

# Vancouver Centre of Excellence



## Research on Immigration and Integration in the Metropolis

Working Paper Series

#98-18

Canadian Human Capital Transfers: The USA and Beyond

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October 1998

## RIIM

### Research on Immigration and Integration in the Metropolis

The Vancouver Centre is funded by grants from the Social Sciences and Humanities Research Council of Canada, Citizenship & Immigration Canada, Simon Fraser University, the University of British Columbia and the University of Victoria. We also wish to acknowledge the financial support of the Metropolis partner agencies:

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**Canadian Human Capital Transfers:  
The USA and Beyond**

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June 7, 1998

The authors would like to thank Sydney Preston for her copyediting services and Francis Rowe and Yunus Ozsomer for their research assistance in the preparation of this paper.

## Abstract

Canada has been a traditional importer of human capital from the rest of the world. During the 1967-87 period Canada received \$ 42.9 billion worth of post-secondary training from this period's immigrant inflow. However, during the late 1980's two trends emerged to offset this surplus. First, human capital transfers to Canada declined as fewer skilled immigrants arrived and secondly highly skilled Canadian began to emigrate to the United States and Asia. During the 1982-1996 period almost 54,000 highly trained Canadians emigrated to the United States with a declining compensating flow from the United States. After 1989 Canadian labour market conditions-especially in the public sector coupled with major immigrant legislative changes in the United States accelerated Canadian emigration to the United States. Concurrently, the flow of United States immigrants to Canada declined. This study documents the value of this Canadian transfer to the United States in several dimensions. First, the total educational cost of this post 1982 Canadian emigration to the United States was estimated to be \$12 billion while the transferred Canadian taxpayer subsidy embodied in this movement was \$5.2 billion. In fact, a major economic incentive to emigrate to the United States by employed highly trained Canadians was the educational taxpayer subsidy they received before leaving. In addition, the study notes that a back door entry to the United States has been created since temporary worker provisions under the NAFTA accord have accelerated the Canadian managerial permanent outflow.

For the most contentious period 1989-1996 it is found that the brain drain to the United States can be evaluated with several metrics; gross numbers, quality adjusted numbers or the value of the transfer. If we adjust for skill comparability and concentrate on the science, managerial and health science movements to the United States we conclude that there has been a minor world-wide net inflow to Canada of (1,971) after we deduct for Canadian emigration to the United States. The economic value of this net inflow however is negative given the settlement and productivity costs to the Canadian economy. The replacement costs for the brain drain to the United States are estimated to be \$12.6 for the 1989-96 period. In fact, the settlement and productivity costs of the average immigrant replacement exceed the value of educational transfer embodied in a highly skilled immigrant to Canada. Hence, on average, the past skilled immigrant could not compensate for the value of the lost Canadian trained emigrant to the United States.

Suggested policy initiatives to mitigate this net outflow include retarding the outflow by reducing the educational subsidy to Canadian emigrants and to a more selective immigration policy which reduces the replacement costs of this leavers. In addition, a more careful match by Canadian universities to the Canadian supply and demand for highly skilled graduates could mitigate the outflow in the health sciences. Canadian immigration policies, which reduce settlement and certification problems, are fundamental to reducing the current brain drain. Prior assessment of language, educational credentials and job experience of highly skilled immigrants by potential employers would insure that the net economic value of skilled immigrants to Canada is again positive.

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## Executive Summary

Canada has been a traditional importer of human capital from the rest of the world. During the 1967-87 period Canada received \$ 42.9 billion worth of post-secondary training from this period's immigrant inflow. However, during the late 1980's two trends emerged to offset this surplus. First, human capital transfers to Canada declined as fewer skilled immigrants arrived and secondly highly skilled Canadian began to emigrate to the United States and Asia. During the 1982-1996 period almost 54,000 highly trained Canadians emigrated to the United States with a declining compensating flow from the United States. After 1989 Canadian labour market conditions-especially in the public sector coupled with major immigrant legislative changes in the United States accelerated Canadian emigration to the United States. Concurrently, the flow of United States immigrants to Canada declined. This study documents the value of this Canadian transfer to the United States in several dimensions. First, the total educational cost of this post 1982 Canadian emigration to the United States was estimated to be \$12 billion while the transferred Canadian taxpayer subsidy embodied in this movement was \$5.2 billion. In fact, a major economic incentive to emigrate to the United States by employed highly trained Canadians was the educational taxpayer subsidy they received before leaving. In addition, the study notes that a back door entry to the United States has been created since temporary worker provisions under the NAFTA accord have accelerated the Canadian managerial permanent outflow.

For the most contentious period 1989-1996 it is found that the brain drain to the United States can be evaluated with several metrics; gross numbers, quality adjusted numbers or the value of the transfer. If we adjust for skill comparability and concentrate on the science, managerial and health science movements to the United States we conclude that there has been a minor world-wide net inflow to Canada of (1,971) after we deduct for Canadian emigration to the United States. The economic value of this net inflow however is negative given the settlement and productivity costs to the Canadian economy. The replacement costs for the brain drain to the United States are estimated to be \$12.6 for the 1989-96 period. In fact, the settlement and productivity costs of the average immigrant replacement exceed the value of educational transfer embodied in a highly skilled immigrant to Canada. Hence, on average, the past skilled immigrant could not compensate for the value of the lost Canadian trained emigrant to the United States.

Suggested policy initiatives to mitigate this net outflow include retarding the outflow by reducing the educational subsidy to Canadian emigrants and to a more selective immigration policy which reduces the replacement costs of this leavers. In addition, a more careful match by Canadian universities to the Canadian supply and demand for highly skilled graduates could mitigate the outflow in the health sciences. Canadian immigration policies, which reduce settlement and certification problems, are fundamental to reducing the current brain drain. Prior assessment of language, educational credentials and job experience of highly skilled immigrants by potential employers would insure that the net economic value of skilled immigrants to Canada is again positive.

*“Canada cannot compete on the weather, and until it competes on job creation and tax rate, not only will a lot of young talent go south, but it’s a one way ticket.”*

*– Expatriate Canadian engineer working in the United States.  
(CATA Newsletter, summer 1996).*

## I. Introduction

The movement of Canadians to the United States and Americans to Canada has a long history. Loyalist and Blacks moved to Canada from the United States to avoid persecution in the 18<sup>th</sup> and 19<sup>th</sup> centuries. Later, large scale Canadian **emigration** to the northeast region of the United States occurred in the early 20<sup>th</sup> century as a byproduct of that period’s large European immigrant inflows to Canada. Again, smaller countervailing flows of Americans to Canada appeared, this time to the Canadian prairies and British Columbia. In the 1930’s North American borders were closed by immigration legislation in both countries reflecting the poor economic conditions of the time. No substantial cross border movement occurred until the 1950’s. This time it was largely one way; Canada to the United States and this movement earned the sobriquet ‘brain drain’ since it consisted largely of highly skilled Canadian emigrants moving to the United States circa 1955-1965. United States immigrant legislation effectively halted this flow in 1965. A robust Canadian economy, unpopular U.S. military adventures and a Canadian policy of tax rebates to skilled immigrants rekindled a one-way flow of highly skilled United States immigrants to Canada between 1965-1972. Then, the two countries entered another near twenty-year period of quiescence with no substantial cross border movement. In the interim Canada fine turned its immigration policy and searched the world with its much-imitated ‘point system’ and experienced a substantial ‘brain gain’ from Europe and the third world. Canadians were not immersed in a debate over the ‘brain drain’ during this thirty-year period since the movement was one way into Canada.

Now the ‘brain drain’ debate has reappeared in the last six months in Canada. Why? Is this **much ado about nothing**? Is it media hype? Do the numbers justify the sobriquet ‘brain drain’? Does the skilled outflow indicate fundamental disequilibrium in the Canadian labour market? Is Canada losing its competitive edge in high knowledge industries because of our tax structure, slow job growth, ill-conceived educational policies or perhaps for all of these reasons?



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

Other **Canadian** firms, which are major participants in NAFTA related trade see the cross border movement to the United States as either benign or beneficent. Canadian movement of highly skilled workers at the behest of these outward looking firms to the United States is 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. **However, current** United States immigration policy permits this idealized view to breakdown **since** these temporary movers **can** convert their **temporary** status to permanent residency in the United States. In other words, the '**brain drain**' **may now occur through** the back door of NAFTA temporary movement when these movers convert their status. But these NAFTA oriented firms have another part to add to the puzzle when they import their United States employees to their **Canadian** home office on a short-term basis for training in the Canadian context. An almost seamless web is created in this context which benefits all-employees with higher pay and both economies with more culturally sensitive and productive employees. Hence, in the absence of leakage, under this vision there is no brain drain if Canadians return, just a mutually beneficial human capital transfer.

What of the other less benign views ? For the Canadian taxpayers and some university presidents the movement of post-secondary graduates has become an irksome problem since the flow of resources is largely one way. Canadian scholars and recent graduates surf the web or listen to glowing reports from recent Canadian emigrants to the United States. Lack of entry-level jobs, inadequate research facilities and higher income allegedly induce Canadian engineers, scientists and young scholars to leave. The cost of this movement is only partially compensated by return movement from the United States. This is not the world of the seamless web of intra company transfers. In fact, the Canadian taxpayer is the loser. She/he subsidizes each highly skilled mover during their education period in Canada under the implicit contract that graduates remain in Canada to pay for the next generation. This heretofore-seamless web of financing education is broken each time a highly skilled Canadian disappears to Houston, New York or Tucson. Of course

the Canadian taxpayer has no spokesperson and university presidents are largely reticent, hence this coalition is under-represented in the debate.

Others critics of the 'brain drain' fill the vacuum. They range from conservatives who decry Canada's high marginal tax rates which they claim **accelerates** the outflow of Canadians to the United State **to academics** with more cogent arguments. **This latter set of critics** are the economic growth theorists who in the last ten years **have** argued that the collapse in Canada's productivity and economic growth **can** be partially attributed to the inability of Canada to gain a strategic and early advantage in the high tech field. Their ingredients to realize this growth advantage are an expansion of Canadian higher education, retention of these skilled graduates and a further importation of the highly skilled from abroad. According to this view Canada in the 1990's is losing these strategic components. Recent graduates are leaving, leading scholars are moving and Canada's ability to attract replacements through immigration has been eroded.

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

To further set the context, we highlight **some** recent anecdotal evidence, which speculates on Canadian push factors as well as United States legislative changes as pull factors.<sup>1</sup> For example, a recent survey published by the Canadian Advanced Technology Association argues that the movement of Canadian-trained computer and electrical engineers to the United States is a major contributor to the industry's manpower problems. According to this report:

*As the Canadian high-tech sector booms, it has become widely apparent that there is a growing shortage of computer and electrical engineers. For example, the Software Human Resource Council projects a shortfall of 20,000 software workers in Canada by the turn of the century. It has also become apparent that one factor in this human resources gap is the brain drain of Canadian graduates in computer and electrical engineering programs to other labour markets, particularly to the United States.*

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<sup>1</sup> *The Immigration Act of 1990* significantly changed the numbers and types of immigrants admitted to the United States under employment-based preferences, but made only slight revisions in the limits under the family-sponsored preference category. The annual limit of employment-based immigration increased from 54,000 in 1991 to a minimum of 140,000 in 1992 while the family sponsored group stayed near constant.

In this same report, which interviewed fourth-year university students at the University of Waterloo, more than three-quarters of the students surveyed were willing to move to the United States for work. Furthermore, of Waterloo alumni working in the United States, almost two-thirds would consider returning to Canada were it not for a gap in take-home pay of more than 40 percent.<sup>2</sup>

Writing in the *Globe and Mail*, journalist Deborah Jones cites a series of possible reasons for this movement of Canadian workers to the United States in knowledge-based industries. These possible push factors include the Canadian social, tax and corporate environments, compounded and aggravated by government and university cutbacks, corporate downsizing, reductions in research funding, and lack of job opportunities. To illustrate the latter point, Jones profiles the experience of a graduate of Simon Fraser University. She writes:<sup>3</sup>

*At just 24 years of age, David Williams is no greenhorn. From his perspective at a desk in a 30-story office tower in Chicago, he already knows as much about the brain drain as anybody. . . Mr. Williams checked out Montreal and Vancouver, and found no hope of a satisfying long term future in his field. And so, bearing a master's degree in economics, he went down yet another road, leading right out of the country. Today his skills as a knowledge worker boost the new economy in the United States, courtesy of Canada's publicly subsidized education system.*

There, however, exist dissenting views over the relevance of the **brain drain** concept or importance of the skilled outflow of Canadians. When the head of the Canadian Nurses Association predicted a nation-wide shortage of nurses partially owing to the brain drain to the United States, a current student nurse stated that:

*"A shortage of nurses would be a chance for graduates to move into full time positions."<sup>4</sup>*

Other commentators cite the benefits of a world-wide exchange of skilled people. Jim Fox observed in the *Globe and Mail* that:

*"Being outside a country may, in fact, provide more of an economic contribution to a (sending) country than being inside."<sup>5</sup>*

<sup>2</sup> "Education for Export? Keeping Canadian-trained computer and electrical engineers in Canada", *Canadian Advanced Technology Association (CATA)*, Summer 1996.

<sup>3</sup> "Why David left Canada", *The Globe and Mail*, December 7, 1996, sec. D (Focus).

<sup>4</sup> Nurses' head predicts national shortage, *The Vancouver Sun*, 17, June, 1997, B2.

<sup>5</sup> "Why think of it as a brain drain?" *The Globe and Mail*, January 7, 1997 Commentary Section.

Fox cites the important contributions of Chinese and Lebanese immigrants living in Canada who led reconstruction efforts in their respective countries of origin. This view argues that Canada lives in the context of a world-wide movement of highly skilled manpower and Fox correctly points us to look at the cross-border movement between all countries and Canada and not to myopically focus on the bilateral United States-Canada flow.

Thus, it is clear that any **balanced** discussion of the recent movement of skilled Canadians to the United States must be put into the broader context of the world-wide transfer of human capital into and out of Canada. In short, the first objective of this study will be to document the net flow of human capital between Canada and the **United States** as well **to Canada from** the rest of the world.

The remainder of the paper is divided as follows. **Section II will provide recent estimates of worldwide** human capital inflows to Canada. Section III focuses on the recent (post-1982) gross and net flows of highly skilled immigrants between Canada and the United States. **Section measures the value of these bilateral movements. Section V will model and estimate the age-earnings profiles for movers and stayers in both Canada and the United States to determine the differential rates of return from movement between the two countries. In addition section V analyzes the impact of differential educational subsidies and tax rates on the incentives to move to the United States for professionally trained Canadian immigrants. Section VI reviews the available data on NAFTA induced temporary movement and the “back door” brain drain phenomenon. We conclude our commentary by addressing the public policy issues in section VII.**

## **II. Canada and world wide transfers of human capital**

Prior to their arrival, all immigrants embody taxpayer subsidies from their country of origin in the form of education. Canada's post-1967 immigration policy encouraged skilled immigration since it evaluated a portion of **its yearly immigrant inflow** based on the 'points system' which particularly valued education (DeVoretz, 1994). As Grubel and Scott (1965) have already noted, 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. Given a few essential assumptions it can be argued that, at least the marginal cost of providing post-secondary education, is a subsidy from

the foreign taxpayer to the Canadian taxpayer (Bhagwati and Dellafar, 1973).<sup>6</sup> The key assumption to insure the validity of these human capital measures is the presence of contemporaneous skilled job vacancies in Canada. The dominance of the point system between 1967-73 insured that jobs were available to match these human capital transfers. However, the 1976 Immigration Act, while maintaining the stringent point system for the independent or selected worker class simultaneously eased entry requirements for the family reunification class and reduced the possibility of the required job match.

Table 1 reports the human capital transfers to Canada circa 1967-**87** from all source countries **for only those immigrants who obtained a post-secondary degree or better** disaggregated by developed (including the United States) and less developed (LDCs) source regions under various cost concepts.<sup>7</sup>

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<sup>6</sup>. Admittedly, human capital comes in many forms from on the job training to formal schooling. In this **study** due to data limitations we focus only on the formal education component of the human capital transfer.

<sup>7</sup>. The standard literature (W.L. Hansen 1963: 131) defines the value of human capital as either the total (social) costs or private costs. Total (social) costs include; (1) school costs incurred by society or teachers salaries, supplies, interest and depreciation on capital, (2) the opportunity costs incurred by individuals, namely, income foregone, (3) incidental school related costs incurred by individuals. Total private resource costs include the same three components except that in (1) tuition fees paid by individuals are substituted for society's costs. Direct costs (social or private) are simply netted for foregone income.

**TABLE 1**  
**Human Capital Inflows from**  
**Developed and Less Developed countries to Canada 1967-87**  
**(000's 1981/1994 dollars)**

	<b>Private Direct Costs</b>	<b>Social Direct Costs</b>	<b>Private Total Costs</b>	<b>Social Total Cost</b>
Panel A: All Countries				
1967-1973	825,236	6,946,046	7,558,630	12,879,270
1974-1979	354,604	2,471,735	3,075,000	5,788,970
1980-87	340,691	2,343,323	2,985,676	5,551,879
Total	1,520,531	11,761,104	13,619,306	24,220,119
	<b>(2,632,230)*</b>	<b>(20,359,951)</b>	<b>(23,576,732)*</b>	<b>(41,928,074)*</b>
Panel B: Developed Countries				
1967-1973	529,014	4,738,722	4,475,160	8,587,345
1974-1979	275,470	1,936,774	2,364,633	4,480,456
1980-1987	228,043	1,608,594	1,963,101	3,726,280
Sub total	1,032,527	8,284,090	8,802,894	16,794,081
	<b>(1,787,434)*</b>	<b>(14,340,802)*</b>	<b>(15,238,917)*</b>	<b>(29,072,667)</b>
Panel C: Less Developed Countries				
1967-1973	296,222	2,207,324	3,083,470	4,291,925
1974-1979	79,134	534,961	710,367	1,308,514
1980-1987	112,648	734,729	1,022,575	1,825,599
Sub total	489,701	3,477,014	4,816,412	7,426,038
	<b>(847,734)*</b>	<b>(6,019,149)*</b>	<b>(8,337,815)*</b>	<b>(12,855,406)*</b>
Source: Coulson and DeVoretz (1992)				

Notes: \* Price inflated by CPI (all items) to **1994 dollars**  
 \*\* Private direct costs include tuition, books, subsistence  
 \*\* Social direct costs are private direct costs plus taxpayer subsidies to students.  
 \*\*\* Private total cost and social total costs are the private costs plus foregone income of students.  
 \*\*\*\*PI cost is value of transferred human capital per immigrant of that epoch.

