

Returns to Investment in Ontario University Education, 1960-1990, and Implications for Tuition Fee Policy

DAVID A.A. STAGER

University of Toronto

Abstract

Because students' university enrolment decisions are influenced by expected returns to their educational investment, policy decisions should be informed by calculations of such returns. Private rates of return, by field of study, for Ontario university graduates in 1990 ranged from 7% (humanities) to 21% (medicine). Returns were generally higher for women than for men. The 1990 results were virtually unchanged from 1985 when there was a sharp reversal of the long-run decline in rates of return that occurred from 1960 to 1980. Alternative assumptions about tuition fee levels show that doubling tuition fees from 1990 levels, or abolishing fees, would change the rates of return by only about two percentage points in either direction. Doubling fees in the major professional faculties would leave rates of return still in excess of returns to arts and science at current fee levels.

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Résumé

Les personnes, qui décident si elles veulent fréquenter l'université, tiennent compte du rendement du capital qu'elles auraient à investir aux fins de leurs études. Par conséquent, ce facteur devrait être pris en considération dans l'élaboration des politiques en matière d'enseignement supérieur. Selon la discipline de formation, les taux de rendement propres aux diplômés des universités ontariennes variaient en 1990 de 7% (lettres et sciences humaines) à 21% (médecine). Les taux en question étaient en général plus élevés chez les femmes que chez les hommes. Les résultats de 1990 étaient à peu près identiques à ceux de 1985, soit l'année où un net revirement s'était produit par rapport à la diminution constante des taux qui avait eu lieu de 1960 à 1980. Selon d'autres hypothèses sur les incidences du niveau des frais de scolarité, le fait de doubler les frais en vigueur en 1990 ou de carrément les abolir donnerait lieu à une variation du taux de rendement n'atteignant qu'environ deux pour cent dans un sens ou dans l'autre. Même si les frais de scolarité perçus par les principales faculté professionnelles étaient doublés, les taux de rendement de leurs diplômés seraient toujours supérieurs à ceux que les diplômés des programmes d'arts et de sciences obtiennent en fonction des frais de scolarité actuels.

Students' decisions about postsecondary educational alternatives are strongly influenced by the expected return to investment in further education. While students do not make explicit calculations of rates of return, they do respond to changes and differences in implicit estimates of these returns. Indeed, there is evidence to suggest that changes in the rate of return have sometimes accounted for more of the variation in enrolments than have changes in either fees or family income (Freeman, 1986). It can also be argued that the postsecondary enrolment growth in the 1960s was due less to the increase in the college-age population than it was to the higher participation rate based on favourable expectations about future earnings for university graduates (Vanderkamp, 1988). Similarly, the slower growth or decline in enrolments in the early 1970s was due mainly to a deterioration of economic conditions and students' employment expectations (Gordon, 1981). Since then, enrolments have

increased more quickly, especially in the programs with the higher expected returns. Furthermore, the recent high enrolments of female students may be attributed in part to the higher expected rates of return for women than for men in most programs.

This paper has three purposes: first, to estimate the return on investment in 1990 for various university programs of study in Ontario; second, to determine whether the increasing returns that were observed for 1985 have continued into this decade; and third, perhaps most important, to explore the effects of alternative tuition fee levels on the estimated returns for various programs.

Estimating Rates of Return to Education

The return to educational investment is usually calculated in terms of the internal rate of return by comparing the benefits with the costs.¹ This measure is directly comparable with the yield rate on investment in physical capital. The internal rate of return to investment in university education can be calculated both for an individual student (private returns) and for the whole economy (total returns). For an individual, the benefits of education are numerous: the increased earnings of university graduates over those of high school graduates; a wider range of opportunities for employment and further education; social status and prestige; enjoyment of learning; and many more. The student's costs of education include expenditures for tuition fees, books, supplies, other direct expenditures, and the net earnings forgone while not in the labour force. (Room and board and transportation expenditures should be included only to the extent that they exceed comparable costs that would have to be incurred by students in an alternative activity.) This comparison of the private costs and benefits is illustrated in Figure 1. The shaded areas show the cost components (forgone earnings, books, tuition fees, etc.) and the benefits (after-tax earnings differential) that are compared in calculating the rate of return. The actual monetary returns attributed to investment in university education are represented by the differentials between the earnings of university and high school graduates, as shown in Figure 2.²

