups more closely, adding in the taxpayers' subsidies for elementary and secondary education.

Using the social cost concepts of Table 7, Table 9 reports values for the human capital flows embodied in Canadian managers who emigrated permanently to the United States between 1982 and 1996. The total social cost

they embodied was large — \$3.8 billion in 1994 dollars — with more than half of the flow occurring in the last five years of that period. Clearly, the management brain drain is a 1990s' phenomenon. (It should be carefully noted, however, that more than 57 percent of this embodied human capital was self-financed by the emigrant managers.)

Column 4 reports the yearly Canadian taxpayers' education subsidy based on 1994 costs for the total 1982–96 managerial gross emigrant flow. In total, the educational transfer in the form of taxpayer subsidies was almost \$1.7 billion (including elementary and secondary school costs) for that period.

More dramatic than this absolute amount is the structural shift in the post-1989 flow. After that year, the average annual taxpayer transfer embodied in emigrating managers was \$157.5 million, in contrast to the earlier annual average of only \$86.5 million. In other words, the value of capital embodied in Canadian emigrant managers rose during the seven years after 1989, with more capital (\$816 million) transferred in the last seven years (1990–96) than in the preceding eight (\$735 million from 1982 to 1989).

Table 10 reports the *net* human capital values transferred under the various cost concepts, all adjusted for the US managerial immigrant flow into Canada. Basically, this adjustment reduced the gross values shown in Table 9 by 33 percent. However, netting for countervailing US immigrants over the entire period would ignore a major policy shift. For the crucial free trade period of 1990–96, the Canadian taxpayers' subsidy was still 80 percent of the gross flow reported in Table 9. As already noted, few trained US managers have come permanently to Canada since 1989.

Table 11 reports the 1982–96 values of the gross and net emigrant flows for all the professional occupations except managers. The gross Canadian flow for the entire period was large:

Table 9: *Managers: Gross Human Capital Outflows to the United States at Replacement Cost, 1982–96*

	Gross Flow of Managers <sup>a</sup> (1)	Private Total Cost (2)	Social Total Cost (3)	Taxpayers' Subsidy (4) = (3) – (2)
	(number)	(1993/94 Canadian \$ millions)		
1982	831	85	149	64
1983	914	94	164	70
1984	996	102	179	77
1985	928	95	167	72
1986	971	100	174	74
1987	1,122	115	202	87
1988	934	96	168	72
1989	1,187	122	213	91
1990	1,751	180	315	135
1991	1,327	136	238	102
1992	1,853	190	333	143
1993	2,022	208	363	155
1994	1,861	191	334	143
1995	1,415	145	254	109
1996	2,065	212	371	159
Subtotals				
1982–89	7,883	810	1,416	609
1990–96	12,294	1,263	2,209	947
1982–96	20,177	2,074	3,625	1,556
Basic schooling <sup>b</sup>	20,177	<sup>c</sup>	134	134
Total gross	20,177	2,074	3,759	1,690

Note: All cost calculations per definitions found in Table 7 except basic schooling from Statistics Canada, *Education in Canada*, cat. 81-229-XPB (Ottawa, June 1997). Discrepancies in some calculations are due to rounding.

<sup>a</sup> Numbers based on the time period January 1 to December 31, yearly. Notice that the value reported in Table 7 covered a different time period (October 1, 1993 to September 30, 1994).

<sup>b</sup> Total presecondary enrollment was 5,362,799 in 1993/94 with total expenditures of \$35,724 billion, for an average expenditure per student of \$6,662.

<sup>c</sup> Not applicable.

34,578, with 20,638 moves occurring after 1989. The net flow of 16,776 was more modest.

The private and social direct costs (including elementary and secondary schooling costs) embodied in the gross professional emigrant flow to the United States (34,578) were \$5.0 billion and \$9.1 billion, respectively. As with managers, a structural shift occurred in the flow of professionals during the free trade period. Almost 60 percent of the human capital flow embodied in them for the entire 1982–96 period was transferred during its last seven years.

When we netted out the bilateral transfer of US professionals to Canada, the cumulative value of the taxpayers' subsidy declined from \$4.0 billion to \$1.9 billion. In other words, \$2.1 billion of the Canadian taxpayers' subsidy in the form of embodied educational transfers was returned during the 1982–96 period.

To better understand the dynamics of the Canadian human capital transfer, it is necessary to search for trends within the individual professions over the 1982–97 period. Appendix B provides this detail in Tables B-1 to B-10. Those tables make it apparent that, after 1988,

Table 10: *Managers: Net Human Capital Outflows to the United States at Replacement Cost, 1982–96*

	Net Flow of Managers (1) <i>(number)</i>	Private Total Cost (2)	Social Total Cost (3) <i>(1993/94 Canadian \$ millions)</i>	Taxpayers' Subsidy (4) = (3) – (2)
1982	215	22	39	17
1983	476	49	86	37
1984	599	62	108	46
1985	545	56	98	42
1986	497	51	89	38
1987	580	60	104	45
1988	477	49	86	37
1989	711	73	128	55
1990	1,413	145	254	109
1991	976	100	175	75
1992	1,493	153	268	115
1993	1,655 <sup>a</sup>	170	297	127
1994	1,487	153	267	114
1995	1,415	145	254	109
1996	2,065	212	371	159
Subtotals				
1982–89	4,100	421	737	315
1990–96	10,504	1,080	1,887	798
1982–96	14,604	1,501	2,624	1,123
Basic schooling	14,604	<i>b</i>	96	96
<i>(1993/94 Canadian \$ billions)</i>				
Total net	14,604	1.5	2.7	2.0

Note: All cost calculations per definitions found in Table 7 except basic schooling, which is based on Table 9. Discrepancies in some calculations are due to rounding.

<sup>a</sup> Calculation based on a simple average of US immigrants to Canada in the manager occupation in 1992 and 1994. See Table 2.

<sup>b</sup> Not applicable.

some professions experienced only modest transfers to the United States while a few experienced dramatic increases. A modest set of gross human capital flows of \$4 million to \$7 million a year was generated by the Canadian architects, health technologists, social scientists, and urban planners who moved to the United States. In contrast, doctors and nurses tripled the value of their embodied gross human capital flows, from an annual average of nearly \$70 million in 1987/88 to nearly \$200 million by 1996/97. Teachers and professors were the intermediate case, sending a near-constant

\$75 million in transferred capital with no discernible trends over the 1982–97 period.

In sum, the size of the Canadian net transfer at social cost to the United States for both managers and professionals over the 1982–96 period was \$6.6 billion (from column 3 in Tables 10 and 11) or almost three times the value of the last major movement during the 1950–63 period. This net flow represents the financial equivalent of an almost \$3.7 billion subsidy to the United States from Canadian taxpayers for the postsecondary training portion of Canada's 1982–96 emigrant flow.

