Who Should Pay for University Education? Some Net Benefit Results by Funding Source for New Brunswick

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INTRODUCTION

For the academic year 1989-90 the province of New Brunswick spent nearly $60 million — or about $220 per person — on its universities. In the same year the federal government contributed $26.7 million, while students contributed another $34.7 million. Total spending from all sources was $237.5 million, or about $330 per person in the province. It is clear that for a small province these are large numbers and, in this era of deficits and debt, all constituencies — governments, students and the public — will want a clearer picture of the returns from such spending. Interest in these issues has also been
sharpened by the federal government’s recent publication of the discussion paper, “Improving Social Security in Canada” (the Axworthy Green Paper). It suggests fundamental changes in the financing of the university sector by the provincial governments, the federal government, and students.

To address in a comprehensive way returns for spending on universities, we will examine benefits and costs for four different constituencies. These are the provincial government (the taxpayers of New Brunswick), the federal and provincial governments (the taxpayers of Canada), university students, and the public, that is, society taken as a whole. Because the provincial government ultimately determines the level of government support we will focus on the benefits and costs to the province. However, because Canada is a federal state with relatively free movement of labour, we will also be interested in the joint benefits and costs to the federal and provincial governments. This we hope will allow conclusions about the appropriate funding responsibilities of the different levels of government. In addition, since students ultimately make the school attendance decision, we will want to know their private benefits and costs. Finally, we will generate a net social or public benefit by comparing total benefits to total costs for all the parties (provincial government, federal government, and students).

Each measure of net benefits addresses different questions. The governmental net-benefit measures provide information on the fiscal consequences to governments of spending on higher education. The private measure provides information relevant to prospective students. The social measure is relevant to governments in their function as social planners determining optimal spending levels for universities.

Before proceeding, a key difficulty is deciding on a manageable definition of university benefits. There are benefits that almost certainly exist but are difficult to quantify. For example, one could argue that university education promotes democratic institutions by developing an informed electorate; that such education increases societal welfare by expanding intellectual and recreational horizons; and that the productivity and wages of non-university educated workers are increased by working with university graduates. Especially important for the provincial government might be the role of universities in regional economic development. In particular, universities through their teaching function create a skilled labour force and through their research function provide knowledge that not only benefits society generally but also may help attract business investment to the local provincial economy.

Without questioning the existence of these benefits, we resign ourselves to their almost fundamental non-quantifiability. Therefore we propose to define benefits more narrowly as the higher wages resulting from university education. This means the benefits for governments are the higher federal and provincial taxes paid. Thus, our approach is to concentrate on what is in principle quantifiable. On this account, the value of the non-quantifiable benefits are thus implicitly set equal to zero. Consequently, the results we generate below should be regarded as conservative measures of the benefits from spending on universities in New Brunswick.

With respect to provincial government spending, this approach collapses to the narrower but still important question: Does the provincial investment in universities generate through additional tax revenues a satisfactory rate of return for the taxpayers of New Brunswick? And at the national level this question becomes: Does federal and provincial investment generate a satisfactory return for the taxpayers of Canada? For students the relevant question becomes: Do student expenditures (including foregone wages) generate sufficient additional after-tax earnings for a satisfactory rate of return for students? Finally for society as a whole, that is, taxpayers and students together, the relevant question compares additional earnings to all private and public spending.

The last two questions are the ones typically examined in the Canadian policy literature. Several
authors have been interested in overall social rates of return to society and private rates of return to students. Although we can and do address these questions, our approach concentrates more on the fiscal implications of university funding for a small province, especially a small province that is a net exporter of human capital. Although the question of what level of government pays and benefits is the main concern, we will also introduce other issues that have obvious policy relevance and have not been previously examined. For example, we shall introduce student attrition and so distinguish between the net benefits from spending on unfinished education and spending on university degrees. This will allow us to say something about the cost to governments of drop-outs.

We will also make a distinction between the net benefit from spending on the teaching function as opposed to the net benefit from total spending, that is, spending on both the teaching and research functions of the university. We do this for two reasons. First, since we restrict benefits to the increased wages due to the increase in human capital produced by the teaching function of the university, it makes sense to compute rates of return that align benefits from teaching and cost of teaching only. Second, this is also a particularly relevant adjustment because of the increased emphasis in the Axworthy Green Paper on user pay. A defensible formulation of user pay can be built on the premise that students directly and primarily benefit from teaching activities but only indirectly benefit (and far less so) from research activities. Students may therefore reasonably feel that user pay formulas should be based on the teaching component of university costs.