Figure 1
Private costs and returns to investment in higher education

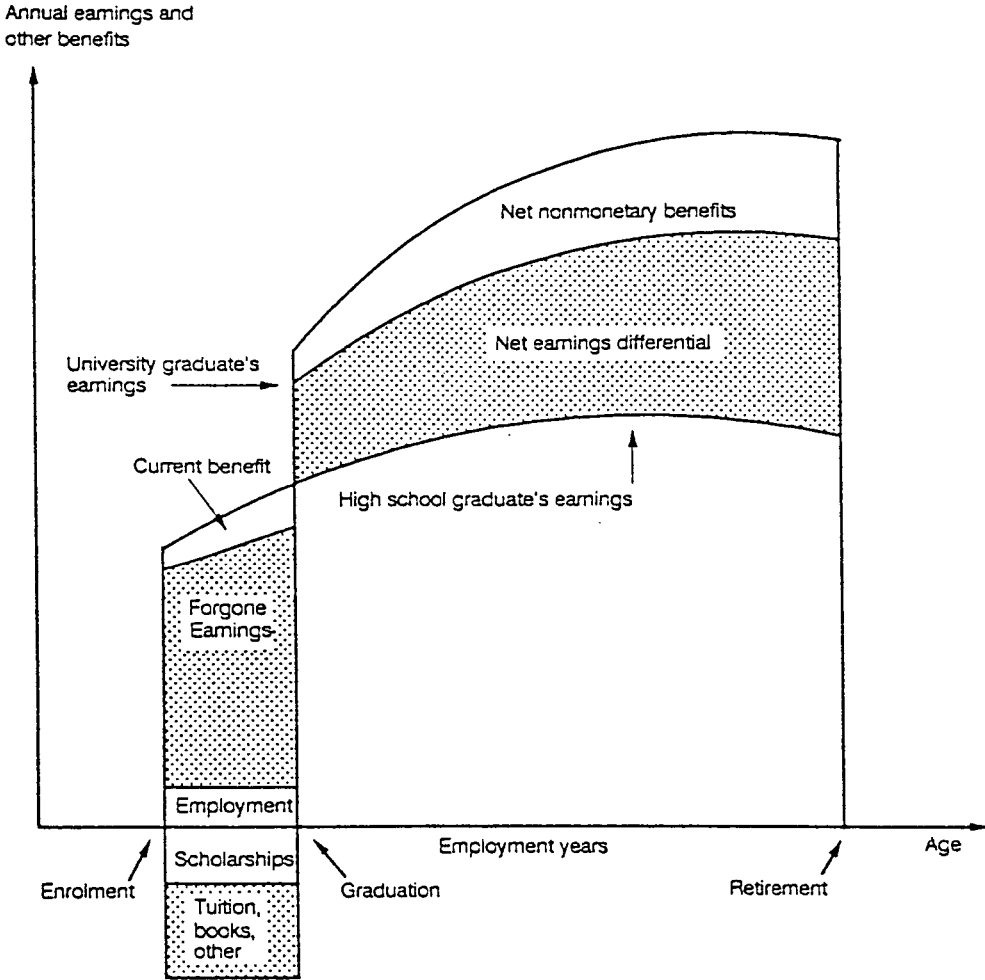
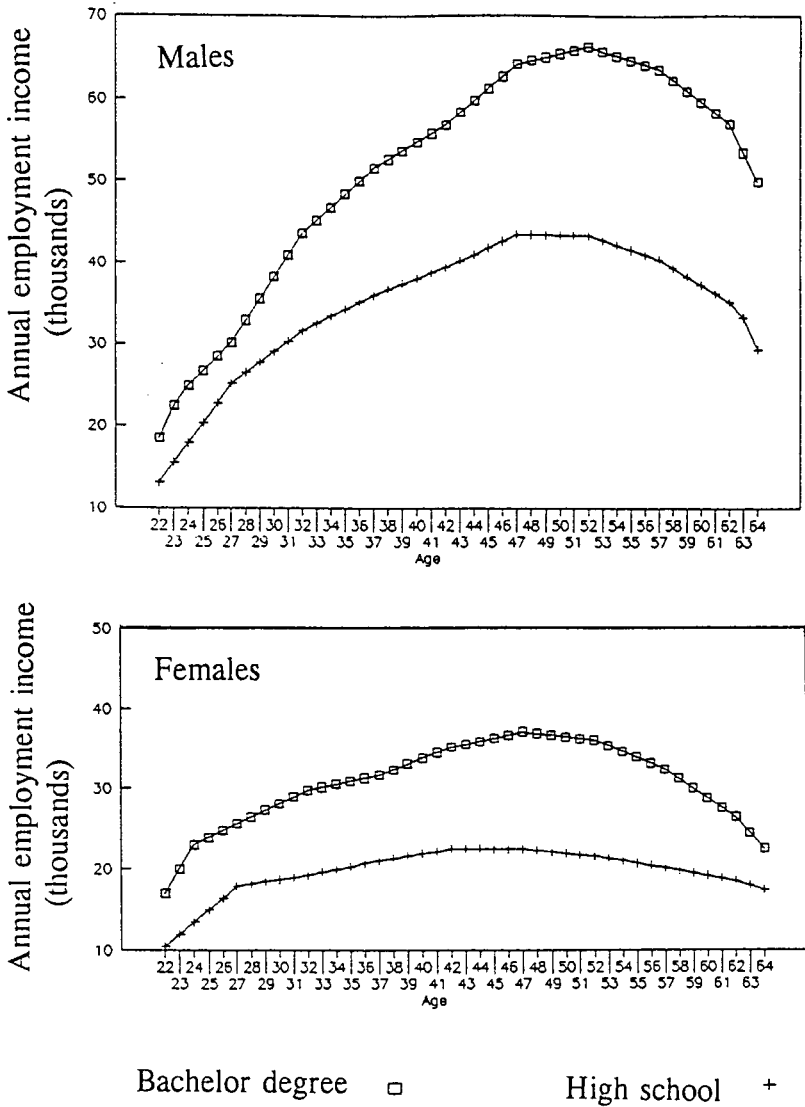