The magnitude of total human capital flows circa 1967-87 for immigrants **valued at their post-secondary education** from all major source regions **to Canada** under several cost concepts is presented in the panel A of Table 1. Several patterns emerge. First, although the total human capital transfer **of post-secondary education** valued at social total cost (column 4) was large (\$24.2 billion 1981 dollars or \$41.9 billion in 1994 dollars), over 51 per cent of this flow occurred in the first seven years (1967-73) when the dominant immigrant screening device was the 'point system'. In the latter policy period, (i.e. 1980-87) only \$5.5 billion (**or \$ 9.5 billion in 1994 dollars**) of human capital (at social total cost) was transferred to Canada from all countries. Moreover, this large decline between the pre and post-1978 periods is repeated for each cost concept. This timing difference is

important to keep in mind. In particular the alleged Canadian – U.S. brain drain for this study is argued to occur in the post 1979 **period when the decline in human capital transfers from the rest of the world occurred.**

The bottom two panels of table 1 separate the human capital flows by study periods and origin areas. Panel B, table 1 reports the developed country human capital transfer **derived from immigrant flows from developed countries with post-secondary training** under the identical set of occupational categories used for the all source country groupings. Several points **again** emerge. First, between 1967-73 developed countries sent 66 per cent of the Canada's total human capital flows, regardless of cost concept utilized. For example, the human capital (valued at social total cost) transferred from developed countries circa 1967-73 totaled \$8.5 billion dollars (**or \$15.5 billion in 1994 dollars**). This distribution in favor of developed countries should not be surprising, given that the majority of immigrants **with post-secondary training came** from developed source countries during this period.

For the 1974-79 and 1980-87 periods the developed countries continued to send the majority of the human capital flows **as measured by the amount of post-secondary education embodied in immigrants** with 77 and 67 per cent of the flows emanating from these developed areas respectively for these two sub-periods. A more dramatic view of the changing patterns is revealed in the decline in human capital transfers by epoch.

A review of the **two major policy transfer periods outlined in table 1** indicates that **Canadian immigration** policy had a substantial impact on human capital transfers. **The pre - 1974 regulators gave substantial entry points for human capital and hence the human capital transfers were large.** The post-1974 immigration regulations reduced the number of immigrants **with post-secondary education** but did not significantly affect the average quality of the representative highly **educated** immigrant. **One important implication for this study is clear. The absolute decline in the numbers of post-secondary trained immigrants arriving to Canada after 1980 could make the contemporary Canadian flows to the United State more worrisome.**

### **III. Recent History of Canada-United States Human Capital Transfers**

The **economist's concern over the highly skilled movement of Canadians** to the United States has a long historical tradition in Canada. Dales' (1964) interpretation of Canada's first growth period (1896-1911) relied fundamentally on the concept that European immigration to Canada displaced Canadian-born workers **to the United States in search of** higher wages. The major economic consequence of this first brain drain for

Canada, according to Dales, was extensive Canadian economic growth without a rise in the standard of living. In short, this initial skill drain led to a larger gross domestic product in Canada but no apparent increase in Canada's per capita income as higher-paid skilled workers left for the United States and in turn were replaced by a large number of lower-paid immigrants.<sup>8</sup> Thus, Dales points us 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. **This productivity loss I will term a churning effect.**

Parai (1965) provided **the first** systematic analysis of the Canadian to United States brain drain issue circa 1950-1963. Parai measured the magnitude of the highly skilled movement in two ways. First, he estimated the actual numbers and types of workers involved. Secondly, he measured this professional and skilled manpower in terms of human capital, that is, in terms of the replacement costs of the specialized education and training embodied in these workers. Parai's study found that over the 1950-63 period, a yearly average of about 9,800 professional and skilled workers emigrated per year from Canada to the United States. Nevertheless, Parai noted that Canada experienced a net brain gain worldwide because the losses to the United States were more than offset by an average annual immigration of 26,000 **highly skilled** workers to Canada. **This lesson of calculating a net flow** will be kept in mind when we analyze more contemporary Canada-United States data.

Parai converted these immigrant numbers into human capital flows by estimating the replacement costs of the human capital embodied in the form of university education for all immigrants to Canada and for Canadian emigrants to the United States. The estimated value of the replacement cost for all immigrants to Canada stood at \$391 million (1961 dollars).<sup>10</sup> Inflating the \$391 million estimate to 1994 dollars yields a more contemporary value of \$2.08 billion.

Grubel and Scott (1977) also examined the same historical period circa 1950-1965 but from the point of view of the United States as a receiving country. They concluded that Canada was the largest immigrant source country for the United States brain gain with Canada's engineers and scientists representing the largest percentage (29.8 percent) **of the United States intake in these occupations.** Grubel and Scott also detected a substantial bilateral flow of other skilled groups. For example, they found that there **were**

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<sup>8</sup> Of course, returns to land and capital no doubt increased and thus Dales only gives a partial picture.

<sup>10</sup> This is the estimated value of the additional university instruction, books and facilities which would have been required to duplicate within Canada the university education and training possessed by these immigrants. **See Table 5 and associated notes for a more complete definition of education costs.**



approximately as many United States-born and trained economists teaching in Canada as there are Canadian-born and trained economists teaching in the United States. This point again emphasizes the need to correct for bilateral flows between the United States and Canada **especially by occupations and not gross flows.**

**As several authors note the 1965 United States 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 twenty-five years. This policy change ended the scholarly interest in this field until now.**

#### **IV. Contemporary Brain Drain Measurement**

There exist several definitional and conceptual problems associated with describing **contemporary** human capital flows. The first conceptual problem is to rigorously define a skilled immigrant. Grubel and Scott define a skilled immigrant 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>13</sup>

This definition of a skilled immigrant in turn requires us to operationally define a permanent mover or an immigrant who has the “intention to hold permanent employment.”<sup>14</sup> Few Canadian emigrants to the United States actually know *ex ante* whether they intend to stay in the United States given the ease of return.<sup>15</sup> In addition, any analysis of the **brain drain issue** is handicapped by **absence of** complete records of the movements of people into and out of Canada. Although the Canadian authorities record the number of immigrants into Canada, they do not record emigration from Canada. Furthermore, estimates of return immigration of Canadian citizens to Canada are not accurate. For these reasons, this study will use United States **administrative** data to estimate the gross flows of Canadian immigrants to the United States. In a similar

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<sup>13</sup> Grubel and Scott (1977, p. 49).

<sup>14</sup> **In section VIII**, we discuss a new category of temporary Canadian emigrants to the United States, which has arisen under the NAFTA agreement.

<sup>15</sup> Canadian citizens may maintain Canadian citizenship while resident in the United States, thus easing their return migration to Canada. **Furthermore, NAFTA temporary residence permits can be easily converted to a permanent status in the United States further making the definition of emigration more ambiguous.**

manner, United States immigrants to Canada will be measured on a gross basis with Canadian data. By subtracting the latter from the former a net bilateral **flow** can be estimated.

The required use of United States **administrative** data in turn leads to further measurement problems. Since United States data is compiled to meet legal requirements it often fails to carefully define the professions covered. In addition, **professional occupational** definitions do not match Canadian immigration occupational definitions making **net** bilateral comparisons **of professional occupations difficult**. **Moreover, the** formal educational qualifications for **various professions** vary widely and **the** United States data does not **report** each occupation's formal educational qualifications. Thus, we will adapt Canadian educational requirements for the relevant professions. **Finally**, place of education is not an unambiguous concept since the data do not **indicate where the education was acquired**.

*Canadian Human Capital Transfers to the United States: 1982-95*

Several structural changes occurred in the economic relationship between Canada and the United States in the 1980s that have potentially increased pressures for cross-border movement of skilled workers. First, the Canadian/American Free Trade Agreement (FTA) in 1989 and later NAFTA in 1994 facilitated trade in goods and services and opened reciprocal short-term cross border immigration in a variety of business and professional classes (**See section VIII**). Papademetriou (1997) also **demonstrates that the United States** employment based entry class was expanded under the 1990 United States **Immigration Act** to a level of 140,000 which opened the potential for more permanent Canadian **emigration** to the United States. **In fact, Papademetriou (1997) reports that an excess of openings existed in the United States for these 140,000 employment based slots which potentially eased the access of highly trained Canadians after 1990**. Table 2 below summarizes the trends in the **post-1981** Canadian emigration flows to the United States. For the pre-FTA period, or 1982-89, the gross permanent Canadian flows to the United States **totaled** 13,940 professionals and 7,883 managerial workers, **respectively with an additional 2,951 skilled movers**.

**Table 2**  
**Canadian Emigration to the United States by Occupational Groups (1982-1996)**

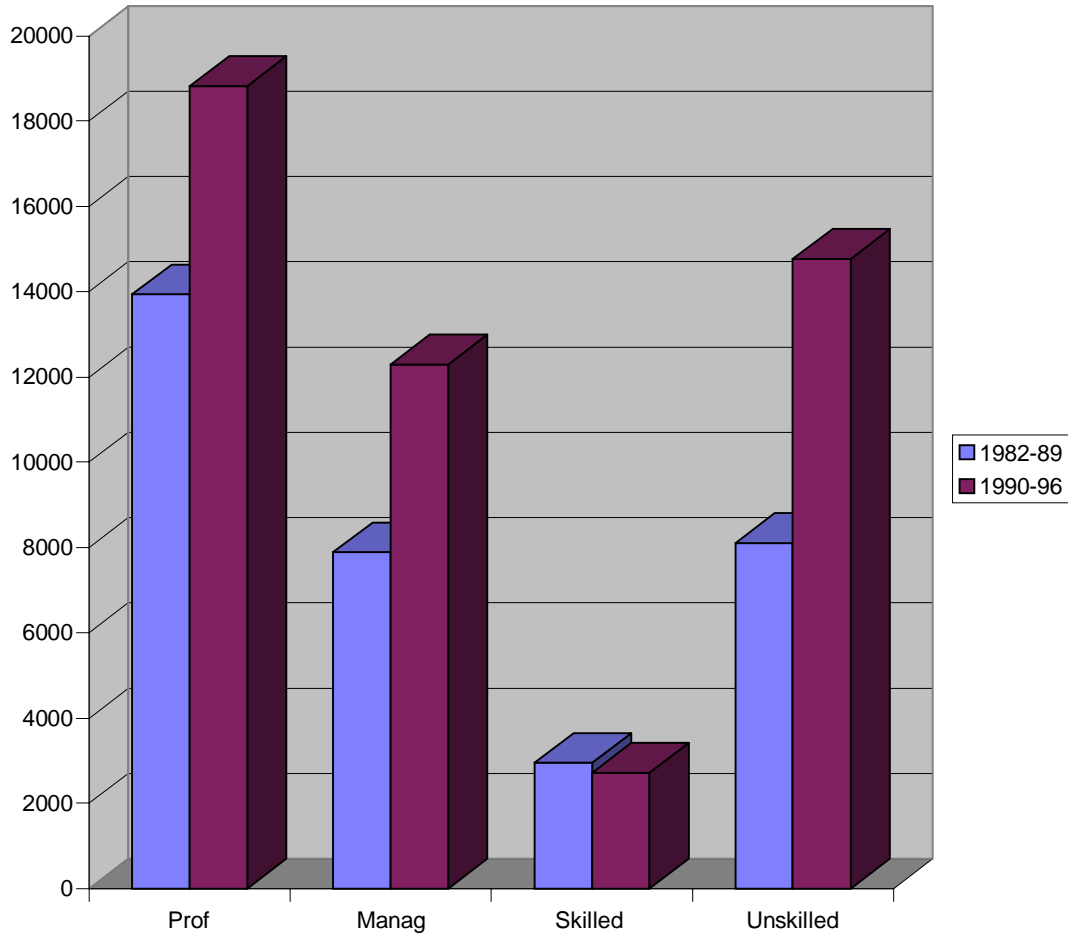
<i>Year</i>	<i>Professionals (Net)</i>	<i>Managerial</i>	<i>Skilled<sup>a</sup></i>	<i>Unskilled<sup>b</sup></i>
<i>1982</i>	1,690	831	264	664
<i>1983</i>	1,627	914	343	900
<i>1984</i>	1,628	996	368	933
<i>1985</i>	1,757	928	378	1,097
<i>1986</i>	1,751	971	336	1,127
<i>1987</i>	1,848	1,122	383	1,143
<i>1988</i>	1,867	934	380	1,111
<i>1989</i>	1,772	1,187	499	1,129
<i>1990</i>	2,493	1,751	752	3,571
<i>1991</i>	2,080	1,327	539	2,709
<i>1992</i>	2,384	1,853	322	2,082
<i>1993</i>	2,916	2,022	318	2,092
<i>1994</i>	2,929	1,861	262	1,798
<i>1995</i>	2,440	1,415	176	1,512
<i>1996</i>	3,581	2,065	351	1,000
<i>1982-1989<sup>c</sup></i>	13,940	7,883	2,951	8,104
<i>1990-1996<sup>c</sup></i>	18,823	12,294	2,720	14,764
<b><i>Total</i></b>	<b>32,763</b>	<b>20,177</b>	<b>5,671</b>	<b>28,539</b>

Source: U.S. Immigration and Naturalization Service, Demographic Statistics Branch, Statistical Yearbooks, passim 1983-97.

Notes:

- a. These include workers in precision production, craft and repair occupations.
- b. These include operators, fabricators, laborers, sales, administrative support, farming, forestry, fishing and service occupations.
- c. Represents cumulative total flows for the respective years.

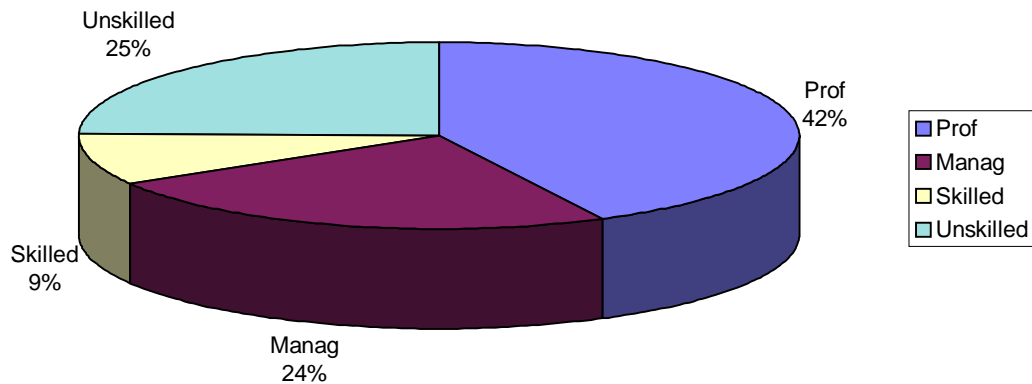
**Figure 1: Canadian Emigration Flows to the United States by Occupational Groups (1982-1996)**



Source: U.S. Immigration and Naturalization Service, Demographic Statistics Branch, Statistical Yearbooks, passim 1982-95 and special tabulations.

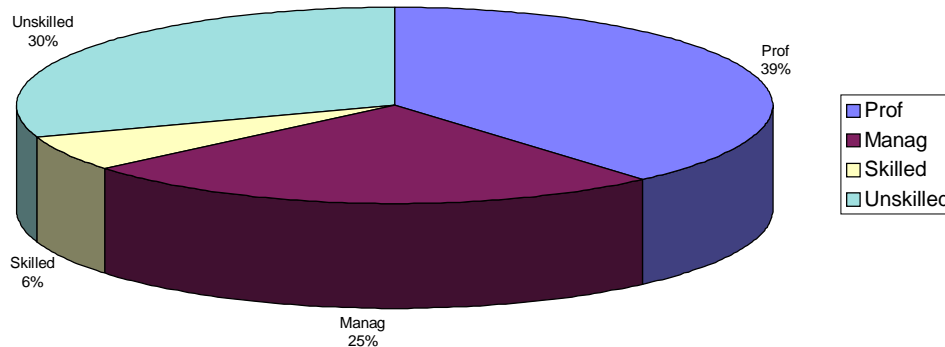
The corresponding **Canadian** emigrant numbers **over** the shorter 1990-96 period are **18,823** professionals, 12,294 managers and **2,720 skilled workers**. Comparing 1982-89 to **the** post-FTA 1990-1996 **period** a significant increase in the **gross** flow of Canadians to the United States in all categories but the skilled occupations (see Figure 1) **is observed**. In fact, the **Canadian** professional and managerial occupational gross **flows to the United States** recorded an increase of about 35 % and 56% respectively after 1989.

**Figure 2: Canadian Emigration Flows to USA by Broad Occupational Groups: 1982-89**



Source: U.S. Immigration and Naturalization Service, Demographic Statistics Branch, Statistical Yearbooks, passim 1982-1995 and special tabulations.

**Figure 3: Canadian Emigration Flows to the United States by Broad Occupational Groupings (1990-1996)**



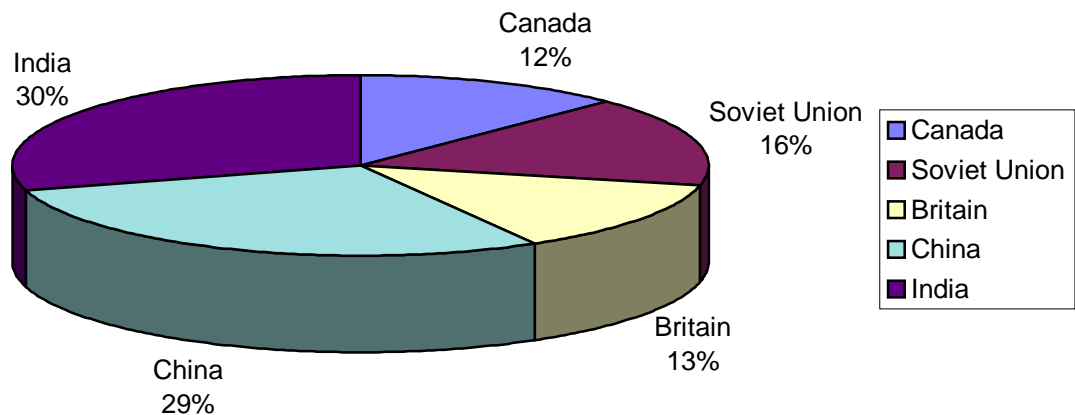
Source: U.S. Immigration and Naturalization Service, Demographic Statistics Branch, Statistical Yearbooks, passim **1982-1995 and special tabulations.**

Figure 2 depicts the shares of Canadian **gross** emigration flows by occupation for the pre-FTA period while Figure 3 describes the changes resulting after **the enactment of** the 1990 U.S. **Immigration Act**. The rise in the share of unskilled Canadian immigrants after 1990 is unexpected but, easy to rationalize.<sup>8</sup> Nevertheless, the key point to emphasize is that over 61 percent of post-1990 Canadian emigrants to the United States were in either the professional or managerial categories.

Figure 4 places Canadian emigration to the United States in context vis-à-vis the flow from other major sending countries to the United States in the post-1990 period.