Table 11: *Professionals: Human Capital Outflows to the United States at Replacement Cost, 1982–96*

	Net Flow of Professionals <sup>a</sup> (1)	Private Total Cost (2)	Social Total Cost <sup>b</sup> (3)	Taxpayers' Subsidy <sup>c</sup> (4) = (3) – (2)
	(number)	Gross Values (1993/94 Canadian \$ millions)		
1982	1,690	242	437	194
1983	1,627	233	421	187
1984	1,628	233	421	187
1985	1,757	252	454	202
1986	1,751	251	453	201
1987	1,848	265	478	213
1988	1,867	268	483	215
1989	1,772	254	458	204
1990	2,493	357	645	287
1991	2,080	298	538	239
1992	2,384	342	617	274
1993	2,916	418	754	336
1994	2,929	420	758	337
1995	4,255	611	1,100	490
1996	3,581	514	926	412
		(1993/94 Canadian \$ billions)		
Subtotals				
1982–89	13,940	2.0	3.6	1.6
1990–96	20,638	3.0	5.3	2.4
1982–96	34,578	5.0	8.9	4.0
Basic schooling	34,578	<i>d</i>	0.2	0.2
Total gross	34,578	5.0	9.1	4.2
		Net Values <sup>e</sup>		
1982–96	16,776	2.2	3.8	1.6
Basic schooling	16,776	<i>d</i>	0.1	0.1
Total net	<i>d</i>	2.2	3.9	1.7

Note: All cost calculations per definitions found in Tables 7 and 9. Discrepancies in some calculations are due to rounding.

<sup>a</sup> Numbers based on January 1 to December 31, yearly.

<sup>b</sup> Column 3 = column 2 × \$143,602 (per Table 6, column 5, row 5).

<sup>c</sup> Column 4 = column 2 × \$258,864 (per Table 8, column 6, row 5).

<sup>d</sup> Not applicable.

<sup>e</sup> To calculate the net flow figure, we deducted the total US flow of professionals per year into Canada and valued this amount at the average embodied human capital per professional circa 1993/94.

## Churning

A counterpoint to this theme of the brain drain is that Canada imports human capital to replace outflows to the United States. The underlying premise of this view is that there is a

one-for-one substitution between Canadian emigrants to the United States and immigrants from the rest of the world to Canada.

But what of the so-called churning costs generated by such a movement? The worldwide exchange of human capital between Can-

Canada and the rest of the world (including the United States) is not trivial. The immigrant-receiving country must absorb administrative and settlement costs for each new immigrant. In Canada, administrative costs alone (net of the right of landing fee) at the federal level were approximately \$2,400 per person in 1994, with provincial settlement costs running an additional \$2,000.<sup>13</sup>

We calculated the total administrative and settlement costs of replacing the 54,755 professionals and managers who moved to the United States during the 1982–96 period at \$241 million. This amount rose by \$747 million when we included the public settlement costs of the entire replacement professional immigrant household, the average size of which is 3.1 persons.

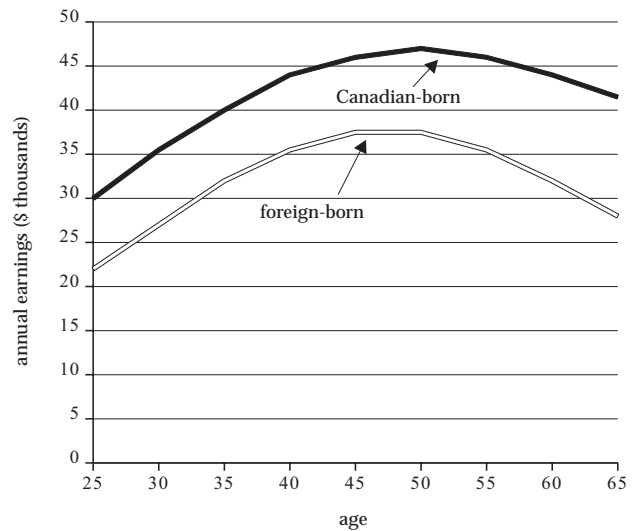
More subtle churning costs arise from the difference in the earnings of a recently arrived professional to Canada and the emigrating professional to the United States. Circa 1981, the entire post-1967 stock of professional immigrants typically took 10 to 15 years to catch up with the earnings of their Canadian-born cohorts.<sup>14</sup>

This difference between arrivers' and leavers' earning power represents one measure of the initial quality difference between Canadian emigrants to the United States and US immigrants to Canada.

Figure 1 provides data for 1991 (the most recent year for which they are available) on this earnings gap for males with 16 years of education. Clearly, there is no convergence between the earnings of a Canadian stayer and a recent stock of highly educated foreign-born males. We estimate this discounted loss at \$216,562 per professional, or \$11.8 billion assuming 54,755 replacement immigrants during the 1982–96 period (see Appendix C).

In sum, total churning costs arising from having to replace the highly skilled outflow to the United States, if such a substitution was indeed occurring, would equal \$12.5 billion.

Figure 1: *Age-Earnings Profile for Males with More than 16 Years of Schooling, 1991*



### *Balance of Trade versus Balance of Payments*

Central to evaluating the presence or absence of a Canada-United States brain drain are the twin concepts of a balance of trade in skilled immigrants — the focus of the previous section — and a balance of payments in human capital transfers — the focus of this section. With the first concept defined as the difference in the number of immigrant arrivals to Canada minus the number of Canadian emigrants, it can be refined to account for possible job mismatches in the Canadian labor market. The gross number of immigrants is scaled down to the number of net arrivals who have credentials that match Canadian market requirements on arrival.

Our values for the trade in human resources based on these adjusted numbers suggest that, for health science professionals, managers, and scientists, a slight trade surplus exists — so long as we net only for emigrant movement to the United States circa 1989–96. If we had included Canadian emigrant movement to the United Kingdom, Europe, and Asia (especially



Table 12: *Canada's Balance of Human Capital Payments: United States and Rest of World, 1989–96*

Occupation	Inflow from Rest of World	Outflow to United States	Net Flow	Net Transfer at Social Total Cost
	(number)		(1993/94 Canadian \$ billions)	
Managers	25,443	20,177	5,266	0.946
Health science professionals	4,409	7,835	- 3,426	- 0.952
Scientists	20,726	20,595	131	0.034
Subtotal	50,578	48,607	1,971	- 0.027
Educational transfer				0.027
Churning costs				- 11.500
Total cost				- 11.220

Hong Kong), this balance of trade in skilled immigrants would have been negative.

This balance-of-trade concept is, of course, incomplete since immigration incurs administrative and settlement costs as well as possible deadweight productivity losses. The benefit from the immigrant inflow is the embodied value of the education in this human capital transfer. These educational benefits minus the churning costs form the values we use in the balance-of-payments concept for human capital transfers.