Finally, before summarizing the main results, because part of what we are doing involves benefits to a province or local economy, we make another point about what we are not doing. There is a large literature that measures the contribution of universities to the local economy through the use of multiplier analysis. This approach looks at direct spending in a local economy by universities, their employees, students, and visitors. It then expands this by a multiplier which summarizes additional rounds of spending in the local economy that are triggered by the initial direct spending. The resulting figure is a measure of the economic impact of a university on the local economy. For our purposes this approach does not provide a meaningful answer to the questions we ask because it does not recognize that tax dollars have alternative uses either as spending on other public programs or as private spending. These dollars allocated elsewhere would have their own multipliers and their own economic impacts.

To summarize briefly our main findings, we find that rates of return for spending on university degrees are higher for the federal and provincial governments taken together (between 4.3 and 5.1 percent) than for the provincial government alone (between 0.9 and 2.3 percent). These rates of return were approximately 2 percent higher for both funding sources when spending was restricted to teaching costs only. The higher returns for the federal and provincial government together occur because the federal government benefits substantially from its share of additional income and consumption taxes associated with university education while the provincial government is the principal statutory funding source. We also find that the differences widen dramatically when an adjustment is made for the residency of New Brunswick graduates. Since New Brunswick is an exporter of persons with university education, incorporating data on students remaining in the province sharply reduces rates of return to the province. This implies that provinces if left to their own resources, particularly small poor provinces with outmigration of educated persons, may be tempted to spend less on education.

We also conclude that it is important to distinguish between spending on education and spending on degrees. This is because a significant portion of students entering university in New Brunswick did not finish their degree. In fact, only 45 percent of the 1986-87 freshman class of 4,271 students earned degrees from New Brunswick universities within
seven years of entering these institutions. For this class it took 12,786 years of education to produce approximately 1,930 degrees. Since the salary benefits from “some university” should be less than salary benefits from a university degree, taking into account drop-out effects reduces rates of return for spending on universities across-the-board.

Finally, we also calculate the more commonly discussed social and private rates of return on investment in a university education. The private rate of return relates private benefits (after-tax wages) to private spending on education, while the social rate of return relates all benefits to all private and public spending. One interesting result is that the private and social returns to women graduates typically exceeded those for men. Another is that, as in the previous literature, the private rates exceeded social rates. This result in particular is sometimes used to argue that students should pay a greater share of the cost of university. However, when spending was restricted to teaching-only expenditures, we found that the private return to a university degree was much closer to the social return.

In the following sections we shall present our procedure for calculating internal rates of return and introduce the different rates of return that interest us. We will then present our results and conclude with a policy discussion.

**Rates of Return from Spending on Universities**

The approach we use to answer the different questions about the economic impact of universities is to calculate for each question an internal rate of return (IRR). The IRR is the rate of return for which the present value of a stream of benefits over a period of years exactly balances the present value of a stream of costs over the same period. In other words, the IRR is the value of $i$ that solves

$$\sum B_t/(1+i)^t = \sum C_t/(1+i)^t$$

where $B_t$ and $C_t$ are the benefits and costs in year $t$. For the questions we want to ask about universities, we shall assume that the benefits (positive or negative) extend from the age of 19 to retirement age of 65, while the costs extend from 19 until graduation or other exit from the university system. Thus, implicitly all benefits and costs are defined against the alternative of a high school education. To explain precisely how we compute internal rates of return we begin with the provincial and federal governments.

**The Benefits and Costs to Governments (Taxpayers)**

**Benefits**

The first step is to determine the benefits stream. For governments, this stream is the additional tax revenue due to the additional earnings of university-educated persons as compared to high school graduates. In order to measure this first requires earnings profiles, so we begin with four regressions, provided by François Vaillancourt, which relate earnings to age for a sample of New Brunswick men and women with high school certificates and bachelor degrees. The four regressions are based on data for New Brunswick drawn from the 1991 Census Individual micro data file. The least-squares regressions all take a standard semi-logarithmic form in which the natural logarithm of earnings is regressed against an intercept, age, and age squared. For bachelor degree recipients dummy variables representing fields of study were also added. These were included as dichotomous variables, modifying the intercept, and also interactively with age, thus modifying the slope coefficient for age. The four regressions are shown in the Appendix.

To generate an earnings profile for each category extending from age 19 to 65, we use coefficients from the appropriate regressions significant at the 10 percent level for a one-tail test. We also make an adjustment to take into account the later entry into the full-time workforce of college graduates.
Specifically, at the outset there will be some period when high school graduates’ earnings will exceed university graduates because the latter are still in school. During this period we shall assume that university students, through summer and part-time work, will earn one-third of what a high school person of the same age and sex would have earned.\(^\text{10}\)

