Recent Changes in Effective Tax Rates on PSE Level Human Capital in Canada

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I. Introduction

There has been considerable interest in recent years in the tax treatment of education and training. Boskin (1975) analyzed and described the different incentive effects of the tax system on human capital. Since then these effects and their welfare consequences have been studied in a general equilibrium context by Davies and Whalley (1991), Dupor et al. (1996), Perroni(1995) and Heckman et al. (1999). Some features of the tax system, e.g. progressivity, tend to discourage human capital formation, while others, e.g. deductions or credits, have the opposite effect. In order to know the net impact, one needs estimates of the effective tax rate (ETR) on human capital. The ETR is the difference between gross and after-tax rates of return to human capital. It takes into account support students receive via the tax system while in school, tax support parents may receive in saving for the kids' education, and taxation of income flows over the lifetime after graduation.

As in the case of any other investment, when investing in human capital there is an initial net outflow (e.g. cost of a university education) and later a series of net inflows (e.g. the increase in income received over the lifecycle as a result of going to university). While it is nice to have a high before-tax rate of return, the bottom line is the after-tax return. The ETR is a tool that allows us to say just how much the tax system reduces this return. The ETR on human capital reflects the propensity of the tax authority to garnish the (future) wages of those investing in human capital. The higher the ETR, the more the tax system "penalizes" the individual for investing. The purpose of this paper is to explore the size of this penalty and how it may affect human capital investment in Canada.

While many studies of the rate of return to human capital investment have been performed that could have identified the ETR, in practice this has not generally been done. (See e.g. Stager, 1996; Vaillancourt, 1995, 1997; Vaillancourt and Bourdeau-Primeau, 2002; Rathje and Emery, 2002.) Published results of these studies tend to

compare the *public* rate of return on human capital investment and the after-tax rate of return to the individual. The difference between these two rates is an indicator of the total impact of taxes and expenditures, but it does not identify their separate effects. Given that significant changes in the tax treatment of education and in tax rates have taken place in Canada in recent years separating these impacts is of interest.

In previous work (Collins and Davies - - hereafter "CD", 2003, forthcoming) we set out the idea of the human capital ETR and provided some analysis of its theoretical properties. Mintz (2001) reports the results of related work. CD (2003) did a Canada/U.S. comparison, using 1998 SCF earnings data for Canada and March 1998 CPS data for the U.S. Results showed that ETRs on university level human capital were about twice as high in Canada as in the U.S. CD (forthcoming) used 1995 SCF data to estimate ETRs at the university level under the 1998 tax system. We found that these were sizeable although not as large as marginal ETRs found for physical capital by previous authors. They varied considerably across individuals. On average they were greater for males than for females, and increased with income. The ETRs were lower for individuals who took out student loans, and for those who took advantage of Registered Education Savings Plans (RESP's). There were also differences in ETRs created by a number of other tax features. The conclusion was that Canada had far from uniform tax treatment of human capital.

This paper examines the impact of the changes in the tax system since 1998 on first degree university level human capital ETRs in Canada. We model the impacts of both personal income tax and the two major payroll taxes, CPP and EI. As in our previous work we use the Ontario system to represent provincial taxes. Our results take the form of a comparison of 1998 and 2003. In both cases we use the 1998 SCF as our source of earnings data, allowing us to concentrate on the impacts of changes in taxation.

There have been important changes in the tax system affecting human capital since 1998. One is that students' tax credits have become more generous. The education amount was $200 in 1998, but rose to $400 federally for the 2003 tax year. Another is

that the federal personal income tax (PIT) rate schedule has changed considerably. In 1998 we still had three tax brackets, with marginal tax rates (mtr's) of 17, 26, and 29%. The 2001 tax year saw this replaced by four tax brackets with rates of 16, 22, 26, and 29% and less steep progression over a broad middle income range. All surtaxes had also been eliminated by 2003. The result of these changes was that both PIT progressivity and average tax rates had fallen significantly, both of which tend to reduce human capital ETRs, as we shall see.