To illustrate this balance-of-payments concept in the Canadian context, we present two scenarios. In scenario A, we assume that Canada received just enough skilled immigrants to compensate for the 1982–94 outflow to the United States. On the surface, the implication is that the loss of human capital valued at its social total costs was completely offset by the newly arrived human capital. Thus, without including the administrative costs and productivity losses, scenario A seems to suggest that Canada has no brain drain at all: the educational value embodied in 54,000 Canadian emigrants is offset by a similar inflow embedded of 54,000 (or more) skilled immigrants from the rest of the world.

But we have noted the necessity of adding \$216,562 to the cost of each replacement immi-

grant due to the deadweight loss in earning power plus administrative and settlement costs.

Thus, the costs to the Canadian economy of this supposedly zero-sum game of 54,000 movers would actually be about \$12.3 billion. In fact, on average, the churning costs per immigrant of \$229,000 exceed the average educational replacement value embodied in the immigrant (see Table 7) for most professions. In other words, on average, Canada receives a negative value-added per replacement professional immigrant since for most professions the loss to the Canadian economy in churning costs exceeds the value (at social total cost) of the education embodied in the immigrant.

What of the actual case at hand? In scenario B, we concentrate on the 1989–96 period of bilateral flows between the United States and Canada for the three most contentious groups: managers, health science professionals, and scientists. Table 12 reports the balance of payments of human capital transfers for this period.

When we used adjusted immigrant numbers for the three occupational groups, we obtained a slight positive inflow of 1,971 immigrants. This is the balance-of-trade measure. In particular, there was a substantial net outflow in the health sciences and a small net inflow in the sciences. For managers, the net flow to Canada was positive, owing to move-

---

ment from Asia (many individuals may have returned by 1998).

We now turn to the balance-of-payments concept. Table 12, column 4, reports the net education value at social total cost of this transfer. There was a moderate educational transfer for the sciences and a much larger transfer from the managerial inflow, but these two inflows are largely offset by the costly health sciences outflow. Thus, the worldwide educational value transfer was slightly positive.

More to the point, when we now calculate the churning costs for the inflow of 50,578 immigrants from the rest of the world, total churning costs equal \$11.5 billion. Adding to that amount the small positive educational transfer yields a negative balance-of-payments value of \$11.2 billion, even given the slight positive inflow of immigrants in these occupations circa 1989–96.

Thus, Canada's brain drain to the United States is real and costly.

## The Rewards to Moving

Having suggested that the brain drain is a balance-of-payments question, as opposed to a balance-of-trade question, we now shift our focus to economic forces that may influence the phenomenon.

Immigrants move for a variety of reasons, but the economic forces that shape this movement can be summarized as push or pull forces. Table 13 presents a snapshot of the economic and demographic characteristics of both Canadian emigrants resident in the United States and US immigrants in Canada circa 1990/91 that may have conditioned their decisions to move or stay.

Clearly, this is a picture of a stock of immigrants who arrived in either country before 1990 or 1991 and subsequently did not leave. Nonetheless, some stylized facts are self-evident. Notice the population estimates (the

last line of Table 13). Canadian professionals and managers living in the United States were more numerous than their US counterparts living in Canada.

More relevant to this study is the time of entry for these stocks. The number of Canadian professionals and managers who emigrated to the United States grew substantially over the 1980–90 period. In sharp contrast, the number of US professional and managerial emigrants in Canada experienced a substantial decline after 1980; indeed, those who arrived after 1980 represent the smallest portion of the 1991 stock in Canada.

Several attributes of the foreign-born stocks in the two countries are unexpected. Of the Canadian managers who moved to the United States, fewer than 44 percent had post-secondary degrees. (These lesser-educated managers are doubtless concentrated in the pre-1960 emigrant outflow.) And the US professionals and, to a lesser extent, managers worked substantially fewer hours in Canada than did their Canadian counterparts in the United States. In particular, US workers with professional qualifications reported only a 32-hour work week in Canada.

The income returns to working in the country of destination differed for the two resident immigrant stocks. Professionally trained Canadian emigrants in the United States earned approximately C\$10,000 more than US immigrants in the professions in Canada. Canadian managers in the United States received a smaller but still substantial premium (C\$7,400) over their US counterparts in Canada.

### *Age-Earnings Profiles and Human Capital Theory*

These stylized facts must, however, be treated with caution since we have not controlled for income-earning characteristics of the two countries' emigrant flows. We address this point in Appendix A, which presents an econometric

Table 13: *Some Economic and Demographic Variables for 20–64 Year-Olds, US and Canadian Professional and Managerial Migrants, fiscal year 1990/91*

	Professional Occupations <sup>a</sup>		Managerial Occupations <sup>b</sup>	
	Canadian Emigrants to United States	US Immigrants to Canada	Canadian Emigrants to United States	US Immigrants to Canada
Age	41.3	40.1	42.7	41.4
Weeks worked	45.6	44.2	48.7	47.5
Hours worked	40.8	32.1	43.8	38.7
Married (%)	69.3	66.8	73.7	71.5
Year of immigration <sup>c</sup>				
1980–90 (%)	26.0	20.0	21.4	19.6
1970–79 (%)	16.5	36.2	17.3	34.0
1960–69 (%)	28.0	32.5	29.5	32.9
Before 1960 (%)	29.4	11.3	31.8	13.5
Education <sup>c</sup>				
Elementary (%)	1.1	1.4	7.4	6.8
Secondary (%)	30.7	22.2	49.1	30.6
University (%)	68.2	76.4	43.6	62.6
Income variables <sup>d</sup>				
Total income (\$)	48,362	37,965	58,678	51,278
Wages and salaries (\$)	44,601	34,236	53,749	46,806
Investment income (\$)	1,821	1,176	2,676	2,357
Self-employment income (\$)	685	977	755	795
Other income (\$)	220	307	203	322
Sample size	3,209	1,264	2,589	663
Population estimate	64,180 <sup>e</sup>	41,712 <sup>f</sup>	51,780 <sup>e</sup>	21,879 <sup>f</sup>

<sup>a</sup> Includes natural sciences, engineering, mathematics, social sciences and related occupations, teaching and related occupations, medicine and health, and art, literary, and recreational occupations.

<sup>b</sup> Includes executive, administrative, and managerial occupations.

<sup>c</sup> Due to rounding, some columns of percentages do not add to 100.

<sup>d</sup> All in Canadian dollars. To convert US dollars to Canadian dollars, purchasing power parity for income variables was taken from R. Summers and A. Heston, "The Penn World Table (Mark 5): An Expanded Set of International Comparisons, 1950–1988," *Quarterly Journal of Economics* 106 (May 1991): 327–368. In 1990, that purchasing power parity value was 1.2074.