Figure 2
 Lifetime earnings for university and high school graduates by age,
 Ontario 1990



The benefits of education for the economy as a whole consist primarily of the benefits accruing to an individual graduate, plus 'externalities' – the benefits accruing to the rest of the economy. These include the increment in output from others whose productivity is indirectly affected by the higher levels of education; and other benefits such as technological progress, a better informed electorate, higher quality of political and business leadership, and so on. The economy's total costs of university education include the direct expenditures made by universities for salaries, books, supplies, and equipment; the implicit costs of depreciation and forgone interest on physical plant and equipment; tax exemptions; students' expenditures for books, supplies, net costs of accommodation and travel; and the value of the output forgone while students are not in the labour force.

While benefit-cost analysis of education has some shortcomings if improperly interpreted, the basic logic of the analysis is unassailable. This approach simply compares all benefits and costs associated with a particular program to determine whether there is a net gain or loss. The criticisms of benefit-cost analysis in postsecondary education are mainly concerned with the earnings data: they are historical and may not represent future earnings; all of the earnings differential between two groups is attributed to formal education without allowing for 'innate ability'; and the differential may simply be a premium employers pay for the screening process in university education (Blaug, 1985).

Although some of these objections are important when broad comparisons are made – such as between health and education programs – they become less serious when similar programs are compared. The more important objections are: first, that much of the private nonmonetary benefit and the external benefit is omitted from the calculation of total economic returns to education but, to this extent, the calculations underestimate the true returns; and second, that part of the earnings differentials between occupations may reflect different labour market structures or conditions rather than a return to human capital. Comparisons of rates of return to different university programs of study avoid most of these methodological problems, however, because variations in externalities, ability, and screening effects are less significant within this group than between high school and university graduates.

Returns to Investment in University Education by Program of Study, 1990

The rates of return to various programs of study in Ontario universities for 1990 are presented in Table 1. These rates can be compared in three directions: across programs, between genders, and for private and total investment in education.³ The private rates of return for male graduates in humanities, social sciences, biological and physical sciences range from 7% to 15%; they are higher for law, engineering, and commerce (15% to 16%), and are highest for medicine (almost 21%).

A major part of the difference in returns may be related to genuine productivity differences both in terms of variation in the number of hours worked per week and in productivity per hour. Moreover, there is a return to managerial enterprise in the case of many self-employed professionals, such as lawyers, accountants and engineers, who employ paraprofessionals.

The private returns for women are higher than for men, with the exception of medicine; indeed, the return for women is more than twice that for men in the case of humanities and the biological sciences.