In addition to studying ETRs, CD(forthcoming) compute effective subsidy rates (ESR's). ESRs reflect the subsidy per full-time equivalent student that results from governments' direct grants to universities and subsidized student loans. The values of the ESRs will differ depending upon a number of factors. For instance, fields of study are treated differently in provincial funding formulas. The physical sciences, engineering and medicine are more heavily subsidized, due to their need for laboratories, special equipment, etc., than the humanities or social sciences and, therefore, have much higher ESRs.[1] Interestingly, ESRs are also higher for women than for men - - because equal subsidies are relatively more important for females due to their lower earnings. CD(forthcoming) find that, on average, for both genders combined, ESRs were larger than ETRs. And for females they were more than twice as great. Since 1998 tuition and ancillary fees have risen considerably at most Canadian universities and operating grants from (mainly provincial) governments have declined in relative terms as a source of university finance. This means that ESRs have likely been declining. Unfortunately, we were not able to obtain the data necessary to update our 1998 ESR estimates to 2003, so that we cannot currently say whether ESRs or ETRs have fallen more in the last few years.

The remainder of this paper is organized as follows. The next section lays out the concept of the human capital ETR, and discusses some of its properties and behaviour. Section III then describes the relevant features of the Canadian tax system and how it changed from 1998 to 2003. Our results are presented in Section IV, and Section V concludes.

II. Concepts and Methods

The ETR Concept

Computing the effective tax rate on human capital requires a comparison of before- and after-tax rates of return to human capital. Estimates depend on individual circumstances and require a comparison of the taxes that would be paid in the absence of taking a degree vs. those paid if extra schooling is obtained. The most meaningful calculation compares the before- and after-tax rates of return to participation in a complete education program, whether it be e.g. community college, undergraduate university study, M.A. or Ph.D. work.[2] These tax rates are similar to the commonly computed EMTR's on physical capital in that they measure the effective tax rate on the last meaningful unit of education, but since these units are not small, in our work we examine *effective tax rates* (ETR's) rather than EMTR's.

The ETR for human capital is defined as the gap between gross- and net-of-tax rates of return to a whole program of study, r_g and r_n, respectively:

$$(1) \qquad ETR = \frac{r_g - r_n}{r_g} = 1 - \frac{r_n}{r_g}$$

This definition, which is built on the use of internal rates of return, follows the methodology applied in computing ETRs on personal financial assets by Davies and Glenday (1990).[3]

Suppose that an individual aged t is planning to engage in a program of education that will take m years of study. We will assume that after this program is completed the individual will stay in the labor force until age T. Students may continue to earn while going to school. Their wage rates can vary over time, perhaps increasing while they are still in school, and likely rising in real terms over much of the lifetime after graduation.

Actual earnings before-tax are given by E_t, which is the product of the wage rate and hours worked. Earnings before-tax in the absence of the educational program would have been E_t^*, where we assume that $E_t^* < E_t$ in the T - m years after graduation. Forgone earnings costs of education, FE_t, are thus $E_t^* - E_t$ in the first m years. In addition to these costs, there are private direct costs of education, C_t. After-tax variables will be denoted E_t^a, E_t^{a*}, FE_t^a, and C_t^a. Initially we will assume that human capital investments are self-financed, that is that student loans are absent.