The next step is to calculate the benefits to governments from the higher earnings profiles of university-educated persons. For the provincial government, this is the additional provincial income tax and provincial sales tax that these persons, as compared to high school graduates, will pay over their careers. For the federal government, it is the additional federal income tax and consumption tax (the GST).\(^\text{11}\) To compute the income tax benefits to the province we consider the simplest case of a New Brunswick resident filing in 1990 and assume the resident is single, claims the personal deduction, the exemptions for working expenses and contributions to unemployment insurance and CPP funds, and contributes to both a RRP and RRSP.\(^\text{12}\) In 1990 the income tax paid to the province was 60 percent of the basic federal income tax. In 1990 the income tax paid to the federal government was the basic federal tax plus a small federal surtax.\(^\text{13}\)

To determine provincial and federal consumption tax revenues, we first subtract federal and provincial income taxes from earnings to obtain a profile for disposable income. We then, based on the Provincial Economic Accounts, assign 90 percent of this disposable income to consumption.\(^\text{14}\) To obtain consumption tax revenues we multiply this consumption figure by the relevant consumption tax rates.\(^\text{15}\) Although the GST rate is 7 percent and the provincial sales tax rate 11 percent, the effective tax rates are smaller because these taxes do not apply to all consumer spending. In our calculations we used an effective tax rate of 3.67 percent for the federal government and 4.50 percent for the provincial government.\(^\text{16}\)

When measuring the taxation benefit for the province, a key consideration should be the percentage of university students who remain in New Brunswick. Alumni data from three of the universities (Moncton, New Brunswick, and Saint Thomas) indicate that 64 percent of alumni with known addresses reside in New Brunswick. Accordingly, to reflect this outmigration, we adjust the taxation benefits by this ratio and present rates of return to the province with and without this adjustment.

The taxation numbers we use do not explicitly allow for employment participation rates less than one. However, our earnings data do contain an implicit adjustment since the data are based not on individuals’ full-time earnings but instead on individuals with any positive earnings during the year. Therefore, to some extent, the different employment participation experiences of college men and women as opposed to high school men and women are already embedded in the data.

Another problem is that the earnings and taxation profiles are based on the state of affairs for a single year, 1990. The problem with single year cross-section data is that we cannot be sure how well the structure of taxation and earnings for 1990 projects into the future. This problem is unavoidable and therefore the results produced should be regarded with this caveat in mind.

An additional interpretive problem concerns how much of the additional earnings should be attributed to additional education and how much to differences in inherent abilities or to the use of education as a screening device by employers.\(^\text{17}\) Rather than attempt an arbitrary adjustment we shall present rates of return unadjusted for ability differentials and point out that any adjustment for ability will reduce the estimates.\(^\text{18}\)

Summarizing, in essence what the above procedures do is to create a taxation-age profile to match the earnings-age profile. We create a separate profile for males and females for the educational categories of high school certificate and bachelor degree. This will allow us to compute the benefit to
governments from spending on university education against the alternative of a high school education.

**Costs**
The taxation profiles can be used to calculate benefits per person to the New Brunswick government and to the New Brunswick and federal governments jointly. What remains is to calculate the annual costs per student to the provincial government and both governments jointly. Provincial spending on New Brunswick universities for the academic year 1989-90 is taken from Statistics Canada, *Financial Statistics on Education (1990)*, and is defined as total expenditures minus federal contributions, fees, and other income. Spending by all governments is then simply total expenditures minus fees and other income. To obtain spending per student we divide spending by the number of full-time students plus the number of part-time students weighted by .208.

As pointed out in the introduction, because of measurement difficulties benefits are defined narrowly. One implication is that the benefits associated with the research function of universities are not measured. Instead, we focus on measuring the benefits from the more skilled labour force produced by the teaching function of the university. In order to match more closely such teaching benefits with teaching costs, we take all of the relevant government expenditures introduced above but subtract an estimate of research costs. As previously mentioned, this new cost concept should also be useful in the debate about who should pay for university. In particular when “user pay” arguments are advanced, we have said what should be matched are student fees and teaching expenses.

To net out research costs one could use figures for sponsored research. However, this number almost certainly underestimates research cost, in part because it omits the cost of faculty time devoted to research activity. Our imperfect solution is a relationship developed by Hettich (1971) who obtained figures on research costs for 23 Canadian universities from a unit cost study jointly sponsored by the Association of Universities and Colleges and the Canadian Association of University Business Officers. Hettich calculated a regression relating these research costs (R) to sponsored research (SR) and total expenditures (TE). The resulting regression, \( R = .9172 \text{SR} + .2191 \text{TE} \) (adjusted R-squared = .98), will be used to measure research costs in New Brunswick universities. In the results section below, rates of return based on both total costs and teaching costs only will be introduced.

After annual cost per student, what is required next is the average number of years spent earning a degree. To measure the duration of education we use enrolment data for New Brunswick universities from a special report from the Maritime Provinces Higher Education Commission. The data track the incoming freshman class of 1986-87, most of whom would normally graduate in 1989-90, for seven years. We assumed that anyone who attended university four or more years received a degree. Based on this assumption we found that the incoming class of 4,271 students produced 1,930 degrees requiring 8,824 years of attendance. This is an average of 4.57 years per degree. The remaining 2,341 non-degree students attended a total of 3,962 years or an average of 1.69 years.