<sup>8</sup> Papademetriou notes that the 1990 U.S. **Immigration Act** explicitly reserved a fixed number of employment visas for the unskilled. Unskilled Canadians could now enter through this gate. Others have also suggested that the unskilled appear as a lagged flow arising from the 1988 amnesty accorded to undocumented Canadians (and others) living in the United States. In short, the United States invoked an amnesty for undocumented residents circa 1988. This act led to a sharp post-1990 increase in the recorded numbers of formerly undocumented and unskilled Canadian workers.

**Figure 4: Professional Occupations: Immigrants to the United States (1990-1996)**



Source: U.S. Immigration and Naturalization Service, Demographic Statistics Branch, Statistical Yearbooks, passim 1990-95 **and special tabulations.**

Figure 4 illustrates two points. First, unlike the earlier brain drain circa 1950-63, Canada is **absolutely** a small sender of brain power to the United States when compared to India or China. However, on a per capita basis, Canada is again the world's largest exporter of professionals to the United States.

How does **these Canadian outflow numbers** compare in other dimensions to the pre-1965 brain drain? In short, the 1982-96 flow of Canadian professionals to the United States exceeded that of 1950-63. Using Parai's definitions for highly trained workers, we see the **emigrant** outflow rise from 36, 147 in 1950-63 to **58,611** for the 1982-96 period. **In contrast if** we compare the post 1982 flow not to the total base population but the stock of existing technical, managerial and skilled population the recent outflow is very modest.<sup>9</sup> **We return to the significance of this latter point later in the essay.**

<sup>9</sup> Note Canadian emigrants in the professional **and managerial** categories as a percentage of the professional manpower **stock averaged 1% of the 1989 – 1996 stock or approximately 1/10 of the ratio circa 1950 - 1963.** See Statistics Canada's, Labor Force History Review.

To more accurately reflect the ultimate economic impact of this cross border movement we present tables 3 and 4 to net for U.S. immigrant movement to Canada:

**Table 3**  
**Canadian Gross & Net (of U.S. Flows to Canada) Emigration to the United States by Occupational Groups (Professionals and Managers: 1982-1996)**

Year	Professionals <sup>a</sup>			Managers		
	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)
1982	1,690	1,576	114	831	616	215
1983	1,627	1,043	584	914	438	476
1984	1,628	876	752	996	397	599
1985	1,757	797	960	928	383	545
1986	1,751	980	771	971	474	497
1987	1,848	1,067	781	1,122	542	580
1988	1,867	910	957	934	457	477
1989	1,772	927	845	1,187	476	711
1990	2,493	N.A. <sup>b</sup>	2,493	1,751	N.A.	1,751
1991	2,080	834	1,246	1,327	351	976
1992	2,384	980	1,404	1,853	360	1,493
1993	2,916	999	1,917	2,022	370	1,652
1994	2,929	877	2,052	1,861	374	1,487
1995	2,440	676	1,764	1,415	332	1,083
1996	3,581	641	2,940	2,065	302	1,763
1982-1989 <sup>c</sup>	13,940	8,176	5,764	7,883	3,783	4,100
1990-1996 <sup>c</sup>	18,823	5,007	13,816	12,294	2,089	10,205
<b>Total</b>	<b>32,763</b>	<b>13,183</b>	<b>19,580</b>	<b>20,177</b>	<b>5,872</b>	<b>14,305</b>

Source: US Immigration and Naturalization Service, Demographic Statistics Branch, Statistical Yearbooks, passim 1982-1986, and Citizenship and Immigration Canada, Immigration Statistics, 1982-1994, plus special tabulations.

**Notes:**

- a. These include professionals in natural and social sciences, teaching, medicine and health and the performing arts.
- b. Data not available for these years.
- c. Represents cumulative totals for the respective years.



**Table 4**  
**Canadian Gross & Net (of U.S. Flows to Canada) Emigration to the United States by**  
**Occupational Groups (Skilled and Unskilled Occupations: 1982-1996)**

Year	Skilled <sup>a</sup>			Unskilled <sup>b</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)
1982	264	325	-61	664	1,191	-527
1983	343	215	128	900	954	-54
1984	368	205	163	933	882	51
1985	378	195	183	1,097	908	189
1986	336	197	139	1,127	894	233
1987	383	243	140	1,143	972	171
1988	380	190	190	1,111	743	368
1989	499	245	254	1,129	797	332
1990	752	N.A. <sup>c</sup>	752	3,571	N.A.	3,571
1991	539	182	357	2,709	659	2,050
1992	322	149	173	2,082	574	1,508
1993	318	147	171	2,092	600	1,492
1994	262	123	139	1,798	522	1,276
1995	176	72	104	1,512	245	1,267
1996	351	50	301	1,000	319	681
1982-1989 <sup>d</sup>	2,951	1,815	1,136	8,104	7,341	763
1990-1996 <sup>d</sup>	2,720	723	1,997	14,764	2,919	11,845
<b>Total</b>	<b>5,671</b>	<b>2,538</b>	<b>3,133</b>	<b>22,868</b>	<b>10,260</b>	<b>12,608</b>

Source: US Immigration and Naturalization Service, Demographic Statistics Branch, Statistical Yearbooks, passim 1982-1986, and Citizenship and Immigration Canada, Immigration Statistics, 1982-1994, plus special tabulations.

**Notes:**

- a. These include workers in precision production, machining, craft and repair and construction occupations.
- b. These include operators, fabricators, labourers, sales, clerical, farming, forestry, mining, fishing and service occupations.
- c. Data not available.
- d. Represents cumulative totals flows for the respective years.

A comparison of the gross to net immigrant numbers is revealing. The net Canadian emigrant flows for either the professional or managerial categories between 1982-1989 were 5,764 and 4,100 respectively. In fact, for the early 1980's the yearly net flows for either grouping averaged below 1,000 per year. A dramatic shift in the net flows occurs after 1989 as United States inflows decline and a marked increase in the Canadian outflow occurs. If we compute the ratios of the net to gross emigration flows for the pre and post 1990 period these trends are made even more pronounced. Between 1982-89 the net flows out of Canada to the United States were only 40% and 52% of the gross flows to the United States for the professionals and managers respectively. In other words, during this period Canada was being substantially compensated for its cross border movement to the United States. After 1990- these ratios were 76% and 86% respectively indicating that little United States counter flow is evident after 1989. Two conclusions can be drawn from tables 3 and 4. First, aggregating net flows over the 1980's and 1990's as has been done by some authors is clearly misleading since it misses the fundamental post-1988 shift in trends. Secondly, two separate forces- push and pull were operating which simultaneously lowered United States immigration to Canada and increased Canadian emigration to the United States after 1989. We return to these points in section VII.

Finally, raw emigrant numbers whether on a gross or net basis are misleading since they offer little economic insight. Ultimately the value of this transfer which is of central interest in this paper. We now turn to this valuation.

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

To properly address the **many economic** issues **alluded to earlier** the reported emigrant numbers must be converted to a valuation measure which reflects the resources embodied in the flow. Following **Coulson and DeVoretz (1993)**, we **initially** calculate the value of the human capital transfers by the replacement cost method for only the post-secondary 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 exclude lower levels of education. **Later, however we value all the** education embodied in **all Canadian immigrants regardless of schooling level** to more accurately reflect the Canadian taxpayers' total subsidy. **In**

**addition, we widen our perspective by noting that replacement** costs can be valued from either society's or the individual's viewpoints. The private or individual direct costs include private payments for tuition, books and fees. If you add foregone earnings (**while attending school**) to the private direct costs, you estimate private total costs to the individual<sup>16</sup>. The reported social direct costs include private direct costs plus any government subsidy. Finally, social total costs equals social direct costs plus the foregone earnings for the relevant occupations.

**Table 5 reports in detail the replacement cost estimates for the 1993/94 Canadian immigration flow to the United States for both managers and eight other broad occupational groups.<sup>17</sup> Later we will report aggregated occupational transfers for the 1982-1994 to allow a trend analysis.**

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<sup>16</sup> Calculation of foregone earnings for the relevant post-secondary degree was as follows. Each profession's post-secondary degree requirement was first determined and if only a B.A. was required, then the average earnings for the average full-time full-year high school graduate between the ages of 18-22 was used. Data source was the Public Use Sample Tape Individual Files 1991 Census. If the occupation required an advanced degree beyond the B.A., a similar procedure was followed **except the foregone income not earned** was generated for the appropriate number of years required to obtain the assigned post-B.A. degree level.

<sup>17</sup> As noted in **Table 5** immigrant numbers in the United States are collected on a fiscal-year basis, hence the overlapping years 1993/94.

**Table 5: Gross Value of Human Capital Flow at Canadian 1993/94 Replacement Costs by Occupations (1993/94 Canadian \$)**

<i>Occupations</i>	<i>(1)Number of Immigrants<sup>a</sup></i>	<i>(2) Private Direct Costs per Student<sup>b</sup></i>	<i>(3) Social Direct Costs per Student<sup>c</sup></i>	<i>(4)=(3)-(2) Taxpayers' Subsidy per Student</i>	<i>(5) Private Total Costs per Student<sup>d</sup></i>	<i>(6) Social Total Costs per Student<sup>e</sup></i>	<i>(7)=(1) X (5) Private Total Costs for all Immigrants</i>	<i>(8)=(1) X (6) Social Total Costs for all Immigrants</i>	<i>(9)=(8)-(7) Taxpayers' Subsidy for all Immigrants</i>
<i>Manager</i>	2689	\$ 62,445	\$ 139,333	\$ 76,888	\$ 102,804	\$ 179,692	\$ 276,439,956	\$ 483,191,788	\$ 206,751,832
<i>Engineer</i>	452	\$ 83,256	\$ 179,366	\$ 96,110	\$ 133,705	\$ 229,815	\$ 60,434,660	\$ 103,876,380	\$ 43,441,720
<i>Natural Scientist</i>	293	\$ 94,056	\$ 209,388	\$ 115,332	\$ 153,498	\$ 287,913	\$ 44,974,914	\$ 84,358,509	\$ 39,383,595
<i>Professor</i>	251	\$ 94,056	\$ 247,832	\$ 153,776	\$ 170,388	\$ 364,523	\$ 42,767,388	\$ 91,495,273	\$ 48,727,885
<i>Teacher<sup>f</sup></i>	318	\$ 67,810	\$ 163,920	\$ 96,110	\$ 146,335	\$ 242,445	\$ 46,534,530	\$ 77,097,510	\$ 30,562,980
<i>Physician</i>	319	\$ 119,356	\$ 273,132	\$ 153,776	\$ 236,047	\$ 389,823	\$ 75,298,993	\$ 124,353,537	\$ 49,054,544
<i>Nurse</i>	1,068	\$ 50,056	\$ 126,944	\$ 76,888	\$ 90,415	\$ 167,303	\$ 96,563,220	\$ 178,679,604	\$ 82,134,384
<i>Medical Tech.</i>	42	\$ 50,056	\$ 126,944	\$ 76,888	\$ 90,415	\$ 167,303	\$ 3,797,430	\$ 7,026,726	\$ 3,229,296
<i>Other Prof.</i>	1,504	\$ 86,856	\$ 163,744	\$ 76,888	\$ 127,215	\$ 204,103	\$ 191,331,360	\$ 306,970,912	\$ 115,639,552
<i>Skilled</i>	318	\$31,227	\$69,666	\$38,439	\$51,400	\$89,846	\$16,345,200	\$28,571,028	\$12,225,828
<b>Total</b>	7,254	N.A.	N.A.	N.A.	N.A.	N.A.	\$854,487,651	\$1.585 billion	\$631,113,467

Notes :  
<sup>a</sup> Immigration and Naturalization Services, U.S.. numbers reported for **fiscal year** October 1, 1993 to September 30, 1994.

<sup>b</sup> Private Direct Costs. Tuition plus books, fees, lodging and food. **Source: Statistics Canada Tuition and Living Accommodation.81-219.**

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

<sup>d</sup> Private total costs per student equals direct costs plus foregone earnings for the relevant time spent in school. All occupations are four(4) years except five(5) years for engineers, six(6) years for scientists and teachers, and eight(8) years for both physicians and professors. Foregone earnings are defined as \$9248.21 per year for those occupations requiring four years of schooling and \$17,491.29 per year for those occupations that require a post B.A, B.B.A. or B.Sc. Earnings calculated from PUST 1991 Census. To convert 1990 earnings to 1993-94 dollars earnings were inflated using consumer price indices from 1991 and 1993 taken from Statistics Canada Catalogue no. 62-010-XPB.

<sup>e</sup> Social total costs equals direct costs plus foregone earnings.

<sup>f</sup> Based on a **post-B.A.** two year education program.

Table 5 columns 2 and 3 **reports** the replacement values of the **transferred** human capital from the individual's (private direct) and society's (social direct) viewpoints. As the stylized **facts cited in the popular literature** suggest, physicians generate both the greatest private (\$119,356,) and social (\$273,132) direct costs. Professors are a close second, with \$94,056 and \$247,832 in form of private and social direct **costs per emigrant**. Nurses, medical technicians and managers absorb the lowest private (and social) direct costs **per leaver since their** education **ranged** from \$50,056 under the **private cost concept to** \$139,333 for the social direct costs.

Turning to the aggregate cost figures for the 1993/94 flow, we see that total private direct costs or the resources paid out by the **students who subsequently emigrated** to the United States totaled **\$854 million** for all occupations. More interesting than this yearly total figure is the distribution of replacement values by occupation under the private cost concept for the 1993/94 Canadian **emigrant** flow. Managers dominated the total flow of outgoing resources with a \$276.4 million valued at private direct replacement costs. This high value indicates that the relatively large number of managerial **emigrants** outweighed their low private direct cost endowment in the total private direct cost calculation. This pattern is again repeated for managers **under** the social direct cost concept with \$483.2 million of embodied educational costs flowing to the United States **in 1994**.

Total private or social direct **costs embodied in either emigrant** physicians **or** engineers **to the United States was** substantially less **circa 1993/94** given relatively **fewer** movers. **In fact, nurses**, owing to the large volume of their emigrant outflow, sent greater total endowed capital to the United States in 1993/94 than either engineers or physicians. Finally, medical technicians appear incidental in the overall valuations.

*Canadian taxpayer subsidies:*

Two important public finance concepts can be derived from table 5. First, it should be noted that the calculated difference between column (3) minus (2), or (6) minus (5), yields the taxpayer subsidy per student as revealed in column 4. The estimated taxpayer-direct subsidies reported in column 4 for 1994 ranged from \$153,776 (physicians and professors) to only \$76,888 for the **medical technicians and** "other" professional categories. Secondly, it is apparent from column 4 that managers pay the largest share of their direct costs of post-secondary education, which is greater than any other professional group. **The range of taxpayers' subsidies as a percentage of the total direct costs of**

**post-secondary education in the remaining professional occupations varies from 39 percent for physicians and professors to 42 percent for teachers and engineers.**

Column (9) reports the **total** taxpayer subsidy for each occupational grouping's total flow of **Canadians** who moved to the United States in 1993/94. Given the already cited large number of **Canadian emigrant** managers in 1993/94 outflow (2,689), the total taxpayer subsidy is the largest for this group at **\$206.7 million**. Again, although nurses had one of the smallest **absolute taxpayer-subsidy levels** (\$76,888) per student they represented the second largest number of movers in 1994 (1,068). These countervailing forces resulted in a substantial taxpayer transfer from this nursing flow to the United States of \$82.1 million in 1994. Engineers and physicians, **two frequently cited categories of the brain drain**, represented only 11 percent of the 1994 immigrant flow to the United States. The dollar value of the embodied taxpayer subsidy was also correspondingly low at only 14.9 percent of the total 1993/94 outflow.

**Table 6**  
Value of Net Human Capital Flow at Canadian 1993/94 Replacement Costs by Occupations  
(1993/94 Canadian \$)

<i>Occupations</i>	<i>(1) Net Flow of Immigr ants</i>	<i>(2) Private Direct Costs per Student</i>	<i>(3) Social Direct Cost per Student</i>	<i>(4)=(3)-(2) Taxpayers' Subsidy per Student</i>	<i>(5) Private Total Costs per Student</i>	<i>(6) Social Total Costs per Student</i>	<i>(7)=(1)*(5) Private Total costs for all Immigrants</i>	<i>(8)=(1)*(6) Social Total Costs for all immigrants</i>	<i>(9)=(8)-(7) Taxpayers' Subsidy for all Immigrants</i>
<i>Managers</i>	2,315	\$ 62,445	\$ 139,333	\$ 76,888	\$ 102,804	\$ 179,692	\$ 237,991,260	\$ 415,986,980	\$ 177,995,720
<i>Natural Scientists<sup>a</sup></i>	465	\$ 88,656	\$ 194,377	\$ 105,721	\$ 143,602	\$ 258,864	\$ 65,482,512	\$ 120,371,760	\$ 54, 889,248
<i>Professors/ Teachers</i>	116	\$ 67,810	\$ 163,920	\$ 96,110	\$ 146,335	\$ 242,445	\$ 16,974,860	\$ 28,123,620	\$ 11,148,760
<i>Professionals</i>	1,471	\$ 88,656	\$ 194,377	\$ 105,721	\$ 143,602	\$ 258,864	\$211,238,540	\$380,788,940	\$169,550,400
<b><i>Total Above</i></b>	<b>4,367</b>	N.A.	N.A.	N.A.	N.A.	N.A.	<b>\$531,687,172</b>	<b>\$945,271,300</b>	<b>\$413,584,128</b>
<b><i>Pre-Secondary</i></b>	<b>4,367</b>	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	<b>\$237,600,000</b>	<b>\$237,600,000</b>
<b><i>Grand Total</i></b>	<b>4,367</b>	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	<b>\$1,182,871,300</b>	<b>\$651,184,128</b>

Notes:

<sup>a</sup> The Natural Scientist occupation includes natural sciences, engineers and architects

b. Assume 2 years of post-secondary education for skilled requirements.

Source: Column (1) per table 4 and 9, columns 2 to 9 per table 4.

10/10/98

**Human capital flows should be based on a net concept if we are to accurately measure both the public finance and productivity impacts on the Canadian economy. Table 6 nets for the value of United States emigrants to Canada before calculating the relevant cost concepts circa 1993/94<sup>10</sup>. The taxpayer subsidy for the net flow of managers is 86% (\$ 177,995,720) of the taxpayer subsidy based on the gross flow of managers as reported in table 4. For teachers and natural scientists the corresponding percentages are 37% (\$ 11,148,760) and 64% (\$ 54,889,248) respectively. The residual professional categories provided a net transfer of human capital to the United States of **\$380.7 million with a \$160.9 million Canadian taxpayers subsidy.****

**In sum, the total taxpayer subsidy for all these occupations is 67% of the gross flow circa 1993/94 reported in table 5. To put this latter value in perspective, this one year outflow of taxpayer-financed human capital is the equivalent of 2.5 years' Simon Fraser University's 1996/97 operating budget, which covers an enrollment of 15 thousand students per year.**

In addition, **some** argue that elementary and secondary school social direct costs should be added to the cost measures since it implies a delayed but consequential taxpayer subsidy. In 1993/94 the United States bound net emigrant flow took a total taxpayer subsidy of approximately **\$237.6 million** in the form of elementary and secondary social direct cost **and raises the 1994 net Canadian taxpayers subsidy to \$651.2 million.**<sup>11</sup>

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<sup>10</sup> **Due to differing definitions of immigrant occupational groups between U.S. and Canadian data sources we report individually only the comparable groups. The rest of the transfer is reported as residual professionals.**

<sup>11</sup> The social direct cost, which is equal to the tax payer subsidy for elementary and secondary schooling, per student for the year 1993/94 is \$6523.24. To calculate the total taxpayer subsidy we took this figure and multiplied by the twelve years of elementary and secondary schooling that is required for one to move on to university. Clearly, this estimate is a conservative one as no compounding **of the secondary and elementary costs by the real rate of interest** was used to inflate the dollar value over the twelve year time period.