Rates of return on the investment described are calculated as internal rates of return. For example, we can compute the gross private rate of return, r_g, from:

$$(2) \qquad \sum_{t=1}^{T} \frac{E_t - C_t}{(1+r_g)^{t-1}} = \sum_{t=1}^{T} \frac{E_t^*}{(1+r_g)^{t-1}}.$$

By replacing E_t, E_t^*, and C_t with the after-tax variables E_t^a, E_t^{a*}, and C_t^a, we could compute the net after-tax rate of return, r_n, using this same equation.[4] Note that in the case of a flat tax with tuition and other direct costs of education deductible $r_n = r_g$, and ETR = 0. This is because with such a tax levied at the rate, say, τ, we have $E_t^a = (1-\tau)E_t$, $E_t^{a*} = (1-\tau)E_t^*$, and $C_t^a = (1-\tau)C_t$. That is, the three variables have the same relative values after- as before-tax. This type of tax system may be referred to as *neutral* with respect to human capital.[5] It imposes a zero ETR because the forgone earnings and direct costs of education are implicitly subsidized at the same rate, τ, at which the gains from education are taxed.

Note that the term "neutrality" has a special, and limited, meaning here. It is simply a benchmark. There is no implication that a zero ETR on human capital is the optimal rate. Externalities of human capital, or capital market imperfections that make it difficult for students to finance their studies, could call for a negative ETR.[6] Absent such factors, a non-zero ETR could be needed in the second-best solution if there were a positive EMTR on physical capital. In that case, while a low ETR would avoid

depressing investment it would also tilt the playing field away from physical capital investment, causing a distortion in the composition of investment. Clearly, optimal design of the tax treatment of human capital is contingent on any constraints (political or otherwise) on the tax treatment of physical capital.

By replacing private costs with public costs, C_t^p, we can use (2) to compute the public rate of return, r_p. Given r_p we can define the effective subsidy rate (ESR) on human capital:

$$(3) \qquad ESR = \frac{r_g - r_p}{r_g}.$$

Whether the tax and expenditure systems combined have an incentive or disincentive effect on human capital investment can be investigated by computing the *net* effective tax rate on human capital, ETR – ESR.

CD (forthcoming) investigates the theoretical behavior of ETRs in a simple environment where there are just two periods: the schooling period and the working period. Define τ_s as the average tax rate that would have applied to forgone earnings during the schooling period if the person had *not* gone to university, and τ_w as the average tax rate over the working lifetime on the incremental earnings due to taking the university route. The most important results can then be summarized as follows:

i) Zero Direct Costs, No Student Loans:

When C = 0 and there are no student loans we have:

$$(4) \qquad ETR\big|_{C=0} = \frac{r_g - r_n}{r_g} = \frac{\tau_w - \tau_s}{1 - \tau_s}$$

Result 1. The ETR > 0, = 0, or < 0 according to whether $\tau_w > \tau_s$, $\tau_w = \tau_s$, or $\tau_w < \tau_s$. The ETR rises with τ_w and falls with τ_s.

Result 2. If $\tau_w > \tau_s$, equal absolute or equal proportional increases in taus and tauw increase the ETR.

The first of these results indicates that a progressive tax system will have ETR > 0. Also, the ETR will tend to rise with increasing progressivity, which will increase the gap between τ_w and τ_s. The second result has the interesting implication that taxes that are close to just a blowup of the basic tax system, like provincial PIT in Canada outside Quebec prior to the change in the tax collection agreements in 2001, raise the ETR. Moreover, even adding a *flat* provincial income tax to the federal PIT as in Alberta, which would raise τ_w and τ_s by the same absolute amount, raises the ETR. Further, in a lifetime context one could think of general sales taxes, like provincial sales taxes or the GST as approximately equivalent to flat wage taxes. Bringing them into the analysis (which we however do not do in the calculations reported in this paper) would again raise the ETR.[7]

ii) Positive Direct Costs, Student Loans:

Result 3. If C is deductible at a rate less than τ_w, the ETR > 0 if $\tau_w > \tau_s$.

Result 4. Increases in credits or deductions for C or in interest deductibility on student loans reduce the ETR.

Result 5. A rise in tuition or other direct costs raises the ETR.