<sup>e</sup> Sample size multiplied by 20 to represent total populations.

<sup>f</sup> Sample size multiplied by 33 to represent total populations.

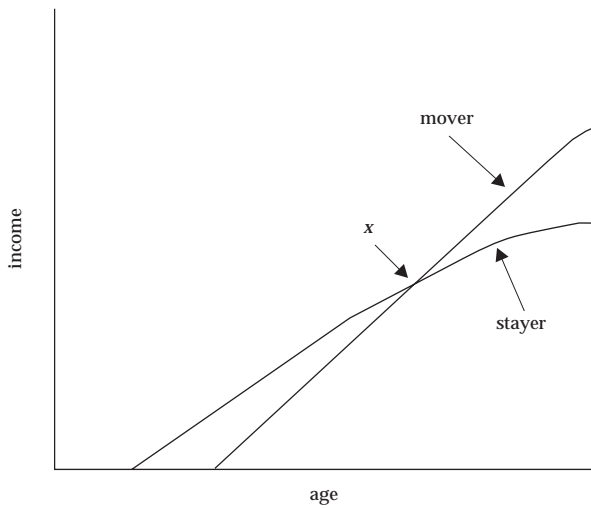
Sources: Authors' calculations from the 1991 Canadian population census (3% Public Use Sample Tapes); and 1990 US population census (5% Public Use Sample Tape).

estimation of the age-earnings profiles for professionals and managers. That analysis demonstrates that emigrating professionals reap large income gains (5 percent annually) compared with those who remain in Canada and have similar characteristics in terms of age, sex, years of schooling, and weeks of work. The same earnings differentials are not found for managers sharing similar characteristics.

Human capital theory provides a framework in which to use the estimated age-earnings profiles from Appendix A to deduce when professionals or managers in Canada would consider it economically rational to move to the United States. Figure 2 provides a sketch of this process.

The potential emigrant's incentive to move is depicted by the difference in post-movement

Figure 2: *Potential Age-Earnings Profiles for Immigrants and Non-Immigrants*



earnings after the crossover point,  $x$ , between the representative stayer and mover. In addition, the earnings function reflects the emigrant's income prospects, given his or her education in the home country as well as the assimilation process expected while resident in the receiving country (that is, the costs of acquiring additional training and knowledge in the latter's labor market). The financial and other costs of movement are depicted in Figure 2 by the low earnings of movers on arrival, which are recouped when his or her earnings in the new country exceed those of the stayer. In sum, the motivation to move is the present value of the difference in earnings before and after the crossover point  $x$  in the figure.

The central question now is, does the actual income performance of a representative Canadian mover correspond to the idealized view depicted in Figure 2? If it does, what is the rate of return to this movement, and how is it affected by the heavily subsidized Canadian educational system? In other words, does the educational subsidy accelerate the human capital transfer to the United States?

At this point, we compare the hypothetical case of Figure 2 to an estimated case. Figure 3 presents the estimated age-earnings profiles for professionally qualified Canadians in Canada (stayers) and similarly trained Canadians in the United States (movers).<sup>15</sup> Framing the question within the context of stayers and movers highlights two features well known in the literature. First, potential movers' motivation to leave is captured by the recent past performance of emigrants in the destination country. In short, the immigration decision is a distributed lagged phenomenon in which today's decision to stay or move is predicated on knowledge of the outcome of last year's mover's decision.

Second, the prospect of return or temporary migration depends on the unsuccessful outcomes of past movers. If the outcomes of movers exceed the rewards for the stayers, little return migration is likely<sup>16</sup> and the flows we observe will be permanent.

Inspection of Figure 3 indicates that the estimated age-earnings profiles for Canadian professionals yield no crossover point. Thus, on their arrival in the United States (at the av-

Figure 3: *Professional Earnings of Canadians in Canada and the United States*

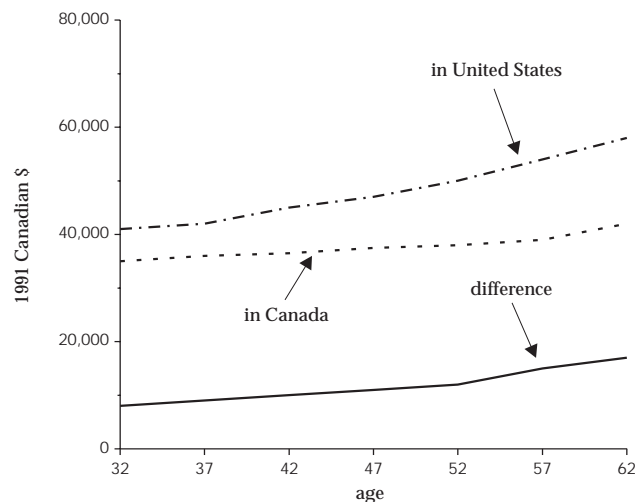
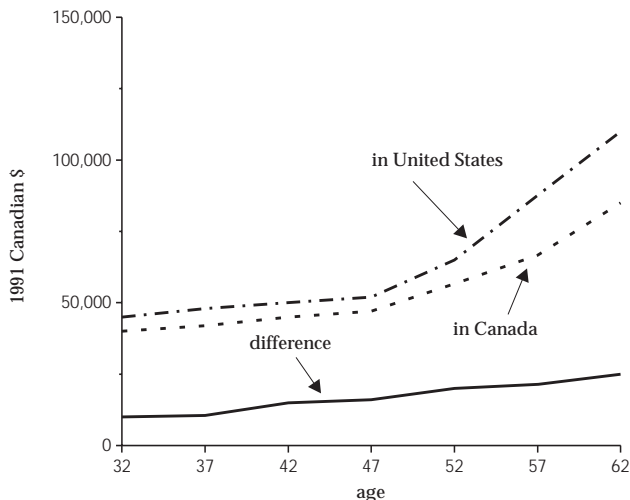


Figure 4: *Managerial Earnings of Canadians in Canada and the United States*



erage age of 32), Canadians initially and thereafter earn more than those of their cohort who have stayed in Canada. Hence, when calculating the present value return, there exists no forgone loss in income, as theory might predict.

Similarly, Figure 4 reproduces the projected age-earnings patterns for Canadian managers who moved to the United States and those who stayed in Canada. Again, Canadian movers dominate the stayers' earnings, indicating that, unless the costs of movement or adaptation are extraordinarily large, the present value gain is positive for the representative managerial emigrant to the United States.

To evaluate the effect of these estimated earnings profiles on the decision process of a potential Canadian emigrant, we calculated the discounted present values for the managerial and professional occupations. Table 14 presents alternative values under various policy environments circa 1991. Case A reports the present value derived for professional or managerial emigrants under two educational cost concepts, ig-

norning the two countries' different tax regimes. Case B adds in the impacts of the different tax structures.