The (total) rates of return for the whole economy are lower than the private rates in all cases. Although the before-tax income used in the total rate of return calculation is greater than the after-tax income used in calculating private rates, it does not offset the higher total cost because the income differential is greatest at higher ages where the differential is substantially discounted in the present value formula.

Changes in the Rates of Return, 1960 to 1990

There was a significant drop in the rate of return to university education in several countries during the 1970s. This decline was symbolized in the titles of two articles that appeared with a fifteen-year interval: in 1960 Becker published the pioneering article, "Underinvestment in college education?"; in 1975 Freeman responded with an article titled "Overinvestment in college training?". Freeman also attracted much attention with his book, *The Over-Educated American*, in which he

Table 1
**Rates of Return¹ for Bachelor and First Professional Degree
 Programs, Ontario, 1990**

Program	Private		Total	
	Males	Females	Males	Females
Humanities, Fine Arts	7.3	14.8	5.3	9.9
Social Sciences ^a	12.8	17.0	9.9	11.4
Commerce	16.2	21.8	12.7	14.8
Biological Sciences	6.8	15.0	4.7	9.9
Maths, Physical Sciences	15.1	21.2	11.5	14.6
Health Professions ^b	14.9	21.0	10.1	12.3
Engineering ^c	16.0	19.8	11.5	12.6
Law	15.0	16.0	13.0	12.4
Medicine ^d	20.8	19.7	14.4	11.8
All Bachelor Degree Programs	13.8	17.6	10.7	11.9

¹ See endnote 1 for a definition of the rate of return

^a Excludes Commerce, Social Work, and Law

^b Includes Nursing, Pharmacy, and Rehabilitation Medicine

^c Includes Architecture

^d Includes Dentistry, Veterinary Medicine, and Optometry

reported earlier findings: the average private rate of return for male⁴ graduates of American four-year colleges had been about 11.0% from 1939 to 1959, increased to 11.5% in 1969 and then dropped to 10.5% in 1972 and to 8.5% in 1974 (Freeman, 1976). A similar decline during the 1970s was found in private rates of return in the United Kingdom for male university graduates, especially those in science and engineering (Wilson, 1980).

Indeed, a review of studies from many countries suggested that this decline was a global phenomenon (Psacharopoulos, 1989).

Comparable estimates for Ontario show that the average private return for male university graduates dropped from 17.4% in 1960 to 12.2% in 1970; it had declined further by 1980, to 9.9%.⁵ But the decline in returns to higher education in the 1970s was a cyclical condition rather than the beginning of a long-term trend. The rates of return increased rather sharply: by 1985, the private rate of return for male graduates of Ontario universities was 14.0% (Stager, 1989). And the estimates reported in this paper show that it continued at virtually the same level (13.8%) to 1990. Other studies reported a similar upturn in rates of return in the United States during the 1980s (Cohn & Hughes, 1994).

This rise in the rates of return has been attributed to the slower increase in supply of new graduates than in the demand for their services (Murphy & Welch, 1989). This would confirm Freeman's forecast that the relative earnings of new college graduates would "improve moderately in the 1980s and rapidly in the later 1980s, though not to the boom conditions of the 1960s" (Freeman, 1976, p. 187). These results may appear counter-intuitive in an era when there is some concern about unemployment and underemployment of university graduates. The data used in these calculations do, however, take employment conditions into account since the reported earnings reflect the quantity and quality of graduates' employment. Indeed, it is partly because university graduates fare better through recessions than do high school graduates that the returns have increased since the 1970s.

Implications for University Finance and Tuition Fee Policy

The long cycle in the rates of return from 1960 to 1985 shows the need to take a long view in planning and financing university education. During the 1960s, economists advised governments to increase investment in higher education because the returns on this investment were higher than for most other economic activity. Governments were happy to have this rationale for educational policies that were already well underway. The result was not only a rapid increase in university enrolment but also a substantial increase in the real expenditure per student.

But the declining returns to this investment in the 1970s caused governments to react too quickly with 'cutbacks' on educational spending instead of recognizing that the economy needed time to adjust to the substantial increase in the supply of graduates, and to the higher average level of skills in the labour force.

