Atlantic Institute for AIMS Market Studies

WHAT'S A DEGREE WORTH?

WHO PAYS AND WHO BENEFITS AT ATLANTIC CANADA'S UNIVERSITIES

John Philippe
AIMS' 2001 Summer Intern

March 2002

Atlantic Institute for Market Studies

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CONTENTS

Foreword . . . . . **iv**

Executive Summary . . . . . **v**

About the Author . . . . . **viii**

Introduction **1**

Analytical Framework **6**

Methodology and Data **8**

Calculation of Costs **9**
- Public Costs 9
- Private Costs 12

Calculation of Benefits **13**
- Public Benefits. 13
- Private Benefits 15

Pre-Migration Findings and Analysis **16**

Migration Issues **19**
- Introduction 19
- Causes of Migration 22
- Undergraduate Degree Holders 22
  - *Nova Scotia* 23
  - *New Brunswick* 23
  - *Newfoundland* 24
  - *Prince Edward Island* 24
- Graduate Degree Holders 25
- Student Migration 26

Does post-Graduation In-Migration Compensate? **28**

Employment Issues **29**

Student Attrition Issues **31**

Demand for University Graduates **33**

Policy Recommendations **36**
Introduction 36
Private Funding 36
Tuition Policy. 36
Firms 38
Tax Credits 38
Taxpayer Support of Students 39
Public Funding and Incentives 39
Attrition 40
Macroeconomic Conditions 40

Conclusions . . . . . **.42**

Appendix A . . . . . **.44**

Appendix B . . . . . **.46**

Appendix C . . . . . **.47**

Appendix D . . . . . **.49**

Appendix E . . . . . **.53**

Appendix F . . . . . **.55**

Bibliography . . . . . **.56**

FOREWORD

Atlantic Canadian taxpayers give substantial financial support to our region's university students. Similarly, students invest considerable resources in time, tuition fees and forgone income, to get their university degrees. But what value do taxpayers and students respectively get in return for their investment? And does each contribute to the cost of a university degree in proportion to the benefit they receive from it? It was to answer these questions that AIMS' Summer Intern, John Philippe, wrote this very fine paper.

Through this report, the author clearly identifies the flaws in the current system for financing university education and suggests several amendments to fortify it. Philippe analyses and calculates the costs and benefits of a university education to both individuals and society at large, and thoroughly examines related issues, including the arrival of large numbers of out-of-province students to study in the region, as well as the departure of equally large numbers of local students after graduation to other jurisdictions.

This paper makes an excellent contribution to AIMS' fine tradition of commentary on education issues. At the post-secondary level, for example, it joins the seminal essay that the late Prof. E.G. West wrote for us in 1995 entitled *Reforming the Universities: The Coming Upheaval in Higher Education in Nova Scotia and Elsewhere*, as well as an earlier student intern essay, *Reforming Education the Income Contingent Way* by the Institute's 1996 Summer Intern, Kevin Lacey. At the level of our public schools, it joins the ranks of our recently released report entitled, *"Testing and Accountability: The Keys to Educational Excellence in Atlantic Canada"* written by Charles Cirtwill, Rod Clifton, and John D'Orsay, which effectively illustrates that governments cannot claim to be properly managing our educational resources, money and students, without using standardised tests for basic benchmarks; and earlier publications including "*Charter Schools in Atlantic Canada: An Idea Whose Time Has Come*" by Joe Freedman, MD (assisted by Fred McMahon).

AIMS has been exceptionally lucky to have student interns of the calibre of John Philippe. The Institute would also like to thank the Max Bell Foundation, without whose support AIMS' 2001 summer internship would not have been possible.

Brian Lee Crowley
Halifax, March 2002

EXECUTIVE SUMMARY

Who pays, who benefits?

Atlantic Canada has the strongest concentration of universities per capita in Canada. Tremendous growth has taken place in the university system in the region in the past three to four decades. That growth manifests itself in the enrolment figures and in the financial commitment on behalf of the taxpayers of the four provinces. In light of this trend, what value are the taxpayers of the Atlantic provinces receiving in return for this investment in their university students? The data is not encouraging.

From an economic point of view, students, not taxpayers, are the prime beneficiaries of university education in Atlantic Canada. At every level and in every major field of study, students themselves are receiving more value for their education dollars than are taxpayers. Engineering graduates in Nova Scotia and New Brunswick, for example, realize returns on investment of 16.5 per cent whereas the taxpayers' returns are in the range of 6.5 to 7.5 per cent. Yet taxpayers are incurring the majority of the costs—approximately 75 per cent of the cost of engineering students. Taxpayer support of medical and graduate students is three to five times as much as the students' contributions, yet master's students in Nova Scotia, for example, realize a return of 3.1 per cent whereas the public return is 0.6 per cent. Since students are the primary beneficiaries of university education, they should bear the greater burden of the cost.

The gap between returns to students and returns to taxpayers on investment in education widens considerably when graduate mobility is taken into account. The value for provincial taxpayers is reduced because many graduates leave their province following graduation for greater opportunities elsewhere.

The value added to society—that is, the return to taxpayers—by investing in one discipline or level of study also varies greatly one relative to another. In particular, returns to taxpayers for both health disciplines and graduate programs are either negative or quite modest despite taxpayers' significantly greater investment in them relative to disciplines that yield higher returns. Policy makers need to look at such data with an aim toward possible re-allocation of taxpayer dollars or cost savings in light of such discrepancies.

Tuition fees

A market-oriented tuition policy would have several advantages. Allowing tuition levels to be determined by supply of and demand for each program, which would inevitably yield different tuition fees across programs, would enable universities to be more flexible in responding to changes in students' demands for particular programs. It would act as an incentive for universities to re-allocate taxpayer dollars from those programs less in demand to those more in demand. Such a tuition policy would empower students to

determine what educational programs are valued and subsequently offered. Since higher tuition would result from greater demand for a particular program and since greater demand is largely due to greater earning power (higher salaries) in a given discipline, it seems appropriate that earnings and tuition increase proportionately. Students would likely use more discretion in selecting a field of study, seeking the highest return possible.

This tuition policy would address to some degree the problem of student attrition; many second-year university students — as many as 40 to 50 per cent at some institutions — do not complete their degree within five years. Currently tuition levels, with a few exceptions, are more or less equal across disciplines so as not to sway students to pursue one discipline over another on the basis of cost. However, this policy prohibits universities from efficiently allocating scarce resources to meet the changes in demand for given disciplines.

In the case of Nova Scotia and New Brunswick, the data indicate that the provinces should consider ways to reduce the burden on local taxpayers caused by large numbers of out-of-province students who do not remain in their province of study following graduation, thus providing no return on investment for the provincial taxpayer. Two proposals are offered. In the first, a system of differential tuition fees would be established for out-of-province students. Out-of-province students who earned their degree in Nova Scotia or New Brunswick and subsequently remain to work would be eligible for a refund on the excess tuition paid. The second alternative would involve keeping uniform tuition fees for local and out-of-province students, but with students from the home province being eligible for merit-based scholarships. In effect, the home province would target its resources more directly to help its own students pay relatively lower tuition.

Student loans

An income-contingent loan system would be fairer to students. Under the system, loan repayments would be linked to earnings. An earnings threshold would exist above which the graduate would pay a fixed percentage of those excess earnings toward his or her loan each year. Those earning below the threshold would not repay any portion of their loan, thus postponing repayments until they are above the threshold. Graduates with low earnings, therefore, would have repayments more in line with their earnings and would be able to spread payments over a longer time period. Currently some students, having to pay a fixed amount of loan repayment regardless of income level, have difficulty meeting their payments and subsequently default on their student loan.

Introducing an element of competition into the method by which taxpayer dollars are granted to universities would increase the efficiency and effectiveness of these institutions. Taxpayer funding to universities should be based not on input measures, such as enrolment or plant and equipment, but on output measures, such as retention and graduation rates, student and graduate satisfaction, and employer satisfaction with the quality of graduates. Funding to universities that outperform other universities would be

a more efficient use of taxpayer money and would provide an incentive to the universities to produce the best graduates. Universities, therefore, by being held accountable for what they produce, would be enticed to deliver education more effectively. Universities not able to maintain a certain standard of quality would inevitably cease to exist. The current incentive structure impedes efficiency and lacks accountability.

Policy makers in Atlantic Canada must adopt more economically sound policies particular to the university sector to increase the system's effectiveness. This must happen in combination with general economic policies that make the region attractive to university graduates. Nothing less than a concerted policy effort will enable the region's universities to fulfill their critical role in Atlantic Canadian society.

ABOUT THE AUTHOR

John Philippe was AIMS' Summer Fellow during the Summer of 2001. He holds a Bachelor of Business Administration degree majoring in Economics from Nipissing University in North Bay, Ontario, as well as a diploma in Broadcast Journalism from Canadore College in North Bay.

Prior to his work at AIMS, John, as a Research Assistant at Nipissing University, performed research in the areas of poverty in Canada and economic development in lesser-developed countries.

John has a keen interest in various social and economic policy issues. He is interested in the wide range of alternatives available, notably the role markets can play, to address these policy issues.

INTRODUCTION

In this era, seemingly more so than in the past, people are urging fiscal efficiency and accountability on government. Allocating tax dollars more efficiently into areas benefiting a wider scope of the population is part of this drive. In the field of education, hot debate is currently taking place with respect to the effectiveness and efficiency of publicly delivered education. Particular to post-secondary education, issues of accessibility and distribution of costs and benefits dominate the debate—Who should pay for it? Who is the prime beneficiary?

The focus of this study will be on university education. The purpose is to assess the "return on investment" in university students. In particular, it will focus on the return that the four Atlantic provinces are receiving by investing in their university students, by province, by field of study at the undergraduate level, and in general terms by level of study. That is, what are taxpayers who finance public universities getting in return? To what extent do taxpayers reap rewards such as additional provincial income and consumption taxes attributable directly to a university graduate's higher earnings? To what extent do these rewards exceed the costs to taxpayers of funding them?

This study will attempt to answer the following questions: In which fields and levels of study do mismatches in balance of payments (i.e. cost-benefit) exist? For example, do the benefits accruing to taxpayers (relative to the cost incurred by them) in funding Engineering & Applied Science students outweigh the cost-benefit ratio of such spending on Social Science students? Do the benefits accruing to taxpayers in funding a Master's student outweigh those of a Bachelor's student? Are there certain disciplines in which the benefits to taxpayers greatly exceed or significantly fall short of their costs? For each major field of study at the undergraduate level, and for Master's and Doctoral at the graduate level, percentage returns to taxpayers will be calculated.

Percentage returns to the student, referred to as private returns, by major field and level of study will also be calculated. For example, do benefits, measured as after-tax earnings, accrued to Engineering & Applied Science students relative to costs, measured by costs of tuition and books and forgone earnings, outweigh those of a Humanities student?

Important analysis can then be conducted and conclusions drawn by comparing the returns to taxpayers of one discipline versus another, or by comparing one level of study versus another. In a sense, what is measured is the value added to society by investing in one discipline or level of study relative to another. This has important implications for possible re-allocation of taxpayers' funds in light of such imbalances. Important analysis can also be conducted by comparing public returns to private returns. This has obvious implications with respect to who should pay for university education. For example, if the private return to an Engineering graduate far outweighs the public return, perhaps it is easily justified that the burden of financing such studies shift from the taxpayer to the student.

An area of further analysis that alters the public return figures is that of graduate mobility.

Much debate is taking place in the area of "brain drain" of young Canadian talent to the United States. To what extent does an Atlantic Canadian "brain drain" problem exist and thus impact the overall return to provincial taxpayers? Graduates of Atlantic Canadian universities, financed substantially by their respective provincial taxpayers, may migrate to the United States, to other regions of Canada, or to another province within Atlantic Canada. Taxpayers might have something to say if they realize that a significant proportion of skilled labour generated within their province takes its earnings elsewhere. Fifty-two per cent, or over 14,500, of Atlantic Canadians who left the region between 1991 and 1996 hold a post-secondary certificate, diploma, and/or degree (Atlantic Provinces Economic Council 1998). Identifying why graduates leave their province of graduation, and to where they relocate, could prove to be valuable information for policy makers aiming towards realizing better returns to the taxpayer.

Given the Atlantic provinces' historically high rates of unemployment, the extent to which skilled labour in the form of university graduates is utilized or idle and its impact on returns is worthy of analysis. Unemployment rates decrease as level of schooling increases, yet many university students find themselves unemployed. According to Statistics Canada's National Graduate Survey, which asks graduates whether they are employed two years after graduation, the unemployment rate for 1995 college graduates was ten per cent, whereas the rate for Bachelor's graduates was nine per cent (Paju 1999, p. 1). Employment figures will vary by field of study and level of study. Identifying the sources of unemployment could better enable decision-makers to adopt appropriate policies to address these sources.

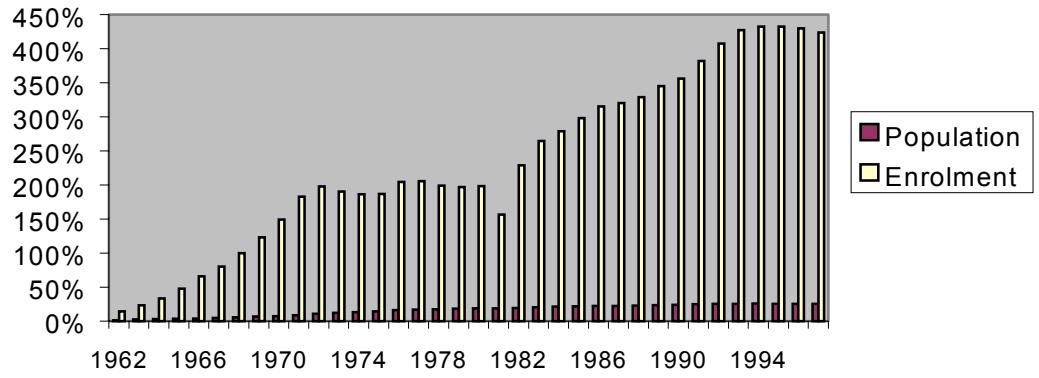
As with any other investment, taxpayers should have an interest in what returns their investment is producing. If provincial taxpayers and policy-makers know the degree of return on their investment, they could identify "losing" and "winning" investments. Undoubtedly, some areas of study within university education provide returns to investment more attractive than other areas. If particular fields of study are yielding poor returns to taxpayers, perhaps ways to reduce costs of that particular degree can be found or ways can be found to increase the benefits. Appropriate policies can be implemented to help to bring about more efficient use of taxpayers' money, fairness with respect to the graduate and taxpayer cost-benefit balance, and a climate conducive to economic growth and development, which benefits all concerned.

The overriding objectives of the study are to generate awareness, discussion, and debate with an aim toward maximizing the public return on investment in our university students.

It is acknowledged that the impact of the university system as a whole on jurisdictions is significant. Yet, that is beyond the scope of this study.

Tremendous growth in university education has occurred in Atlantic Canada in the past four decades. Figure One illustrates the growth in full-time undergraduate enrolment as compared to the growth in population during this time period using 1962 as the base year.