In 1991 dollars, the untaxed discounted values for the first 30 years in United States for a Canadian professional, net of private and social educational costs, are about C\$124,000 and negative C\$82,000, respectively. Again in 1991 dollars, the net present values of a move for a Canadian manager to the United States *vis à vis* what he or she would have earned in Canada are C\$85,000 and negative C\$32,000, respectively. Notionally, therefore, if employed Canadian managers or professionals had to repay their educational subsidy before leaving, no income motivation would exist for them to move to the United States, because the value of

Table 14: *Present Value of Income Derived from Canadian Emigration to the United States*

	Net of Private Direct Educational Costs	Net of Social Total Educational Costs
(1991 Canadian dollars)		
<b>Case A: No Tax Adjustment<sup>a</sup></b>		
Professionals	124,412	- 81,588
Managers	85,326	- 31,921
<b>Case B: Tax Adjustment<sup>b</sup></b>		
Professionals	49,843	- 156,157
Managers	45,506	- 71,741

<sup>a</sup> The computation formula is  $G = (Y_i - Y_j) / (1 + r)^t - (C)$ , where  $C$  = private or social total costs of education plus transport costs,  $Y_i$  and  $Y_j$  are earnings differences between movers and stayers, and  $r$  is set to 0.03. See Appendix A for further explanation. Median appropriate educational costs for professions are derived from Table 7.

<sup>b</sup> Returns are adjusted for differential tax rates in the United States and Canada as follows:  $(Y_i - Y_j)$  is now  $[(1 - t_i)(Y_i) - (1 - t_j) Y_j]$ , with  $t_i$  and  $t_j$  referring to US and Canadian tax rates and earnings, respectively. The tax rates are only for income and assume at first a single person at the pre-\$50,000 earnings range and then switching to a married person with a working spouse and mortgage at an earnings range of \$50,000 and beyond. In both cases, the assumed cities of residence are New York and Toronto, which would be typical destinations for professionals in the legal or financial sectors. The differences would be magnified between Toronto and other US destinations with lower tax rates than New York.



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the subsidy from society is less than the value of the move to the individual. (For an individual who has less than full-time employment, however, the incentives to move are greater.)

The picture changes somewhat, but not fundamentally, when we admit that the two countries have different tax rates and that the choice of city destination can enhance or decrease the differential. For case B, we chose a typical origin and destination set of cities — Toronto and New York — and calculated the effect of income taxes (only) on the present value calculations for Canadian professionals or managers contemplating a move between these two cities. Taxes in both countries are substantial, the absolute decline in after-tax earnings is also substantial for movers and stayers; all present values are reduced by almost 50 percent for both professionals and managers. The post-tax adjusted present value gain netted for private direct educational costs reduces to about C\$50,000 and C\$46,000 (in 1991 dollars) for professionals and managers, respectively, leaving Canada for the United States. And when the taxed present value gains are netted for the social total cost of the embodied education, the returns are negative for both occupations.

Thus, the permanent movement of *employed* Canadians to the United States is a byproduct of Canada's subsidized educational system. For an individual who has less than full-time employment, the incentives to move are greater.

## Conclusion

Canada is a major participant in the global exchange of human capital. Since 1967, it has received a large gross inflow of professionally qualified immigrants from all over the world. The flow of human capital has been primarily from developed countries but with a large secondary contribution from less-developed countries (although inflows from the latter

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source diminished throughout the 1980s). In short, the diminution in the inflow of human capital to Canada coupled with the recent rise in outflow to the United States (and Asia) has reduced Canada's status as a traditionally large net importer of human capital.

Two further points are clear from this study. NAFTA-induced temporary movement has generated an increased conversion of Canadians to permanent residency status in the United States beyond the already substantial post-1989 permanent flow of Canadian managers to that country. This transfer is substantial relative to the net managerial flow for the entire 1982–96 period. Clearly, a back door has appeared through which the brain drain can now flow to the United States.



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We also conclude that assessing the brain drain on the basis of absolute immigrant flows is misleading in several ways. First, although the brain drain is small relative to the current stock of highly skilled people in the Canadian labor force, this comparison confuses concepts of stocks and flows.<sup>17</sup> When we more appropriately compared Canadian emigrants to the United States in specific occupations relative to the flow of graduates, we gained a better understanding of the policy issues at stake. Clearly, Canadian public policy can only affect changes in the stock of professionals and managers by altering the size of emigrant inflows to, and/or the number of graduates in, those professions.

Given that the equivalent of more than 11 percent of post-1990 Canadian graduates surveyed in this paper have emigrated to the United States, educational policy looms large in the brain drain process and is crucial for some professions. For example, the equivalent of more than 40 percent of 1991 nursing graduates emigrated to the United States within a year, while the equivalent of 12 percent of the 1989 physician class has gone.<sup>18</sup> The fact that substantial numbers continue to graduate in these occupations in Canada, in many cases at substantial cost to the public purse, relieved

only by subsequent movement to the United States, indicates a serious educational policy issue, regardless of the large professional stocks that still remain in Canada.

Moreover, the outflow to the United States relative to the size of the graduating class may be more serious than a simple indicator of short-term excess supply. Among scientists, for example, the yearly emigrant flow to the United States represents 14.5 percent of the graduation rate, indicating a serious public policy issue inasmuch as Canada has been actively trying to attract engineers; the outflow of Canadian engineering graduates merely exacerbates this shortage.

Our analysis also sheds light on the myriad push and pull forces cited in the popular press. For a limited number of professions — nurses, physicians, scientists, and professors — the shrinking public sector has no doubt hastened emigration. For all the skilled people included in this study, however, the United States' overriding pull force is clear. They are induced to move by the pre- or post-tax rate of return in the form of higher income in the United States.

Finally, the churning costs to Canada of exchanging one Canadian-bound trained immigrant for one US-bound emigrant are substantial.

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## Appendix A: Age-Earnings Profiles for Professionals and Managers

Immigrant lifetime earnings are the key variable in rationalizing the economic incentives to migrate. Succinctly stated, the economic gains from movement are

$$G = (Y_j - Y_i) / (1 + r)^t, \quad (1)$$

where  $G$  equals the present value income gain from moving between areas  $i$  and  $j$  with  $Y_i$  and  $Y_j$  equaling the expected income earned over  $t$  years in those areas, and  $r$  represents the prevailing interest rate.<sup>19</sup> In essence, the stayer who remains in area  $i$  earns  $Y_i$  while an immigrant earns  $Y_j$  after moving. If the costs of moving are less than  $G$ , then stayers have a motive to move.<sup>20</sup>

In order to delve into the underlying public policy issues, especially the role of education, we expand the earnings equations to compare the importance of the relevant human capital arguments in the stayers' and movers' earnings functions.