Meanwhile, two basic changes were occurring in the labour market: first, with higher consumer incomes and changes in technology the demand for graduates' services increased more quickly; and second, the graduates of the 1960s were acquiring the experience that must complement formal education to produce the pay-off in higher earnings. By 1985 the graduates of 1965 were in their early forties and were approaching the peak earning years of ages 45 to 55. The result was the rise in the return on investment in university education.

In assessing the significance of the rates of return for public policy purposes, it should be recalled that they omit most external benefits and therefore provide a lower estimate than the true rate of return on educational investment. Nonetheless, the returns are high when compared with other uses of economic resources. The total rates of return can be compared with the 10% rate that is used by government agencies, such as the federal Treasury Board, because it approximates the real pre-tax rate of return on private investment (Vaillancourt & Henriques, 1986). The private rates of return can be compared with the rate of 3 per cent that approximates the real after-tax return on private capital (Burgess, 1981).

Based on these benchmarks, one can conclude that the allocation of resources to university education remains a rational investment from the perspective of the whole economy. Even if externalities were not valued highly, the direct monetary returns alone would be more than sufficient to warrant an increase in the level of resources used in university education. The possible exceptions are for males in humanities and biological sciences where the returns are only about five per cent. But since a large fraction of graduates of these programs are in teaching, where salaries and the demand for teachers are determined by public policy, the return to investment in these fields may be strongly biased by public sector salary policies.

Table 2
**Private rates of return, under alternative tuition fee levels, for
 Bachelor and First Professional Degree programs, Ontario, 1990**

Program	Tuition:	Males			Females		
		Zero	Current	Double	Zero	Current	Double
Humanities, Fine Arts		8.5	7.3	6.4	17.7	14.8	12.7
Social Sciences ^a		15.1	12.8	11.1	21.5	17.0	14.1
Commerce		18.5	16.2	14.5	26.1	21.8	18.7
Biological Sciences		8.5	6.8	5.7	19.0	15.0	12.4
Maths, Physical Sciences		17.5	15.1	13.4	25.3	21.2	18.3
Health Professions ^b		17.3	14.9	13.0	25.3	21.0	17.9
Engineering ^c		18.3	16.0	14.3	23.2	19.8	17.3
Law		16.3	15.0	13.9	18.2	16.0	14.3
Medicine ^d		22.7	20.8	19.3	22.1	19.7	17.7
All Bachelor Degrees		15.9	13.8	12.3	21.3	17.6	15.1

¹ See endnote 1 for a definition of the rate of return

^a Excludes Commerce, Social Work, and Law

^b Includes Nursing, Pharmacy, and Rehabilitation Medicine

^c Includes Architecture

^d Includes Dentistry, Veterinary Medicine, and Optometry

While the total rates of return indicate that the economy's allocation for university education is rational, (and should be increased in most fields), this does not necessarily mean that the current sharing of costs between students and taxpayers is at the appropriate level. Because the private rates of return in all fields are quite high by comparison with the 3% criterion reported by Burgess (1981), the private share of the cost could be increased substantially before the declining rate of return would result in lower enrolment. (It should be noted that a private rate of return

on education of ten per cent is an after-tax return of ten per cent annually for forty years. No other personal investment can begin to compare with this rate of return.)

The effect on the rates of return of shifting the private-public cost ratio is shown by the data in Table 2. A doubling of the tuition fee (i.e., a 100% increase - from \$1,950 to \$3,900) would reduce the private rate of return for males by only about 1.5 percentage points. Alternatively, abolition of tuition fees would increase the rate only by about 2 percentage points. More important, doubling the fees - which would increase the private share to about 40% of the total direct cost - would leave the private rate of return in the range of 10% to 20% for most programs.

In the case of women, doubling the tuition fee would reduce the rate of return by about 3 percentage points but, with the exception of medicine, would still leave them with a higher return than for men. Furthermore, the rates of return for women would still be in the range of 12% to 19%, and would remain a strong economic incentive for enrolling in any of the university programs.