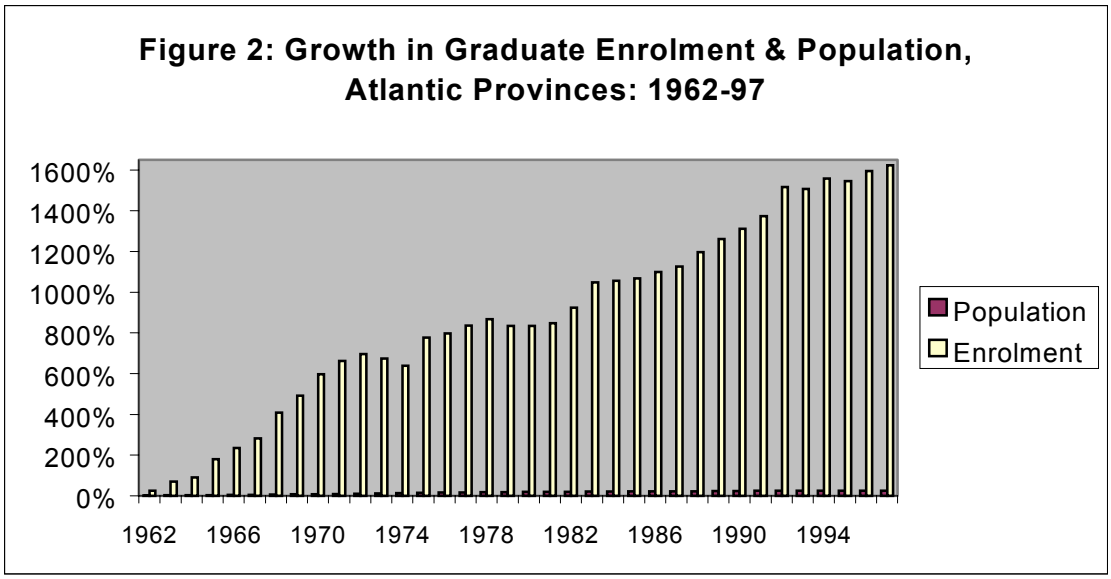
Figure 1: Growth in Undergraduate Enrolment & Population, Atlantic Provinces: 1962-1997



Source: Statistics Canada, "Education in Canada" various years; Statistics CANSIM Disc 1999-2; Calculations by Author

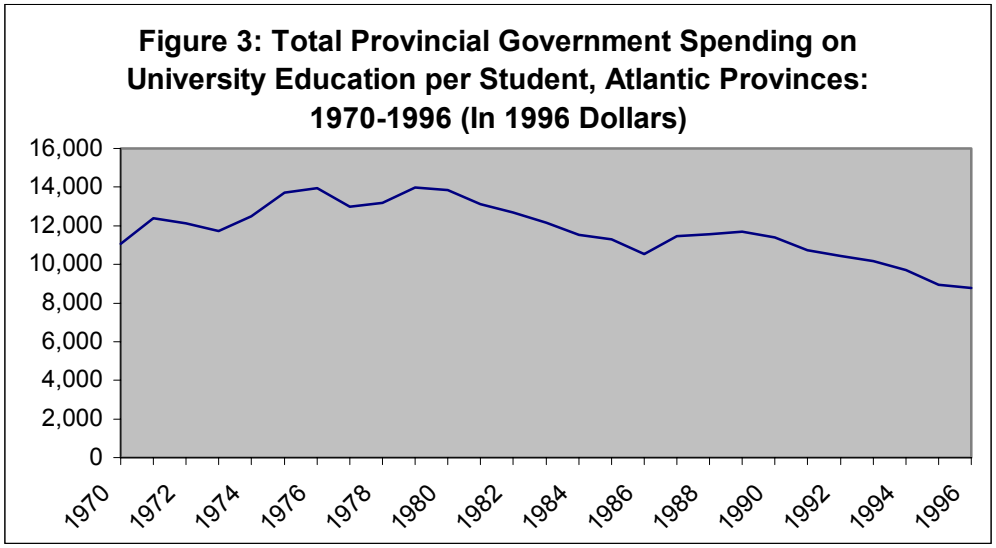
Over this period, enrolment has grown by over 400 per cent while the population has grown by only 25 per cent. The growth is even more pronounced at the graduate level. Figure Two indicates the growth in full-time graduate enrolment vis-à-vis the population for the same time period. Graduate student enrolment has grown over sixteen-fold, compared with a population increase of 25 per cent.

The percentage of GDP spent on university education in the four provinces combined has declined slightly over the past 30 years. Total spending, both public and private, in 1972, over $166 million, constituted 2.57 per cent of the provinces' aggregate GDP. In 1997, spending of $1.072 billion constituted 2.09 per cent of the aggregate GDP.



Source: Statistics Canada, "Education in Canada" various years; Statistics CANSIM Disc 1999-2; Calculations by Author

Atlantic Canadian taxpayers make a significant financial commitment per university student. Figure Three shows the amount, adjusted for inflation, spent in aggregate by the four provincial governments on university education per full-time student between 1970 and 1996.

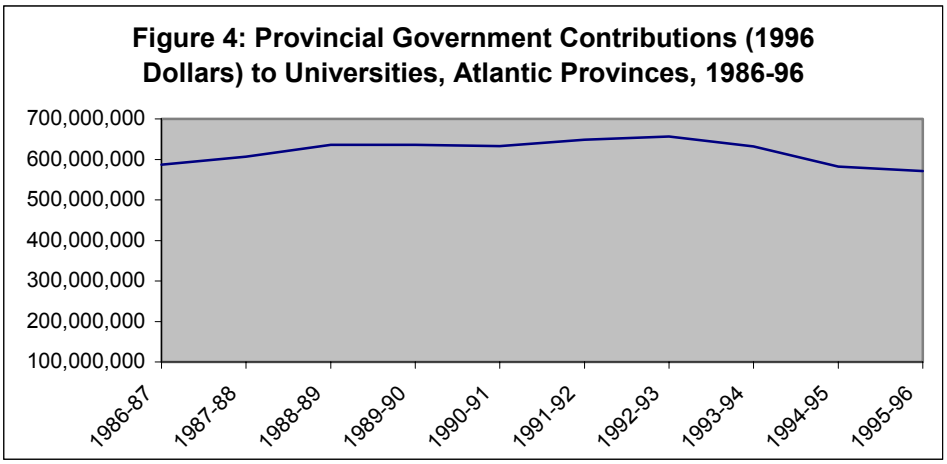


Source: Statistics Canada, "Financial Statistics of Education," 1971-82, 1985-90; Statistics Canada CANSIM Table 478-0007; Calculations by Author

Canadian provinces have historically contributed the majority of funding toward university education. The four provincial governments contributed over $570 million to universities in the 1995-96 academic year. (Statistics Canada, CANSIM Table 478-0007) Much of this money goes to produce human capital, or graduates, the primary product of

the university system. In Atlantic Canada, provincial taxpayer support of universities as a percentage of all sources of spending on universities, while still the majority, has declined from the mid-1980's to the mid-1990's. In 1986-87, provincial taxpayer support constituted 65 per cent of all funding of university education. In 1995-96, provincial taxpayer support of universities constituted 56 per cent of all funding. Private sources are increasingly being relied upon to support universities in Atlantic Canada. Figure Four shows the aggregate provincial commitment, adjusted for inflation, to university education in absolute dollar terms.

Figure 4: Provincial Government Contributions (1996 Dollars) to Universities, Atlantic Provinces, 1986-96



Source: Statistics Canada, "Financial Statistics of Education, 1989-90," Table 25; Statistics Canada CANSIM Table 478-0007

Appendix A breaks down the financial commitment of each of the four provinces. Given the substantial amount of provincial taxpayer support of university students, strong concentration of universities in the Atlantic provinces, and rising enrolment, it seems worthwhile to assess what return the taxpayers of Newfoundland, Nova Scotia, Prince Edward Island, and New Brunswick are receiving from this investment.

Once I have presented the essential framework of the study, consisting of percentage returns and graduate mobility, I will address three other areas pertinent to the subject matter. They are student attrition, employment issues, and the demand side of the regional labour market. Policy recommendations and conclusions will then be advanced.

ANALYTICAL FRAMEWORK

As mentioned, the purpose of this paper is to assess the returns to investment in university students for taxpayers and graduates of the four Atlantic Canadian provinces. This is not an attempt to measure the economic impact of the institutions themselves or the university system as a whole on the Atlantic region.

Within the context of assessing economic returns, for each province I will look at returns by major field of study for undergraduate students and in general terms for Master's and Doctoral students at the graduate level. By arriving at a cost-benefit calculation by area of study and level of study for each province, it can be determined which fields of study and levels of study are providing good or poor returns. Private returns will be brought into the picture in order to compare cost-benefits of the taxpayer to those of the graduate.

The classification of areas of study will be as follows: Education; Fine and Applied Arts; Humanities; Social Sciences; Commerce, Management, and Administration; Agricultural and Biological Sciences; Engineering and Applied Sciences; Health Professions (to be subdivided further by Health and Medicine/Dentistry due to relatively significant differences in costs); and Mathematics and Physical Sciences.

The study will focus on the 17 public degree-granting institutions in Atlantic Canada. Appendix B lists these institutions.

The study will exclude university students graduating with certificates or diplomas. It will focus only on those students graduating with a degree. The enrolment data comprises all types of university students; that is, those working toward degrees and those working toward diplomas or certificates. Therefore, as will be acknowledged in the analysis of costs and benefits, some of the enrolment not accounted for via graduation will be attributed to those diploma and certificate-seeking students.

I acknowledge that the impact of a university-educated population reaches beyond solely monetary benefits. In no way do I wish to treat the subject of costs and benefits of university in an overly simplistic manner, nor do I claim that these findings report the whole picture of costs and benefits resulting from training human capital. Economists themselves widely acknowledge the complexity and difficulty in attempting to attribute improvements in social well being to university education. To attempt to quantify this cause and effect relationship given the resources and time available would not do the subject matter justice.

This study does not attempt to measure the impact of research, another primary function of universities. Funds contributed toward research, even provincial outlays, are excluded from this study with the desire and intent to measure the economic impact of students only.

Another aspect of the university investment question is how much of the value added by a university education is due to the education process versus the innate ability of the student. In other words, to what extent are increments in earnings directly attributable to a university education? Is university education, in light of this, overvalued? Would a given student, based on his or her innate ability, earn the same had he or she not attended university? The assumption in this study is that additional earnings are completely attributable to a university education. No credible measures exist to allow us to separate the effects of these two factors on earnings.

METHODOLOGY AND DATA

In reviewing the literature regarding returns to education, it appears the most appropriate methodology to use is based on incremental values. Two studies in particular by Vaillancourt (2001) and Dickson et al (1996) suggest measuring costs and benefits using an incremental approach. Adopting this incremental approach, this study will measure costs and benefits based on incremental costs incurred by government and benefits derived from university graduates over and above those of high school graduates. Statistics Canada's Public Use Individual Microdata File from the Census will be a valuable source of earnings data. It is assumed that Master's students have completed an undergraduate degree prior and that Doctoral students have completed a Master's degree prior. Benefits to the taxpayer in the case of an undergraduate will consist of the additional provincial income and consumption taxes generated as a result of the university graduate's excess earnings over those of a high school graduate. Benefits to the student will consist of the additional after-tax earnings generated as a result of the university graduate's education. A similar incremental approach will be adopted for estimating costs and benefits of a graduate degree-holder over those of an undergraduate degree-holder. For example, benefits in the case of a Master's graduate consist of the additional benefits generated in excess of those of an undergraduate degree holder.

Using the internal rate of return method, I will arrive at a percentage return figure for the taxpayer and the student for each major field of study for undergraduates and for level of study for graduates. This will be done for each of the Atlantic provinces. The method involves determining which percentage produces a result whereby the present value of a stream of costs is equal to the present value of a stream of benefits. This percentage represents the return on investment. These results are under the assumption that the graduate stays in and is employed in his or her province of graduation. In reality, however, some graduates leave their province of graduation. Therefore, I will assess to what extent graduate mobility affects the results, and I will derive a modified set of return figures to factor it in.

CALCULATION OF COSTS

Public Costs

Costs to each of the four Atlantic provinces have been gathered and are illustrated in Table 1.

Table 1: Provincial Contributions By Type of Expenditure

	Operating (Excluding Sponsored Research)	Sponsored Research	Capital	Student Support	Other	Total ($) Expenditures
NFLD						
1990-91	128,918,000	941,000	3,317,000	12,575,000	2,426,000	148,177,000
1991-92	128,977,000	990,000	4,000,000	13,813,000	2,447,000	150,227,000
1992-93	140,896,000	1,592,000	6,500,000	12,280,000	2,095,000	163,363,000
1993-94	134,771,000	1,955,000	1,306,000	12,321,000	2,070,000	152,423,000
1994-95	138,934,000	1,802,000	2,500,000	3,728,000	2,251,000	149,215,000
1995-96	131,388,000	3,400,000	4,500,000	2,942,000	2,338,000	144,568,000
PEI						
1990-91	31,161,000	245,000	0	1,939,000	-2,975,000	30,370,000
1991-92	31,336,000	81,000	0	1,919,000	-2,886,000	30,450,000
1992-93	32,062,000	63,000	0	1,739,000	-1,797,000	32,067,000
1993-94	31,332,000	37,000	693,000	1,547,000	-1,972,000	31,637,000
1994-95	29,201,000	187,000	581,000	148,000	2,783,000	32,900,000
1995-96	28,938,000	289,000	1,924,000	949,000	-1,899,000	30,201,000
NS						
1990-91	212,785,000	4,140,000	4,734,000	13,336,000	10,219,000	245,214,000
1991-92	216,189,000	7,158,000	3,484,000	12,231,000	15,163,000	254,225,000
1992-93	219,024,000	3,908,000	6,789,000	12,633,000	12,228,000	254,582,000
1993-94	213,121,000	3,120,000	5,019,000	899,000	31,081,000	253,240,000
1994-95	210,712,000	2,748,000	904,000	2,759,000	-2,038,000	215,085,000
1995-96	205,184,000	2,878,000	2,603,000	2,257,000	-100,000	212,822,000
NB						
1990-91	132,619,000	3,808,000	973,000	14,311,000	15,218,000	166,929,000
1991-92	135,884,000	3,261,000	4,233,000	15,095,000	18,381,000	176,854,000
1992-93	136,305,000	1,614,000	8,215,000	15,328,000	20,084,000	181,546,000
1993-94	140,009,000	3,067,000	8,634,000	3,652,000	15,871,000	171,233,000
1994-95	140,696,000	3,210,000	3,464,000	8,439,000	18,123,000	173,932,000
1995-96	142,377,000	3,518,000	11,105,000	8,896,000	17,406,000	183,302,000

Source: Statistics Canada CANSIM Table 478-0007

I have chosen to use operating expenditures (excluding research) and student support in attempting to allocate costs to students. Capital expenditures, which fluctuate greatly from year to year, are accounted for in a given year with the resulting benefits recognized over a period of years. I recognize that capital expenditures, such as in the form of new classrooms and labs, play a role in educating students. But given their volatility and the difficulty of allocating them to each year, capital expenditures are excluded from the costing calculations. Capital expenditures at most comprise five per cent of total provincial contributions to university education in Atlantic Canada for the period under study.