*Managerial U.S. – Canada Bilateral Flow 1982-96***Table 7. Gross Value of Human Capital Flows at Canadian Replacement Costs for Managers for the years 1982-1996 (1993/94 dollars)**

	(1)	(2)	(3)	(4)=(3)-(2)
Year	Number of Managers <sup>a</sup>	Private Total Costs for Managers	Social Total Costs for Managers	Taxpayers' subsidy
1982	831	\$ 85,430,124	\$ 149,324,052	\$ 63,893,928
1983	914	\$ 93,962,856	\$ 164,238,488	\$ 70,275,632
1984	996	\$ 102,392,784	\$ 178,973,232	\$ 76,580,448
1985	928	\$ 95,402,112	\$ 166,754,176	\$ 71,352,064
1986	971	\$ 99,822,684	\$ 174,480,932	\$ 74,658,248
1987	1122	\$ 115,346,088	\$ 201,614,424	\$ 86,268,336
1988	934	\$ 96,018,936	\$ 167,832,328	\$ 71,813,392
1989	1187	\$ 122,028,348	\$ 213,294,404	\$ 91,266,056
1990	1751	\$ 180,009,804	\$ 314,640,692	\$ 134,630,888
1991	1327	\$ 136,420,908	\$ 238,451,284	\$ 102,030,376
1992	1853	\$ 190,495,812	\$ 332,969,276	\$ 142,473,464
1993	2022	\$ 207,869,688	\$ 363,337,224	\$ 155,467,536
1994	1861 <sup>b</sup>	\$ 191,318,244	\$ 334,406,812	\$ 143,088,568
1995	1415	\$145,467,450	\$254,264,090	\$108,796,640
1996	2065	\$212,215,400	\$371,472,850	\$158,257,450
1990-96	12,294	\$ 1,392,295,500	\$2,209,133,000	\$ 816,830,633
1982-96	20,174	\$ 2,074,275,888	\$ 3,624,723,000	\$1,551,476,800
Pre-secondary	20,177	NA	\$ 134,419,000	\$ 134,419,000
Total Gross	20,177	\$2,074,275,888	\$ 3,759,132,000	\$ 1,685,895,800

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

<sup>b</sup> This 1994 value is lower than the value reported in table 5 which covered a different time period (Oct. 1993 - Sept. 30, 1994).

<sup>c</sup> All cost calculations per definitions found in **Table 5 except Pre-secondary from Statistics Canada, Education in Canada, Cat. No. 81-229-XPB June 1997.**

<sup>d</sup> Total Enrolment (pre-secondary) = 5,362,799

<sup>e</sup> Total Expenditures (1994/95) = \$ 35,724 billion

<sup>f</sup> Average Expenditure Per Student = \$ 6,662

**Table 7** reports values for the human capital flows embodied in Canadian managers who permanently emigrated between 1982-**96** to the United States under the several cost concepts reported in Table 5. The total social cost embodied in **emigrant** managers over the study period was large, **\$3.8 billion** (1994 dollars) with over 50 percent of the flow occurring in the last five years. Clearly, the management brain drain is a 1990's phenomenon. However it should be carefully noted that, over 57 percent of this embodied human capital was self-financed by the immigrant managers.

Column (4) reports the yearly Canadian taxpayer education subsidy based upon 1994 costs for the total managerial gross immigrant flow circa 1982-**96** to the United States. In total, the 1982-**96** educational transfer in the form of taxpayer subsidies was **\$1.68 billion (including pre-secondary costs)**. More **dramatic than this absolute amount** is the structural shift in this flow,

which occurred after 1989. The average yearly post-1989 taxpayer transfer embodied in managers was \$135.5 million while the pre-1990 yearly average emigrant human capital managerial flow was valued at only \$75.5 million per annum. **In other words, the value of capital embodied in Canadian immigrant managers rose after 1989 with more capital (\$816 million) transferred in the last seven years (1990-96) than in the preceding eight years (\$735 million in 1982-1989).**

**Table 8** Net Value of Human Capital Flows at 1994 Canadian Replacement Costs for Net Flow of Managers for the years 1982-1994 (1993/94 dollars)

Year	(1) Net Flow of Managers <sup>a</sup>	(2) Private Total Costs for Managers	(3) Social Total Costs for Managers	(4)=(3)-(2) Taxpayers' subsidy
1982	215	\$ 22,102,860	\$ 38,633,780	\$ 16,530,920
1983	476	\$ 48,934,704	\$ 85,533,392	\$ 36,598,688
1984	599	\$ 61,579,596	\$ 107,635,508	\$ 46,055,912
1985	545	\$ 56,028,180	\$ 97,932,140	\$ 41,903,960
1986	497	\$ 51,093,588	\$ 89,306,924	\$ 38,213,336
1987	580	\$ 59,626,320	\$ 104,221,360	\$ 44,595,040
1988	477	\$ 49,037,508	\$ 85,713,084	\$ 36,675,576
1989	711	\$ 73,093,644	\$ 127,761,012	\$ 54,667,368
1990	1,413	\$ 145,262,052	\$ 253,904,796	\$ 108,642,744
1991	976	\$ 100,336,704	\$ 175,379,392	\$ 75,042,688
1992	1,493	\$ 153,486,372	\$ 268,280,156	\$ 114,793,784
1993	1,655 <sup>b</sup>	\$ 170,140,620	\$ 297,390,260	\$ 127,249,640
1994	1,487	\$ 152,869,548	\$ 267,202,004	\$ 114,332,456
1995	1,415	\$ 145,467,660	\$ 254,264,180	\$ 108,796,520
1996	2,065	\$ 212,290,260	\$ 371,063,980	\$ 158,773,720
Sub. 1990-96	10,504	\$ 1,079,853,216	\$ 1,887,484,768	\$ 797,631,552
Total Net 1982-96	14,604	\$ 1,501,349,616	\$ 2,624,221,968	\$ 1,122,872,352
<b>Pre secondary</b>	<b>14,604</b>	<b>NA</b>	<b>\$ 96,360,000</b>	<b>\$ 96,360,000</b>
<b>Grand Total</b>	<b>14,604</b>	<b>\$ 1.5 billion</b>	<b>\$ 2.7 billion</b>	<b>\$ 1.2 billion</b>

<sup>a</sup> All cost calculations per definitions found in Table 5.

<sup>b</sup> This figure is calculated based on a simple average of United States immigrants to Canada in the manager occupation in 1992 and 1994. See table 10.

**Table 8** reports the net human capital values transferred under the various cost concepts when we adjust for **the** United States **managerial** emigrant flow **into** Canada. Basically, this adjustment for the bilateral counter flow from the United States reduced the reported gross values by 33 per cent. **However, netting for countervailing United States over the entire period is misleading. For the crucial post FTA period of 1990-96 the Canadian taxpayers' subsidy**

was still **80% of the gross flow reported in table 7. As noted above, little countervailing human capital transfers in the form trained managers occurred after 1989.**

**Table 9.** Value of Human Capital **Gross and Net** Flows at Canadian Replacement Costs for all Professionals for the years 1982-1996 (1993/94 dollars)

Year	(1) Number of Professionals <sup>a</sup> Gross/Net	(2) Private Total Costs for all Professionals	(3) Social Total Costs for all Professionals	(4)=(3)-(2) Taxpayers' Subsidy Gross
1982	1690	\$ 223,517,710	\$ 387,525,450	\$ 164,007,740
1983	1627	\$ 215,185,393	\$ 373,079,235	\$ 157,893,842
1984	1628	\$ 215,317,652	\$ 373,308,540	\$ 157,990,888
1985	1757	\$ 232,379,063	\$ 402,888,885	\$ 170,509,822
1986	1751	\$ 231,585,509	\$ 401,513,055	\$ 169,927,546
1987	1848	\$ 244,414,632	\$ 423,755,640	\$ 179,341,008
1988	1867	\$ 246,927,553	\$ 428,112,435	\$ 181,184,882
1989	1772	\$ 234,362,948	\$ 406,328,460	\$ 171,965,512
1990	2493	\$ 329,721,687	\$ 571,657,365	\$ 241,935,678
1991	2080	\$ 275,098,720	\$ 476,954,400	\$ 201,855,680
1992	2384	\$ 315,305,456	\$ 546,663,120	\$ 231,357,664
1993	2916	\$ 385,667,244	\$ 668,653,380	\$ 282,986,136
1994	2929	\$ 387,386,611	\$ 671,634,345	\$ 284,247,734
1995	4,255	\$562,760,260	\$975,691,640	\$412,928,870
1996	3,581	\$473,617,970	\$821,114,025	\$347,520,016
1990-96 Gross	<b>20,638</b>	\$3.07 billion	\$4.73 billion	\$2.0 billion
1982-96 Gross	34,578	\$4.57 billion	\$ 7.92 billion	\$ 3.3 billion
1982-96Net	16,776 <sup>c</sup>	\$ 2,2billion	\$ 3.8 billion	\$ 1.6 billion
<b>1982-96 Gross-sec</b>	<b>34,578</b>	<b>NA</b>	<b>\$ 230,358,640</b>	<b>\$ 230,358,640</b>
<b>1982-96 Net-sec</b>	<b>16,776</b>	<b>NA</b>	<b>\$ 111,761,000</b>	<b>\$ 111,761,000</b>
<b>Grand Gross</b>	<b>34,578</b>	<b>\$4.57 billion</b>	<b>\$ 8.1 billion</b>	<b>\$ 3.4 billion</b>
<b>Grand Net</b>	<b>NA</b>	<b>\$2.2 billion</b>	<b>\$ 4.01 billion</b>	<b>\$1.7 billion</b>

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

<sup>b</sup> All cost calculations per definitions found in Table 5.

<sup>c</sup> To calculate the net flow figure we deducted the total United States immigrant flow per year into Canada and valued this net flow at the average embodied human capital per professional circa 1993-94..

**Table 9** reports the 1982-1996 values of the gross and net immigrant flows for all the professional occupations except managers. The **gross Canadian** emigrant flow of professionals for the entire **1982-96** period is large, **34,578** with 20,638 moves occurring after 1989. The net flow of **16,776** is more modest. The embodied private and social direct costs in the gross **professional emigrant** flow to the United States (**34,578**) was **\$4.57** billion and **\$8.2** billion transferred under these two concepts respectively. Again, as with managers, a structural shift occurred **in the Canadian professional emigrant flow** in the 1990-1996 period. Almost **60%** of the human capital flow

embodied in professionals for the entire fifteen-year period (1982-96) was transferred in the last seven years.

**When we deduct for the bilateral transfer of United States professionals to Canada the cumulative value of the taxpayer subsidy declines from \$3.5 billion to \$1.7 billion if we include pre-secondary educational costs. In other words, \$1.5 billion of the Canadian taxpayer subsidy in the form of embodied educational transfers was returned during the 1982-1996.**

To better understand the dynamics of the Canadian human capital transfer it is necessary to search for trends within the individual professions over the 1982-1997 period.<sup>12</sup> Annex A tables A-1 to A-10 provide this detail. It is apparent from these tables that some professions experienced only modest transfers to the United States while a few grew dramatically after 1988. A modest set of gross human capital flows of 4-7 million dollars a year were individually generated by Canadian architects, health technologists, social scientists and urban planners moving to the United States. In contrast doctors, nurses tripled the value of their embodied gross human capital flows from an annual average of nearly 70 million dollars in 1987/88 to nearly 200 million dollars per occupation by 1997. Teachers and professors were the intermediate case sending a near constant 75 million in transferred capital with no discernable trends over the 1982-97 period.<sup>13</sup>

In sum, the size of the Canadian **net** transfer at social cost **to the United States** for both managers and all other professionals over the 1982/96 period was **\$6.7 billion** or **almost 3 times** the value of the last major movement in 1950-63. This **net** flow represents the financial equivalent of **almost \$3 billion Canadian taxpayers' subsidy to the United States for post-secondary training portion of Canada's 1982/94 emigrant flow.**

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<sup>12</sup> Note 1997 Canadian Immigration Data is unavailable to include in tables 7-9.

<sup>13</sup> There are select immigrant categories that can be matched between Canada and the United States to deduce net movement by occupation. For example, Canada collects United States immigrant inflows for teachers, medical and health workers and a combined group labeled natural scientists, engineers, math's, etc. Each one of these Canadian immigrant categories contains a highly intensive and lowly intensive human capital component. For example, the Canadian medical and health immigration category contains nurses and physicians. Thus, simply combining United States physicians and nurses and deducting them from a similar aggregate Canadian outflow to the United States to obtain a net flow is meaningless.

**Table 10**  
Comparison of Supply of **Selected Canadian** Graduates (1991) and Number of Emigrants (1993/94)

Field of Study	(1) Number of Degrees Conferred (1991)	(2) Number of Emigrants (1993/94)	(3)=(2)/(1) Percentage of Graduates that emigrated
Managers	14,486	2689	18.6
Engineers	7124	452	6.3
Scientists <sup>a</sup>	2017	293	14.5
Professors	2947	251	8.5
Teachers	16,631	318	1.9
Physicians <sup>b</sup>	2194	319	14.5
Nurses	2657	1068	40.2
Medical Tech.	N.A.	42	N.A.
Other Prof.	N.A.	1504	N.A.
<b>Total</b>	<b>48,056</b>	<b>6936</b>	<b>14.4</b>

Sources: U.S. Immigration and Naturalization Service, Demographic Statistics Branch, Statistical Yearbook 1994. Statistics Canada. Education in Canada 1991-92, Cat. No. 81-229.

Notes:

- a. The scientist category includes agriculture and biological sciences, mathematics and physical sciences.
- b. The physician category excludes dental studies and research, pharmacy, and rehabilitation medicine.

In order to later evaluate 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 immigrants in the various occupational categories that we have specified. Assuming a 2 year time lag between the date of degree confirmation and the date of emigration **table 10** reports the 1991 graduates by degree and the **subsequent** 1993 emigration flows to the United States in order to compute ratios of the leakage<sup>14</sup>. The first point to note is that **the average leakage rate is 14.4 percent. This is a gross leakage since it does not take into account any recent United States graduates who may have entered Canada. For managers the gross leakage reported of 18.6% is a modest overstatement of the net leakage. If we net for the in managerial in movement (367) in 1993 the corrected leakage for managers is now 16%.** In sum, professions reported in **table 10** the net leakage's range from 40 per cent for nurses to 2 per cent for teachers.

<sup>14</sup> The two-year lag chosen for this illustration of leakage reflects the average lead time required to actually emigrate to the United States after the graduation date.

## Section V. Rewards From Moving

Immigrants move for a variety of reasons, however the economic forces, which shape this movement, can be summarized as push or pull forces. **Table 11** reports a cross section or snapshot of the economic and demographic characteristics of both Canadian emigrants resident in the United States and **United States immigrants** in Canada (circa 1990/91) which may **have conditioned** their decisions to move or stay. Clearly, this is a picture of a stock of immigrants who arrived in either country prior to 1990 (or 1991) and subsequently did not leave. Nonetheless, some stylized facts are self evident. The Canadian **emigrant** stocks for both professionals and managers living in the United States were larger than the American stocks living in Canada. In particular, approximately 51,000 Canadian **emigrant** managers lived in the United States, while American managerial immigrants living in Canada in 1991 numbered **only** approximately 22,000. In the professional occupations, the Canadian stock **of emigrants** in the United States (64,180) was again substantially larger than the American stock of movers **living in** Canada (41,712). More relevant to this study is the time of entry for these stocks. The number of **Canadian emigrants** to the United States, whether in the professions or the managerial classes, grew substantially over the 1980-90 period. In sharp contrast, American emigrants in Canada experienced a substantial decline in **numbers after 1980. The United States managers and professionals who arrived after 1980 represent the smallest portion, of the 1991 stock in Canada.**

**Table 11**  
**Some Economic and Demographic Variables for 20-64 Year olds, US-Canadian Human Capital**  
**Flows in Professional and Managerial Occupations (1990/91)**

	Professional <sup>a</sup> Occupations		Managerial <sup>b</sup> Occupations	
	Canadian immigrants to the United States	American immigrants to Canada	Canadian immigrants to the United States	American immigrants to Canada
Age	41.29	40.09	42.72	41.42
Weeks Worked	45.6	44.17	48.69	47.45
Hours Worked	40.79	32.13	43.78	38.7
Married (%)	69.3	66.8	73.7	71.5
<b>Year of Immigration</b>				
1980-1990 (%)	26	20	21.4	19.6
1970-1979 (%)	16.5	36.2	17.3	34
1960-1969 (%)	28	32.5	29.5	32.9
Before 1960 (%)	29.4	11.3	31.8	13.5
<b>Education</b>				
Elementary (%)	1.1	1.4	7.4	6.8
High School / Post Sec. (%)	30.7	22.2	49.1	30.6
University (%)	68.2	76.4	43.6	62.6
<b>Income Variables</b>				
Total Income	C\$48,362	C\$37,965	C\$58,678	C\$51,278
Wages and Salaries	C\$44,601	C\$34,236	C\$53,749	C\$46,806
Investment	C\$1821	C\$1176	C\$2676	C\$2357
Self Employment	C\$685	C\$977	C\$755	C\$795
Other Income	C\$220	C\$307	C\$203	C\$322
Sample Size	3209	1264	2589	663
Population Estimate	64,180 <sup>c</sup>	41,712 <sup>d</sup>	51,780	21,879

Source: Authors' Calculations from the 1991 Canadian Population Census (3% Public Use Sample Tapes) and 1990 US Population Census (5% Public Use Sample Tape).

**Notes:**

- a. These include natural sciences, engineering, mathematics, social sciences and related occupations, teaching and related occupations, medicine and health, art, literary and recreational occupations.
- b. These include executive, administrative and managerial occupations.
- c. Sample size multiplied by 20.
- d. Sample size multiplied by 33.
- e. Sample size multiplied by 33. **Purchasing power parity for income variables** taken from version 5.6 of the Penn World Table (Summers and Heston 1991) to convert US\$ to C\$. In 1990 that **purchasing power parity value was 1.2074**.