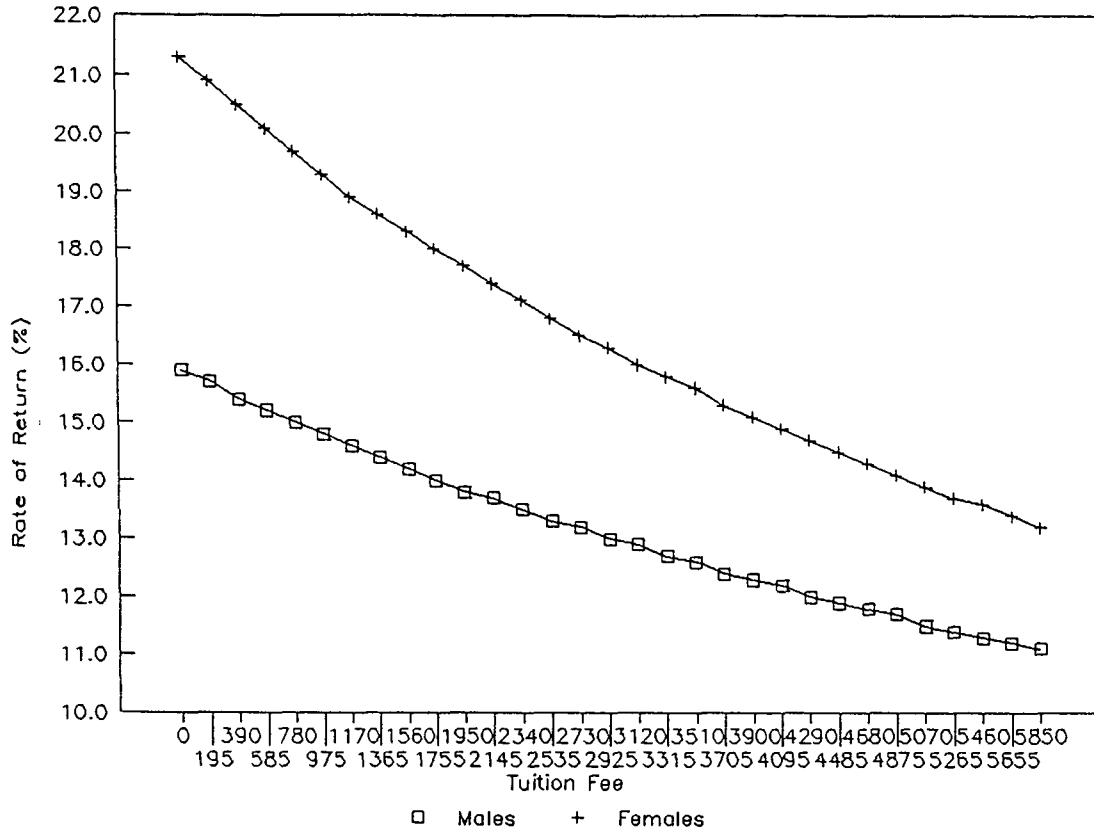
The effect of incremental changes in tuition fees on the rates of return for men and women (all bachelor degree programs) can be seen in Figure 3, where fees are changed by 10 percentage steps in each direction from the current level. For example, this graph shows that the ten per cent increase in tuition fees that has been announced by the Ontario government for each of 1994-95 and 1995-96 will reduce the private rates of return by less than one-half percentage point.

The greater sensitivity of women's rates of return to changes in fees is explained by their higher ratio of fees to forgone earnings. (Table A1 shows that women's forgone earnings are about three-quarters of men's forgone earnings.) Consequently, changes in fees represent larger relative changes in women's total costs.

Comparisons of the rates of return across programs of study also suggest that there could be a greater differentiation of tuition fees by program. For example, if fees were to be doubled for commerce, engineering, law and medicine, the rates of return for both men and women (with the exception of female law graduates) would still exceed the rate of return in the social sciences at the current fee level.

Figure 3

Private rates of return, all bachelor degrees, under alternative tuition fees



Conclusions

Because students view their postsecondary education primarily as an investment that is expected to result in wider employment options and higher incomes, it is important to estimate the rates of return to these estimates over time and across fields of study. The internal rates of return to university education in Ontario are higher than for many other private and public projects, differ greatly across programs, and generally are higher for women than for men. These results are a major factor in the increasing participation rate in university education, especially for women.