I have also chosen to exclude sponsored research from the calculations. Given my intent to measure the cost of taxpayer investment in students, to include sponsored research costs would inaccurately allocate costs incurred by the university in fulfilling its research function rather than that of producing human capital. Of course, results of research eventually make their way into classrooms and laboratories. But to consider research results directly attributable to educating students in the year in which these costs are incurred would be an indefensible attribution of those costs. Results of research are more likely to bear fruit in future cohorts or generations of students. "Other expenditures" consist of departmental costs including: interprovincial transfer and administrative expenditures. These are not taken into account when considering the cost to taxpayers of students.

When documenting costs or budgets by academic department, most universities include both undergraduate and graduate students. This makes it difficult to distinguish between costs of educating students by level of study.

Vaillancourt (2001) concludes that the relative cost comparison of various undergraduate courses were as follows:

- Education, Humanities, Social Sciences, Commerce, and Mathematics - **1** (*reference point*);
- Pure Sciences - **1.5**;
- Engineering - **2**;
- Health - **3.33** (two-thirds of health degrees);
- Medicine - **5**

Regarding Fine and Applied Arts, not included in this list, I am making the assumption that it belongs in the first group of disciplines. The cost attributed to those undergraduates who have not yet declared their major is simply the average cost of the nine major fields of study. This analysis leads to the conclusion that it costs twice as much to educate an undergraduate engineering student than it does to educate an undergraduate education or humanities student. Likewise, it costs five times as much to educate a student of medicine and so forth. Cost data on a full-time equivalent student basis for Dalhousie University in Nova Scotia and Memorial University in Newfoundland provide evidence supporting this cost structure.

At the graduate level, the structure is as follows:

Master's:
- Education, Humanities, Social Sciences, Commerce: 2;
- Mathematics and pure sciences, Engineering, Health: 3;

PhD:
- All disciplines: 6;

From this data, we see that it costs six times as much to educate a student at the PhD level compared to the least expensive undergraduate discipline (those with reference points of 1). At the Master's level, it costs twice as much to educate an education student compared to the least expensive undergraduate student, and so forth. Therefore, costs to Atlantic Canadian taxpayers to educate students in the major fields of study, it will be assumed, follow the cost structure found in the Vaillancourt study. Appendix C includes further details of methodology particular to Health Professions, Education, and Social Sciences.

For each field of study, undergraduate and graduate enrolment data by status have been gathered. Enrolment data has been adjusted so that it is in Full-time Equivalent (FTE) form. Each full-time university student equals one FTE student, while the total number of part-time university students is divided by 3.5 to calculate the FTE figure. An FTE figure by field of study at the undergraduate level is then easily calculated.

Graduate enrolment by Master's and Doctoral levels is concealed within the graduate data. Therefore, provincial breakdowns by Master's and Doctorate, for the period under study, are used. Graduate enrolment data for the four Atlantic provinces indicates that approximately 80 per cent of graduate students are at the Master's level, with the exception of Prince Edward Island. Therefore, the assumption is made that the remaining 20 per cent of FTE graduate students are at the Doctoral level. In the case of Prince Edward Island, a 100-0 Master's-Doctoral distribution is assumed. Within each of the levels, the FT-PT distribution has been averaged for the period for each province and then applied to each field of study. Appropriate FTEs are then determined.

So, I have attributed total provincial university expenditures (net of capital, sponsored research, and other expenditures) to the major fields of study, taking into account the cost structure just outlined and enrolment data. The result is a cost per full-time equivalent student by field of study and level of study for each of the years 1992 to 1996. Appendix D shows the cost to taxpayers of students by major field of study at the undergraduate level and generally at the graduate level. The following assumptions are made with respect to time required to complete degrees: four years for undergraduate; two years for Master's; and four years for Doctorate. Since some students do not necessarily complete their degree in the minimum time, costs per degree are artificially low and will tend to understate the real cost of these degrees, making my assumptions quite conservative.

Private Costs

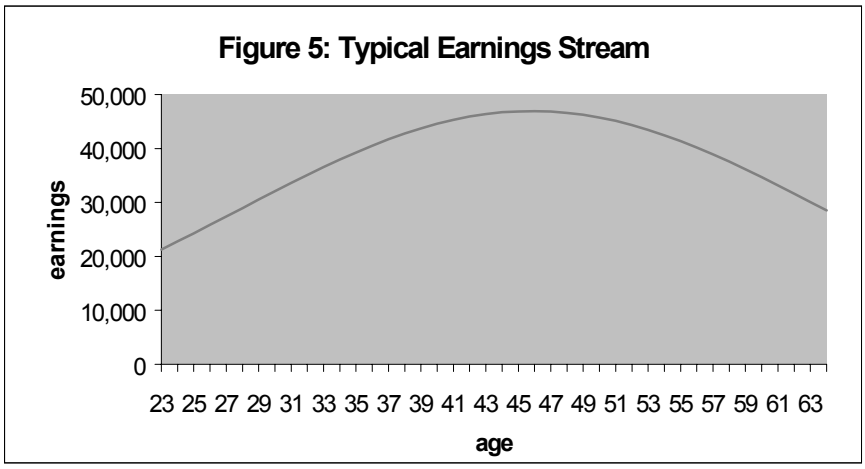
Private costs for FTE students in each of the four Atlantic provinces have been calculated and illustrated in Appendix E. They consist of tuition fees, additional fees, and cost of books and supplies per student for the years 1992 to 1996. Forgone earnings, the earnings the university student sacrifices while attending university, are then included in the student's cost calculation. Forgone earnings are those of a high school graduate.

CALCULATION OF BENEFITS

Public Benefits

Using Statistics Canada's Public Use Individual Microdata File from the 1996 Census, earnings data have been gathered. Benefits accruing to provincial taxpayers begin upon the graduate's entrance into the labour force and end upon retirement at age 65. It will be assumed that high school graduates enter the labour force at age 19; Bachelor's graduates, at 23; Master's graduates, at 25; and Doctoral graduates, at 29.

Producing data sets by field and level of study separately for each province would yield results too small to be statistically valid. Therefore, earnings by field and level of study are grouped together encompassing all four Atlantic provinces in one data set. Thus, the earnings stream for commerce graduates, for example, in Newfoundland is the same as that in New Brunswick. Some statements will be made in the analysis about likely underestimating or overestimating actual earnings based upon general earnings trends among the Atlantic provinces. Taking the difference between earnings of worker by area of study and those of high school graduates, additional earnings are derived. Earnings regression equations have been calculated by field of study in order to construct an earnings stream for the graduate's working life. See Appendix F. I have calculated the natural log of earnings data before performing each regression equation. The resulting equation, by entering the person's age, yields a value which, when its anti-log (or exponent) is calculated, produces an earnings figure for the given age. This process for each age produces an expected earnings stream for a worker by each field of study. Figure Five illustrates the behaviour of a typical earnings stream.



Monetary benefits to provincial taxpayers consist of the additional provincial taxes, both income and consumption taxes, generated by the graduate's additional earnings in excess of those of a high school graduate. To calculate a stream of income taxes paid according to income, I have used Statistics Canada's income tax by after-tax income quintiles for each of the four provinces. Using average income tax paid for each quintile, the midpoint of the quintile is assigned the average income tax figure. Income tax paid is then

interpolated for incomes in between. It is assumed that each province's implicit tax rate (1998 rates are used) is unchanged throughout the earner's working life.

Data from Statistics Canada's Provincial Economic Accounts provides data indicating personal expenditure on consumer goods and services for each province. Averaging the personal expenditure as a percentage of disposable income (marginal propensity to consume) for the years 1996 to 1998 provides an average marginal propensity to consume for each province that will be used in the calculation of consumption tax. It is assumed this marginal propensity to consume is unchanged throughout the earnings streams. Once the marginal propensity to consume is applied to disposable income, resulting in a consumption figure, the additional consumption tax benefits are derived.

By applying provincial sales tax figures, I have derived the additional consumption tax benefits. In Newfoundland, New Brunswick, and Nova Scotia, the share of the 15% Harmonized (i.e. joint federal–provincial levied on the GST tax base) Sales Tax is 8 percentage points. In Prince Edward Island, which is not party to the HST, provincial sales tax (on a narrower tax base) is 10 per cent. While important items such as most groceries are not taxed, certain items such as cigarettes and alcohol are taxed at rates higher than the standard provincial sales tax figure (e.g. 8 per cent in case of Newfoundland). It is assumed then that the provincial sales tax of 8 per cent (or 10 in the case of P.E.I.) balances these two extremes and thus provides a rough approximation of how much value the consumer gives back in the form of consumption tax.

As a result, for each field of study at the undergraduate level and generally for the two levels of graduate students, an excess or additional benefit to the province is derived. Using the internal rate of return method, the percentage return by field of study and level of study is determined for each province. These return figures are found in Table Two. This stage of the cost-benefit analysis does not take into account important aspects of the analysis, namely out-migration. The next stage takes into account migration data.

Private Benefits

Using the earnings streams already developed in calculating the public benefits, I now calculate the private benefits. A stream of benefits is derived which consists of the additional after-tax earnings generated by the graduate's additional earnings in excess of those of a high school graduate. Using the internal rate of return method, the percentage return by field of study and level of study is determined for each graduate. These return figures are found in Table Two.

Table 2: Public & Private Returns for Atlantic Provinces By Field of Study & Level of Study

	Newfoundland		Nova Scotia		P.E.I.		New Brunswick	
	Public	Private	Public	Private	Public	Private	Public	Private
Education	2.2	4.4	3.0	4.4	0.2	4.7	2.5	4.5
Fine/Applied Arts*	8.5	13.4	10.1	13.4	5.9	13.9	9.3	13.6
Humanities	1.4	4.1	2.3	4.1	0.3	4.4	1.8	4.2
Social Sciences	5.4	8.2	6.3	8.0	3.9	8.3	5.9	8.1
Commerce & Management	7.3	10.7	8.3	10.6	5.4	11.0	7.8	10.7
Agricultural & Biological Sciences	4.1	9.6	5.1	9.8	2.5	9.9	4.6	9.7
Engineering & Applied Sciences	6.0	16.6	7.4	16.5	3.7	16.9	6.7	16.6
Math & Physical Sciences	6.1	8.8	6.9	8.7	4.5	9.0	6.5	8.8
Health Professions	0.3	8.4	1.1	8.3	-1.2	8.6	0.7	8.4
Medical/Dental**	-0.9	6.0	-0.1	5.9	n/a	n/a	n/a	n/a
Master's	-0.6	3.2	0.6	3.1	-2.5	3.0	0.2	3.1
Doctorate	-3.7	0.5	-3.0	0.5	n/a	n/a	-3.2	0.4

*Due to a small sample size, results are likely not accurate

**Results are likely understated because the Census data grouped under one field of study Medical/Dental with other Health Professions such as Optometry, Pharmacy, Public Health, and others

PRE-MIGRATION FINDINGS & ANALYSIS

Keep in mind that the earnings regressions were derived from the four provinces as a whole because sample sizes would not allow reliable regressions to be conducted on the provinces individually. Newfoundland earnings data, and thus returns, are likely understated because Newfoundland generally has higher earnings than the other Atlantic provinces. Prince Edward Island earnings data, and thus returns, are likely overstated because P.E.I. generally has lower earnings than the other Atlantic provinces. New Brunswick and Nova Scotia earnings are generally closer to the mean for Atlantic Canadian earnings.

The public return, or return to the taxpayer, represents the additional benefit accrued exclusively to each taxpayer who helped to finance the student's degree. It captures the extent to which the taxpayer reaps a reward in the form of additional provincial taxes directly attributable to the graduate's higher earnings (excess of earnings of a high school graduate), while taking into account the taxpayer-financed portion of costs in the form of provincial financial contributions to universities.

The private return, or return to the student, represents the additional benefit accrued exclusively to the graduate for obtaining a university degree. It captures the extent to which the graduate reaps a reward in the form of additional earnings (excess of earnings of a high school graduate), while taking into account the student-financed portion of costs in the form of tuition, cost of books and supplies, and forgone earnings. Forgone earnings is the opportunity cost of getting a university degree – mainly, the earnings the student sacrifices during his or her pursuit of a university degree.

In looking at Table Two, it is significant that in every case the graduate received more value for his or her education dollar than did the taxpayer. Private returns are always positive whereas some disciplines yield public returns that are negative. Keep in mind, though, the significance of less tangible externalities which are difficult-to-quantify, for example – the social benefits attributable to a university-educated population. That being said, these results are a significant reference point with respect to the issue of who should pay for university education.

Economic returns on investment to the taxpayer are generally more favourable at the undergraduate level than at the graduate level. While some undergraduate programs provide negative or quite low returns to the taxpayer, they generally provide more substantial benefits than do graduate programs.

Commerce, Management & Administration, Engineering & Applied Sciences, and Math & Physical Sciences graduates post the highest public returns at the undergraduate level in each of the four provinces. Fine & Applied Arts earnings data is not credible because

the sample size from which the earnings stream was derived is so small and thus not reliable. According to data from Statistics Canada's National Graduate Survey, Fine & Applied Arts earnings are comparable to those of Humanities. (Taillon and Paju 1999, p. 13) Social Sciences, Agricultural & Biological Sciences, Humanities, Education, and Health Professions round out the bottom end of the scale.

Returns to taxpayers of all four provinces for Master's degrees are either negligible or negative. The additional returns via taxes derived from greater earnings for a Master's degree holder do not come close to matching the cost to the taxpayer. Part of the explanation for this is the two years of labour force earnings sacrificed by the Master's graduate (and thus the tax revenues thereby forgone by the province) while the Bachelor's graduate has entered the labour force. Otherwise, the earnings trends of Bachelor's and Master's graduates are similar, with earnings peaking while the worker is in his or her late 40's.

Returns to taxpayers of all four provinces for Doctoral degrees are negative. A Doctoral degree, by far the most costly to the provinces, clearly provides the weakest return. The Doctoral student sacrifices four years of earnings while the Master's graduate has already entered the workforce and has begun to accelerate his or her earnings. It is during these years that present value discounting has its weakest effect. Once the Doctoral graduate enters the workforce at age 29, his or her earnings lag those of a Master's graduate until the graduate is in his or her early 40's. From that point forward, the Doctoral graduate's earnings exceed those of a Master's graduate. However, the fact that the Doctoral graduate's prime earnings years occur later in life than do those of the Master's graduate, including a later peak earnings, mitigates the effects of these higher earnings because of present value discounting. As a result, the returns to Doctoral degrees are always lower than those of Master's degrees.

The relatively most costly areas of study, namely Medical/Dental, Master's, and Doctorate, yield negative or quite modest positive public returns. The relatively less costly undergraduate programs produce a mixed bag of returns. In the case of Prince Edward Island, returns are relatively lower, due primarily to the province's significantly greater costs per FTE relative to the other three provinces. P.E.I., with less than 3,000 FTE students enrolled per year, is least able to capture economies of scale efficiencies relative to the other provinces.