**Several** attributes of the **foreign-born** stocks in the two countries are unexpected. Of the Canadian managers who moved to the United States, few (less than 44 percent) have post-

secondary degrees. These lower-educated managers are no doubt concentrated in the pre-1960 emigrant outflow. Next, American professionals and to a lesser extent American managers work substantially fewer hours in Canada than expected. In particular United States **workers** with professional qualifications in Canada **reported only a 32 hour work week**.

The income returns to working in their country of destination differed for **these two** resident immigrant stocks circa 1990/91. Canadian professionally trained **emigrants** in the United States earned approximately \$10,000 (Cdn) more than United States immigrants in the professions in Canada. There is also a smaller but **still** substantial premium paid to Canadian managers in the United States versus American managers in Canada (\$7,400 Cdn).

**These stylized facts however must be treated with caution since** we have not controlled for income-earning characteristics of the two countries' emigrant flows. We address this issue below **to gain a better understanding of the** attractiveness for both movers and stayers **in the** United States and Canada.

### *Age-Earnings Profiles Professionals and Managers*

Immigrant lifetime earnings are the key variable in rationalizing the economic incentives to migrate. Succinctly stated the economic gains from movement can be stated as:

$$\text{Eq. 1 } G = (Y_j - Y_i) / (1+r)^t$$

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 areas i and j with r representing the prevailing interest rate (Sajastad, 1962).<sup>15</sup> In essence what is being stated is that if a stayer remains at home in area i they earn  $Y_i$  while immigrants earn  $Y_j$  after moving. If the costs of moving are less than G then stayers would be motivated to move<sup>16</sup>.

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

A general human capital formulation of the earnings function is :

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<sup>15</sup> The literature carefully distinguishes between wages and income and prefers the income measure to reflect the total rewards from moving.

<sup>16</sup> Alternatively you can calculate the rate of return from a migration investment.



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

**Table 12** reports the estimated coefficients for the earnings functions **for movers and stayers** in the professional occupations **in the two countries**.

**Table 12**  
Earnings Functions by Place of Birth and Residence: Professional Occupations.

	<i>const</i>	<i>Age</i>	<i>Age2</i>	<i>WKS</i>	<i>Ed</i>	<i>Mar</i>	<i>Male`</i>	<i>YSM*</i>	<i>R<sup>2</sup></i>
<i>Can in</i>	5.8*	.05*	-.0004*	.04*	.07*	.15*	.34*	.09*	.48
<i>USA</i>	(19.2)	(3.3)	(-2.4)	(27)	(6.3)	(3.8)	(8.7)	(1.8)	
<i>Can in</i>	5.7*	.09*	-.001*	.04*	.05*	.10*	.28*	NA	.48
<i>Can</i>	(141)	(46)	(-39)	(161)	(40)	(16)	(51)	(NA)	
<i>USA in</i>	5.8*	.05*	-.0004*	.04*	.07*	.15*	.34*	.001*	.48
<i>Can</i>	(19.2)	(2.8)	(-2.4)	(27)	(6.3)	(3.2)	(8.7)	(1.8)	

Source: Author's **computations** : Available upon request

Notes: \* indicates that **t-values in parenthesis are significant**

The first relevant comparison **between estimated earnings profiles** 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 either rows 1 or 2 are similar in magnitude to those **reported** in the literature (Fagan, 1995). Most importantly, the estimated coefficients for the mover's (row 1) earnings functions are **mostly larger than the stayers' coefficients (row 2)** and thus, each argument **except age** yields a larger return for those **Canadians** who moved to the United States as opposed to those staying in Canada. **In fact**, one additional year in the United States labour market adds 14 per cent to the Canadian movers' earnings as opposed to only a 9 per cent yearly increment from those **Canadians** who stayed in Canada. This 14 percent yearly gain in earnings is owing to two components; one year in age adds **5** percent and one year in residence in the United States (YSM) adds a further **9** percent to immigrant earnings. It should also be noted that the returns from education are larger (7 percent) in the United States for a professionally trained Canadian **emigrant** than for the cohort who stays in Canada (5 per cent). Thus, **this structural difference in earning** equations indicates that even if the movers and stayers were endowed with identical

values for age, etc. those who moved would earn more in the United States given the larger coefficients reported in **table 12**.<sup>17</sup>

Comparing rows 2 to 3 in **table 12** allows a second interesting comparison between Canadian stayers in Canada and United States **emigrants** to Canada both with professional qualifications. In all respects the United States immigrants in Canada tend to perform not like Canadian stayers but like Canadian movers to the United States with the exception of the YSM variable. This very crucial exception suggests that such a low value for YSM for Americans living in Canada indicates little assimilation or earnings "catch-up" after their arrival independent of the aging effect.

**Table 13**

Earnings Functions by Place of Birth and Residence: Managerial Occupations.

	<i>Con</i>	<i>Age</i>	<i>Age2</i>	<i>WKS</i>	<i>Ed</i>	<i>Mar</i>	<i>Male`</i>	<i>YSM</i>	<i>R2</i>
<i>Can in</i>	6.1	.05*	-.0004*	.04*	.05*	.17*	.32*	.0007	.43
<i>USA</i>	(14)	(2.6)	(-1.8)	(14)	(3.6)	(2.1)	(4.8)	(.70)	
<i>Can in</i>	5.6	.09*	-.0009*	.03*	.06*	.13*	.37*	NA	.37
<i>Can</i>	(96)	(32)	(-27)	(74)	(45)	(13)	(42)	(NA)	
<i>USA in</i>	6.1	.05*	-.0004*	.04*	.05*	.17*	.33*	.0007	.43
<i>Can</i>	(14)	(2.5)	(-1.8)	(14)	(3.6)	(2.1)	(4.8)	(.70)	

Source: Author's **estimates**

Notes: \* indicates t-values in parenthesis are significant.

**Table 13** reports the estimated earnings equation coefficients for managers by birth place and residence. If we compare rows 1 to 3 all coefficients are **almost** identical for United States managerial immigrants in Canada vis a vis Canadian managers **resident** in the United States. **The** assimilation variable, YSM, is **insignificant for either group indicating little** or no **assimilation in either country** after their arrival. Thus, if earnings differences arise between Canadian emigrant managers and United States managers in Canada it would be owing to both the endowment of human resources and not due to differential assimilation experiences after arrival in the respective countries.

Comparing Canadian managerial earnings functions for Canadian stayers and leavers (rows 1 and 2) reveals that in general the earnings coefficients for Canadian managers who stayed in Canada are greater for the age, education and gender (male) variables. **This implies that Canadian stayers who are managers also out perform U.S. managers in Canada. This**

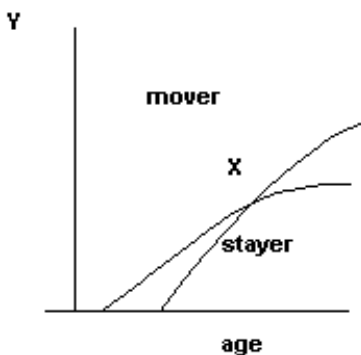
<sup>17</sup> This of course assumes that the earnings of movers and stayers are not affected by unobserved variables.

result was also found by Borjas (1990) who noted that Canadian movers did not receive a bonus in the form of a **significant** assimilation effect after arrival in the United States.<sup>18</sup>

### *Age earning profiles and Human Capital theory*

Human capital theory provides a framework to utilize the above estimated age-earnings profiles to deduce when professionals or managers in Canada would consider it economically rational to move to the United States. An idealized view of this process appears below.

**Figure 5: Theoretical Age-Earnings Profiles for Immigrants**



The incentive for the potential Canadian bound emigrant to the United States to move is depicted by the difference in post movement earnings after the cross-over point (x) in earnings between the representative Canadian stayer and Canadian mover. In addition the earnings function reflects the Canadian emigrant income prospects, given his/her Canadian education as well as the assimilation process (YSM variable) expected while resident in the United States.<sup>19</sup> The financial and other costs of movement are depicted in figure 5 by the drop in emigrant earnings after departure which are recouped when the mover's U.S. earnings exceeds the earnings of the stayer in Canada. In sum, the

<sup>18</sup> . Specifically, **Borjas found that** Canadians emigrating to the U.S. have been much more economically successful than Americans who have emigrated to Canada. For example, Canadian men who migrated to the United States in the late 1970s were predicted to have lifetime earnings that were 23% 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 were expected to have lifetime earnings that were almost 16% higher than those of demographically comparable white males. While 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 U.S.-born men.

<sup>19</sup> **Assimilation in the new labor market is the process of acquiring additional training and knowledge in the labor market.**

**motivation to move is the present value (G in equation 7) which equals the difference in earnings before and after the cross over point x in figure 5.**<sup>20</sup>

The central question now **is does the actual income performance of a representative Canadian mover** correspond to the idealized view depicted in figure 5? Moreover, **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 and if so by how much?**

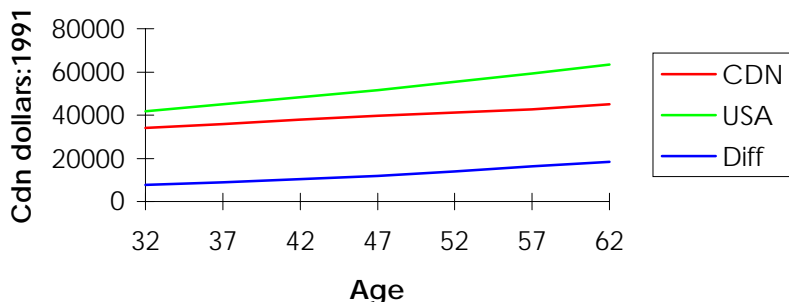
At this point we compare the hypothetical case of figure 5 to the estimated case in figure 6. Figure 6 presents the estimated age-earnings profiles for professionally qualified Canadians in Canada (stayers) and similarly trained Canadians in the United States (movers).<sup>21</sup> **Framing the question within the context of stayers and movers highlights two well known features in the migration literature. First, the motivation to leave for potential movers 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 years mover's decision. Secondly, the prospect of return or temporary migration to the United States depends on the unsuccessful outcomes of past movers. If the outcomes of movers exceed the rewards from the stayers in Canada, little return migration is likely (Borjas and Bratsberg, 1996) and the flows we observe would be permanent.**

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<sup>20</sup> Other fixed movement costs include the **embodied private educational** costs to obtain these skills and minor transport costs.

<sup>21</sup>To generate the age-earnings profiles produced in both figures 6 and 7 we inserted the mean values for all the variables in each of the significant variables **reported in tables 12 and 13** except age and years in residence. Next, we started the labor force entry date for both movers and stayers at 32 (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.

**Figure 6 Professional earnings of Canadians in Canada and USA**



**Inspection of figure 6 indicates that the estimated age-earnings profiles for Canadian professionals yield no "cross-over" point. Thus, Canadians upon arrival in the United States (age 32) initially and thereafter earn more than their cohort which stayed in Canada. Hence, when calculating the present value return there exists no foregone loss in income as theory predicts.**

**Figure 7 Managerial earnings of Canadians in the USA and Canada**

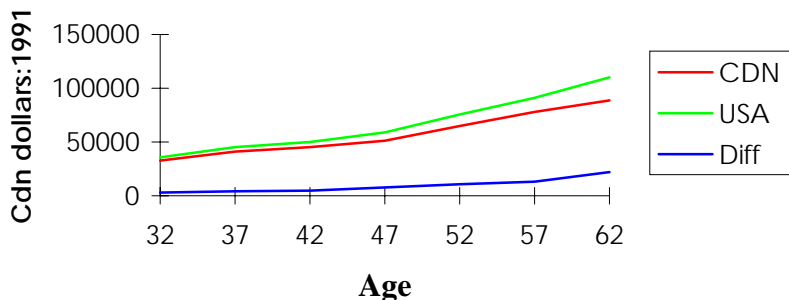


Figure 7 reproduces the projected age earnings patterns for Canadian managers who either moved to the United States or stayed in Canada. Again, Canadian movers dominate the stayer's earnings indicating that unless the costs of movement or education are extraordinarily large the present value gain from movement is positive for the representative managerial immigrant to the United States.

**Table 14**

Present value of income derived from Canadian **emigration** to the United States: (in 1991 dollars)

Occupations	Return: Net of Private Direct Ed Costs*	Return: Net of Social total Ed Costs
Panel A	<b>No tax adjustment</b>	<b>No tax adjustment</b>
Professionals	<b>\$124,412**</b>	<b>-\$81,588**</b>
Managers	<b>\$85,326**</b>	<b>-\$31,921**</b>
Panel B	<b>Tax adjustment***</b>	<b>Tax adjustment***</b>
Professionals	<b>\$49,843**</b>	<b>-\$156,157**</b>
Managers	<b>\$45,506**</b>	<b>-\$71,741**</b>

Notes:

\* Computation formula is Eq. 1  $G = [(Y_i - Y_j) / (1+r)^t - (C)]$

Where C = private or social total costs of education plus transport costs,  $(Y_i - Y_j)$  are earning differences between movers and stayers and r is set to .03.

\*\* Median appropriate educational costs for professions **are derived** from table 5.

\*\*\* 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 United States 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 living in New York and Toronto respectively and then switching to a married with working spouse and mortgage at \$50,000 (Cdn) and beyond earnings range in the same two cities.

To evaluate the effect of these estimated earnings profiles on the decision process of a potential Canadian emigrant to the United States we must calculate the discounted present values or G in Eq. 1 for the managerial and professional occupations. **Table 14** presents alternative values for G under various policy environments circa 1991. The first case in panel A reports the present value derived from **professional or managerial** emigrants under two educational cost concepts ignoring the differential tax regimes in the two countries. The second case in panel B combines both the impacts of Canadian educational fiscal policies and differential tax structures between Canada and the United States on the present value returns **gained from moving** to the United States **for a representative professional or manager**.

The untaxed discounted value for the first thirty years in United States for a Canadian professional net of private and social educational costs are \$124,412 and a negative \$81,588 (1991 Cdn) respectively. In only the educationally subsidized case (net of private costs) are the gains from movement **to the United States** clearly positive for a typical professional without any tax considerations. The net present value of a move for a Canadian manager to the United States **vis a vis** what he would have earned in Canada is \$85,330 and a negative \$ 31,921

when netted respectively for the private direct and social total cost of their embodied education. **In short, circa 1991 without an educational subsidy there would exist no income** motivation for **employed** Canadian managers to move to the United States.

**Differential** tax rates do appear in the two countries and the choice of city destination can enhance or decrease these differential tax rates. In **Panel B** we choose a typical origin and destination set of cities -Toronto and New York - to calculate the effect of income taxes (only) on the present value calculations for Canadian professionals or managers contemplating a move between these two cities. Since there exists a substantial absolute decline in after tax earnings for movers and stayers **all present values are reduced by** almost 50 per cent for either professionals or managers. The post tax adjusted present value gain netted for private direct educational **costs** reduces to \$49,843 and \$45,506 for professionals and **managers** leaving Canada for the United States. If the taxed present value gains are netted for the social total cost of the embodied education then for both occupations the returns are negative. **Again in the absence of an educational subsidy there exists no post - tax income incentive to move to the United States for either managers or professionals. Thus, permanent movement to the United States of employed Canadians is a byproduct of Canada's subsidized educational system if you are already employed. If you have less than full time employment the incentives to move are greater.**

**These computations were based on the premise of permanent movement. What of temporary movement? What is the special inducement that leads temporary movers to United States? Why do they convert to a permanent status? We now turn to these initially declared temporary movers.**

## VI. Temporary Workers- Pre and Post NAFTA

**In section III we alluded to the "back door" entry of Canadians which arise under more liberal temporary entry arrangements embedded in United States - Canada recent trade agreements.**

DeVoretz and Laryea (1998) and Globerman and DeVoretz (1998) have argued elsewhere that contrary to conventional trade theory NAFTA has **increased** migration movements between the member states of Mexico, Canada and the United States. A short recapitulation of the legal restraints on temporary movement should clarify this contention. Prior to the FTA and NAFTA Canadian professional workers could be granted admission to the United States on a temporary basis through a **H1-B classification**. Under this classification a profession is defined as an

occupation that requires critical and practical application of a body of highly specialized knowledge. In practice a professional with a bachelor's degree **satisfies** this definition. **Most importantly under an H1-B designation both** the employee and the employer in the United States **must** complete complex documentation before admission into the United States is granted.<sup>22</sup>

The most time consuming portion of the process **was** the assembly of the necessary documentation. The H1-B status **was** granted for a three-year period with a three-year extension available.<sup>23</sup>

With the signing of the FTA and more recently NAFTA a new temporary worker status was granted to Canadian workers. Under NAFTA temporary workers, treaty traders, investors, temporary professionals and those non-immigrant classifications covered under the FTA are eligible for TN-1 status. **The TN-1** application procedure is much less cumbersome than that of the H1-B status **and a much efficient process results**. However, the main advantage of the TN-1 status is that a Labour Certification Application is not required which implies that it is not necessary for either the employer or the employee to prove that the worker is or **will not** adversely **affect** a U.S. worker. Although some documentation is required no formal application from either employer or employee **is now** required.<sup>24</sup> If this documentation is presented in person at the border it is suggested that the TN-1 may be granted within an hour. The TN-1 status is granted to an individual for one year and may be renewed for subsequent one-year periods. The renewal process may continue indefinitely.

**Grasmick (1997) notes the flexibility of this new TN-1 status now allows a U.S. employer the opportunity to assess a Canadian employee's performance and adaptability to the organization and then, if both parties are satisfied and want the arrangement to be**

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<sup>22</sup> For example, both must prove that the ensuing employment be temporary in nature and the employer must demonstrate the need for a high level employee. Moreover, both must prove via a Labour Condition Application, which must be approved by the Department of Labour, that the hiring of this professional employee will not adversely affect U.S. workers in terms of wages or employment opportunities.

<sup>23</sup> After this period one had to remain outside of the country for at least one year before re-applying for this status.

<sup>24</sup> Some of the necessary documentation that increases the probability of success includes the following:

- 1) Letter from U.S. or Canadian employer specifying the nature of the applicant's U.S. business activity.
- 2) Copies of the applicant's diploma's or degrees.
- 3) Proof of possession of a license to practice the noted profession in the U.S.
- 4) Documentation of remuneration arrangements with the U.S. employer.
- 5) Letter from the U.S. employer stating that the employment will be temporary.



longterm a permanent residence visa can be obtained.<sup>25</sup> This is a key point in our analysis. It is now possible that temporary emigration has become a back door to permanent emigration into the United States under TN-1 status. Tables 15 and 16 shed light on this phenomenon. The number of Canadian professionals granted temporary worker status under NAFTA has grown tenfold between 1989 (2677) and 1996 (26,987). It should be noted that these numbers do not reflect anything more than the yearly number of approvals under the TN-1 admission status. Conversion rates from temporary to permanent status appear in table 16. For example over 37 percent of intra-company transfers result in a permanent movement. This is a strikingly different picture suggested by both firm interviews and the press, which argued that NAFTA induced movement, was primarily intra-company temporary transfers.