The study's results also show that the higher returns to education in the early 1980s, following a decline during the 1970s, have continued through to the beginning of this decade. Most important, the estimates presented here show that major changes in tuition fees have little effect on the rate of return. This is because tuition fees are such a small portion of the student's total cost of university education. While it is not the purpose of this paper to propose a specific share for the private contribution to the total cost of university education, it does suggest strongly, however, that a major change in the level of fees would likely have very little impact on enrolment. It also presents preliminary evidence that would support a greater differentiation of fees across university programs, possibly in proportion to their rates of return on investment. 🍁

Appendix

Data and Assumptions

Rates of return to university programs were estimated using the mean earnings by five-year age-group for graduates of various university programs and for high school graduates. These data were provided by Statistics Canada from the 1991 population census of Canada.⁶ Earnings include wages and salaries plus self-employment income for part-time and full-time workers for the calendar year 1990. The age-group earnings were interpolated for individual year of age and were then adjusted for life expectancy⁷ and labour force participation.⁸ These latter adjustments are necessary because the rates are calculated as the average for

the whole cohort that commences a given university program. Not all of this cohort will survive to retirement age nor participate in the labour force. But adjustment for employment status (within the labour force participants) is not required because the earnings data reflect both part-time work and unemployment. For calculations of the private rates of return, the earnings were also reduced by the amount of personal income tax.⁹

The implicit costs of earnings forgone while at university are based on employment income for high school graduates, for ages 19 to 24, also obtained from the 1991 census (See Table A1). The actual forgone earnings were adjusted upward on the assumption that university students would have earned more than the average for high school graduates.¹⁰

The students' costs and the institutions' costs for each program are shown in Table A2. Data for students' costs are estimated from A Profile of Post-Secondary Students in Canada, Statistics Canada, 1987. Direct institutional costs are based on the value of the basic operating income, consisting of the provincial government grant, multiplied by the weight that is assigned to each enrolment in a specific program, plus the tuition fee for that program. Indirect institutional costs include depreciation and forgone interest associated with fixed assets and tax exemptions for educational institutions.¹¹

Sensitivity to Assumptions

The sensitivity of estimated returns to the assumptions employed in this study was tested in alternative calculations. Estimates based on cross-sectional earnings data are sometimes criticized for not taking account of expected real economic growth over a graduate's lifetime. But the effect of real growth can easily be estimated. For example, an assumption of a 2% annual growth in real income over the graduate's working lifetime would add two percentage points to the calculated rate of return since the compounded growth rate is symmetrical with the compounded discount rate, that is, the estimated internal rate of return.

Studies have also shown that part of the observed earnings differential associated with higher levels of education can be attributed to 'innate ability' and/or the interaction of this ability with formal education (Welland, 1980). This effect has been taken into account in some studies

Table A1
Forgone earnings for university undergraduates, by age and gender,
Ontario, 1990

Age	Actual ^a	Ability Adjusted ^b	After Tax ^c	Part-time Earnings ^d	Forgone Earnings	
					Private ^e	Total
Males						
19	8,537	9,903	9,428	2,200	7,228	7,703
20	10,042	11,649	10,810	2,750	8,060	8,899
21	11,547	13,395	12,189	3,300	8,889	10,095
22	13,050	15,138	13,503	3,850	9,653	11,288
23	15,500	17,980	15,715	4,400	11,315	13,580
24	17,948	20,820	17,905	4,950	12,955	15,870
Females						
19	6,947	7,642	7,459	1,650	5,809	5,992
20	8,098	8,908	8,587	1,980	6,607	6,928
21	9,240	10,164	9,554	2,420	7,134	7,744
22	10,390	11,433	10,644	2,860	7,784	8,573
23	11,888	13,077	11,900	3,300	8,600	9,777
24	13,392	14,731	13,184	3,740	9,444	10,991

^a Mean annual employment income of high school graduates.

^b Actual forgone earnings increased by 16% for males and 10% for females.

^c Adjusted for federal and provincial (Ontario) income tax.

^d Mean summer employment earnings, reduced by 20% for unemployment and non-participation.

^e Private forgone earnings are net of income tax.

Table A2
Costs per full-time student-year for university programs, Ontario, 1990

Program	Students' Costs		Institutional Costs	
	Fees ^a	Books, etc ^b	Direct ^c	Indirect ^d
Humanities, Fine Arts	1,890	1,250	7,160	4,296
Social Sciences	1,890	1,250	7,160	4,296
Maths, Physical Sciences	1,890	1,400	7,160	4,296
Biological Sciences	1,890	1,500	7,160	4,296
Commerce	1,890	1,250	7,160	4,296
Health Professions ^e	1,890	1,400	8,916	5,350
Engineering	2,030	1,500	9,056	5,434
Law ^e	1,890	1,400	7,160	4,296
Medicine ^e	2,330	1,800	19,895	11,937
All Bachelor Degree Programs	1,950	1,350	7,400	4,440

^a Includes tuition and incidental fees

^b Includes books, supplies, and transportation.