In the case of P.E.I., the disciplines producing the most graduates provide mixed results. Social Sciences and Agricultural & Biological Sciences produced the most graduates in 1996. These disciplines yield public returns of 3.9 and 2.5 per cent respectively. Commerce & Management, which constitutes 20 per cent of graduates, yields a public return of 5.4 per cent. Fine & Applied Arts and Math & Physical Sciences, two of the disciplines posting relatively higher returns, at 5.9 and 4.5 per cent respectively, constitute only three per cent of 1996 graduates. Master's graduates in the province yielded a public return of –2.5 per cent. In every field of study and at every level, private returns exceeded public returns. Both public and private returns are likely positively

biased due to the aforementioned observation that earnings in P.E.I. generally lag those of the other Atlantic provinces.

In New Brunswick, results are mixed. Social Sciences, at 5.9 per cent, and Education, at 2.5 per cent, comprise nearly one-half, or 48 per cent, of the graduates in the class of 1996. Commerce, Management & Administration and Engineering & Applied Sciences, together comprising 23 per cent of graduates, post returns of 7.8 and 6.7 per cent respectively. Humanities, Agricultural & Biological Sciences, and Health Professions, together comprising 24 per cent of graduates, post relatively lower public returns. Graduate degrees yielded relatively the lowest public returns. In every field of study and at every level, private returns exceeded public returns

Returns appear to be more favourable in Nova Scotia. Commerce, Management & Administration and Social Sciences, with returns of 8.3 and 6.3 per cent respectively, constitute nearly 40 per cent of undergraduates in the province. The next most active group of disciplines provides mixed returns, from Engineering & Applied Sciences, at 7.4 per cent, to Humanities, at 2.3 per cent. The balance of disciplines provides a variety of returns, including Fine & Applied Arts at 10.1 per cent, and the Health Professions, which provide very low or negative returns. Graduate degrees yielded relatively the lowest public returns. In every field of study and at every level, private returns exceeded public returns.

In Newfoundland, the results are not so favourable. The four most beneficial disciplines comprise only 23 per cent of 1996 graduates in the province. Social Sciences, the fifth best discipline, comprising nearly 24 per cent of graduates in Newfoundland, produced a modest return of 5.4 per cent. Social Sciences produced the most graduates in Newfoundland as well as in the other three provinces, albeit with varying degrees of benefit in terms of returns to investment. Both public and private returns are likely negatively biased due to the aforementioned observation that earnings in the other Atlantic provinces generally lag those of Newfoundland.

MIGRATION ISSUES

Introduction

In 1996, 14,989 students graduated with a degree from Atlantic Canadian universities. This section focuses on the labour force outcomes, and where these graduates end up.

There are numerous important reasons to retain graduates in Atlantic Canada. A more skilled local labour force increases productivity, fosters an investment-friendly environment, creates jobs, keeps costs relatively lower, and fosters difficult-to-quantify social benefits. A continuous drain of skilled labour has negative consequences on the regional investment climate. Businesses will look elsewhere to locate, to areas where there is an abundance of skilled labour and lower wages. But how do you foster the development of a skilled labour pool without an increase in investment and thus job creation? By identifying the extent of out-migration, its composition, and characteristics, policy makers can better address negative causes and ramifications of such out-migration.

This drain also negatively affects the dependency ratio, the ratio of skilled, working-age residents to dependents, such as children and seniors. This will put more of a burden on a shrinking group of taxpayers to support an aging population, which will increase demands on scarce public money through the health care system. The contrast to the younger cohort leaving Atlantic Canada is the net inflow to Atlantic Canada of those aged 50 and over, approximately 3,900 between 1991 and 1996. (Atlantic Provinces Economic Council 1998)

The public and private returns found in Table Two are under the assumption that no migration takes place. However, not all graduates remain in their province of study. Therefore, the gap between public and private return figures surely widens when migration data is taken into account. That is, the public return in reality is lower than the figure found in Table Two when all graduates and all movement of graduates are taken into account. Table Three on the next page adjusts the return figures taking migration into account. Engineering and Applied Sciences graduates in Newfoundland, for example, previously generating a public return of 6 per cent, now generate a return of 4 per cent to reflect the fact that one-third of such graduates leave the province following graduation.

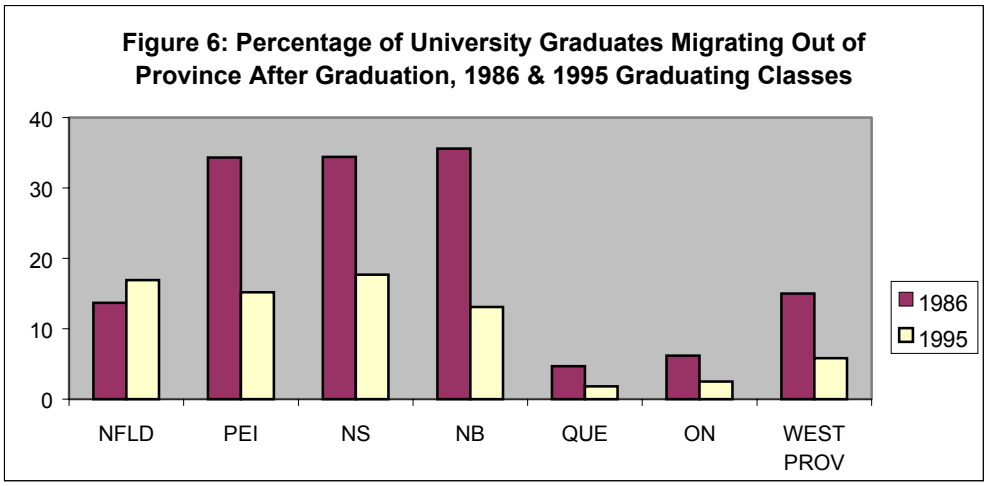
With historically higher unemployment rates in Atlantic Canada and its proximity to Ontario and Quebec, two of Canada's economic powerhouses, one would surmise that these four provinces would experience a net outflow of people. Collectively, the four Atlantic provinces have experienced significant net out-migration to the rest of Canada since the mid-1970s. (Denton et al 1998, p. 15) During that time the four provinces, except for Newfoundland, have experienced brief periods of net in-migration, but the dominant trend is one of net out-migration. (Denton et al 1998, p. 15) AIMS' paper entitled *Population Change in Atlantic Canada: Looking at the Past, Thinking About the*

Future addresses in more detail the ramifications, both current and future, of such population change, of which net out-migration is an important factor.

Table 3: Public & Private Returns for Atlantic Provinces Taking Into Account Out-migration

	Newfoundland		Nova Scotia		P.E.I.		New Brunswick	
	Public	Private	Public	Private	Public	Private	Public	Private
Education	1.8	4.4	2.7	4.4	0.2	4.7	2.5	4.5
Fine/Applied Arts*	8.5	13.4	10.1	13.4	5.9	13.9	9.3	13.6
Humanities	0.7	4.1	0.8	4.1	0.3	4.4	1.8	4.2
Social Sciences	4.7	8.2	4.1	8.0	3.9	8.3	4.2	8.1
Commerce & Management	2.4	10.7	6.7	10.6	5.4	11.0	5.9	10.7
Agricultural & Biological Sciences	4.1	9.6	4.1	9.8	2.5	9.9	4.6	9.7
Engineering & Applied Sciences	4.0	16.6	2.5	16.5	3.7	16.9	1.0	16.6
Math & Physical Sciences	6.1	8.8	2.3	8.7	4.5	9.0	4.9	8.8
Health Professions	0.3	8.4	1.1	8.3	-1.2	8.6	0.5	8.4
Medical/Dental**	-0.3	6.0	-0.1	5.9	n/a	n/a	n/a	n/a
Master's	-0.6	3.2	0.6	3.1	-2.5	3.0	0.2	3.1
Doctorate	-3.7	0.5	-3.0	0.5	n/a	n/a	-3.2	0.4

Among this out-migration is a large amount of highly skilled labour. In looking at the classes of 1986 and 1995, it is clear that Atlantic Canadian provinces export university graduates to a greater degree relative to other Canadian provinces. Figure Six shows the percentage of university graduates who resided two years after graduation in a province other than the province in which they graduated. Bear in mind that, particularly in the case of Nova Scotia and New Brunswick, many of these out-migrating graduates came from another province in order to study, some perhaps with no intention of staying to work.



Source: "Education Indicators in Canada, Report of the Pan-Canadian Education Indicators Program 1999" Statistics Canada Internet site, www.statcan.ca

Note the significant drop in out-migration between 1986 to 1995 for the Atlantic Provinces, except for Newfoundland. Between 1995 and 1997, Newfoundland experienced negative annual employment growth while the other three Atlantic Provinces experienced positive annual employment growth (Beale 1999, p.1). As well, Newfoundland was the only Atlantic Canadian province to experience negative annual average employment growth between 1991 and 1996. (Royal Bank 1999, p. 4), thus lending some validity to the previously mentioned correlation between employment growth and worker mobility.

Not only do many Atlantic Canadian graduates relocate to other regions in Canada, but they also leave for the United States. The "brain drain" of skilled Canadian labour to the U.S. is well documented. It is estimated that between 2,200 and 3,500 Atlantic Canadians left for the U.S. annually during the 1990s (Statistics Canada 2000, p. 11, 39). This includes a disproportionate amount of labour that is highly educated, highly paid, and in its prime earning years relative to the Canadian population as a whole (Statistics Canada 2000, p. 11).

These figures mean that hundreds of students graduating each year from Atlantic Canadian universities are relocating elsewhere within two years of graduation, hence providing no return to the province that financed their post-secondary education. Which means that each year hundreds of thousands of dollars are invested in university students from whom the province reaps no reward.

Causes of Migration

Some of the conditions conducive to graduates migrating from one province or region to another include: relatively greater job opportunities, relatively higher earnings, and differentials in income and other taxes. It is generally understood or supposed that greater employment prospects are a dominant force behind interprovincial or interregional migrants' decision to relocate. Measuring relative opportunities can be done in different ways. According to a Royal Bank study, employment growth rather than the unemployment rate is much more important in determining the extent to which people migrate from one province to another (Royal Bank 1999, p. 4).

In Canada, the Atlantic provinces have relatively higher income taxes than the rest of the country. A more favourable tax system in the U.S. is a factor in Canadians' decisions to leave for the U.S. to work. Atlantic Canadian graduates do not need to look far, either West or south of the border, to find more attractive rewards for their university education.

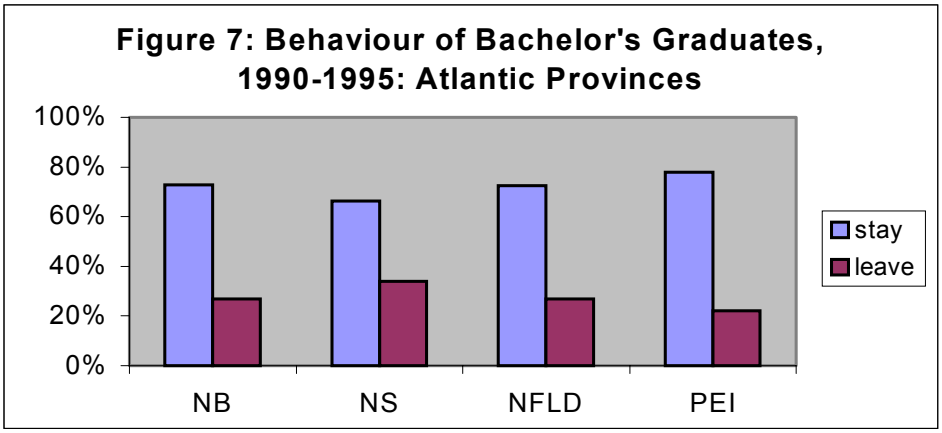
University graduates generally earn higher salaries in Canadian provinces outside of Atlantic Canada than those within Atlantic Canada (Statistics Canada 1999, p. 246). Mobility has a much more significant effect on earnings of young workers (e.g. university graduates) than on those of their older co-workers, especially in the case of men. Effects are generally strong and positive for men leaving the poorer provinces. (Human Resources Development Canada)

Undergraduate Degree Holders

Using the Statistics Canada Public Use Individual Microdata File, data have been gathered indicating, for each of the Atlantic Provinces, interprovincial mobility patterns for Bachelor's, Master's, and Doctoral graduates. This data source, comprising approximately three per cent of the Canadian population, anonymously identifies individuals by over 100 variables, including educational attainment, migration characteristics, and age, among others.

The data enables the user to determine for each province where the individual resided one year ago and five years ago. Current province for individuals is 1995; therefore, it enables the user to determine by level of study and field of study where the graduate resided in 1994 and 1990. It essentially determines the probability of graduates leaving a given province within five years. It is assumed that this period and the period under study, 1996 and beyond, have similar characteristics in graduate migration. The emphasis will be on those in the 19-30 age group. By focusing on this cohort, it is easier to presume that the graduate spent little or no time working in his or her province of graduation prior to migration. Including older workers would make it difficult to surmise how much time that worker spent in earning money in the province of graduation. For example, in the case of a 50-year-old with a Bachelor's degree residing in Ontario who resided in Newfoundland five years earlier, he or she may have earned the bulk of his earnings in Newfoundland and just recently moved to Ontario.

Figure Seven illustrates the probability of Bachelor's degree holders between the ages of 19 and 30 staying or leaving the province in which they received their degree within five years.



Source: Statistics Canada Individual Microdata File, 1996 Census

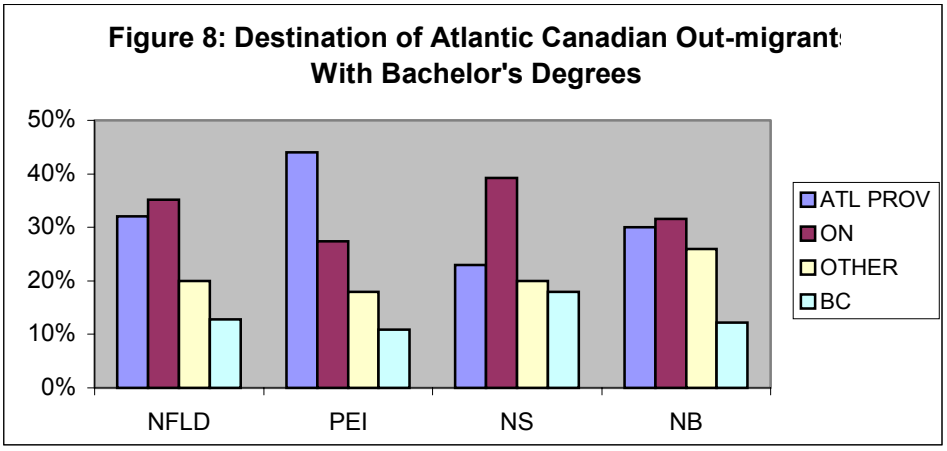
Nova Scotia

Social Sciences, Business, Management & Administration, Humanities, and Education are the most prevalent degrees conferred in Nova Scotia. Yet, with a dominant trend of out-migration to Ontario, the province is losing more graduates than it is retaining in the field of Humanities. It is also losing more graduates than it is retaining in Engineering & Applied Sciences and Mathematics & Physical Sciences with migrants in these two disciplines scattered among several other provinces. On the whole, Ontario is by far Nova Scotians with Bachelor's Degrees' favourite place of relocation with 39 per cent choosing Ontario as their place of relocation. Of the 23 per cent of Bachelor's Degree holders who chose to stay in Atlantic Canada, the majority (14 per cent), chose New Brunswick. Figure Eight shows the patterns of out-migration of Bachelor's graduates for the Atlantic Provinces. With the disciplines of Humanities, Engineering & Applied Sciences, and Mathematics & Physical Sciences producing over 1,800 graduates in 1996 in Nova Scotia, the province is losing in excess of that number to other provinces. To the extent that Social Sciences, Business, Management & Administration and other disciplines can retain more graduates than they lose, combined with the in-migration of Bachelor's graduates from other provinces, it is apparently not enough to offset the loss of Nova Scotia graduates who leave the province. (Statistics Canada 1999, p. 249) Thus Nova Scotia is a net exporter of university graduates at the Bachelor's level.