These results are also relevant in Canada. First, federal PIT gives a tuition credit at the basic federal tax rate of 16%. While the education amount, of $400 per month, also deductible at a 16% rate, adds to this tax assistance, as long as it is not exceeded by non-tuition direct costs we still have that the overall deduction rate on C is not greater than 0.16. Since most university graduates will penetrate tax brackets with higher mtr's over

their working lives, they have $\tau_w > 0.16$. Hence by Result 3, progressivity of the tax system still gives us ETR > 0 even with tax assistance for education expenses.

Result 4 is interesting since interest deductibility on student loans was zero before 1998, when it was made deductible at the base federal PIT rate. Also, the deductibility of C has been increasing via the rising education amount. This greater tax assistance for students reduces ETRs. On the other hand, Result 5 says that the increasing out-of-pocket costs of education we have seen in recent years have likely increased ETRs. This indicates that whether ETRs have been rising or falling is a question that can only be resolved by looking at the data. It also illustrates the interesting point that changes in parameters *outside* the tax system can affect the strength of tax disincentives for human capital accumulation.

Estimation Methods

Rates of return on human capital could be estimated with some precision if we had panel data on education and earnings over complete lifetimes. If, in addition, we had full information about taxes paid, these rates of return could be computed on a before- and after-tax basis. In fact, while some panel data is available, it covers much less than a full lifetime. Also, we are not really so interested in the *ex post* differences in before- and after-tax returns earned by cohorts born long ago. A more likely goal, and the one we try to achieve in this paper, is to try to summarize the incentive or disincentive effects for human capital provided by the tax system that is in force at a particular moment in time. This suggests calculating the after-tax rate of return assuming that the current tax structure stays in place over the long run. This is in a similar spirit to the common practice of estimating human capital rates of return using cross-section earnings data (which we of course also follow).[8]

Our attention in the calculations reported in Section IV is focused on ETRs for people at particular quantiles of the earnings distribution, especially the median. We believe this has more value than computing rates of return and ETRs using average

earnings. Since the skewness of the earnings distribution changes over the lifetime, average earnings do not correspond to the earnings of a person at a constant percentile of the distribution over the lifetime. Also, the rate of return computed using average earnings does not equal the average rate of return. The latter could be estimated by averaging the rates of return for people at all quantiles, which would in general produce a different result.

III. Treatment of Human Capital under the Canadian Tax System

The calculations in the next section incorporate the effects of both the personal income tax system (federal and provincial) and payroll taxes, as they applied in the 1998 and 2003 tax years. As we describe below, federal budgets in the period 1996 - 1998 ushered in a number of changes that provided more tax support for students and for parents saving for their children's education.[9] These were all operative by the 1998 tax year. The last five years have seen further increases in the tax support for students. But, more importantly for human capital ETRs they have seen a significant reduction in the progressivity of the tax system.

The Personal Income Tax (PIT) System in 1998

As shown in Table 1, in 1998 basic federal marginal rates of 17%, 26 % and 29% were levied on taxable income in the ranges 0 - $29,590, $29,591 - $59,180, and $59,181+. (These rates and brackets were in force from 1993 to 1999.) Adding in surtaxes and provincial income tax, the full marginal rates in the three brackets came to about 26, 40, and 46% (Canadian Tax Foundation, 1999, Table 3.5). Important deductions made in arriving at taxable income included those for Registered Retirement Savings Plan (RRSP) and Registered Pension Plan (RPP) contributions and child care expenses. Rather than providing personal allowances or exemptions as in most other

countries, a system of personal credits was applied. These gave all taxpayers the same relief as if they had received personal deductions but were in the 17% marginal tax bracket. On that basis, the credits given were equivalent to deductions of $6,456 for the taxpayer and $5,380 for a dependent spouse or child over 18.