In summary, the taxation profile for individuals from age 19 to 65 provides the benefits per person to governments from university. The cost profile lasting 4.57 years for degree recipients provides the cost per person to governments. Since the taxation benefits are also initially negative (a 19-year-old high school graduate in the workforce pays more tax than a university student), investment in a class of university students very much involves trading off present day costs and future benefits.

**The Private and Social Benefits and Costs**

We turn now to the calculation of private and social rates of return on spending in education. Private rates
of return compare after-tax earnings to private costs for individuals while social rates compare gross earnings to all costs incurred by all constituencies.

For the private rate we again consider males and females who attend college for 4.57 years and obtain a degree. The after-tax earnings stream is just the difference between the earnings and taxation (income plus consumption) streams already calculated. Private costs are of two kinds: explicit expenditures for fees and books and implicit expenditures in the form of foregone after-tax earnings while at university. The first we measure as student fees (except those for non-credit instruction) divided by enrollment (measured in the same way as before) plus expenditures for books and materials. Foregone earnings are two-thirds of the earnings of a matching (by age and sex) high school graduate. It should be noted that unlike our other cost calculations, private costs, because they include different foregone earnings, vary between males and females.

Finally, the social or total rate of return relates additional earnings from university education and total private and public costs. Additional earnings for men and women have already been defined. Total cost per student are federal and provincial expenditures, explicit private expenditures (tuition fees, books), other expenditures (spending financed by donations to universities) and foregone pre-tax earnings (two-thirds of the earnings of a matching high school graduate), all divided by the measure of enrollment described above. As with our rates-of-return calculations for governments, we also calculate a social rate of return based on federal and provincial expenditures adjusted to measure only a cost of teaching.

This completes our explanation of the different rates of return used. For easy reference, these rates of return and the corresponding flows of per capita benefits and costs equalized by these rates are summarized in Table 1. We turn now to the results.

<table>
<thead>
<tr>
<th>Rate of Return</th>
<th>Per Capita Benefit (Age 19-65)</th>
<th>Per Capita Cost 4.57 years (university)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provincial government</td>
<td>additional provincial income &amp; consumption taxes</td>
<td>provincial government spending</td>
</tr>
<tr>
<td>Total government</td>
<td>additional total income &amp; consumption taxes</td>
<td>total government spending</td>
</tr>
<tr>
<td>Private</td>
<td>additional after-tax earnings</td>
<td>tuition, books, after-tax foregone earnings</td>
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<tr>
<td>Total or social</td>
<td>additional earnings</td>
<td>total government spending, tuition, books, foregone earnings, other spending (donations)</td>
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</tbody>
</table>

*Note:
a) For calculation of benefits the comparison person is a male or female high-school graduate.
b) For each of the four categories, rates of return are calculated for male and female university graduate (4.57 years attendance).
c) For three categories (provincial government, total government, social) rates of return are also calculated based on a “teaching-only” definition of government spending that excludes research expenditures.
d) For the provincial government category, rates of return are also estimated with an adjustment for residency of university graduates.

Source: Authors' compilation.
RATES OF RETURN RESULTS

We report in Table 2 rate-of-return results by spending source (provincial government, federal and provincial governments, private student, and total) for two definitions of spending: the first includes spending on both teaching and research while the second excludes our measure of research expenditures. Also, for the provincial government spending source, we report rates of return adjusted for outmigration. Before examining the numbers, we should reiterate that they are derived from a narrow construction that defines benefits as ultimately originating only in the measurable increase in earnings of university-educated persons.

Several patterns emerge from the rates-of-return results in Table 2. First, the rates of return on private spending are largest, followed (in descending order) by rates of return for social spending, federal and provincial spending, and provincial spending. Regarding this pattern, the rates of return by spending source each answer a different question. The private IRR provides information directly relevant to individuals considering university education, that is, does the private IRR make university worthwhile? The social IRR provides information that is relevant to governments in their function as social planners determining total spending levels on higher education; that is, is the social IRR at least equal to the IRR on the marginal dollar allocated to some other use? Finally, the two governmental IRRs provide information on the fiscal consequences to governments of spending on higher education. In particular, is governmental spending on higher education self-financing or almost self-financing in terms of the taxation return to government?