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<sup>25</sup> It is important to note that 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 the TN-1 status is eligible for both statuses.

**Table 15**

Flow of Canadian Non Immigrant Workers and Their Families to the  
United States under Both FTA and NAFTA

Year	1989	1990	1991	1992	1993	1994	1995	1996
<u>Canada-U.S. Free Trade Agreement (FTA)</u>								
Professional Workers under FTA(TC)	2,677	5,293	8,123	12,531	16,610			
Spouses and children of FTA workers	140	594	777	1,271	2,386			
						<u>North American Free Trade Agreement(NAFTA)</u>		
Professional Workers under NAFTA (TN)						19,806	23,904	26,987
Spouses and children of NAFTA workers (TD)						5,535	7,202	7,694

Source: United States Department of Justice, Statistical Yearbook of Immigration and Naturalization Service, and various years.

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

**Table 16**

Percentage of Non-Immigrants from Canada Changing Status to Permanent Residents in the United States

<u>Category</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>
Exchange visitors	2.01	1.94	1.25	1.90	1.78	1.5	.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, *Statistical Yearbook of Immigration and Naturalization Service*, various years.

## VII. Conclusions

Canada is a major participant in the global exchange of human capital. Since 1967 Canada has received a large gross inflow of professionally qualified immigrants from the entire world. The direction of the flow of human capital has been primarily from developed countries to Canada with a large secondary contribution from less developed countries. This later source diminished throughout the 1980's. 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.

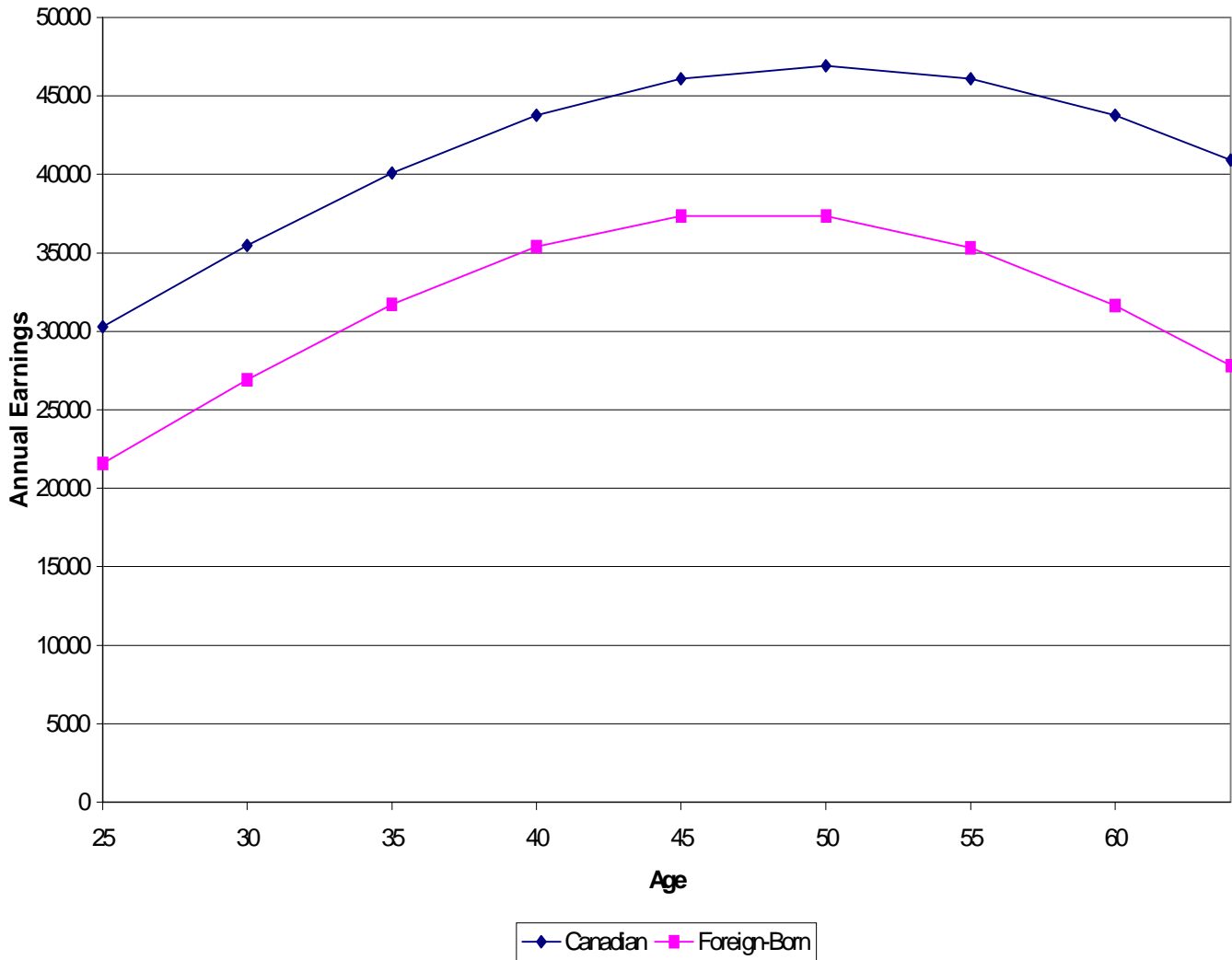
Two further points are clear from this study. Temporary NAFTA induced movement generated a conversion to a permanent residency status which increased the already substantial post 1989 permanent flow of Canadian managers to the United States. This transfer is substantial in relation to the net managerial flow for the entire 1982-96 period. Clearly a 'backdoor' has appeared for the brain drain to flow to the United States.

One counterpoint to this theme of the brain drain is that Canada can and does import human capital to replace the gross or net outflow to the United States. The underlying premise of this view is that there is an implied 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 churning costs generated by this movement? This worldwide exchange of human capital between Canada and the rest of the world including the United States is not trivial. There first exists the administrative and settlement costs that Canada absorbs for each new immigrant. The administrative costs per immigrant (net of the right of Landing Fee) at the federal level are approximately \$2,400 circa 1994 with an additional charge of \$2,000 for provincial settlement costs (DeVoretz, 1995). The total administrative cost of replacing the 54,755 professionals and managers who moved to the United States in terms of administrative and settlement costs for 1982-1996 is an additional \$241 million. This administrative and settlement cost rises to \$747 million if we include the public settlement costs of the entire (average sized) replacement professional immigrant household.<sup>26</sup>

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<sup>26</sup> The average family size for an immigrant household is 3.1 persons. Hence, 3.1 times \$240 million equals \$744 million.

**Figure 8**  
**Age Earnings Profile For Men With More Than 16 Years of Schooling: 1991**



**There also exists more subtle churning costs that arise from the difference in the earnings of a recently arrived professional to Canada and the emigrating professional to the United States. The entire post 1967 stock of professional immigrants typically took 10-15 years to catch-up to the earnings of their Canadian-born cohort (Fagnan, 1995) circa 1981. This difference in income earning power between the arriver and the leaver represents one measure of the initial quality difference between the Canadian emigrant to the United States and immigrant to Canada. Figure 8 provides the latest information ( 1991) 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 for the 54,755 replacement immigrants during the 1982-96 period.<sup>27</sup> In sum, total churning costs arising from replacing the highly skilled outflow to the United States equals \$ 12.5 billion.

Thus, any set of policy measures, which intends to reduce the financial impact of the brain drain, must mitigate the impact of these two cost components. Let us first address measures to reduce the churning costs.

The recent legislative review of Canada's immigration policy offers several proposals, which would reduce the churning costs of an immigrant replacement strategy.<sup>28</sup> English and French language training for both adults and children have been cited in the review as a major component of the post 1980 "churning costs" and two proposals were made to mitigate these costs. First, the principle applicant would be required to have a working knowledge of English and/or French. In addition, the immigrant family must self finance the required language training for the accompanying family members. The second component of the churning costs, reduced earnings upon arrival, can be mitigated with relevant experience prior to arrival in Canada. One suggested core requirement in the legislative review for entering highly skilled workers is two years or more of relevant experience in the intended profession. This experience requirement would reduce the earnings gap between immigrants and Canadian stayers. Finally, the review offers a suggestion to eliminate many churning costs by recommending that foreign graduate students be allowed to apply from within Canada.

Central to reducing the churning costs through lost productivity would be the initiation of an employer based sponsoring scheme. Under this scheme the employer would be given the right to recruit a highly skilled worker for immediate employment. Attestation by the employer that no similar Canadian is available would be the sole requirement for recruitment and every employer would be bonded to prevent fraud. Citizenship and Immigration would still retain the right to review the workers records to insure that criminality is not an issue. Temporary visas could be granted under this scheme which could be converted to a permanent basis if some core value i.e. language was initially missing in the applicant. Under this employer driven scheme no job mismatch would occur and the productivity loss

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<sup>27</sup> See appendix tables C.

<sup>28</sup> Citizenship and Immigration, Not Just Numbers, 1998.

associated with the churning costs would be eliminated since no employer would sponsor an immigrant whose credentials would not be recognized.

None of above suggestions recognize the competitive nature of immigrant demand worldwide. Canada not only competes with the United States for Canada's graduates but for skilled immigrants from the rest of the world. To give Canada a competitive advantage the tax forgiveness statute of the early 1970's should be re-considered for key skilled occupations in excess demand such as engineers. The thrust of this policy is an income tax rebate given to a skilled immigrant for the first five years in residence. However this forgiveness only becomes active after three years of residence in Canada. This three year waiting period would reduce short-term opportunism and allow the recent highly skilled immigrant arrival to integrate into the Canadian economy and society making subsequent move far costly.

Public finance questions also arise in the context of the brain drain. The gains from moving to the United States relative to staying home are heavily conditioned by the size of the educational subsidy that is taxpayer financed. The representative employed Canadian-born professional or manager who compares his/her earnings after emigrating to an employed Canadian-born professional who stays behind would not be motivated to move if there existed no educational subsidy<sup>29</sup>. Hence, a deterrent to movement would be based on a forgivable loan scheme for Canadian professionals. If a recent graduate in an emigrant prone field worked in Canada and paid taxes equal to the principle of his or her education loan than the loan would be forgiven. If the individual emigrated prior to that anniversary date she must repay the residual of the educational loan. This forgivable loan scheme would apply to those who left who were employed or unemployed prior to departure. This complete coverage would insure that the educational decision to invest in professional training would be based upon market considerations while still maintaining the public finance principle of intra-generation transfers. Educational policy which is often insensitive to market considerations would now allow students to incorporate the economic consequences of career choice before an educational decision is made while still maintaining a subsidy for those who remain in Canada.

We also conclude from this study that assessing the brain drain on the basis of absolute immigrant flows is misleading in several dimensions. First, while it is

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<sup>29</sup> The key to this statement is that both the mover and stayer must be employed. An unemployed Canadian professional would leave regardless of the size of the educational subsidy just to recoup their direct educational costs.

that the brain drain is small relative to the current stock of highly skilled in the Canadian labour force this comparison confuses concepts of stocks and flows.<sup>30</sup> When we more appropriately compared Canadian immigrants 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 professional and managerial via altering the size of immigrant inflows and/or the number of graduates in those professions. Given that that over 14.4 percent of the 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 in nursing over 40 percent of the 1991 graduates emigrated to the United States in one year while 12% of the 1989 physician class has left for the United States.<sup>31</sup> The fact that substantial graduation numbers in these occupations continue to occur in Canada 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 graduating class can be more serious than a simple indicator of short term excess supply. For scientists the yearly emigrant flow to the United States represents 14.5 per cent of the graduation rate. In this case the ratio of immigrants to graduates indicates a more serious public policy issue since Canada has been actively attempting to import engineers and the outflow of Canadian engineering graduates only exacerbates this shortage.

Our analysis also sheds light on the myriad of push and pull forces cited in the popular press. For a limited number of professions the shrinking public sector no doubt hastened the movement of nurses, physicians, scientists and professors. However, for all the skilled people included in this study the over-riding pull force of the United States is clear. The pre or post tax rate of return in the form of higher income coupled with Canada's subsidized higher educational system induced people to move. This dominant role of Canada's educational subsidies in facilitating emigration is often omitted in the popular literature.

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<sup>30</sup> See DeVoretz and Maki, 1983 for the 1970 values of immigrants to the stock of specific professional types.

<sup>31</sup> . See Ryten (1998) who argues that the brain drain of doctors to the United States will result in more foreign-born doctors in Canada if Canada is to keep its doctor-patient ratio constant.



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 and a balance of payments in human capital transfers. The first concept is defined as difference in the number of immigrant arrivals to Canada minus the number of Canadian emigrants. This gross concept can be refined to account for possible job mismatches in the Canadian labour market. The gross number of immigrants is scaled down to the number of net arrivals who have credentials which match Canadian market requirements (See appendix B tables B-1-B-6) upon arrival. The balance of trade in human resources based upon on these adjusted numbers indicate that for the health sciences, managers and scientists a slight balance of trade in human resources exist if we net only for emigrant movement to the United States alone circa 1989-96. If we included Canadian emigrant movement to the UK, Europe and Asia (especially Hong Kong) this balance of trade in skilled immigrants would be 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 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 receives just enough skilled immigrants to compensate for the 1982-1994 outflow to the United States. On the surface this would imply that the loss of human capital valued at its social total costs is completely offset by the newly arrived human capital. Thus without including the administrative costs and productivity losses it would appear in scenario A that Canada has no brain drain since all the 54,000 Canadian emigrants educational value is offset by a similar inflow of 54,000 ( or more) skilled from the rest of the world. But we have noted that the combined deadweight loss (\$216,000) plus administrative-settlement costs (\$13,240) must be added to the costs of each replacement immigrant. Thus, the costs to the Canadian economy of this imagined zero sum game circa 1982-94 of 54,000 movers would actually be \$12.3 billion. In

fact on average the churning costs per immigrant of \$229,000 exceeds the average educational replacement value embodied in the immigrant (see table 5) for most professions. Hence, on average Canada receives a negative value added per replacement professional immigrant since for most professions the loss to the Canadian society (\$229,000) exceeds the value (at social total cost) of the education embodied in them when they enter Canada.

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 18 below reports the balance of payments of human capital transfers for this period.

**Table 17**  
**Canada's Balance of Human Capital Payments 1989-96: ROW and United States**

<b>Occupation</b>	<b>Inflow:ROW</b>	<b>Outflow:USA</b>	<b>Net flow</b>	<b>Net \$transfer at STC</b>
<b>Managers</b>	<b>25,443</b>	<b>20,177</b>	<b>5266</b>	<b>\$948 million</b>
<b>Health Sciences</b>	<b>4,409</b>	<b>7,835</b>	<b>(-4409)</b>	<b>(-\$1.2 billion)</b>
<b>Sciences</b>	<b>20,726</b>	<b>20,595</b>	<b>131</b>	<b>\$33.8 million</b>
<b>Sub-total</b>	<b>50,578</b>	<b>48,607</b>	<b>1,971</b>	<b>(-\$285 million)</b>
<b>Ed transfer</b>				<b>(-\$285 million)</b>
<b>Churning costs</b>				<b>(-\$11.5 billion)</b>
<b>Total costs: Ed+churning</b>				<b>(-\$11.8 billion)</b>

Using the adjusted immigrant numbers reported in Appendix B for the three relevant occupations a slight positive inflow of 1,971 immigrants results. This is the balance of trade measure. In particular there is a substantial net outflow in the health sciences and a moderate-corrected for quality- inflow in the sciences. For managers the net flow to Canada is positive owing to the past movement from Asia to Canada which may have already returned. We now turn to the balance of payments concept embedded in table 18. Table 18, column 4 rows 2-5 reports the net education value at social total cost of this transfer. There exists a moderate educational transfer for the sciences (\$33.8 m) and a much larger educational transfer owing to the managerial inflow (\$948 m). These two inflows are offset by

**the costly (-\$1.2 billion) health science outflow. Thus the world-wide educational value transfer is slightly negative owing to the fact that health sciences has a large outflow component of expensive physicians. More to the point if we now calculate the churning costs for the rest of the world inflow (ROW) of 50,578 immigrants the total churning costs equal \$11.5 billion (row 7). Adding the small negative educational transfer to the calculated churning costs yields a negative balance of payments value of \$11.8 billion even give the slight positive immigrant inflow in these occupations circa 1989-96.**

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

## References

- Akbar, Sajjad and DeVoretz, Don J. 1993. " Canada's Demand for Third World Highly Trained Immigrants ", *World Development*, pp. 177-187.
- Bhagwati, J. and W. Dallafar, 1973 "The Brain Drain and Income Taxation", *World Development*, pp. 94-101.
- Berger, M. and W. Michael, 1997 "Commercial Policy and the Brain Drain", *Applied Economics*, pp. 143-153
- Borjas, G. 1990 *Friends or Strangers: The Impact of Immigrants on the U.S. Economy*, New York: Basic Books Inc.
- Borjas, G. and B. Bratsberg, 1996 " Who Leaves? The out migration of the Foreign-born", *The Review of Economics and Statistics*, pp. 165-176.
- Canada. Citizenship and Immigration. *Immigrant Statistics*, passim.
- Canada. Citizenship and Immigration. Temporary Entry to Canada under the North American Free Trade Agreement,
- Coulson, R.G. and D. DeVoretz. 1993. "Human Capital Content of Canadian Immigration 1967-1987 ", *Canadian Public Policy* pp.: 357- 366
- Dales, J. 1964. "The Cost of Protectionism with High International Mobility of Factors", *Canadian Journal of Economics and Political Science* pp.512-525.
- \_\_\_\_\_. 1966. *The Protective Tariff in Canada's Development*. Toronto: University of Toronto Press.
- DeVoretz, D. J.1995. *Diminishing Returns: The Economics of Canada's recent Immigration Policy*, ( C.D. Howe Institute and Laurier Institution ).
- DeVoretz, D.J. and D. Maki. 1975. "The Brain Drain and Income Taxation", *World Development* pp. 705-716.
- \_\_\_\_\_. 1980. "The Size and Distribution of Human Capital Transfers from LDC's to Canada 1966-73", *Economic Development and Cultural Change* pp. 779-800.
- \_\_\_\_\_. 1983. "The Immigration of Third World Professionals to Canada.", *World Development* pp.: 55-64.