Refundable tax credits for children under 18 were provided via the Canada Child Tax Benefit (CCTB) and the National Child Benefit Supplement (NCBS). The latter were clawed back on family net incomes above $25,921 and $20,921 respectively. These programs have little impact on costs of education, since relatively few students have children, but they increase marginal tax rates for many graduates, and therefore drive up the ETR on human capital somewhat.[10]

The tax relief on tuition and other direct expenses provided by the PIT comes in the form of various credits, not as a deduction. In 1998 a credit was given for 17% of tuition and additional mandatory fees paid to approved post-secondary institutions. A further credit equal to 17% of the "education amount" was provided. The education amount was $80 per month prior to 1996, but was raised in steps to $200 per month by 1998. Since most students have low incomes, these credits would in many cases not be very valuable if they were only available to reduce the student's own tax liability. Their value is enhanced by the fact that any unused portion can be transferred to a spouse, parent or grandparent.[11] Also, in 1997 a carryforward provision for unused education credits was introduced that would allow students to obtain tax relief themselves in later years. These measures ensured that by 1998 the effective implicit federal subsidy on direct costs of education via PIT was close to being uniform at a 17% rate. Adding in provincial tax, the average rate of relief was about 26%.

Note that the "education amount" credits are not related to actual expenditures, but are simply paid as a lump sum. They are thus similar to a system of student grants. This form of assistance would not have a tax-side rationale under a flat tax, but with progressivity might be advocated as a rough offset to the effect of graduated marginal tax rates on human capital ETR*s*.

The PIT system also provides assistance for education and training via registered savings plans. First, Canadians are able to withdraw funds from their RRSP's without penalty two years after contributions are made. This means that, assuming contribution limits are not binding, parents could save for their children's post-secondary education via their RRSP's. While this avenue is no doubt sometimes chosen, it is not as attractive as it might be since RRSP contribution limits have been held at relatively low levels.[12] Also, withdrawals are taxed. Parents will typically be in their peak earning years when their kids go to college, and will therefore face high tax rates on withdrawals. This will also make the RRSP saving route less attractive.

Parents are encouraged to save for their kids' education via Registered Education Saving Plans (RESP's). In contrast to an RRSP, contributions to an RESP are not tax deductible. However, income earned within the plan is tax free, and if the proceeds are spent on the child's education withdrawals of accrued income enter the child's income for tax purposes. Given that post-secondary students are generally in low tax brackets, the result is that the net of tax rate of return on RESP saving generally exceeds that on non-sheltered saving.[13] While RESP's provide a higher rate of return than on non-sheltered saving, in the pre-1998 regime they were not sufficiently attractive to induce much use. This may have been due to the opportunities for fully sheltered saving (e.g. via RRSPs) or because a higher rate of return could be achieved by paying down mortgages and consumer debt.[14]

The 1996, 1997 and (especially) 1998 federal budgets introduced a number of changes intended to reduce burdens on post-secondary students and to stimulate education and training in Canada. The following were the principal changes:

1. The 1996 and 1997 budgets announced that the education amount would be raised from its original $80 per month to $150 per month in 1997 and $200 per month in 1998.

2. The education amount was extended to part-time post-secondary students in the 1998 budget, at $60 per month. Part-time students also became eligible to claim child care expense deduction (CCED) for the first time, up to $2,200 per year.

3. Canada Study Grants (CSG's) of up to $3,000 per year were created in the 1998 budget for both full- and part-time students in financial need who had children or other dependants.

4. Interest on student loans became eligible for a tax credit at the 17% rate in the 1998 budget.

5. Tax-free withdrawals of up to $10,000 per year ($20,000 in total) from RRSPs were introduced in the 1998 budget to finance full-time training or education (or part-time for disabled people). These withdrawals must be repaid within 10 years.

6. The 1996 and 1997 budgets raised the annual contribution limits on RESPs from $1,500 to $4,000 per student, and also increased the lifetime limit on contributions from $31,500 to $42,000. The 1998 budget introduced Canada Education Saving Grants (CESGs) equal to 20% of RESP contributions up to a limit of a $400 annual grant per student. CESG amounts become part of the RESP. The 1998 budget also made it possible to transfer an RESP balance to an RRSP if the student did not go on to qualifying study after leaving high school.