<table>
<thead>
<tr>
<th>Funding Source Benefits and Costs</th>
<th>Males</th>
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<th>Females</th>
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<tbody>
<tr>
<td></td>
<td>Research Included</td>
<td>Research Excluded</td>
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<tr>
<td>Provincial government</td>
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<tr>
<td>IRR</td>
<td>2.3</td>
<td>4.3</td>
<td>0.9</td>
<td>3.3</td>
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<tr>
<td>Federal and provincial government</td>
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<tr>
<td>IRR</td>
<td>5.1</td>
<td>7.0</td>
<td>4.3</td>
<td>6.7</td>
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<tr>
<td>Private student</td>
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<tr>
<td>IRR</td>
<td>7.6</td>
<td>7.6</td>
<td>11.6</td>
<td>11.6</td>
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<tr>
<td>Social (total) spending</td>
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<tr>
<td>IRR</td>
<td>6.1</td>
<td>6.9</td>
<td>8.5</td>
<td>10.3</td>
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<tr>
<td>Provincial government (residency adjusted)</td>
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<tr>
<td>IRR</td>
<td>0.8</td>
<td>2.6</td>
<td>-0.8</td>
<td>1.4</td>
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</tbody>
</table>

SOURCE: Authors’ compilation.
Of particular interest are the fiscal consequences for the province of New Brunswick. Given the current historically high real rate of interest of around 6 percent (the bank rate minus the inflation rate), an IRR of between 0.9 percent (women) and 2.3 percent (men) is very low. If we assume that the return for any alternative use of funds can be approximated by the real rate of interest of around 6 percent, then from the narrow perspective of the fiscal consequences for the province, spending on education is a poor investment. This low rate is in contrast to the considerably higher IRR of between 4.3 percent (women) and 5.1 percent (men) for federal and provincial governments together. That the latter should be higher is probably not a surprise since, as defined, the province contributes most of the expenditures but shares less of the benefits. Finally, since the average private and social IRRs are both above 6 percent, this implies that, for the private student and for governments acting collectively as social planners, spending on education is worthwhile.

A second way to look at the results is to compare men and women. What the results show are that the return to governments as funding sources are slightly higher for men, but the private and social returns are clearly higher for women. The higher private and social returns for women university graduates may be surprising since wages for university women are lower than for equivalent university men. Two factors account for this. One is that high school women, as compared to high school men, have low average wages ($9.3 thousand compared to $21.9 thousand), so that there is a great private and social advantage to moving to the university category. In addition, the private and social costs are lower for women than men since women incur lower foregone earnings while attending university.

A third way to interpret the Table 2 results is to look at what happens when spending excludes research. As already explained, excluding research aligns more closely expenditures and benefits since, as defined, benefits flow exclusively from the more educated labour force produced by teaching in the universities. In Table 2, except for the private student whose spending is not influenced by research expenditures, rates of return are higher for all spending sources when research costs are excluded. This follows naturally because benefits are unchanged, but costs to governments are lower. In fact, except for the provincial government, the average rates of return are all higher than our cut-off point of 6 percent. If we assume that the benefits from the research function of universities produce their own separate rates of return equal to or close to those in the table, then rates of return on total spending are satisfactory for all spending sources except the province.

Another issue also reemerges when examining how excluding research influences the relationship between social and private IRRs. When we include all university spending, the social IRR is considerably less than the private IRR — a standard result in the literature. This result could be used to argue that students should pay a larger proportion of university costs through higher tuition. However, when expenditures are restricted to teaching, then the difference narrows considerably, thus weakening somewhat the conclusion that students should pay more. In any case, to the extent that “user-pay” policies are advocated, it should be clear that what students mostly use are the teaching functions of the university.

The issue of outmigration is addressed by the results in the bottom row of Table 2. These numbers summarize the fiscal impact for the provincial government of the outmigration of persons educated at New Brunswick universities. The IRRs are all very low and confirm rather emphatically that the rate of return for the province is unsatisfactory.

Finally, we note that all the numbers in Table 2 are for students who complete the degree after 4.57 years. We know that many students attend but do not complete degrees and because of this the numbers in the table may be overestimates. Ideally, to incorporate this drop-out factor, we would like to
create an earnings profile for drop-outs. Since these data are not available, we made a calculation based on the pessimistic premise that drop-outs acquired no additional human capital and hence no additional earnings. Therefore, because the class of 4,271 students produced 1,930 degrees requiring 12,786 years of attendance (8,824 years for degree recipients, 2,341 years for drop-outs), we calculated rates of return parallel to those in Table 2 based on \((12,786/1,930) = 6.62\) attendance years.

The numbers produced are lower-bound estimates. The flavour of the results is indicated by the following IRR figures, in parentheses, which match the first column of Table 2, that is, they are for university men and include research spending: provincial (1.2), federal and provincial (3.9), social (5.0), private (6.6), and provincial with outmigration (−.25). Clearly, taking drop-outs into account does lower rates of return to the point where only the private rate passes the 6-percent test.30

How do our findings compare with other Canadian results? Since our study focuses on rates of returns from different perspectives than other work, we can only make comparisons of aggregate private and social (total) rates of return. Vaillancourt (1995) provides a summary of 12 Canadian studies, none of which focus on New Brunswick separately. Our sense is that our private and social rates of return are well within the range of results reported elsewhere, but slightly below the average.31 For the closest study by location, Vaillancourt and Henriques (1986) report, for 1981 university males from the Atlantic region, private and social returns respectively of 12 and 8 percent.