- DeVoretz, D. and Samuel A. Laryea, 1997. "Canadian Immigration Experience: Any Lessons for Europe ?", Conference on European Migration: What Do we Know? SELAPO University of Munich,
- DeVoretz, D. J. and Samuel A. Laryea, 1998. "Canada's Immigration-labour market Experience" OECD Seminar on Migration, Free Trade and Regional Integration in North America, Mexico City 1998.p.21.
- Engerman, S. and R. Jones, 1997. " International Labor Flows and National Wages", American Economic Review, pp. 200-203.
- Fagan, S. 1995. " Canadian Immigrant Earnings:1971-86", In D. DeVoretz, ed., *Diminishing Returns: The Economics of Canada's Immigration Policy*. Toronto: C.D. Howe Institute, and Vancouver: Laurier Institution.
- George, Jason. 1996. "Education for Export? Keeping Canadian-trained computer and electrical engineers in Canada", *Canadian Advanced Technology Association (CATA)* Summer.
- Globerman, S. and D. DeVoretz 1998. "Trade Liberalization and the Migration of Skilled Workers ", report prepared for Industry Canada p.43.
- Grasmick, J.G. 1991. *Canada-US Business Immigration Handbook*. Thomson Professional Scarborough Ontario
- Green, David. 1995. "Intended and Actual Occupations of Immigrants", In D. DeVoretz, ed., *Diminishing Returns: The Economics of Canada's Immigration Policy*. Toronto: C.D. Howe Institute, and Vancouver: Laurier Institution.
- Grubel, Herbert B., and Anthony D. Scott. 1965. "The International Flow of Human Capital", *American Economic Review* pp. 277-280.
- \_\_\_\_\_. 1966. "The Immigration of Scientists and Engineers to the United States 1949-1961", *Journal of Political Economy* pp. 81-98.
- \_\_\_\_\_. 1977. *The Brain Drain: Determinants, Measurement and Welfare Effects*. Waterloo: Wilfrid Laurier University Press.
- Haque, Nadeem and Se-Jik Kim, 1995. " Human Capital Flight : Impact of Migration on Income and Growth", *IMF Staff Papers*, pp. 577-607.
- Markusen, J.R. and Svensson, L.E. 1985. "Trade in Goods and Factors with International Differences in Technology", International Economic Review, pp. 175-192.

- Markusen, J. R. 1983. " Factor Movements and Commodity Trade as Complements", Journal of International Economics, pp. 341-356.
- Mundell, R.A. 1957. : "International Trade and Factor Mobility", American Economic Review, pp. 321-335.
- Parai, L. 1965. *Immigration and Emigration of Professional and Skilled Manpower during the Post War Period*", Economic Council of Canada, Special Study no. 1. Ottawa: Queens Printer.
- Papademetriou, D. "Employment Based Immigration in the United States: A review , Analysis and Critique, Presented at Settlement Seminar, Citizenship and Immigration, Ottawa, 1997.
- \_\_\_\_\_ and Rakowski, J. 1969. " Is Labour Mobility a Substitute for Trade? ", Economic Journal, pp. 174-178.
- Ryten, E. et al. 1998. " The class of 1989 and post-MD training ", Canadian Medical Journal, pp.741-48.
- Sajastad, L., 1962. "The Costs and Returns of Human Migration ", *Journal of Political Economy*, pp. 80-93.
- Statistics Canada. Public Use Sample Tape Individual Files. 1991 Census.
- \_\_\_\_\_. Cat. 81-219. *Tuition and Living Accommodation*.
- \_\_\_\_\_. Cat. 62-010-XPB. Ottawa. Annual.
- Stark, Oded, et al. 1997. "A brain gain with a brain drain", Economics Letters, pp. 227-234.
- Straubhaar, Thomas, 1988. " International Labour Migration within a Common Market: Some Aspects of EC Experience", Journal of Common Studies, pp.. 45-61.
- Summers, R., and A. Heston, 1991. "The Penn World Table (Mark 5): An Expanded Set of International Comparisons, 1950-88", *Quarterly Journal of Economics* p.106.

Annex A  
Value of Human Capital Flow to USA  
By occupations

**Table A-1**  
**Value of Human Capital Flow to USA at Canadian 1993/94 Replacement Costs by Occupations**  
**(1993/94 Canadian \$): Architects**

(1) Year	(2) Number	(3) Private Total Cost	(4) Social Total Cost	(5) = (4)-(3) Taxpayers' Subsidy
1983/84	37	\$4,706,955	\$7,551,811	\$2,844,856
1984/85	N.A. <sup>a</sup>	N.A.	N.A.	N.A.
1985/86	27	\$3,434,805	\$5,510,781	\$2,075,976
1986/87	27	\$3,434,805	\$5,510,781	\$2,075,976
1987/88	40	\$5,088,600	\$8,164,120	\$3,075,520
1988/89	35	\$4,452,525	\$7,143,605	\$2,691,080
1989/90	N.A.	N.A.	N.A.	N.A.
1990/91	N.A.	N.A.	N.A.	N.A.
1991/92	24	\$3,053,160	\$4,898,472	\$1,845,312
1992/93	23	\$2,925,945	\$4,694,369	\$1,768,424
1993/94	23	\$2,925,945	\$4,694,369	\$1,768,424
1994/95	N.A.	N.A.	N.A.	N.A.
1995/96	N.A.	N.A.	N.A.	N.A.
1996/97	19	\$2,417,085	\$3,877,957	\$1,460,872
<b>Total</b>	<b>255</b>	<b>\$32,439,825</b>	<b>\$52,046,265</b>	<b>\$19,606,440</b>

Source: United States Immigration and Naturalization Service, Demographic Statistics Branch, Washington DC.

Notes: a. Data not available for these years.

**Table A2**  
**Value of Human Capital Flow to USA at Canadian 1993/94 Replacement Costs by Occupations**  
**(1993/94 Canadian \$): Doctors**

(1) Year	(2) Number	(3) Private Total Cost	(4) Social Total Cost	(5) = (4)-(3) Taxpayers' Subsidy
1983/84	267	\$63,024,549	\$104,082,741	\$41,058,192
1984/85	N.A.	N.A.	N.A.	N.A.
1985/86	169	\$39,891,943	\$65,880,087	\$25,988,144
1986/87	189	\$44,612,883	\$73,676,547	\$29,063,664
1987/88	183	\$43,196,601	\$71,337,609	\$28,141,008
1988/89	91	\$21,480,277	\$35,473,893	\$13,993,616
1989/90	N.A.	N.A.	N.A.	N.A.
1990/91	N.A.	N.A.	N.A.	N.A.
1991/92	192	\$45,321,024	\$74,846,016	\$29,524,992
1992/93	240	\$56,651,280	\$93,557,520	\$36,906,240
1993/94	319	\$75,298,993	\$124,353,537	\$49,054,544
1994/95	N.A.	N.A.	N.A.	N.A.
1995/96	N.A.	N.A.	N.A.	N.A.
1996/97	522	\$123,216,534	\$203,487,606	\$80,271,072
<b>Total</b>	<b>2172</b>	<b>\$512,694,084</b>	<b>\$846,695,556</b>	<b>\$334,001,472</b>

Source: United States Immigration and Naturalization Service, Demographic Statistics Branch, Washington DC.

Notes: a. Data not available for these years.

**Table A 3**  
**Value of Human Capital Flow to USA at Canadian 1993/94 Replacement Costs by Occupations**  
**(1993/94 Canadian \$): Nurses**

(1) Year	(2) Number	(3) Private Total Cost	(4) Social Total Cost	(5) = (4)-(3) Taxpayers' Subsidy
1983/84	512	\$46,292,480	\$85,659,136	\$39,366,656
1984/85	N.A.	N.A.	N.A.	N.A.
1985/86	379	\$34,267,285	\$63,407,837	\$29,140,552
1986/87	353	\$31,916,495	\$59,057,959	\$27,141,464
1987/88	417	\$37,703,055	\$69,765,351	\$32,062,296
1988/89	277	\$25,044,955	\$46,342,931	\$21,297,976
1989/90	N.A.	N.A.	N.A.	N.A.
1990/91	N.A.	N.A.	N.A.	N.A.
1991/92	450	\$40,686,750	\$75,286,350	\$34,599,600
1992/93	704	\$63,652,160	\$117,781,312	\$54,129,152
1993/94	1068	\$96,563,220	\$178,679,604	\$82,116,384
1994/95	N.A.	N.A.	N.A.	N.A.
1995/96	N.A.	N.A.	N.A.	N.A.
1996/97	1104	\$99,818,160	\$184,702,512	\$84,884,352
<b>Total</b>	<b>5264</b>	<b>\$475,944,560</b>	<b>\$880,682,992</b>	<b>\$404,738,432</b>

Source: United States Immigration and Naturalization Service, Demographic Statistics Branch, Washington DC.

Notes: a. Data not available for these years.

**Table A 4**  
**Value of Human Capital Flow to USA at Canadian 1993/94 Replacement Costs by Occupations**  
**(1993/94 Canadian \$): Professors**

(1) Year	(2) Number	(3) Private Total Cost	(4) Social Total Cost	(5) = (4)-(3) Taxpayers' Subsidy
1983/84	159	\$27,091,692	\$57,959,157	\$30,867,465
1984/85	N.A.	N.A.	N.A.	N.A.
1985/86	171	\$29,136,348	\$62,333,433	\$33,197,085
1986/87	205	\$34,929,540	\$74,727,215	\$39,797,675
1987/88	173	\$29,477,124	\$63,062,479	\$33,585,355
1988/89	208	\$35,440,704	\$75,820,784	\$40,380,080
1989/90	N.A.	N.A.	N.A.	N.A.
1990/91	N.A.	N.A.	N.A.	N.A.
1991/92	171	\$29,136,348	\$62,333,433	\$33,197,085
1992/93	319	\$54,353,772	\$116,282,837	\$61,929,065
1993/94	251	\$42,767,388	\$91,495,273	\$48,727,885
1994/95	N.A.	N.A.	N.A.	N.A.
1995/96	N.A.	N.A.	N.A.	N.A.
1996/97	208	\$35,440,704	\$75,820,784	\$40,380,080
<b>Total</b>	<b>1865</b>	<b>\$317,773,620</b>	<b>\$679,835,395</b>	<b>\$362,061,775</b>

Source: United States Immigration and Naturalization Service, Demographic Statistics Branch, Washington DC.

Notes: a. Data not available for these years.



**Table A 5**  
**Value of Human Capital Flow to USA at Canadian 1993/94 Replacement Costs by Occupations**  
**(1993/94 Canadian \$): Teachers, Except Post-secondary**

(1) Year	(2) Number	(3) Private Total Cost	(4) Social Total Cost	(5) = (4)-(3) Taxpayers' Subsidy
1983/84	191	\$27,949,985	\$46,306,995	\$18,357,010
1984/85	N.A.	N.A.	N.A.	N.A.
1985/86	242	\$35,413,070	\$58,671,690	\$23,258,620
1986/87	234	\$34,242,390	\$56,732,130	\$22,489,740
1987/88	224	\$32,779,040	\$54,307,680	\$21,528,640
1988/89	268	\$39,217,780	\$64,975,260	\$25,757,480
1989/90	N.A.	N.A.	N.A.	N.A.
1990/91	N.A.	N.A.	N.A.	N.A.
1991/92	306	\$44,778,510	\$74,188,170	\$29,409,660
1992/93	337	\$49,314,895	\$81,703,965	\$32,389,070
1993/94	318	\$46,534,530	\$77,097,510	\$30,562,980
1994/95	N.A.	N.A.	N.A.	N.A.
1995/96	N.A.	N.A.	N.A.	N.A.
1996/97	319	\$46,680,865	\$77,339,955	\$30,659,090
<b>Total</b>	<b>2439</b>	<b>\$356,911,065</b>	<b>\$591,323,355</b>	<b>\$234,412,290</b>

Source: United States Immigration and Naturalization Service, Demographic Statistics Branch, Washington DC.

Notes: a. Data not available for these years.

**Table A 6**  
**Value of Human Capital Flow to USA at Canadian 1993/94 Replacement Costs by Occupations**  
**(1993/94 Canadian \$): Health Technologists**

(1) Year	(2) Number	(3) Private Total Cost	(4) Social Total Cost	(5) = (4)-(3) Taxpayers' Subsidy
1983/84	54	\$4,882,410	\$9,034,362	\$4,151,952
1984/85	N.A.	N.A.	N.A.	N.A.
1985/86	54	\$4,882,410	\$9,034,362	\$4,151,952
1986/87	61	\$5,515,315	\$10,205,483	\$4,690,168
1987/88	60	\$5,424,900	\$10,038,180	\$4,613,280
1988/89	64	\$5,786,560	\$10,707,392	\$4,920,832
1989/90	N.A.	N.A.	N.A.	N.A.
1990/91	N.A.	N.A.	N.A.	N.A.
1991/92	49	\$4,430,335	\$8,197,847	\$3,767,512
1992/93	46	\$4,159,090	\$7,695,938	\$3,536,848
1993/94	42	\$3,797,430	\$7,026,726	\$3,229,296
1994/95	N.A.	N.A.	N.A.	N.A.
1995/96	N.A.	N.A.	N.A.	N.A.
1996/97	33	\$2,983,695	\$5,520,999	\$2,537,304
<b>Total</b>	<b>463</b>	<b>\$41,862,145</b>	<b>\$77,461,289</b>	<b>\$35,599,144</b>

Source: United States Immigration and Naturalization Service, Demographic Statistics Branch, Washington DC.

Notes: a. Data not available for these years.

**Table A 7**  
**Value of Human Capital Flow to USA at Canadian 1993/94 Replacement Costs by Occupations**  
**(1993/94 Canadian \$): Social Scientists and Urban Planners**

(1) Year	(2) Number	(3) Private Total Cost	(4) Social Total Cost	(5) = (4)-(3) Taxpayers' Subsidy
1983/84	21	\$2,671,515	\$4,286,163	\$1,614,648
1984/85	N.A.	N.A.	N.A.	N.A.
1985/86	39	\$4,961,385	\$7,960,017	\$2,998,632
1986/87	28	\$3,562,020	\$5,714,884	\$2,152,864
1987/88	32	\$4,070,880	\$6,531,296	\$2,460,416
1988/89	33	\$4,198,095	\$6,735,399	\$2,537,304
1989/90	N.A.	N.A.	N.A.	N.A.
1990/91	N.A.	N.A.	N.A.	N.A.
1991/92	21	\$2,671,515	\$4,286,163	\$1,614,648
1992/93	41	\$5,215,815	\$8,368,223	\$3,152,408
1993/94	29	\$3,689,235	\$5,918,987	\$2,229,752
1994/95	N.A.	N.A.	N.A.	N.A.
1995/96	N.A.	N.A.	N.A.	N.A.
1996/97	31	\$3,943,665	\$6,327,193	\$2,383,528
<b>Total</b>	<b>275</b>	<b>\$34,984,125</b>	<b>\$56,128,325</b>	<b>\$21,144,200</b>

Source: United States Immigration and Naturalization Service, Demographic Statistics Branch, Washington DC.

Notes: a. Data not available for these years.

**Table A 8**  
**Value of Human Capital Flow to USA at Canadian 1993/94 Replacement Costs by Occupations**  
**(1993/94 Canadian \$): Engineers, Surveyors and Mapping Scientists**

(1) Year	(2) Number	(3) Private Total Cost	(4) Social Total Cost	(5) = (4)-(3) Taxpayers' Subsidy
1983/84	386	\$51,610,130	\$88,708,590	\$37,098,460
1984/85	N.A.	N.A.	N.A.	N.A.
1985/86	447	\$59,766,135	\$102,727,305	\$42,961,170
1986/87	488	\$65,248,040	\$112,149,720	\$46,901,680
1987/88	456	\$60,969,480	\$104,795,640	\$43,826,160
1988/89	383	\$51,209,015	\$88,019,145	\$36,810,130
1989/90	N.A.	N.A.	N.A.	N.A.
1990/91	N.A.	N.A.	N.A.	N.A.
1991/92	464	\$62,039,120	\$106,634,160	\$44,595,040
1992/93	662	\$88,512,710	\$152,137,530	\$63,624,820
1993/94	452	\$60,434,660	\$103,876,380	\$43,441,720
1994/95	N.A.	N.A.	N.A.	N.A.
1995/96	N.A.	N.A.	N.A.	N.A.
1996/97	487	\$65,114,335	\$111,919,905	\$46,805,570
<b>Total</b>	<b>4225</b>	<b>\$564,903,625</b>	<b>\$970,968,375</b>	<b>\$406,064,750</b>

Source: United States Immigration and Naturalization Service, Demographic Statistics Branch, Washington DC.

Notes:

a. Data not available for these years.

**Table A 9**  
**Value of Human Capital Flow to USA at Canadian 1993/94 Replacement Costs by Occupations**  
**(1993/94 Canadian \$): Mathematical and Computer Scientists**

(1) Year	(2) Number	(3) Private Total Cost	(4) Social Total Cost	(5) = (4)-(3) Taxpayers' Subsidy
1983/84	66	\$10,130,868	\$19,002,258	\$8,871,390
1984/85	N.A.	N.A.	N.A.	N.A.
1985/86	84	\$12,893,832	\$24,184,692	\$11,290,860
1986/87	87	\$13,354,326	\$25,048,431	\$11,694,105
1987/88	93	\$14,275,314	\$26,775,909	\$12,500,595
1988/89	90	\$13,814,820	\$25,912,170	\$12,097,350
1989/90	N.A.	N.A.	N.A.	N.A.
1990/91	N.A.	N.A.	N.A.	N.A.
1991/92	124	\$19,033,752	\$35,701,212	\$16,667,460
1992/93	137	\$21,029,226	\$39,444,081	\$18,414,855
1993/94	150	\$23,024,700	\$43,186,950	\$20,162,250
1994/95	N.A.	N.A.	N.A.	N.A.
1995/96	N.A.	N.A.	N.A.	N.A.
1996/97	148	\$22,717,704	\$42,611,124	\$19,893,420
<b>Total</b>	<b>979</b>	<b>\$150,274,542</b>	<b>\$281,866,827</b>	<b>\$131,592,285</b>

Source: United States Immigration and Naturalization Service, Demographic Statistics Branch, Washington DC.

Notes: a. Data not available for these years.

**Table A 10**  
**Value of Human Capital Flow to USA at Canadian 1993/94 Replacement Costs by Occupations**  
**(1993/94 Canadian \$): Natural Scientists**

(1) Year	(2) Number	(3) Private Total Cost	(4) Social Total Cost	(5) = (4)-(3) Taxpayers' Subsidy
1983/84	110	\$16,884,780	\$31,670,430	\$14,785,650
1984/85	N.A.	N.A.	N.A.	N.A.
1985/86	117	\$17,959,266	\$33,685,821	\$15,726,555
1986/87	107	\$16,424,286	\$30,806,691	\$14,382,405
1987/88	117	\$17,959,266	\$33,685,821	\$15,726,555
1988/89	82	\$12,586,836	\$23,608,866	\$11,022,030
1989/90	N.A.	N.A.	N.A.	N.A.
1990/91	N.A.	N.A.	N.A.	N.A.
1991/92	97	\$14,889,306	\$27,927,561	\$13,038,255
1992/93	147	\$22,564,206	\$42,323,211	\$19,759,005
1993/94	143	\$21,950,214	\$41,171,559	\$19,221,345
1994/95	N.A.	N.A.	N.A.	N.A.
1995/96	N.A.	N.A.	N.A.	N.A.
1996/97	195	\$29,932,110	\$56,143,035	\$26,210,925
<b>Total</b>	<b>1115</b>	<b>\$171,150,270</b>	<b>\$321,022,995</b>	<b>\$149,872,725</b>

Source: United States Immigration and Naturalization Service, Demographic Statistics Branch, Washington DC.