A general human capital formulation of the earnings function is

$$Y_i = f(\text{age, age}^2, \text{education, marital status, gender, weeks worked, years since immigration}). \quad (2)$$

Table A-1 reports the estimated coefficients for the earnings functions for movers and stayers in the professional occupations in the two countries.

The first relevant comparison of the earnings functions is between Canadian movers (row 1) and Canadian stayers (row 2). All of the traditional arguments are significant, and the earnings function is quadratic, thus conforming to human capital theory. The coefficients reported in both rows are similar in magnitude

to those reported in the literature.<sup>21</sup> Most important, the estimated coefficients for the movers' earnings functions are mostly larger than those of the stayers. Thus, each argument, except age, yields a larger return for Canadians who moved to the United States than for those who stayed in Canada. In fact, one additional year in the US labor market adds 14 percent to movers' earnings, while stayers gain only 9 percent for one more year in Canada. These 14 percentage points for movers have two components; one year in age adds 5 and one year in residence in the United States (indicated by YSM in the table) adds a further 9.

Note also that the returns from education are larger (7 percent) in the United States for a professionally trained Canadian emigrant than for the cohort that stays in Canada (5 percent). Thus, this structural difference in earning equations indicates that, even if movers and stayers were endowed with identical values for age and so on, those who move would earn more in the United States, given the larger coefficients reported in Table A-1 (assuming, of course, that the earnings are not affected by unobserved variables).

Comparing rows 2 to 3 in Table A-1 allows a second interesting comparison between Canadian stayers in Canada and US emigrants to Canada, both with professional qualifications. In all respects, the US immigrants to Canada tend to perform not like Canadian stayers but like Canadian movers to the United States — with the crucial exception of the “years since migration” (YSM) variable, which suggests that such a low value for YSM for Americans living in Canada indicates they enjoy little assimilation or earnings catch-up after their arrival independent of the aging effect.

**Table A-1: Professional Occupations:  
Earnings Functions by Place of Birth and Residence**

	Con	Age	Age <sup>2</sup>	Weeks	Ed	Mar	Male	YSM	R <sup>2</sup>
Canadians in United States	5.8* (19.2)	0.05* (3.3)	-0.0004* (-2.4)	0.04* (27)	0.07* (6.3)	0.15* (3.8)	0.34* (8.7)	0.09* (1.8)	0.48
Canadians in Canada	5.7* (141)	0.09* (46)	-0.001* (-39)	0.04* (161)	0.05* (40)	0.10* (16)	0.28* (51)	— —	0.48
Americans in Canada	5.8* (19.2)	0.05* (2.8)	-0.0004* (-2.4)	0.04* (27)	0.07* (6.3)	0.15* (3.2)	0.34* (8.7)	0.001* (1.8)	0.48

\* Indicates that t-values in parentheses are significant.

Source: Authors' calculations, available on request.

**Table A-2: Managerial Occupations:  
Earnings Functions by Place of Birth and Residence**

	Con	Age	Age <sup>2</sup>	Weeks	Ed	Mar	Male	YSM	R <sup>2</sup>
Canadians in United States	6.1 (14)	0.05* (2.6)	-0.0004* (-1.8)	0.04* (14)	0.05* (3.6)	0.17* (2.1)	0.32* (4.8)	0.0007 (0.70)	0.43
Canadians in Canada	5.6 (96)	0.09* (32)	-0.0009* (-27)	0.03* (74)	0.06* (45)	0.13* (13)	0.37* (42)	— —	0.37
Americans in Canada	6.1 (14)	0.05* (2.5)	-0.0004* (-1.8)	0.04* (14)	0.05* (3.6)	0.17* (2.1)	0.33* (4.8)	0.0007 (0.70)	0.43

\* Indicates that t-values in parentheses are significant.

Source: Authors' calculations, available on request.

Table A-2 similarly reports the estimated earnings equation coefficients for managers by birthplace and residence. All coefficients are almost identical for US managerial immigrants in Canada and Canadian managers resident in the United States. The assimilation variable, YSM, is insignificant for both groups, indicating little or no assimilation in either country after arrival. Thus, earnings differences that arise between Canadian managers in the United States and US managers in Canada would be due to the endowment of human resources, not differences in assimilation experiences after arrival in the new country.

Comparing managerial earnings functions for Canadian stayers and leavers reveals that, in general, the earnings coefficients for stayers are greater for the age, education, and gender (male) variables. The implication is that Canadian stayers who are managers also outperform US managers in Canada. This result was also found by Borjas, who notes that Canadian

movers did not receive a bonus in the form of a significant assimilation effect after arrival in the United States.<sup>22</sup>

Specifically, Borjas finds that Canadians who emigrate to the United States have been much more economically successful than Americans who emigrate to Canada. For example, Canadian men who migrated to the United States in the late 1970s are predicted to have lifetime earnings 23 percent higher than those of native-born Americans. (A more refined comparison shows that Canadian men who migrated to the United States in the late 1970s can expect lifetime earnings almost 16 percent higher than those of demographically comparable white males.) Although this percentage differential is higher than those of earlier Canadian immigrant cohorts, Canadian male immigrants consistently have enjoyed higher potential lifetime earnings streams than demographically comparable white US-born men.

## Appendix B: The Value of Human Capital Outflows to the United States, by Occupation

Given the way Canada and the United States collect data, only selected immigrant categories can be matched between the two countries to deduce net movement by occupation. For example, Canada collects US immigrant inflows for teachers, for medical and health workers, and for a combined group labeled “natural scientists, engineers, maths, etc.” Each one of these Canadian categories contains a

high-intensive and low-intensive human capital component. For example, the Canadian “medical and health” category contains nurses and physicians. Simply combining US physicians and nurses and deducting them from a similar aggregate Canadian outflow to the United States to obtain a net flow would be meaningless.

**Table B-1: Architects: Net Human Capital Outflow to the United States at Replacement Cost, 1983–96**

	Net Flow	Private Total Cost	Social Total Cost	Taxpayers' Subsidy
	<i>(number)</i>	<i>(1993/94 Canadian \$ millions)</i>		
1983	37	5	8	3
1984	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1985	27	3	6	3
1986	27	3	6	3
1987	40	5	8	3
1988	35	4	7	3
1989	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1990	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1991	24	3	5	2
1992	23	3	5	2
1993	23	3	5	2
1994	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1995	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1996	19	2	4	1
Total	255	31	54	23

Note: All cost calculations per definitions in Table 7. Discrepancies in some calculations are due to rounding.

<sup>a</sup> Data unavailable.

Source: United States, Department of Justice, Immigration and Naturalization Service, Statistics Branch; and special tabulations.