New Brunswick

New Brunswick appears to lose most of its undergraduates in Engineering & Applied Sciences to other provinces, mostly to Ontario. Ontario is the choice of destination for New Brunswickers with Bachelor's Degrees as a whole with 32 per cent choosing to migrate there in search for work. Remaining in the Atlantic region was the next favourite alternative, at 30 per cent, including 23 per cent choosing Nova Scotia. In all other disciplines, New Brunswick retains more graduates than it loses. The province is able to

retain the vast majority of its graduates in its most popular disciplines, Education, Social Sciences, and Business, Management & Administration. Similar to Nova Scotia, however, New Brunswick does not attract enough graduates from other provinces in order to offset the loss of its own. Thus the province is a net exporter of Bachelor's graduates. (Statistics Canada 1999, p. 249)



Source: Statistics Canada Nation Series Package #8 Education, Mobility, and Migration, CD-ROM

Newfoundland

In Newfoundland, Business, Management & Administration graduates appear to be leaving the province more than any other discipline. Business, Management & Administration is the province's fourth most produced discipline of graduates. Migrants in this discipline tend to relocate in several other Canadian provinces. Newfoundland Bachelor's degree holders on the whole choose Ontario as their favourite place of out-migration. At 35 per cent, Ontario is deemed a slightly more attractive option than remaining in Atlantic Canada, which absorbed 32 per cent of the province's out-migrants, including 20 per cent to Nova Scotia. Most of the other major fields of study appear to be able to retain their graduates, including Education, Social Sciences, which together produced 44 per cent of the province's graduates in 1996. Data with respect to coming and going of Humanities graduates, constituting 17 per cent of 1996 graduates, is inconclusive. Newfoundland, unlike Nova Scotia and New Brunswick, appears able to "break even" or may even be a net importer of Bachelor's graduates. (Statistics Canada 1999, p. 249)

Prince Edward Island

In Prince Edward Island, data is inconclusive at the discipline level. The island province appears to retain its graduates in those disciplines that constitute the majority of its graduates. As a whole, those graduating in P.E.I. with a Bachelor's Degree prefer staying within Atlantic Canada as opposed to migrating to Ontario. Forty-four per cent of graduates who left the province stayed within the region, including 29 per cent who

migrated to Nova Scotia. This contrasts with 27 per cent who left for Ontario. In aggregate, the province appears to be a net importer of Bachelor's graduates.

Graduate Degree Holders

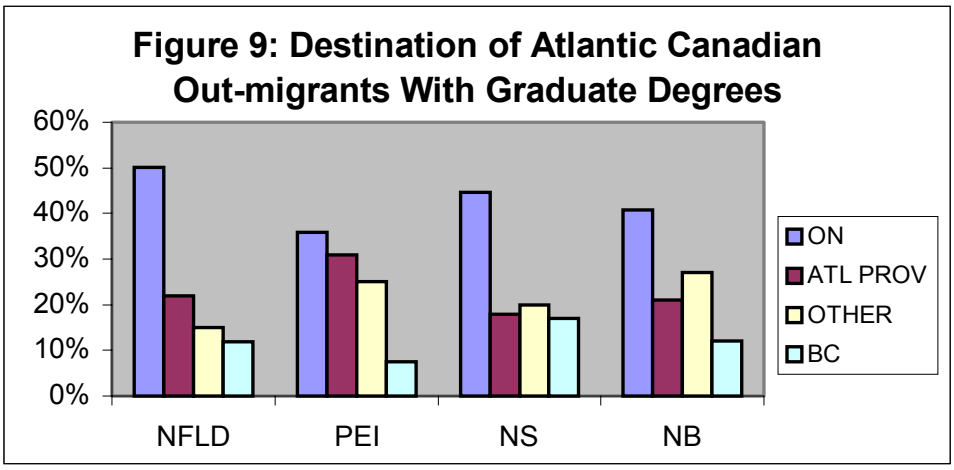
Discovering interprovincial migration trends by major field of study for graduate degree holders is difficult to do. The samples from the microdata file are too small in order to do it reliably. This is an area worthy of further study.

The magnitude of mobility of graduates is positively correlated with higher levels of education. Master's graduates are more likely to migrate than Bachelor's graduates, and Doctoral graduates are more likely to migrate than Master's graduates (Finnie 1999, p. 76). Data for Canada as a whole reveal that between 11 and 16 per cent of Bachelor's graduates are likely to migrate to another province within five years of graduation; Master's graduates, between 13 and 18 per cent; and Doctoral graduates, between 21 and 34 per cent (Finnie 1999, p. 76-77). It is assumed that a similar correlation exists in Atlantic Canada. Thus in referring back to Figure Seven, the gap shrinks between those graduates who stay and those who leave. Fewer graduates at the graduate level are staying than those at the undergraduate level. The impact of this trend is compounded by the fact that it is much more costly to taxpayers to finance graduate degrees than undergraduate degrees.

On the whole, the pattern of out-migration of graduate degree recipients is interesting. Figure Nine captures the relocation trend of Atlantic Canadian graduate degree recipients who leave their respective provinces.

The exodus of those with graduate degrees from Atlantic Canada to Ontario is even more prominent than in the case of undergraduates. Many of those who, as undergraduates, would have migrated from one Atlantic Canadian province to another, as graduates migrate to Ontario or, in some cases, Alberta or Quebec. For example, in the case of Newfoundland, 35 per cent of migrating undergraduates relocated in Ontario while 32 per cent relocated within Atlantic Canada. The percentage of migrating graduate degree recipients who migrate to Ontario jumps to 50 while the percentage migrating within Atlantic Canada falls to 22. A similar trend prevails for the other three Atlantic provinces.

It is estimated that one out of every 4 PhD graduates, one out of ten Master's graduates, and one out of 20 undergraduates leaves Canada within two years of graduation. The disciplines most susceptible to U.S. poaching are medicine, engineering, and teaching. (Berube 1999)



Source: Statistics Canada Nation Series Package #8 Education, Mobility, and Migration CD-ROM

Student Migration

The migration of students, opposed to graduates, has important policy implications as well. Table Four shows the breakdown of graduates for each of the Atlantic Provinces by their province of residence prior to studies.

Table 4: Breakdown of 1995 Graduates By Province of Residence Prior to Studies

	Eventual 1995 Graduates From		
	Home Province	**Out-of-Province**	**Total**
Newfoundland	2,113 (93%)	161 (7%)	2,274 (100%)
P.E.I.	412 (80%)	101 (20%)	514 (100%)
Nova Scotia	4,632 (71%)	1,864 (29%)	6,496 (100%)
New Brunswick	2,998 (80%)	754 (20%)	3,752 (100%)

Source: Statistics Canada. "Pan-Canadian Economic Indicators Program, 1999" p. 249
This trend of in-migration to Atlantic Canada to study is relatively higher than that in the other Canadian provinces

What is significant is the fact that in-migrating students are much more likely to leave the province upon graduation than are indigenous students. This has implications with respect to who should pay for these in-migrating students. Such cases provide the province funding these graduates no return on investment. In fact, of 1996 graduates of the Maritime Provinces who came from other regions to study, two-thirds had left the region by 1997, one year after graduation, and 70 per cent had left the region by the year 2000, four years after graduation. (Maritime Provinces Higher Education Commission 2001, p. 42-43) In contrast, with respect to those originally from their province of graduation, the percentage of those remaining in their province ranges from 75 to 86 per cent one year after graduation. (Maritime Provinces Higher Education Commission 2001, p. 42-43) Also, students who leave the region will likely earn more in the labour force elsewhere.

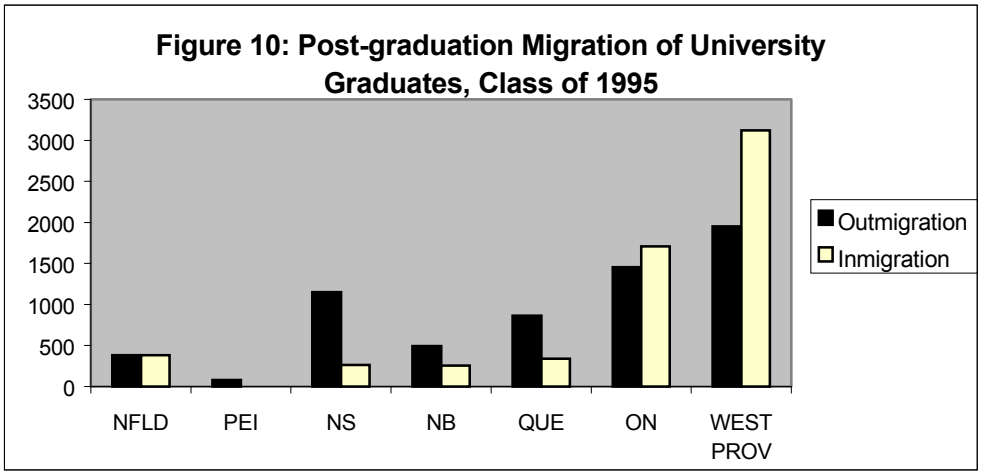
Some may come solely to earn a degree and then return to their own province or region, having had no intention of working in their province of graduation. Such graduates are not from the province of graduation or "attached" to that province, and thus less sensitive to labour market conditions in the province of graduation.

Nova Scotia and New Brunswick stand out as provinces with large numbers of student in-migration. Nova Scotia receives the majority of undergraduate students migrating from New Brunswick, Prince Edward Island, and Newfoundland (Butlin and Calvert 1996, p. 35). A conservative estimate says 1,000 students migrated from these three provinces collectively to Nova Scotia to study and subsequently graduate in 1996. Even 18 per cent of Ontario out-migrants chose Nova Scotia as a place of study (Butlin and Calvert 1996, p. 35). As a result, Nova Scotia is the only Atlantic province experiencing a net in-migration of students.

The higher the level of study, the more likely a student from an Atlantic province will pursue studies in another province. However, the likelihood that Master's and Doctoral students will relocate within Atlantic Canada decreases with level of study. These students are more likely to pursue graduate studies in the larger provinces, namely Ontario, Alberta, and British Columbia. Key reasons for this are that bigger, more diversified institutions, more concentrated in these bigger provinces, are the ones that offer graduate degrees.

DOES POST-GRADUATION IN-MIGRATION COMPENSATE?

To what extent are the Atlantic provinces recouping their losses resulting from out-migration of university graduates? Figure Ten compares the post-graduation out-migration to post-graduation in-migration.



Source: "Education Indicators in Canada, Report of the Pan-Canadian Education Indicators Program 1999" Statistics Canada Internet site, www.statcan.ca

Each of the Atlantic provinces either "breaks even" or has a net out-migration of university graduates. Newfoundland is able to recoup its losses, but Nova Scotia and New Brunswick are unable to do so, reflecting the very large share of out-of-province students studying in the latter two provinces. One must question the fairness of Atlantic provinces, notably Nova Scotia and New Brunswick, subsidizing students to the degree that other Canadian provinces do, yet seeing a net loss of university graduates as a result.

Another aspect pertinent to the return figures is what portion of the career, if any, does the graduate spend in his or her province of graduation. Some graduates may be educated in an Atlantic province, work elsewhere - perhaps for the duration of the career, perhaps not - and then return to work in Atlantic Canada or vice-versa. An HRDC study found that in examining a 13-year period, 91.7 per cent of Canadians remained in the same province. With respect to the university-educated population, this percentage is likely lower. If a graduate is to migrate, he or she is more likely to do so within three years following graduation (Finnie 1999, p. 79-80). Given these trends, it is assumed that the graduate migration trends analyzed in this section account for the extent of graduate migration over these individuals' working lives.

EMPLOYMENT ISSUES

Human resources, or human capital, are similar to other forms of resources or capital in that they are designed for specific purposes and should be efficiently employed for the resource's working life. It is believed that employed university graduates will play an increasingly critical role in the new economy. The rate of unemployment for a given level or field of study represents the degree to which that resource is idle or unproductive. Unemployment rates may signal a degree of incompatibility between labour supply and demand, thus raising the question of re-allocation of scarce resources.

A recent study, consistent with other similar studies done in Atlantic Canada, revealed that 59 per cent of employers surveyed in Atlantic Canada had a difficult time finding labour that possessed the skills necessary for employment. The study also found that literacy is more of a problem in Atlantic Canada relative to the rest of Canada. (McMahon 2000, p. 99) It is uncertain, however, to what extent these survey results reflect employers' difficulties in finding university-educated skilled labour.

Frictional unemployment, or unemployment arising from imperfect information between the supply and demand sides of the labour market, is likely the primary cause of unemployment. Frictional unemployment accounts for approximately 50 per cent of aggregate unemployment (Bruce 1995, p. 579). Demand deficient unemployment, caused, for instance, by fluctuations in the business cycle, and structural unemployment, which involves a mismatch between types of labour supplied and demanded, are also likely causes.

The unemployment rate conceals some important facts worth mentioning at the outset. Some looking for work become "discouraged workers" and thus cease looking for work and drop out of the labour force. This unfavourable scenario lowers the unemployment rate in a misleading way. The unemployment rate conceals whether the worker is full-time or part-time, full-year or part-year. Some part-time workers are not being employed to their optimal working load because many find part-time work sufficient for their needs.

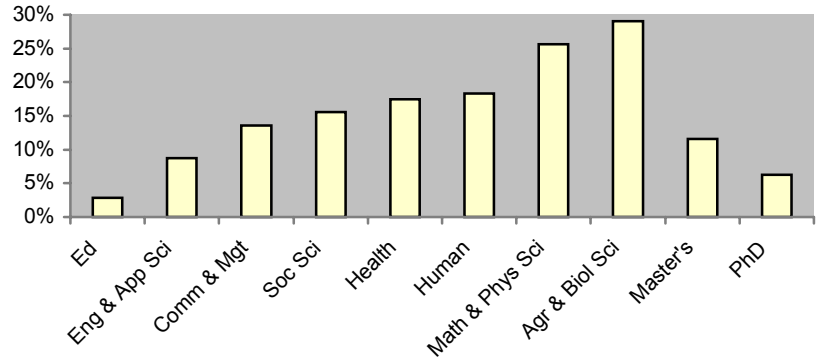
As mentioned employment rates, not surprisingly, are positively correlated with level of education. Unemployment rates are more stable among university graduates than vocational/trade graduates; they are less sensitive to changing labour market conditions. (Taillon and Paju 1999, p.11)

Using the 1996 Census Individual Microdata file, labour force variables have been gathered by field of study and level of study. At the undergraduate level, unemployment rates consist of those unemployed as part of the labour force aged 25 and below; Master's graduates, aged 30 and below; and PhD graduates, aged 35 and below. Figure 11 shows the unemployment rates by field of study at the undergraduate level and graduate level for the Atlantic Provinces in aggregate.