Notes: a. Data not available for these years.

Appendix Table B-1 Adjusted Canadian Immigrant inflows into Canada by degree level in Sciences: 1989-1996.<sup>a</sup>

Year	1989	1990	1991	1992	1993	1994	1995	1996
B.A.	1828	2080	1949	2598	6967	5194	6601	8914
MA,Phd	938	1275	1297	1235	2914	3133	3922	6012
Total	2766	3355	3246	3833	9893	8327	10,523	14,926
% 2/3	33%	38%	40%	32%	29%	38%	37%	40%
USA % <sup>b</sup>	62%	54%	55%	68%	26%	24%	16%	15%

Source: Citizenship and Immigration Canada and U.S. Immigration and U.S. Immigration and Naturalization Service, Demographic Statistics Branch, Statistical Yearbooks, passim 1983-97.

Notes:

- Sciences defined as Life Sciences, Engineers, computer scientists and Physical scientists and mathematics.
- USA%= absolute number of gross Canada emigrants in Sciences to United States divided by row 3, **MA, Ph.D.**

Appendix Table B-2 Adjusted Canadian Immigrant inflows into Canada by degree level in Health: **1989-1997**.

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997
Elite <sup>a</sup>	1033	802	1054	1261	927	634	121	126	66
Other	2800	3169	2519	1932	2243	2292	2680	2610	2496
Total	3833	3971	3573	3193	3170	2926	2801	2736	2562
% 1/3	27%	20%	29%	39%	29%	22%	4.3%	4.6%	2.6%
USA % <sup>b</sup>	63.1%	NA	76.7%	92.9%	171.7%	276%	NA	NA	65%

Source: Citizenship and Immigration Canada and U.S. Immigration and U.S. Immigration and Naturalization Service, Demographic Statistics Branch, Statistical Yearbooks, passim 1983-97.

Notes:

- Elite countries include U.K., USA, Australia, New Zealand, South Africa, France and Ireland.
- USA%= absolute number of gross Canada emigrants in Health services to United States divided by row 2 i.e. elites.

Appendix Table B-3 Adjusted Replacement Value for Canadian Immigrant inflows into Canada By degree level in  
Sciences: 1989-1996.\*

Year	1989	1990	1991	1992	1993	1994	1995	1996	Total
B.A.	\$327,881,048	\$373,081,280	\$349,584,334	\$465,992,868	\$1,249,642,922	\$931,627,004	\$1,183,994,966	\$1,598,868,524	<b>\$6,480,672,946</b>
M.A. Phd.	\$270,062,394	\$367,089,075	\$361,750,161	\$355,572,555	\$838,978,482	\$902,031,429	\$1,129,194,786	\$1,730,932,956	<b>\$5,955,611,838</b>
<b>Total</b>	<b>\$597,943,442</b>	<b>\$740,170,355</b>	<b>\$711,334,495</b>	<b>\$821,565,423</b>	<b>\$2,088,621,404</b>	<b>\$1,833,658,433</b>	<b>\$2,313,189,752</b>	<b>\$3,329,801,480</b>	<b>\$12,436,284,784</b>

Appendix Table B-4 Adjusted Replacement Value for Canadian Immigrant inflows into Canada By degree level in  
Health: 1989-1994.

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	Total
Elite*	\$287,755,579	\$223,407,526	\$293,605,402	\$351,267,943	\$258,227,901	\$176,608,942	\$33,706,123	\$35,098,938	<b>\$18,385,158</b>	<b>\$1,454,655,986</b>
Other	\$779,976,400	\$882,766,147	\$701,700,197	\$538,183,716	\$624,816,809	\$638,466,396	\$746,548,840	\$727,049,430	<b>\$695,293,248</b>	<b>\$5,452,035,036</b>
<b>Total</b>	<b>\$1,067,731,979</b>	<b>\$1,106,173,673</b>	<b>\$995,305,599</b>	<b>\$889,451,659</b>	<b>\$883,044,710</b>	<b>\$815,075,338</b>	<b>\$780,254,963</b>	<b>\$762,148,368</b>	<b>\$713,678,406</b>	<b>\$6,906,691,022</b>

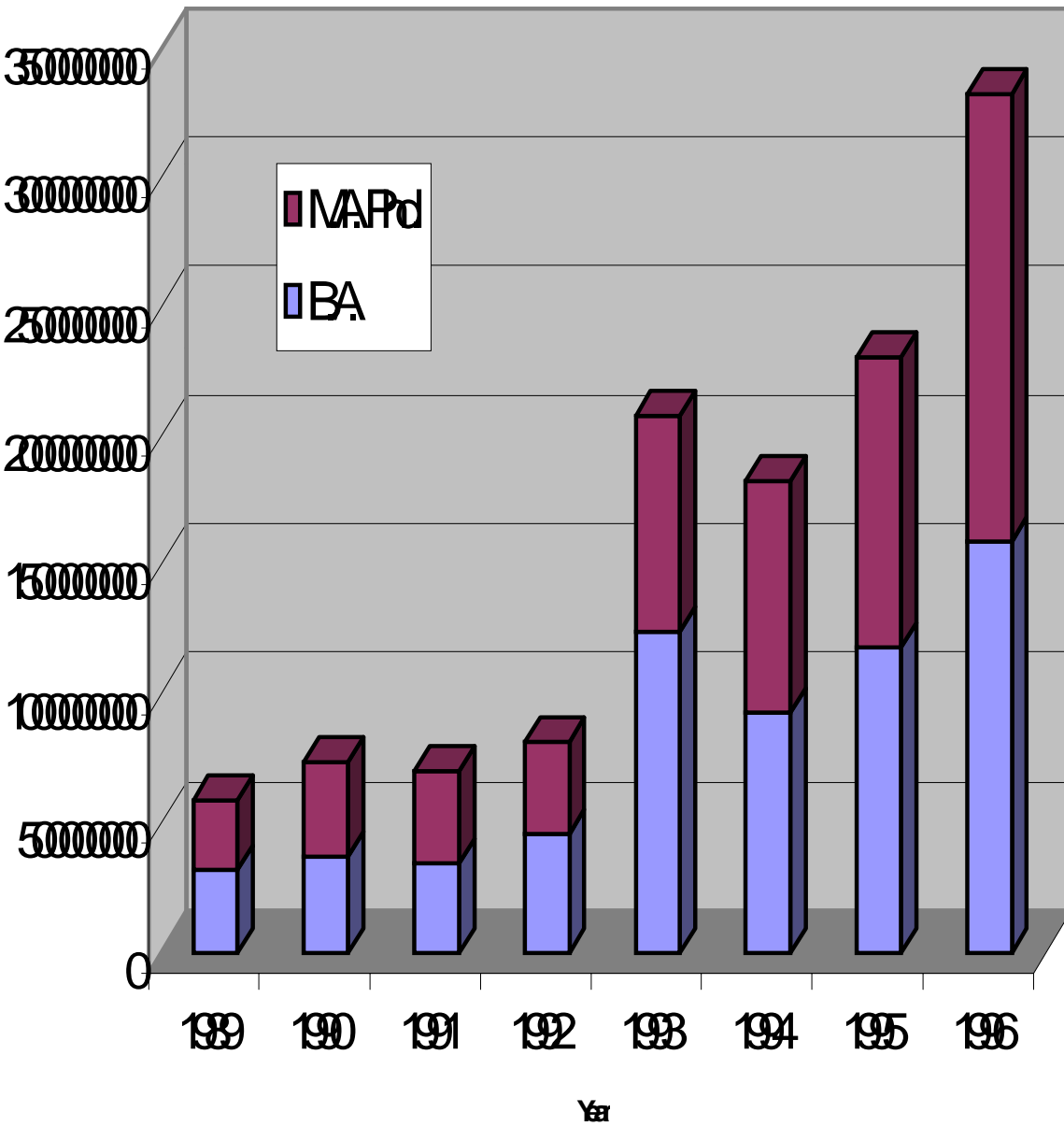
Appendix Table B-5 Value for Canadian Emigrant flows to USA in Sciences: 1989-1996.\*

Year	1989	1990	1991	1992	1993	1994	1995	1996	Total
Numbers	949	N/A	979	709	1,945	1,285	1,092	952	<b>7,911</b>
Value	\$273,229,437	N/A	\$281,866,827	\$204,130,317	\$559,990,785	\$369,968,205	\$314,400,996	\$274,093,176	<b>\$2,277,679,743</b>

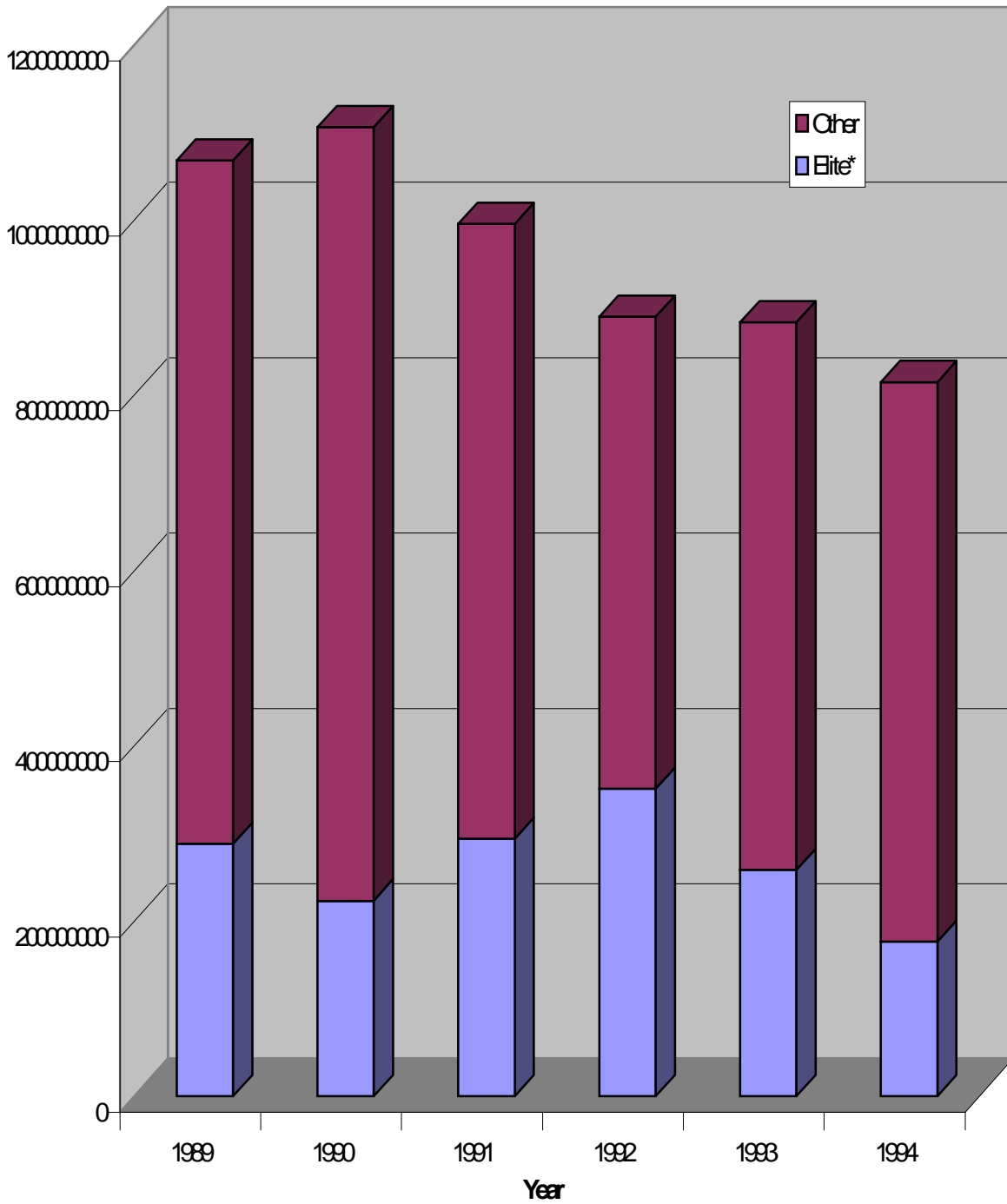
Appendix Table B-6 Value for Canadian Emigrant flows to USA in Health: 1989-1996.\*

Year	1989	1990	1991	1992	1993	1994	1995	1996	Total
Numbers	652	N/A	809	684	980	1,592	1,752	1611	<b>7,428</b>
Value	\$181,623,076	N/A	\$225,357,467	\$190,537,092	\$272,991,740	\$443,472,296	\$488,042,376	\$448,764,993	<b>\$2,069,165,964</b>

**Figure B1**  
**Adjusted present value (APV) for Graduate Migration Series (1989-1996)**  
**(G)**

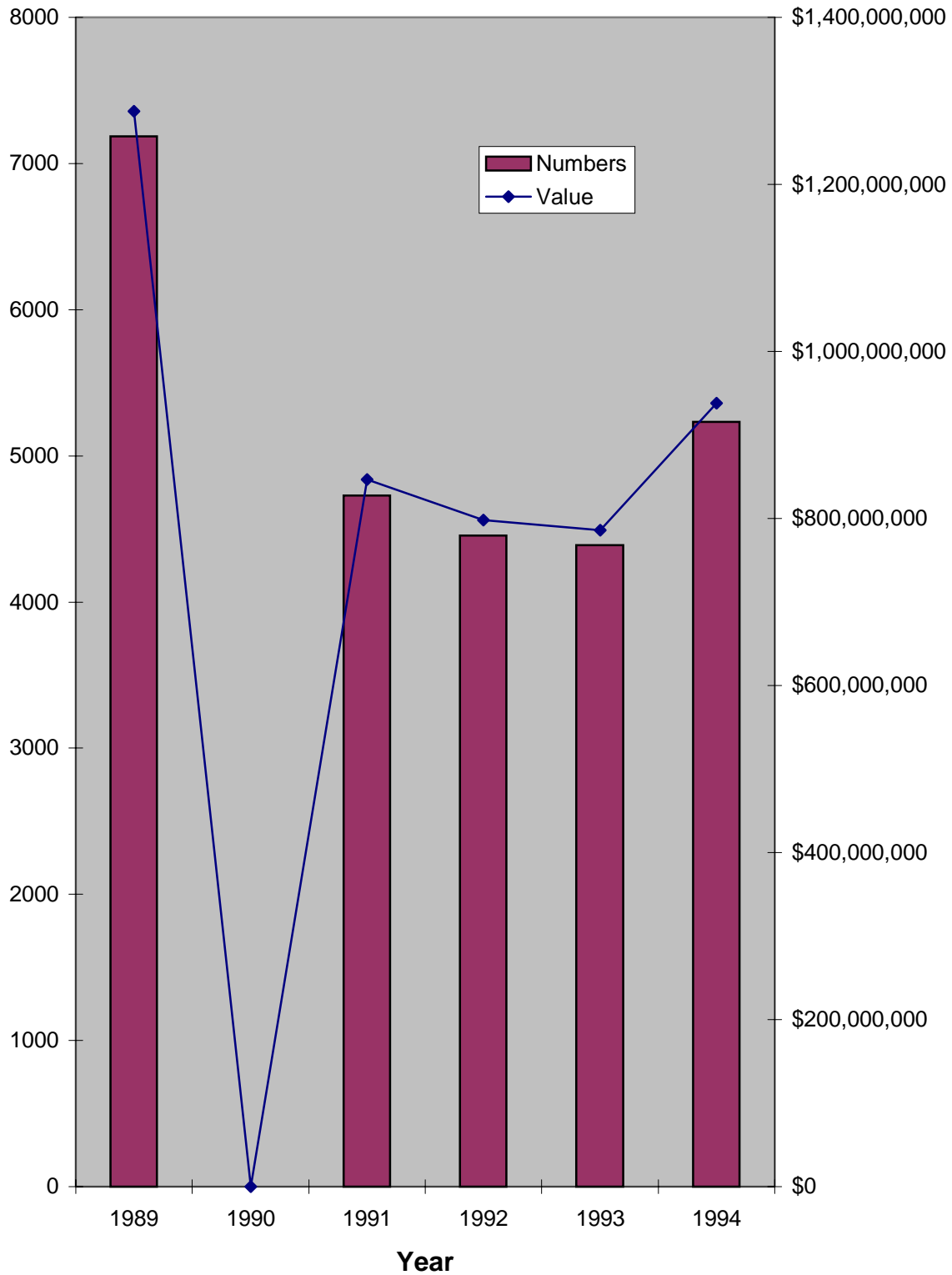


**Figure B2**  
**Adjusted Replacement Value (STC) for Canadian Immigrant Inflows in Health (1994\$ Cdn)**





### Value of Canadian Emmigrant flows to USA in Managerial Occupations (1994\$ Cdn)



**Appendix Table C-1: The Difference of the Net Present Value of Future Earnings between Canadian and Foreign Born Workers by Gender and Education.**

<b>Earnings for Women With More than 11 Years of Schooling, in CN\$</b>									
Age	25	30	35	40	45	50	55	60	64
Canadian	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
<b>Net Present Value</b>	<b>127,999</b>	<b>122,323</b>	<b>111,144</b>	<b>95,090</b>	<b>75,495</b>	<b>54,189</b>	<b>33,193</b>	<b>14,342</b>	<b>2,249</b>
<b>Earnings for Women With More than 16 Years of Schooling, in CN\$</b>									
Age	25	30	35	40	45	50	55	60	64
Canadian	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
<b>Net Present Value</b>	<b>447</b>	<b>-3,851</b>	<b>-13,640</b>	<b>-27,308</b>	<b>-41,582</b>	<b>-51,760</b>	<b>-52,282</b>	<b>-37,543</b>	<b>-10,105</b>
<b>Earnings for Men With More than 11 Years of Schooling, in CN\$</b>									
Age	25	30	35	40	45	50	55	60	64
Canadian	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
<b>Net Present Value</b>	<b>288,135</b>	<b>279,567</b>	<b>265,408</b>	<b>245,007</b>	<b>217,207</b>	<b>180,412</b>	<b>132,884</b>	<b>73,133</b>	<b>15,723</b>
<b>Earnings for Men With More than 16 Years of Schooling, in CN\$</b>									
Age	25	30	35	40	45	50	55	60	64
Canadian	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
<b>Net Present Value</b>	<b>216,562</b>	<b>203,507</b>	<b>189,106</b>	<b>173,438</b>	<b>155,297</b>	<b>132,211</b>	<b>100,892</b>	<b>58,012</b>	<b>13,075</b>

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