**Table B-2: Doctors: Net Human Capital Outflow  
to the United States at Replacement Cost, 1983–96**

	Net Flow	Private Total Cost	Social Total Cost	Taxpayers' Subsidy
	(number)	(1993/94 Canadian \$ millions)		
1983	267	63	104	41
1984	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1985	169	40	66	26
1986	189	45	74	29
1987	183	43	71	28
1988	91	21	35	14
1989	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1990	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1991	192	45	75	30
1992	240	57	94	37
1993	319	75	124	49
1994	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1995	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1996	522	123	203	80
Total	2,172	513	847	334

Note: All cost calculations per definitions in Table 7. Discrepancies in some calculations are due to rounding.

<sup>a</sup> Data unavailable.

Source: United States, Department of Justice, Immigration and Naturalization Service, Statistics Branch; and special tabulations.

**Table B-3: Nurses: Net Human Capital Outflow  
to the United States at Replacement Cost, 1983–96**

	Net Flow	Private Total Cost	Social Total Cost	Taxpayers' Subsidy
	(number)	(1993/94 Canadian \$ millions)		
1983	512	46	86	40
1984	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1985	379	34	63	29
1986	353	32	59	27
1987	417	38	70	32
1988	277	25	46	21
1989	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1990	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1991	450	41	75	34
1992	704	64	118	54
1993	1,068	97	179	82
1994	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1995	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1996	1,104	100	185	85
Total	5,264	476	881	405

Note: All cost calculations per definitions in Table 7. Discrepancies in some calculations are due to rounding.

<sup>a</sup> Data unavailable.

Source: United States, Department of Justice, Immigration and Naturalization Service, Statistics Branch; and special tabulations.

**Table B-4: Professors: Net Human Capital Outflow to the United States at Replacement Cost, 1983–96**

	Net Flow	Private Total Cost	Social Total Cost	Taxpayers' Subsidy
	(number)	(1993/94 Canadian \$ millions)		
1983	159	27	58	31
1984	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1985	171	29	62	33
1986	205	35	75	41
1987	173	29	63	34
1988	208	35	76	40
1989	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1990	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1991	171	29	62	33
1992	319	54	116	62
1993	251	43	91	48
1994	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1995	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1996	208	35	76	41
Total	1,865	316	679	363

Note: All cost calculations per definitions in Table 7. Discrepancies in some calculations are due to rounding.

<sup>a</sup> Data unavailable.

Source: United States, Department of Justice, Immigration and Naturalization Service, Statistics Branch; and special tabulations.

**Table B-5: Teachers (except Postsecondary): Net Human Capital Outflow to the United States at Replacement Cost, 1983–96**

	Net Flow	Private Total Cost	Social Total Cost	Taxpayers' Subsidy
	(number)	(1993/94 Canadian \$ millions)		
1983	191	28	46	18
1984	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1985	242	35	59	24
1986	234	34	57	23
1987	224	33	54	21
1988	268	39	65	26
1989	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1990	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1991	306	45	74	29
1992	337	49	82	32
1993	318	47	77	30
1994	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1995	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1996	319	47	77	30
Total	2,439	357	591	234

Note: All cost calculations per definitions in Table 7. Discrepancies in some calculations are due to rounding.

<sup>a</sup> Data unavailable.

Source: United States, Department of Justice, Immigration and Naturalization Service, Statistics Branch; and special tabulations.



**Table B-6: Health Technologists: Net Human Capital Outflow to the United States at Replacement Cost, 1983–96**

	Net Flow	Private Total Cost	Social Total Cost	Taxpayers' Subsidy
	(number)	(1993/94 Canadian \$ millions)		
1983	54	5	9	4
1984	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1985	54	5	9	4
1986	61	6	10	4
1987	60	5	10	5
1988	64	6	11	5
1989	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1990	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1991	49	4	8	4
1992	46	4	8	4
1993	42	4	7	3
1994	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1995	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1996	33	3	6	3
Total	463	42	77	35

Note: All cost calculations per definitions in Table 7. Discrepancies in some calculations are due to rounding.

<sup>a</sup> Data unavailable.

Source: United States, Department of Justice, Immigration and Naturalization Service, Statistics Branch; and special tabulations.

**Table B-7: Social Scientists and Urban Planners: Net Human Capital Outflow to the United States at Replacement Cost, 1983–96**

	Net Flow	Private Total Cost	Social Total Cost	Taxpayers' Subsidy
	(number)	(1993/94 Canadian \$ millions)		
1983	21	3	4	1
1984	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1985	39	5	8	3
1986	28	4	6	2
1987	32	4	7	3
1988	33	4	7	3
1989	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1990	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1991	21	3	4	1
1992	41	5	8	3
1993	29	4	6	2
1994	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1995	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1996	31	4	6	2
Total	275	36	56	20

Note: All cost calculations per definitions in Table 7. Discrepancies in some calculations are due to rounding.

<sup>a</sup> Data unavailable.

Source: United States, Department of Justice, Immigration and Naturalization Service, Statistics Branch; and special tabulations.

**Table B-8: *Engineers, Surveyors, and Mapping Scientists: Net Human Capital Outflow to the United States at Replacement Cost, 1983–96***

	Net Flow	Private Total Cost	Social Total Cost	Taxpayers' Subsidy
	(number)	(1993/94 Canadian \$ millions)		
1983	386	52	89	37
1984	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1985	447	60	103	43
1986	488	65	112	47
1987	456	61	105	44
1988	383	51	88	37
1989	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1990	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1991	464	62	107	45
1992	662	89	152	63
1993	452	60	104	44
1994	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1995	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1996	487	65	112	47
Total	4,225	565	971	406

Note: All cost calculations per definitions in Table 7. Discrepancies in some calculations are due to rounding.

<sup>a</sup> Data unavailable.

Source: United States, Department of Justice, Immigration and Naturalization Service, Statistics Branch; and special tabulations.

**Table B-9: *Mathematical and Computer Scientists: Net Human Capital Outflow to the United States at Replacement Cost, 1983–96***

	Net Flow	Private Total Cost	Social Total Cost	Taxpayers' Subsidy
	(number)	(1993/94 Canadian \$ millions)		
1983	66	10	19	9
1984	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1985	84	13	24	11
1986	87	13	25	12
1987	93	14	27	13
1988	90	14	26	12
1989	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1990	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1991	124	19	36	17
1992	137	21	39	18
1993	150	23	43	20
1994	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1995	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1996	148	23	43	20
Total	979	150	282	132

Note: All cost calculations per definitions in Table 7. Discrepancies in some calculations are due to rounding.

<sup>a</sup> Data unavailable.

Source: United States, Department of Justice, Immigration and Naturalization Service, Statistics Branch; and special tabulations.