The unemployment rate for Canadian university graduates of Fine & Applied Arts, for which the sample size was very small, is likely between that of Humanities and Agricultural & Biological Sciences, in the 20-25 per cent range.

A limitation of the unemployment data is that it is a snapshot, a picture of unemployment at a given point in time and thus gives no indication of the length of unemployment. A study by Hasan and de Broucker concluded that 80 per cent of Canadian unemployment spells are less than three months. (Bruce 1995, p. 579) I suspect that the 20 per cent of those unemployed longer than three months consists of a disproportionately low number of university graduates. Unemployment rates invariably drop as the graduate's time in the workforce lengthens. (Maritime Provinces Higher Education Commission 2001, p.9)

Figure 11: Unemployment Rates for University Graduates, Atlantic Provinces: 1995



Source: 1996 Census Individual Microdata File

Because long spells of unemployment are unlikely, I have not modified the return figures to account for unemployment, given that these returns represent the period of the graduate's working life, until age 65. Nonetheless, the unemployment figures in Figure 11 should prove as a useful starting point in identifying causes of unemployment by field of study.

STUDENT ATTRITION ISSUES

Another aspect of university education that the returns as calculated do not capture is that of university students who enrol but, for one reason or another, do not complete their degree or do not do so within a standard time period. Students may set out as full-time students and then adjust to part-time status, may not have the capability or desire to complete a program, may transfer to another program, or may leave the province to pursue additional schooling or other interests. Whatever the reason for failure to complete their studies, it is important to attempt to assess the public cost of such students vis-à-vis the benefits.

A general finding of the Smith Report, "Commission of Inquiry on Canadian University Education" published in 1991, is that first-year experiences are important in determining the completion rate of undergraduate studies. Therefore, screening and monitoring of first-year students in particular is crucial in facilitating a more efficient investment of taxpayer dollars.

The *Maclean's* magazine university rankings ranks the universities according to percentage of full-time second-year undergraduates who complete their degree within one year of the expected graduation date. According to the 1997 publication, the relatively larger Atlantic Canadian universities show mixed results in this area. Dalhousie, one of the leaders among Canadian schools in this department, ranks consistently near the top, in the 81-90 per cent graduation rate range. Memorial, however, ranks among the lowest of Canadian universities, falling in the 56-67 per cent range. University of New Brunswick is in the middle of the pack in the 72-74 per cent range. The smaller Atlantic Canadian schools are similarly represented throughout the rankings. University of Moncton, in the low 90's, heads the list, while St. Thomas University is consistently at or near the bottom of the rankings, between 50-58 per cent. Even allowing five years for expected graduation, there are still large numbers of students who do not graduate in this time period, for whatever reason. These numbers likely underestimate the problem because they do not take into account first-year dropouts.

It is very difficult to assess at the undergraduate level which fields of study are more likely to experience higher or lower proportions of students who graduate. Many undergraduates in their first or second year of study have yet to declare a major, or field of study. In other cases, some undergraduates require three years of university, not necessarily culminating in a degree, in order to enter a professional program, such as medicine or law. Also, the earnings data of dropouts conceal fields of study. As a result, it is difficult to match costs with earnings of dropouts in order to determine the return on investment taxpayers receive on such dropouts.

There is better data available regarding attrition and retention of graduate students. The Canadian Association for Graduate Studies tracked four entering cohorts, from each of years 1985, 1986, 1987, and 1988 until 1996. Master's students generally were more

able to complete their studies than Doctoral students except in the case of Agricultural & Biological Sciences and Health Professions. Table Five indicates percentages of graduate students who had completed their degrees within the 1988-1996 period. Such data for Atlantic Canada exclusively is not available.

Table 5: Percentage of Graduate Students Completing Degree Within 1988-1996 Period

	Full-time		Part-time	
	Master's	**PhD**	**Master's**	**PhD**
Humanities	73.9	49.8	67.3	62.5
Social Sciences	77.4	52.1	68.6	47.8
Natural & Applied Science	78.1	70.4	68.2	53.4
Life Sciences	79.5	80.1	66.9	77.8

Source: Canadian Association for Graduate Studies

It is not simply a matter of screening those unable to meet the demands of university or those with inadequate university preparation. St. Thomas University and Mount Saint Vincent University, for example, rank fourth and sixth respectively out of 23 institutions in the area of Average Entering Grade in the 1997 survey. These schools, however, consistently rank near the bottom with respect to Proportion Who Graduate. (Maclean's 1997, p. 46) The Smith Report, as one of its findings, concluded significant attrition exists among students with passing grades. (Association of Universities and Colleges in Canada 1991, p. 106). This raises the question of how strong a correlation exists between high school performance, as measured by grades, and university performance.

Is there any incentive for universities to track and measure outcomes of non-graduates? The current approach of how provinces fund universities, based on enrolment measures, provides little incentive for universities to measure and answer for attrition. Universities are not held accountable for such graduate or retention figures. Given the significant number of students, and the associated taxpayer dollars invested, who do not complete their studies, governments and universities do not appear too concerned regarding what happens to such students. This lack of accountability comes in an age in which fiscal efficiency, optimization of taxpayer dollars, and the critical role universities are to play are arguably never greater.

What incentive is there currently to motivate students to excel at university or to choose their program more wisely? Perhaps because the majority of the cost is funded by taxpayers and because of the previously mentioned accountability problem, there is not a great enough incentive for students to make an informed, committed decision regarding post-secondary studies.

Without knowing and being able to identify the causes and paths followed as a result of dropping out, we cannot address the issue properly and make recommendations to address it.

DEMAND FOR UNIVERSITY GRADUATES

How compatible is the supply of graduates with the demands of the regional labour market? How well do universities in Atlantic Canada prepare graduates to enter the labour force? A study by the Council of Ministers of Education (CMEC) suggests a moderately strong link exists between the needs of the employment market and the skills provided by Canada's post-secondary education system. The strength of this link varies by field of study and by region. (Council of Ministers of Education, Canada 1996) The CMEC found that the link strengthens by level of study with respect to university graduates, but that the link between education and employment is weaker for Bachelor's graduates than for college and trade/vocational graduates. MPHEC's survey of 1996 graduates found that 53 per cent of university graduates, including 48 per cent of Bachelor's graduates, considered their job to be directly related to their education (Maritime Provinces Higher Education Commission 2001, p. 25). The relationship varies by field of study. Percentages of those believing their employment was directly related to their education were highest in the Health, Education, Engineering & Applied Sciences, and Business, Management & Administration disciplines. It was lowest in the fields of Agricultural & Biological Sciences, Humanities, Social Sciences, and Math & Physical Sciences.

HRDC estimates that in Canada over 23 per cent of new jobs created between 1999 and 2004 will require a university degree. The outlook is either good or fair for undergraduate and Master's degree holders, regardless of field of study. Compared to college, trade & vocational programs, this outlook for university graduates is the most promising. Areas of strong demand include Business, Management & Administration, Engineering & Applied Sciences, and Social Sciences. Table Six shows the labour market outlook for 1999 – 2004 in Canada by field of study.

With respect to Atlantic Canada, each of the four provinces should experience a strong demand for graduates from the Health Professions and Computer sciences. Particular occupations within Education, Engineering & Applied Sciences, and Business, Management, & Administration are also a part of HRDC's sample list of occupations with favourable outlooks.

The current decreasing trend of Humanities graduates seems appropriate given the low public return, the relatively high unemployment, and the relatively weak demand for them in years to come. In Nova Scotia in particular, which loses more Humanities graduates than it retains, they are decreasing in both absolute terms and as a proportion of total graduates.

Table 6: Labour Market Outlook for University Graduates By Field of Study, Canada		
Major Field of Study	**Outlook**	**Comments**
Fine & Applied Arts	Fair	# new job openings = # new job seekers
Business, Management, & Administration	Good	# new job openings > # new job seekers
Education	Fair	# new job openings slightly > # new job seekers
Engineering & Applied Sciences	Fair	# new job openings slightly > # new job seekers
Humanities	Fair	# new job openings slightly > # new job seekers
Health Professions	Good	# new job openings > # new job seekers
Agricultural & Biological Sciences	Fair	# new job openings slightly < # new job seekers
Social Sciences	Fair	# new job openings slightly < # new job seekers
Math & Physical Sciences	Good	# new job openings slightly < # new job seekers; due primarily to demand for computer science graduates

Source: Human Resources Development Canada web site;

Regarding the Health Professions, each province, except for New Brunswick, is remaining at the same level of numbers produced. The state—many call it a crisis—of the Canadian health care system is well documented. The Health Profession does not seem to be an attractive one at the moment. Stories of crises in emergency rooms, nursing shortages, rising levels of stress and strain in the system, and aggressive external recruiting make it a problem for which there is no easy solution. New Brunswick has increased its number of Health graduates in the years between 1995 and 1998, the year for which most recent data is available. The outlook for Health Professions is good, but as the Canadian health care system becomes increasingly less attractive to graduates, how will the required demands be met?

In the Business, Management & Administration field, where the outlook is good, Newfoundland is experiencing a substantial increase in commerce graduates, but loses many of its commerce graduates to other provinces and regions. P.E.I., conversely, is experiencing a significant decrease in number of commerce graduates. Nova Scotia and New Brunswick are more or less experiencing a stable supply of commerce graduates.

In the Agricultural & Biological Sciences field, where unemployment is high and the outlook is fair, Newfoundland is experiencing a substantial increase in numbers of graduates. In P.E.I., an increasing proportion of Bachelor's degree-holders possess a degree in this field. In Nova Scotia and New Brunswick, a moderate to significant increase in absolute terms and as a proportion of total graduates is occurring in this discipline.

In the field of Math & Physical Sciences, only Newfoundland is experiencing a significant increase, both in absolute terms and as a proportion of the total, in numbers of graduates. The other three provinces are more or less stable. Further exploration with respect to this field is warranted because of the importance that computer scientists will play in the new economy.

In the field of Engineering & Applied Sciences, only New Brunswick is experiencing a significant increase in numbers of graduates. It is in this field where New Brunswick loses more of its graduates than it retains.

In the Social Sciences, there are no defining trends in numbers of graduates. In New Brunswick and Nova Scotia, there is a slight upward trend in the numbers of graduates who possess a degree in this field.

POLICY RECOMMENDATIONS

Introduction

Atlantic Canadian taxpayers have made a substantial investment in their university students over the past 25 years. Yet, as outlined in this paper, the graduate, not the taxpayer, is the primary beneficiary of a university education. Current policies need to be examined to address this issue as well as others related to the public and private costs and benefits associated with university education.

Private Funding

Tuition Policy

Tuition policy has a significant role to play in addressing the key issues and problems raised in this study.

Firstly, since students, not taxpayers, are the primary beneficiaries of university education, the students should bear the greater portion of the cost. Taxpayers currently finance the larger portion of university costs. Until the extent to which social externalities exist is discovered — something that may be impossible to quantify — students, for the sake of fairness, should bear a greater cost of financing their own education. Approximately two-thirds of taxpayers between the ages of 18 and 24 will not attend a postsecondary institution (Fellows 1997, p. 95). Therefore, it is difficult to justify taxpayers paying the greater share of students' education. To accompany this recommendation, an income-contingent student loan system enabling graduates to repay student loans according to their earnings should be implemented. This will be outlined in more detail later.

I propose a method of determining tuition levels based on the supply of and demand for particular programs of study. Firstly, this would enable universities to be more flexible in responding to changes in students' demands for particular programs. Tuition levels determined by supply and demand would act as an incentive for universities to re-allocate taxpayer dollars from those programs less in demand to those more in demand. If the university knows that it can command higher tuition for a particular program, it will draw resources (taxpayer dollars) from other disciplines to those disciplines more in demand. Secondly, it would empower students, rather than government, to determine what educational programs are valued and subsequently offered. As students increasingly pay a greater portion of university costs, universities will thus have a greater incentive to heed the demands of those students (West 1995, p. 17). Thirdly, since higher tuition results from greater demand for a particular program and since greater demand results in large part from greater earning power (higher salaries) in a given discipline, it seems appropriate that tuition and earnings increase proportionately.

Currently tuition levels, with a few exceptions, are more or less equal across disciplines as to not sway students to pursue one discipline over another solely on the basis of cost. However, this policy prohibits universities from efficiently allocating scarce resources to meet the changes in demand for given disciplines.

A market-oriented tuition policy would facilitate a better match between supply of and demand for labour by discipline. Given that the student's monetary investment would be greater in cases of increasing demand, that student is likely to manage that investment more carefully, seeking the highest return possible. Students under this proposed tuition policy are likely to have examined potential labour market outcomes, and would be prepared to pay more for certain disciplines. A stronger incentive for the student to be aware of typical labour market outcomes such as wages and employment possibilities before pursuing a program of study would exist. In other words, they are more apt to select areas of study yielding greater employment opportunities. In this way, a stronger link between demand for and supply of particular types of labour would be formed.

Students would be less likely to choose an area of study not compatible with their talents or desires. This would certainly help to alleviate to some degree the problem of student attrition.

In the case of Nova Scotia and New Brunswick, I believe a system of differential tuition fees should be established for out-of-province students. As mentioned, many students come from out-of-province to earn a university degree in Atlantic Canada, primarily in Nova Scotia and New Brunswick. The majority of these students do not remain in their province of study following graduation. It is unfair to taxpayers that Nova Scotia and New Brunswick subsidize out-of-province students the same as indigenous students. Fairness would be achieved if out-of-province students studying elsewhere, in Ontario, for example, returned to Nova Scotia in reciprocal fashion; however, this is not the case. As part of this policy, out-of-province students who earn their degree in Nova Scotia or New Brunswick and subsequently remain to work would be eligible for a rebate on the excess tuition paid.

An alternative approach to differential tuition fees for out-of-province students would involve uniform tuition, with students from the home province being eligible for merit-based scholarships. In effect, the home province would target its resources more directly to help its own students pay relatively lower tuition.

One argument against a market-oriented approach to tuition fees is accessibility. The argument is that nobody should be denied access to a university education on the basis of wealth…I agree. However, to what extent do lack of personal and family resources restrict those otherwise motivated and able prospective university students from access to university? Nobel Prize Winning Economist James Heckman presents a strong case that such financial constraints are a relatively insignificant factor. He argues that the child's family background and environment largely determine whether the individual will end up going to university. By the time the individual is university age, the student will or will not have the prerequisite characteristics, such as cognitive skills, scholastic ability, and

motivation, conducive to attendance at university. These characteristics are said to be instilled at an earlier age. Therefore, making more funding available has little effect on the individual's likelihood of pursuing a university education. Policies, therefore, fostering the development of the necessary qualities at an early age are deemed more appropriate and effective (Heckman 1999, p. 95-96).