^c Tuition and incidental fee revenue, plus basic formula grant (\$3,513) multiplied by program weight: Health Professions and Engineering = 2.0; Medicine = 5.0; all others = 1.5.

^d Indirect costs (depreciation, forgone interest, forgone taxes) are estimated as 60% of the direct costs.

^e Costs for law graduates are assumed to include three years in social sciences and three years in law school. Costs for medicine graduates are assumed to include two years in biological sciences and four years in medical school.

by reducing the observed earnings differential by 20% to 40%. An assumption that the ability factor accounts for as much as 40% of the differential would reduce the rate of return by about 25% for most programs. However, a recent study (Ashenfelter & Krueger, 1994) suggests that the 'ability factor' has been overestimated and likely is negligible.

The adjustment of forgone earnings, on the assumption that university students would have earned more than the other high school graduates if they had chosen to enter the labour force rather than university produces only a minor effect on estimated returns: the returns for engineering and law are increased by about one percentage point and for humanities it is less than one-half point. The estimated returns are not very sensitive to the arbitrary assumption that indirect institutional costs are 60% of direct costs; the omission of indirect costs altogether increases the estimated returns by about one percentage point for most of the programs. Finally, when students were assumed to enter medicine or dentistry programs with three (rather than two) preparatory years, the returns were reduced by slightly more than one percentage point.

Notes

¹ The internal rate of return is the discount rate that will equate the discounted benefits and costs; that is, where the net present value is zero. This rate is found by iteration in the formula:

$$V_a = \sum_{t=1}^n \frac{B_t}{(1+i)^t} - \sum_{t=1}^m \frac{C_t}{(1+i)^t}$$

where V_a is the net present value at age a , C_t is the cost in year t , B_t is the benefit (adjusted earnings differential) in year t , m is the duration of the educational program, n is the working lifetime in years, and i is the discount rate.

² University graduates included in this analysis are persons with a bachelor degree or with a doctorate degree in medicine, dentistry, veterinary medicine, or optometry. Persons with a master's degree or other doctorate degree are not included. High school graduates are persons whose educational qualification is a secondary school graduation certificate.

³ See the Appendix for sources of data and assumptions used in calculating these rates of return.

⁴ Calculations of rates of return were based only on male graduates in earlier periods because female graduates had much lower labour force participation rates and were concentrated in a few occupations. Their labour force experience has changed substantially in three decades, such that more reliable calculations can be made for the later 1980s.

⁵ Other results for Canada and/or Ontario for the period 1960 to 1985 have been reported by Mehmet (1977), Cousineau & Vaillancourt (1987), Vaillancourt & Henriques (1986), Vaillancourt (1995), and Constantatos & West (1991) but variations in the data and/or assumptions used in each of these studies prevent direct comparisons with the results reported here.

⁶ Earnings tables are available from the author on request.

⁷ Life expectancy is actually the percentage of the original cohort that survives to each age level and was based on mortality tables, by gender, for Ontario for 1980-82 (Statistics Canada, *Life Tables, Canada and Provinces 1980-82*, no. 84-532).

⁸ Labour force participation rates by gender and educational level for Ontario were estimated from data for 1986 (Statistics Canada, *Census of Canada, 1986*).

⁹ The income tax adjustments were based on the effective rates of federal and Ontario tax on total income by detailed income class for 1990 (Revenue Canada, *Taxation Statistics*, 1992 edition, summary Table 2).

¹⁰ The assumed differential in the 1968 study was 16% for males and 10% for females; the same differential was used in this study to permit a direct comparison of results. One could also rationalize the opposite adjustment. Willis & Rosen (1979) have estimated that those who attend university would have earned less as high school graduates than measurably similar people who entered the labour force directly from high school.

¹¹ These costs were set at 60% of the direct costs. A ratio of 47% was estimated by a detailed examination of institutional financial statements for calculating the 1960 rates of return (Stager, 1968). The higher ratio for subsequent years takes the 1960-75 expansion into account, and permits direct comparison with previous calculations for 1985 (Stager, 1989).

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