Table B-10: *Natural Scientists: Net Human Capital Outflow to the United States at Replacement Cost, 1983–96*

	Net Flow	Private Total Cost	Social Total Cost	Taxpayers' Subsidy
	(number)	(1993/94 Canadian \$ millions)		
1983	110	17	32	15
1984	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1985	117	18	34	16
1986	107	16	31	15
1987	117	18	36	13
1988	82	13	24	11
1989	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1990	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1991	97	15	28	13
1992	147	23	42	19
1993	143	22	41	19
1994	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1995	<i>a</i>	<i>a</i>	<i>a</i>	<i>a</i>
1996	195	30	56	26
Total	1,115	172	324	152

Note: All cost calculations per definitions in Table 7. Discrepancies in some calculations are due to rounding.

<sup>a</sup> Data unavailable.

Source: United States, Department of Justice, Immigration and Naturalization Service, Statistics Branch; and special tabulations.

## Appendix C: Age-Earnings Differences

Table C-1: *Earnings of Canadian-Born and Foreign-Born Workers, by Gender and Education*

	Age								
	25	30	35	40	45	50	55	60	64
<i>(Canadian dollars)</i>									
<b><i>Earnings for Women with More than 11 Years of Schooling</i></b>									
Canadian-born	21,809	25,402	28,285	30,109	30,641	29,810	27,725	24,651	21,724
Foreign-born	17,043	19,795	22,112	23,756	24,546	24,392	23,311	21,427	19,475
Net present value of the difference	127,999	122,323	111,144	95,090	75,495	54,189	33,193	14,342	2,249
<b><i>Earnings for Women with More than 16 Years of Schooling</i></b>									
Canadian-born	24,394	29,132	33,259	36,300	37,877	37,782	36,029	32,846	29,531
Foreign-born	23,595	27,454	31,157	34,485	37,227	39,194	40,247	40,307	39,636
Net present value of the difference	447	- 3,851	- 13,640	- 27,308	- 41,582	- 51,760	- 52,282	- 37,543	- 10,105
<b><i>Earnings for Men with More than 11 Years of Schooling</i></b>									
Canadian-born	29,594	34,643	39,158	42,738	45,042	45,837	45,042	42,738	39,961
Foreign-born	19,635	23,911	27,697	30,518	31,987	31,891	30,245	27,285	24,238
Net present value of the difference	288,135	279,567	265,408	245,007	217,207	180,412	132,884	73,133	15,723
<b><i>Earnings for Men with More than 16 Years of Schooling</i></b>									
Canadian-born	30,296	35,464	40,086	43,752	46,110	46,924	46,110	43,752	40,908
Foreign-born	21,601	26,903	31,713	35,383	37,365	37,346	35,330	31,634	27,833
Net present value of the difference	216,562	203,507	189,106	173,438	155,297	132,211	100,892	58,012	13,075

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## Notes

- The authors would like to thank Francis Rowe and Yunus Ozsomer for their research assistance in the preparation of this paper.
- 1 Herbert B. Grubel and Anthony D. Scott, *The Brain Drain: Determinants, Measurement and Welfare Effects* (Waterloo, Ont.: Wilfrid Laurier University Press, 1977), p. 49.
  - 2 D. Papademetriou, "Employment Based Immigration to the United States: A Review. Analysis and Critique" (paper presented at a seminar on Settlement, Department of Citizenship and Immigration, Ottawa, 1997).
  - 3 Ibid.
  - 4 L. Parai, *Immigration and Emigration of Professional and Skilled Manpower during the Post War Period*, Economic Council of Canada Special Study 1 (Ottawa: Queen's Printer, 1965).
  - 5 Statistics Canada, *Historical Labour Force Statistics*, cat. 71-201 (Ottawa), various issues.
  - 6 See D.J. DeVoretz and Samuel A. Laryea, "Canada's Immigration-Labour Market Experience" (paper presented to a seminar on Migration, Free Trade and Regional Integration in North America, Organisation for Economic Co-operation and Development, Mexico City, 1998), p. 21; see also S. Globerman and D. DeVoretz, "Trade Liberalization and the Migration of Skilled Workers" (report prepared for Canada, Department of Industry, Ottawa, 1998).
  - 7 J.G. Grasmick, *Canada-US Business Immigration Handbook* (Scarborough, Ont.: Thomson Professional Publishing Canada, 1991).
  - 8 D.J. DeVoretz, ed., *Diminishing Returns: The Economics of Canada's Recent Immigration Policy*, Policy Study 24 (Toronto; Vancouver: C.D. Howe Institute and the Laurier Institution, 1995).
  - 9 Herbert B. Grubel and Anthony D. Scott, "The International Flow of Human Capital," *American Economic Review* 56 (May 1965): 277-280.
  - 10 J. Bhagwati and W. Dallafar, "The Brain Drain and Income Taxation," *World Development* 1 (1973): 94-101.
  - 11 R.G. Coulson and D. DeVoretz, "Human Capital Content of Canadian Immigration 1967-1987," *Canadian Public Policy* 19 (December 1993): 357-366.
  - 12 Ibid.
  - 13 D.J. DeVoretz, "New Issues, New Evidence, and New Immigration Policies for the Twenty-First Century," in DeVoretz, ed., *Diminishing Returns*.
  - 14 S. Fagnan, "Canadian Immigrant Earnings, 1971-86," in DeVoretz, ed., *Diminishing Returns*, p. 201.
  - 15 To generate the age-earnings profiles produced in both Figures 3 and 4, we inserted the mean values for all the variables in each of the significant variables reported in Tables A-1 and A-2 except age and years in residence. Next, we started the labor force entry date for both movers and stayers at 32 (the average age of movement) and assumed a 30-year time horizon. The fundamental assumption of this method is that the age-earnings function is stable over time.
  - 16 See G.J. Borjas and B. Bratsberg, "Who Leaves? The Outmigration of the Foreign-Born," *The Review of Economics and Statistics* 78 (February 1996): 165-176.
  - 17 For 1970 values of immigrants to the stock of specific professional types, see D.J. DeVoretz and D. Maki, "The Immigration of Third World Professionals to Canada," *World Development* 11 (1, 1983): 55-64.
  - 18 E. Ryten, A.D. Thurber, and L. Buske, "The Class of 1989 and Physician Supply in Canada," *Canadian Medical Association Journal* 158 (6, 1998): 723-730.
  - 19 L. Sajastaad, "The Costs and Returns of Human Migration," *Journal of Political Economy* (special issue, 1962): 80-93. Note that the literature carefully distinguishes between wages and income and prefers the income measure to reflect the total rewards from moving.
  - 20 Alternatively, one can calculate the rate of return from a migration investment.
  - 21 See Fagnan, "Canadian Immigrant Earnings, 1971-86."
  - 22 G.J. Borjas, *Friends or Strangers: The Impact of Immigrants on the U.S. Economy* (New York: Basic Books, 1990).

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