To summarize, our results show that the internal rates of return for total (social) spending fell short of the internal rates of return for private students, but the difference is less when research spending is excluded. Federal plus provincial spending IRRs are lower and IRRs for the New Brunswick provincial government alone are quite low. And taking into account outmigration of university-trained graduates, the rates of return for the province become negligible. We think these results have relevance for the important issue of university financing. We turn to this issue and some others in our concluding discussion.

**Policy Discussion**

What are the policy implications of our rate-of-return results? We recognize that the assumptions needed to produce the results means that, inevitably, some dispute about rate-of-return levels is unavoidable. However, when drawing conclusions based on rankings across the different funding sources, this concern should be less problematical. Taken at face value, then, several interesting points surface. For example, the provisional drop-out results imply governments should be concerned about attrition in university study, since returns to governments and society are lowered by students who drop out.

Another issue of concern to both students and government (taxpayers) is the distribution of the costs of university education, particularly as it relates to user-pay solutions to this issue. Implementing user-pay means defining what students use and this is what is approximated by our estimates of the costs of teaching. Using these costs to compute rates of return suggests that, if economic efficiency is used as the criterion for setting tuition, students’ current share of teaching costs may not be too out of line. In any case we believe discussions about what students should pay should occur against the background of the teaching cost of their education.

For a small province a fundamental concern must be the respective funding responsibilities of the federal and provincial governments. The provincial government has constitutional responsibility for education. But our results show that the provincial return from spending on universities is substantially below both the national return, available jointly to federal and provincial governments, and the private and social returns. In fact when research
expenditures are excluded, all funding sources pass the 6-percent rule except for the provincial government. Moreover, this dismal conclusion for the provincial government is reinforced when allowance is made for the outmigration of university graduates from New Brunswick.

As presented, these results imply that provinces like New Brunswick might be tempted to underinvest in university education and to “free ride” on the university systems of other provinces. In the extreme, a small province like New Brunswick could in theory end all subsidies to its universities, and encourage students to first educate themselves in, say, Ontario, and then return to New Brunswick to earn higher earnings in occupations that require university education. The province would still receive tax revenue from earnings of university graduates working in New Brunswick. But these university graduates would either be graduates of publicly-subsidized universities of other provinces, or graduates of any privately-financed New Brunswick universities. A small province in this case would reap the benefits of higher taxes on such high earnings without having to pay the associated costs.

When looking at New Brunswick’s incentives to pay, it is important to make clear that our results are based on Statistics Canada’s figures, which are based on sources of spending on universities (federal or provincial) as opposed to sources of revenue. This definitional approach served our purposes since we wanted to examine the independent incentive for a province, constitutionally responsible for higher education, to spend on higher education. From the perspective of sources of revenue, funding for higher education has in the past largely come from Established Programs Financing (EPF) — the program providing funding to the provinces through cash transfers and tax points. How much of these EPF dollars are federal or provincial (who owns the tax points?) is really moot. What is central is the implicit recognition in the EPF that, in a country with national labour mobility and national taxation authority, there is a disconnection between provincial funding responsibilities and provincial benefits. This disconnection defines a need for ultimate federal responsibility for higher education.

NOTES

The authors thank Sumana Bandyopadhyay for research assistance, François Vaillancourt for generously providing salary regressions, and James Feehan and this journal’s referees for helpful comments.

1These figures are from Statistics Canada, Financial Statistics on Education, Table 25, 1989-1990 edition and are based on defined sources of spending rather than sources of revenue. Federal contributions come principally through student aid programs and sponsored research financed by agencies such as the Social Sciences and Humanities Research Council. We will return to the distinction between sources of spending and sources of revenue in the conclusion.

2For a more complete listing of these benefits see West (1988), ch. 4.

3With respect to the increased productivity of non-university workers, the point has been made, e.g., West (1988, p. 68), that investment in physical capital could produce the same favourable externality. If so, then in principle a decision to spend more on universities because of this effect must be based on a comparison of the positive externalities associated with investment in human capital and physical capital.

4See the recent work of Vaillancourt and Henriques (1986), Constantatos and West (1991) and Vaillancourt (1995).

5In spirit, our approach is closest to Bluestone (1993), who examines the taxation benefit to the state of Massachusetts from its financing of the University of Massachusetts.

6For a survey of many of these studies, see Leslie and Slaughter (1992).