Another argument against higher tuition involves the wildcard of derived social benefits, or externalities—those difficult-to-quantify, intangible benefits—of a university-educated population. Proponents of higher government funding of university education use this argument against calls for higher tuition fees. Heckman argues that there is little evidence in support of the externality argument, and that any such social benefits of education are more attributable to investment in lower levels of education, namely early childhood education, rather than university education. (Heckman 1999, p. 102-103) Others complement this argument by stating that the social benefits attributable to education decrease as the individual moves up through the education system; that is, social benefits are much greater at the elementary level and are negligible at the post-secondary level (Fellows 1997, p. 73) The effect of university education on social indicators is an area worthy of further research.

Firms

Higher tuition fees would entice students to seek other sources of private funding, from local firms, for example. Local firms could enter into a contractual relationship with students whereby the firms would help to subsidize the student's education and in turn the student would commit to working for that firm for a specified period of time upon graduation. Incentive for students is that they have their tuition subsidized and are guaranteed a job following graduation. Incentive for the firm is that it ensures a supply of skilled labour. If additional incentive is necessary, tax credits could be offered to firms that enter into such contracts. If businesses can attract new grads to work in Atlantic Canada immediately following graduation, there is a greater chance the graduates will spend a good portion of their career in the region.

Tax Credits

I propose tax credits for graduates who stay within their province of graduation to work. Tax credits to graduates, who might otherwise be indifferent to leaving or staying, could entice them to stay in their province of graduation by increasing their after-tax earnings. Such increased labour supply aids in lowering labour costs, which is deemed essential to economic growth. (McMahon, p. 38)

Taxpayer Support of Students

Income-contingent loans are recommended to replace the current student loan system. Many students under the current system have difficulty meeting their student loan obligations. I suspect many potential university students are deterred from pursuing a university education due to the potential debt burden resulting from the student loan system as it currently operates. Some students, having to pay a fixed amount of loan repayment regardless of income level, have difficulty meeting their payments and subsequently default on their student loan. Under the income-contingent loan system, loan repayments would be linked to earnings. Under a scheme outlined by the late economist Edwin West, (p. 42), one that I am proposing here, an earnings threshold would exist above which the graduate would pay a fixed percentage of those excess earnings toward his or her loan each year. Those earning below the threshold would not repay any portion of their loan, thus postponing repayments until they are above the threshold. Graduates with low earnings, therefore, would have repayments more in line with their earnings and would be able to spread payments over a longer time period.

I do not believe that student loans should be the sole approach to taxpayer assistance of students. That is, I do not believe students should be required to cover the whole costs of their education. I believe there is a role for performance-based scholarships. This could be accomplished in two ways. Firstly, students entering university could be assisted through scholarships based on their performance. High school grades or entrance tests could be used to measure performance. Secondly, provincial governments could waive a portion of students' loans following graduation to reward those students with high achievement while at university. To the extent that low-income prospective students are deterred from university attendance by the earnings they sacrifice to do so, governments could offer merit-based funding to help cover these costs.

Public Funding and Incentives

Provincial taxpayer support of university students should be more closely linked to outputs rather than inputs. Funding should be based not on infrastructure, such as plant and equipment, or even enrolment, but on output measures, such as retention, graduation rates, student and graduate satisfaction, and employer satisfaction. Funding to universities that outperform other universities would be a more efficient use of taxpayer money and would provide an incentive to the universities to produce the best graduates. Universities, therefore, by being held accountable for what they produce, would be enticed to deliver education more effectively.

Universities that lag other universities would inevitably have to rely increasingly on other private sources of funding, whether through increased tuition fees or from private sources. Universities not able to maintain a certain standard of quality would inevitably cease to exist. Such competition should increase efficiency and overall quality. In light of the dynamics of scarcer public finances and the increased financial burden on students,

however, the university community seems most concerned with how universities will survive, not how best to meet the demands and wishes of students. (West 1995, p. 17)

Currently there appears to be an unsubstantiated resistance to any innovative measures that might increase quality and efficiency. The words "competition" and "choice" are taboo in the education sector. The evidence of the benefits of competition does not seem merely anecdotal, but pervasive. Heckman, in comparing the U.S. public school system with its university system, says that the effects of competition in education, and virtually every other sector, are beneficial for students. (Heckman 1999, p. 101) A recent study found that when public schools were exposed to competition via "choice schools," student performance improved in all schools. (Wall Street Journal 2001) It is also noted that competition promotes quality within and between universities. In the words of West, "the new competitiveness in the international economy calls for competition all round, embracing the institutions that deliver higher education as well as most other industries." (1995, p. 10) Heckman poses a thought-provoking statement when he states that this resistance to choice in education exists in a society (He is referring to the United States, but the statement applies to Canada.) in which consumer sovereignty and choice are so highly valued (1999, p. 101).

Attrition

Allowing thousands of dollars to go unaccounted for through attrition of students is a problem. An information system capable of tracking students from the time they enter university until graduation and then on into the workforce should be implemented. A central provincial database consisting of each student and an identification number would better enable tracking of university students. The previously mentioned funding-performance link would serve as an incentive for universities to retain students. Information with respect to why students do not complete a program of study or the end result of the student's university experience would prove valuable.

Macroeconomic Conditions

The policy debate with respect to university education takes place within a broader debate regarding macroeconomic policy and economic conditions in Atlantic Canada. For most of the 1990s Atlantic Canada's GDP growth and employment growth have lagged those of the country as a whole (Beale 1999, p. 3). Generally wages are higher and opportunities greater in the rest of Canada than in Atlantic Canada. Atlantic Canada has relatively higher personal income tax rates than the rest of the country. Against these forces, it is understandable why there is a drain of skilled labour from Atlantic Canada to other regions. There is no doubt that implementation of policies at the macroeconomic level to facilitate economic growth would help to address the problems plaguing the university system.

Retaining university graduates is not simply an issue of wages. Raising wages without accompanying increases in productivity makes it difficult for firms to compete. Increases in productivity require more skilled labour and capital. Increasing the supply of skilled labour faces a two-dimensional dilemma—how to retain it and how to attract it. Business is not attracted to the region partly because of the relative lack of skilled labour. Yet skilled labour will not reside here because there are relatively few opportunities, which come from business investment. This troubling cycle is addressed as a key component of Atlantic Canada's economic struggles in an AIMS book, *Retreat from Growth: Atlantic Canada and the Negative-Sum Economy*. Without increases in investment, including capital, excess labour supply occurs amidst relatively lower labour demand. Real economic growth is thus low, and improvements in living standards are negligible or non-existent.

CONCLUSIONS

There are no easy or quick solutions to the issues and problems prevalent in university education in Atlantic Canada today.

The university system in Atlantic Canada is in need of modification. It is at a critical stage, one at which action or lack of action by policy makers will help to shape its future course. The problems and issues facing the system will persist and likely intensify if effective action is not taken. The university sector, in a way similar to one of our other primary social programs—health care—but perhaps not in as dire a condition, has a significant role to play in our quality of life and well being. The importance of efficiently and effectively developing and sustaining a university-education population in Atlantic Canada is crucial to maintaining economic growth and high living standards in the region.

The data show it is not simply an issue of funding. Atlantic Canadian taxpayers have made and continue to make a substantial financial commitment to university students. Yet students, not taxpayers, are the primary beneficiaries of their own education. Out-migration of university graduates exacerbates this problem.

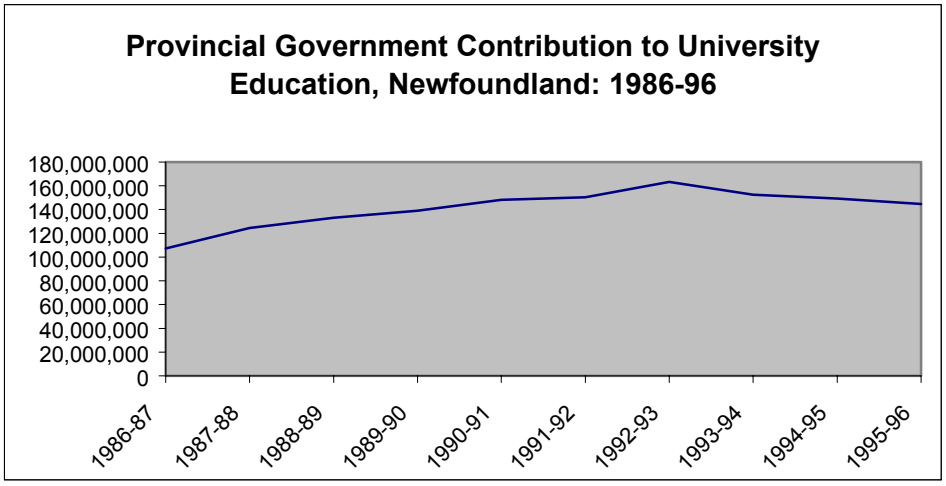
The current incentive structure impedes efficient and effective allocation of taxpayer and student dollars. Allocation of taxpayer dollars to universities based on how these institutions perform would be more efficient than the status quo. Market-oriented tuition levels would facilitate a more efficient use of both student and taxpayer dollars. Implementing a system of student financial assistance based on income-contingency would better enable graduates to repay their student loans. By appropriating taxpayer dollars designated for instruction to students more efficiently, I believe universities would be able to maintain the pool of funding exclusively designated for their other primary function—research.

There is great variation in the returns to investment by field and level of study. In terms of returns to taxpayers, some disciplines yield much better returns than others despite the fact that differences in costs to taxpayers of financing them are negligible. Some fields of study that yield similar returns to other fields involve tremendous differences in costs. In terms of returns to graduates, given the fact that tuition fees for different fields of study are comparable, some fields provide significantly different returns to investment in the form of higher wages. Policy makers need to look closely at such data while also taking into account migration and employment figures. Until concrete evidence is found to substantiate the derived social benefits of university education, the private return-public return disparity should act as a significant reference point with respect to who should pay.

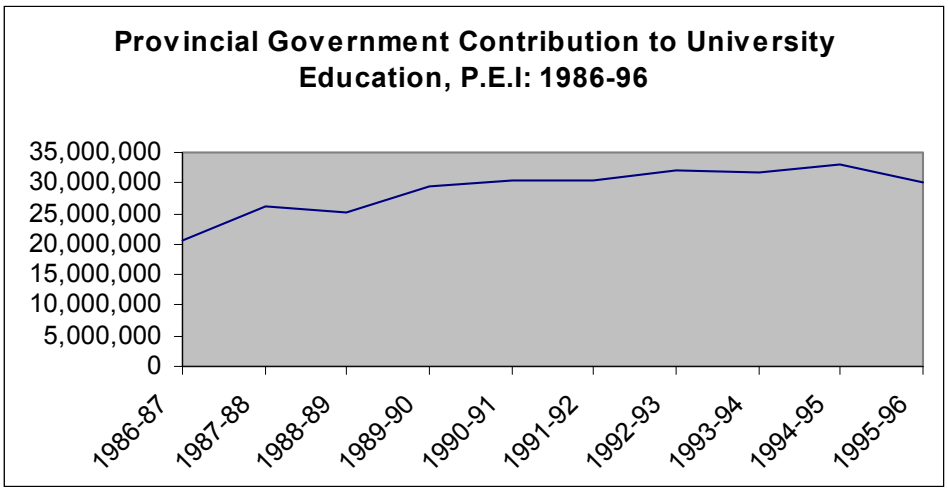
A concerted policy effort is required, in both macroeconomic and microeconomic terms, to address the problems and issues within the system. The problems are rooted in deeper,

more fundamental economic conditions persistent in the region such as high tax rates and low economic growth. Policy makers need to consider the full range of alternatives to enhancing university education. In order to synthesize an effective policy prescription, they need to look elsewhere, to other jurisdictions where change has rendered other educational systems more effective.

APPENDIX A



Source: Statistics Canada Catalogue 81-208, "Financial Statistics of Education," 1989-90; Statistics Canada CANSIM Table 478-0007



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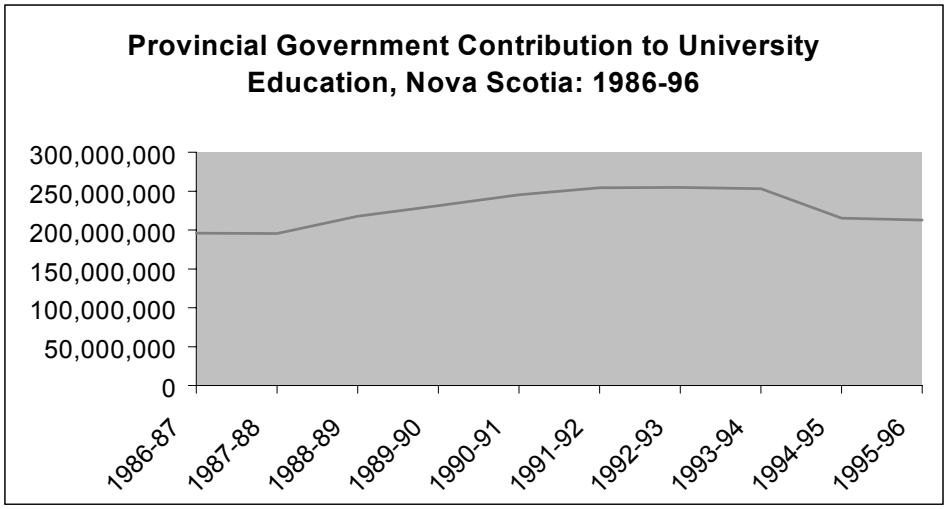

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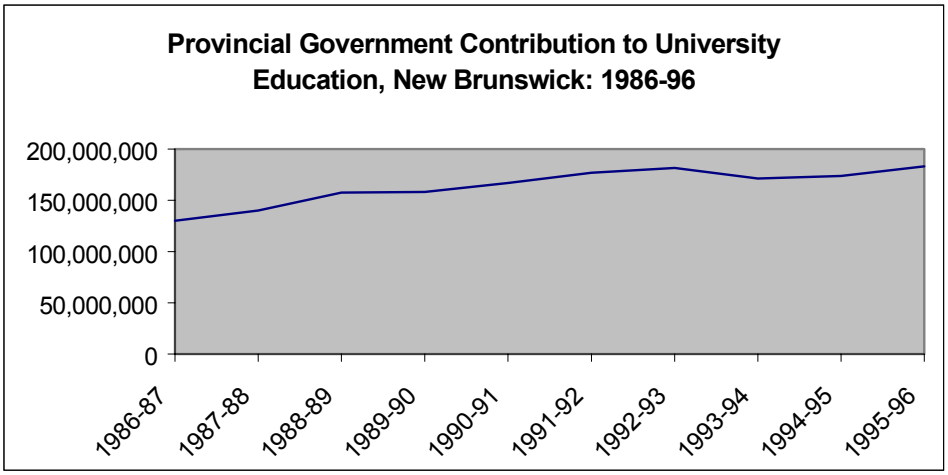

Source: Statistics Canada Catalogue 81-208, "Financial Statistics of Education," 1989-90; Statistics Canada CANSIM Table 478-0007

APPENDIX B

New Brunswick

- Mount Allison University
- St. Thomas University
- Universite de Moncton
- University of New Brunswick

Nova Scotia

- Acadia University
- Atlantic School of Theology
- Dalhousie University
- Mount Saint Vincent University
- Nova Scotia Agricultural College
- Nova Scotia College of Art and Design
- Saint Mary's University
- St. Francis Xavier University
- University College of Cape Breton
- University of King's College
- Universite Sainte-Anne

Prince Edward Island

- University of Prince Edward Island

Newfoundland

- Memorial University of Newfoundland

APPENDIX C

An important distinction must be made with respect to costs in the Health Professions field. A subcategory of Health Professions consists of professions such as nursing, pharmacy, occupational therapy, physiotherapy, and optometry. These disciplines, hereafter referred to as Health, are given a reference point of 3.33 to indicate their cost relative to other fields. Another subcategory of Health Professions consists of medicine and dentistry (hereafter referred to as Medical/Dental). These disciplines are relatively more costly than those in Health and are thus given a reference point of 5.