7Multiplier analysis is more meaningful for questions such as determining the economic impact of the University of New Brunswick on Fredericton. Of course, a taxpayer from another New Brunswick city could view this as the foregone economic impact or cost of the university to their city.
These numbers are based on tables entitled “Years of Attendance” from the Maritime Provinces Higher Education Commission (1993).

This means for college women that the humanities field dummy is used and for college men that the humanities field dummy, engineering field dummy and interactive humanity field-age variable are used. Based on data taken from Table 15 of Statistics Canada’s Enrolment and Degrees Granted and page 35 of the Maritime Provinces Higher Education Report, we calculated the average value for the humanities dummy to be .12 for women and .092 for men, and the engineering dummy average to be .19.

This assumption follows Vaillancourt and Henriques (1986), Constantatos and West (1991), and Vaillancourt (1995).

Most previous studies, e.g., Constantatos and West (1991) and Vaillancourt (1995), confine benefits to income taxes. Here we follow Bluestone (1993) by including consumption taxes.

Table 2A of the 1990 Income Taxation Statistics (Revenue Canada) provides data for different income classes on the ratio of RPP and RRSP contributions to wages and salaries and the ratio of CPP and UI payments to wages and salaries. These ratios are multiplied by employment income to obtain the appropriate deductions.

In 1990 the surtax was 5 percent of the basic federal tax if the tax was less than $15,000. For the portion of the basic federal tax above $15,000, the surtax was 8 percent.

The Provincial Economic Accounts indicate that for 1990 consumption expenditures were 90 percent of disposable income in New Brunswick.

Other consumption taxes, like excise taxes on alcohol, could be included. We include only the major sales taxes because they are quantitatively the most important and are easily calculated. Certain payroll taxes such as business and worker contributions to unemployment insurance could also be included. In fact, we did include these in unreported calculations with no appreciable impact on the results. (One reason for this is the relatively early ceiling on insurable earnings [$32,820] and hence payments.)

There is also a conceptual problem because such payments create a direct insurance claim against the government. A net benefit to government accrues only if college-educated workers are less likely to make such claims. From this perspective, the issue is really the respective propensities of the different educational categories to consume governmental goods and services. For example, which educational category is likely to consume higher levels of health services? This question, while intriguing, is beyond the reach of readily available data.

The Government of Canada Public Accounts report that in 1990 GST tax revenues were 3.67 percent of consumption. In New Brunswick provincial sales tax revenues were 6.4 percent of consumption (Government of New Brunswick, Main Estimates). But officials in the Finance Department of New Brunswick estimate that 30 percent of these revenues come from taxation of business spending on inputs. With this adjustment sales tax revenues are 4.5 percent of consumption.

West (1988) provides a discussion of this as well as other interpretive problems. In addition, for a good summary of all the possible biases inherent in our approach, see Table 4 in Vaillancourt (1995).

Constantatos and West (1991) calculate social (total) rates of return to investment in education with ability adjustments ranging from zero to 35 percent of the salary differences between educational levels.

All of these figures are from Table 25 of the cited Statistics Canada publication. Most of the federal contribution (11 percent of total expenditures) is in the form of sponsored research. The total expenditure figures do not include capital formation expenses.

The New Brunswick university system has no medical or dental school and few graduate students (only 4.9 percent of full-time university students).

The .208 weight for part-time students is based on data from the Registrar’s Office of the University of New Brunswick which indicate that the course load of part-time students is 20.8 percent of full-time students. Other studies have assigned weights of one-third (Vaillancourt and Henriques) or one-half (Constantatos and West). Enrolment figures are from the Statistics Canada publication Enrolment and Degrees Granted.

See An Exploratory Cost Analysis of some Canadian Universities, Association of Universities and Colleges of Canada, 1970. In this study all costs (e.g., administration, academic salaries) are distributed among three activities: instruction, student research, and thesis...
supervision and research. The figures for sponsored research and total expenditures are from *Financial Statistics on Education*.

22The Collective Agreement for Memorial University, a university whose research requirements may be similar to universities in New Brunswick, suggests an interesting alternative measure of research. In the agreement, faculty, in the absence of specific exemptions, are to devote not more than 20 percent of their time to academic service, with remaining time to be split evenly between research and teaching. This suggests a formula defined as sponsored research plus a minimum of 40 percent of salaries and fringe benefits. With this, we calculated research expenditures between $53 and $76 million, depending on how we measured salaries, which is comparable to the $68 million figure from the Hettich formula. (The data for salaries and fringe benefits are from the Canadian Association of University Business Officers document, *Financial Statistics of Universities and Colleges 1989-1990*.)

23See the general appendix in *Role and Planned Capacity: New Brunswick and Prince Edward Island Universities*. The data in this appendix are for New Brunswick and Prince Edward Island. To obtain figures for New Brunswick only, we subtracted similar attendance data provided separately for the University of Prince Edward Island.

24All the Canadian studies on private and social rates of return that we are aware of assume a degree is obtained in four years. This optimistic assumption biases upward the rates of return calculated in these studies.

25Some drop-outs may eventually return for a degree or may transfer to an out-of-province institution.

26Except for books, figures are again from *Financial Statistics on Education* for 1990. The book charge is $590 which is the figure used by Vaillancourt and Henriques for 1981 increased by the increase in the CPI between 1981 and 1990.

27The average wage for university men is $33.3 thousand compared to $18.4 thousand for university women. These averages reflect the low earnings of each sex during the college years (one-third the high school equivalent) and the presence of part-time employment effects (which differ by sex).


29Students are typically not, more than any other member of society, direct beneficiaries of research. There may be small second-order benefits because of complementarities in research and teaching activities (e.g., that research improves teaching). Because of these economies of scope one could argue that research and teaching should be jointly provided.

30Obviously this conclusion is attenuated if there are significant positive additions to human capital. In fact, Osberg (1994) reports earnings regressions for the Atlantic Region (his Tables A1 and A2) that suggest that men and women with “some university” education earn a premium over high school graduates that is 24 percent of the premium earned by degree recipients. Incorporating this assumption into our calculations increases each of the “pessimistic” figures cited in the text by about one-half percent.

31Comparing results is difficult since the studies use different data sets and slightly different procedures for measuring benefits and costs. There are many factors on both the cost and benefit side that can influence the IRR results. One factor unique to our study is the 4.57 year college degree. To show how this can influence the results, a four-year assumption would raise the private return for men from 7.6 to 9 percent, and the social returns from 6.1 and 6.9 (no research costs) to respectively 7 and 8 percent.

32One can also argue that, on the education account, New Brunswick, a “have-not” province, is presently a net contributor of educated outmigrants to the Canadian federation. Nova Scotia, with its 11 universities, could probably make a similar and stronger argument in this regard.

**References**


Memorial University (1992), Collective Agreement between Memorial University of Newfoundland and the Memorial University of Newfoundland Faculty Association (St. John’s).


____ (1992), Universities: Enrolment and Degrees 1990, Catalogue no. 81-204 (Ottawa: Statistics Canada).


## APPENDIX
### Earnings Regressions for New Brunswick

<table>
<thead>
<tr>
<th></th>
<th>Men High School</th>
<th>Men Bachelor's</th>
<th>Women High School</th>
<th>Women Bachelor's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>5.165 (22.30)</td>
<td>5.796 (10.51)</td>
<td>6.602 (21.75)</td>
<td>6.529 (10.22)</td>
</tr>
<tr>
<td>Age</td>
<td>.226 (17.56)</td>
<td>.190 (8.15)</td>
<td>.108 (6.49)</td>
<td>.148 (4.81)</td>
</tr>
<tr>
<td>Age squared</td>
<td>-.0024 (14.70)</td>
<td>-.0018 (6.79)</td>
<td>-.0010 (4.90)</td>
<td>-.0015 (3.92)</td>
</tr>
<tr>
<td>Humanities</td>
<td>-.1198 (2.15)</td>
<td>-.752 (1.30)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social sciences</td>
<td>.343 (.58)</td>
<td>-.650 (1.15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commerce</td>
<td>.184 (.36)</td>
<td>.635 (.72)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pure science</td>
<td>.107 (.19)</td>
<td>.157 (.23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineering</td>
<td>.716 (1.45)</td>
<td>.642 (.49)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health</td>
<td>1.067 (.90)</td>
<td>.395 (.64)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humanity age</td>
<td>.019 (1.37)</td>
<td>.001 (.086)</td>
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<td></td>
</tr>
<tr>
<td>Social science age</td>
<td>-.001 (.07)</td>
<td>.019 (1.25)</td>
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<td></td>
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<tr>
<td>Commerce age</td>
<td>.002 (.13)</td>
<td>-.022 (.78)</td>
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<tr>
<td>Pure science age</td>
<td>.0003 (.02)</td>
<td>-.011 (.54)</td>
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<td></td>
</tr>
<tr>
<td>Engineering age</td>
<td>-.008 (.64)</td>
<td>-.002 (.07)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health age</td>
<td>-.016 (.62)</td>
<td>-.010 (.57)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R^2$ adjusted</td>
<td>.34</td>
<td>.31</td>
<td>.09</td>
<td>.12</td>
</tr>
<tr>
<td>F</td>
<td>231.8</td>
<td>14.95</td>
<td>46.3</td>
<td>5.44</td>
</tr>
<tr>
<td>n</td>
<td>908</td>
<td>444</td>
<td>942</td>
<td>456</td>
</tr>
</tbody>
</table>

**Note:** Dependent variable is logarithm of earnings. Figures in brackets are t-statistics.

**Source:** Regressions provided by François Vaillancourt using data drawn from the 1991 Census individual micro data file.