In Prince Edward Island, only undergraduate programs are offered and only in the Health disciplines. The province offers a Bachelor of Science in Nursing, which is one of the relatively less expensive programs. In New Brunswick, programs are offered at both levels in only the Health discipline. Therefore, the appropriate weights are given in these provinces. In Nova Scotia, two institutions offer programs in Health. Dalhousie University, which offers programs in the Health and Medical/Dental disciplines, does so at both the undergraduate and graduate levels. St. Francis Xavier University offers undergraduate programs in nursing. In looking at enrolment data for two recent years of Dalhousie University, the following breakdown of Health Professions exists at the graduate level: 38 per cent health; 62 per cent medicine. Within Health, there are no Doctorate degrees offered; therefore, enrolment is allocated solely to the Master's level. For Medical/Dental, the Master's-Doctoral distribution is determined using the provincial Master's-Doctoral distribution of 86-14 per cent. The FT-PT distribution is then done for Master's and Doctoral according to the FT-PT distribution of graduate Health Professions students. It is assumed that this enrolment structure existed throughout the period under study. In Newfoundland, graduate enrolment data by field of study at Memorial University was examined for a recent five-year period in order to derive a breakdown by Health and Medical/Dental. Medical/Dental students comprised 64 per cent of students in all Health Professions, with the remaining 36 per cent comprised of Health students. Within the Health discipline, all graduate students are Master's students because there are no Doctoral programs in this category. Within Medical/Dental, Master's and Doctoral students have been determined using average Newfoundland distributions during the period under study: 85-15 Master's-Doctoral.

In the Education field, upon researching several of the institutions, it is decided that undergraduate education degrees are two years in duration. The prerequisite is normally a Bachelor's degree in arts or science. In looking at the earnings streams of arts and science graduates (excluding the Health Professions), the Agricultural and Biological Sciences earnings stream appears to best capture the typical earnings of a bachelor's degree-holder pursuing an undergraduate Education degree. Therefore, the Agricultural and Biological Sciences earnings stream is used in order to determine the incremental benefits of an Education degree recipient.

With respect to Social Sciences at the graduate level, some assumptions have been made. Because Statistics Canada includes graduate student data for Social Sciences and

Commerce in one aggregate total, I have used recent Memorial University enrolment data to arrive at a breakdown by Social Sciences-Commerce. Commerce graduate students as a percentage of total graduate students (averaging 12 per cent for a recent five-year period) is used to determine the number of those in the Social Science category attributable to Commerce. The balance is considered exclusively Social Science students.

APPENDIX D

Public Costs Per Full-time Equivalent Student – Nova Scotia				
Undergraduate	**1992-93**	**1993-94**	**1994-95**	**1995-96**
Arts & Science/General	5,077	4,618	4,665	4,577
Education	5,077	4,618	4,665	4,577
Fine & Applied Arts	5,077	4,618	4,665	4,577
Humanities	5,077	4,618	4,665	4,577
Social Sciences	5,077	4,618	4,665	4,577
Business, Management & Administration	5,077	4,618	4,665	4,577
Mathematics & Physical Sciences	5,077	4,618	4,665	4,577
Agricultural & Biological Sciences	7,615	6,928	6,998	6,865
Engineering & Applied Sciences	10,153	9,237	9,331	9,153
Health	16,753	15,241	15,396	15,103
Medical/Dental	25,383	23,092	23,327	22,884
Major Not Declared	8,681	7,898	7,978	7,826
Graduate – Master's				
Arts & Science/General	10,153	9,237	9,331	9,153
Education	10,153	9,237	9,331	9,153
Fine & Applied Arts	10,153	9,237	9,331	9,153
Humanities	10,153	9,237	9,331	9,153
Social Sciences	10,153	9,237	9,331	9,153
Business, Management & Administration	10,153	9,237	9,331	9,153
Agricultural & Biological Sciences	15,230	13,855	13,996	13,730
Engineering & Applied Sciences	15,230	13,855	13,996	13,730
Health	15,230	13,855	13,996	13,730
Medical/Dental	15,230	13,855	13,996	13,730
Mathematics & Physical Sciences	15,230	13,855	13,996	13,730
Major Not Declared	12,184	11,084	11,197	10,984
Graduate - Doctorate				
All Disciplines	**30,460**	**27,711**	**27,993**	**27,460**

Public Costs Per Full-time Equivalent Student – New Brunswick				
Undergraduate	**1992-93**	**1993-94**	**1994-95**	**1995-96**
Arts & Science/General	5,399	5,007	5,181	5,262
Education	5,399	5,007	5,181	5,262
Fine & Applied Arts	5,399	5,007	5,181	5,262
Humanities	5,399	5,007	5,181	5,262
Social Sciences	5,399	5,007	5,181	5,262
Business, Management & Administration	5,399	5,007	5,181	5,262
Mathematics & Physical Sciences	5,399	5,007	5,181	5,262
Agricultural & Biological Sciences	8,098	7,511	7,771	7,893
Engineering & Applied Sciences	10,797	10,014	10,361	10,524
Health	17,816	16,524	17,096	17,364
Medical/Dental	N/a	N/a	N/a	N/a
Major Not Declared	7,450	6,910	7,149	7,261
Graduate – Master's				
Arts & Science/General	10,797	10,014	10,361	10,524
Education	10,797	10,014	10,361	10,524
Fine & Applied Arts	10,797	10,014	10,361	10,524
Humanities	10,797	10,014	10,361	10,524
Social Sciences	10,797	10,014	10,361	10,524
Business, Management & Administration	10,797	10,014	10,361	10,524
Agricultural & Biological Sciences	16,196	15,022	15,542	15,785
Engineering & Applied Sciences	16,196	15,022	15,542	15,785
Health	16,196	15,022	15,542	15,785
Medical/Dental	16,196	15,022	15,542	15,785
Mathematics & Physical Sciences	16,196	15,022	15,542	15,785
Major Not Declared	12,957	12,017	12,434	12,628
Graduate - Doctorate				
All Disciplines	**32,392**	**30,043**	**31,084**	**31,571**

Public Costs Per Full-time Equivalent Student – Prince Edward Island				
Undergraduate	**1992-93**	**1993-94**	**1994-95**	**1995-96**
Arts & Science/General	9,744	9,513	8,952	9,564
Education	9,744	9,513	8,952	9,564
Fine & Applied Arts	9,744	9,513	8,952	9,564
Humanities	9,744	9,513	8,952	9,564
Social Sciences	9,744	9,513	8,952	9,564
Business, Management & Administration	9,744	9,513	8,952	9,564
Mathematics & Physical Sciences	9,744	9,513	8,952	9,564
Agricultural & Biological Sciences	14,615	14,269	13,427	14,346
Engineering & Applied Sciences	19,487	19,026	17,903	19,128
Health	32,446	31,393	29,540	31,561
Medical/Dental	N/A	N/A	N/A	N/A
Major Not Declared	13,446	13,128	12,353	13,198
Graduate – Master's				
Agricultural & Biological Sciences	29,231	28,539	26,855	28,692

Public Costs Per Full-time Equivalent Student – Newfoundland				
Undergraduate	**1992-93**	**1993-94**	**1994-95**	**1995-96**
Arts & Science/General	6,439	6,275	6,094	6,992
Education	6,439	6,275	6,094	6,992
Fine & Applied Arts	6,439	6,275	6,094	6,992
Humanities	6,439	6,275	6,094	6,992
Social Sciences	6,439	6,275	6,094	6,992
Business, Management & Administration	6,439	6,275	6,094	6,992
Mathematics & Physical Sciences	6,439	6,275	6,094	6,992
Agricultural & Biological Sciences	9,659	9,412	9,141	10,488
Engineering & Applied Sciences	12,878	12,549	12,189	13,985
Health	21,249	20,706	20,111	23,074
Medical/Dental	32,196	31,373	30,472	34,961
Major Not Declared	11,011	10,730	10,421	11,957
Graduate – Master's				
Arts & Science/General	12,878	12,549	12,189	13,985
Education	12,878	12,549	12,189	13,985
Fine & Applied Arts	12,878	12,549	12,189	13,985
Humanities	12,878	12,549	12,189	13,985
Social Sciences	12,878	12,549	12,189	13,985
Business, Management & Administration	12,878	12,549	12,189	13,985
Agricultural & Biological Sciences	19,318	18,824	18,283	20,977
Engineering & Applied Sciences	19,381	18,824	18,283	20,977
Health	19,318	18,824	18,283	20,977
Medical/Dental	19,318	18,824	18,283	20,977
Mathematics & Physical Sciences	19,318	18,824	18,283	20,977
Major Not Declared	15,454	15,059	14,626	16,781
Graduate - Doctorate				
All Disciplines	**38,635**	**37,648**	**36,566**	**41,954**

APPENDIX E

Private Costs Per Full-time Equivalent Student – Nova Scotia				
	Tuition*			
Undergraduate	**1992-93**	**1993-94**	**1994-95**	**1995-96**
Education	2,592	2,847	3,119	3,359
Fine & Applied Arts	2,588	2,836	3,107	3,346
Humanities	2,588	2,836	3,107	3,346
Social Sciences	2,610	2,862	3,135	3,377
Business, Management, & Administration	2,577	2,838	3,109	3,348
Mathematics & Physical Sciences	2,610	2,862	3,135	3,377
Agricultural & Biological Sciences	2,276	2,495	2,733	2,944
Engineering & Applied Sciences	2,558	2,825	3,095	3,333
Health	2,610	2,862	3,135	3,377
Medical/Dental	3,203	3,521	3,857	4,154
Graduate – Master's			3,410	3,673
Graduate - Doctorate	2,702	3,115	3,410	3,673

Private Costs Per Full-time Equivalent Student – New Brunswick				
	Tuition*			
Undergraduate	**1992-93**	**1993-94**	**1994-95**	**1995-96**
Education	2,678	2,805	2,821	2,996
Fine & Applied Arts	2,442	2,557	2,572	2,731
Humanities	2,442	2,557	2,572	2,731
Social Sciences	2,546	2,671	2,686	2,853
Business, Management, & Administration	2,546	2,671	2,686	2,853
Mathematics & Physical Sciences	2,546	2,671	2,686	2,853
Agricultural & Biological Sciences	2,546	2,671	2,686	2,853
Engineering & Applied Sciences	2,546	2,671	2,686	2,853
Health	2,546	2,671	2,686	2,853
Medical/Dental	N/a	N/a	N/a	N/a
Graduate – Master's			3,175	3,367
Graduate - Doctorate	2,691	3,150	3,175	3,367

Includes course fees, additional fees, and textbooks & supplies (assumption: $500/year)

Private Costs Per Full-time Equivalent Student – Prince Edward Island				
	Tuition*			
Undergraduate	**1992-93**	**1993-94**	**1994-95**	**1995-96**
Education	2,773	3,031	3,201	3,440
Fine & Applied Arts	2,545	2,782	2,938	3,157
Humanities	2,545	2,782	2,938	3,157
Social Sciences	2,545	2,782	2,938	3,157
Business, Management, & Administration	2,545	2,782	2,938	3,157
Mathematics & Physical Sciences	2,545	2,782	2,938	3,157
Agricultural & Biological Sciences	2,545	2,782	2,938	3,157
Engineering & Applied Sciences	2,545	2,782	2,938	3,157
Health	2,545	2,782	2,938	3,157
Medical/Dental	N/A	N/A	N/A	N/A
Graduate – Master's			3,498	3,757

Private Costs Per Full-time Equivalent Student - Newfoundland				
	Tuition*			
Undergraduate	**1992-93**	**1993-94**	**1994-95**	**1995-96**
Education	2,062	2,414	2,601	2,800
Fine & Applied Arts	2,062	2,414	2,601	2,800
Humanities	2,062	2,414	2,601	2,800
Social Sciences	2,062	2,414	2,601	2,800
Business, Management, & Administration	2,062	2,414	2,601	2,800
Mathematics & Physical Sciences	2,062	2,414	2,601	2,800
Agricultural & Biological Sciences	2,062	2,414	2,601	2,800
Engineering & Applied Sciences	2,062	2,414	2,601	2,800
Health	2,062	2,414	2,601	2,800
Medical/Dental	2,062	2,414	2,601	2,800
Graduate – Master's			2,012	2,166
Graduate - Doctorate	1,598	1,868	2,012	2,166

* Includes course fees, additional fees, and textbooks & supplies (assumption: $500/year)

APPENDIX F

Regression Results By Field of Study (Undergraduate) and Level of Study, Atlantic Provinces

	Constant	Age	Age^2	R^2	F	N
High School	8.0144 (22.588)	0.0871 (4.590)	-0.0009 (-3.519)	0.082	32.016	717
Bachelor's	8.180 (29.102)	0.105 (7.147)	-0.001 (-5.880)	0.083	75.327	1,674
Education	8.358 (11.599)	0.094 (2.542)	-.001 (-2.135)	0.043	9.330	416
Fine & Applied Arts	9.232 (6.122)	0.069 (0.929)	-0.0008 (-0.917)	0.067	0.432	15
Humanities	6.874 (7.773)	0.163 (3.470)	-.0018 (-3.035)	0.141	11.411	142
Commerce & Management	8.289 (18.975)	0.100 (4.221)	-0.001 (-3.173)	0.228	47.092	322
Social Sciences	7.726 (14.602)	0.118 (4.310)	-0.001 (-3.362)	0.203	31.726	252
Agricultural & Biological Science	7.573 (8.887)	0.139 (3.096)	-0.002 (-2.652)	0.186	9.145	83
Engineering & Applied Science	9.583 (11.257)	0.055 (1.289)	-0.001 (-1.159)	0.018	1.498	165
Math & Physical Science	8.364 (4.448)	0.085 (0.856)	-0.001 (-0.564)	0.051	3.212	122
Health	8.000 (5.120)	0.109 (1.379)	-0.001 (-1.103)	0.135	4.064	55
Medical/Dental	9.076 (5.375)	0.072 (0.807)	-0.001 (-0.655)	0.026	1.144	89
Master's	7.739 (15.705)	0.131 (5.669)	-.001 (-5.169)	0.091	23.219	465
Doctorate	7.355 (4.099)	0.132 (1.620)	-0.001 (-1.291)	0.131	6.781	93

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