All of these provisions acted to increase the net-of-tax expected return to planned or actual human capital investment for some taxpayers.[15] Note, however, that the incidence of the increased returns varies greatly. Increased education amounts raise r_n for almost all students. On the other hand, interest credits only benefit those with student loans, and the RESP/RRSP provisions have similarly limited incidence. Note also that the value of the RESP/RRSP measures will vary substantially even among those who make use of these savings plans. CESG's are proportional to RESP contributions; the benefit of RESP saving depends on how attractive is the after-tax rate of return on the next-best saving vehicle; the value of the option to rollover unused RESP funds into an RRSP depends on how likely it is that education plans will fall through; and the benefit of being able to take money out of an RRSP temporarily to finance education depends on the size of the tax rate thereby avoided.

Personal Income Tax Changes since 1998

Since 1998 the most important PIT changes affecting human capital have been (i) a doubling of the education amounts in the 2001 tax year (to $400 and $120 per month for full-time and part-time students respectively), (ii) reductions in federal tax rates and changes in the rate structure, (iii) the freeing-up of provincial PIT rate structures, and (iv) re-indexation of brackets, credits and deductions announced in the February 2000 budget.

Changes in rate structure over the last five years have taken us from a sharply graduated three bracket structure to more gradual progressivity. For the 2003 tax year, as shown in Table 1, federal rates apply at the rates of 16, 22, 26, and 29% on taxable income in the ranges 0 - $30,183, $32,184 - $64,368, $64,369 - $104,648, and $104,649+. All federal surtaxes has now been removed. Including a representative nominal provincial tax, Canadian Tax Foundation (2003, Table 3.5) estimates that full marginal rates in the four brackets were 24%, 33%, 40%, and 44% in 2002. (Results for 2003 are not yet available.) The comparison with the much more progressive 1998 structure shown in Table 1 is striking. This reduced progressivity has reduced human capital ETR's in Canada considerably, as discussed in the next section.

Re-indexation of the tax system has already had a non-trivial effect on PIT structure. From 2001 to 2003 it resulted in a 4.6% upward shift in brackets, credits and deductions. Thus, e.g., the threshold for entering the 26% federal marginal tax bracket rose from $61,510 to $64,369. Such changes ensure that, holding the real earnings structure constant, average personal tax rates before and after university graduation will not change due to inflation, preventing any tendency for the ETR on human capital to rise or fall as a result of the "bracket creep" that would otherwise be present.[16]

Prior to the 2001 tax year all nine provinces that were signatories to the federal-provincial tax collection agreements were bound to levy their basic PIT as a flat % of the basic federal tax. (Quebec levied and collected its own separate PIT.) Under this

arrangement, federal surtaxes did not affect provincial PIT, and the provinces were free to enact their own surtaxes and credits additional to those provided by Ottawa. While in the 1970s and 80s provincial PIT payments could broadly be thought of as proportional to federal, by 1998 this approximation was becoming strained. Some provinces, notably Ontario, levied sizable surtaxes, and a wide range of provincial credits were provided, e.g. for provincial political contributions, qualifying investments, property and sales taxes, and dependent children. Finally, the Quebec rate structure was somewhat less progressive than the federal structure, featuring marginal rates of 17%, 21.25%, and 24.5% on taxable incomes of 0 - $26,000, $26,001 – $52,000, and $52,000+ in 2001, for example.

Beginning in 2001 provinces covered by the tax collection agreements were free to levy tax as a function of federal taxable income rather than basic federal tax. This has already led to significant differences in rate structure across the provinces, and divergence from the federal structure. While as of 2002 six provinces still kept the three-bracket structure, New Brunswick followed the federal lead to create a new $103,000+ bracket. Alberta had introduced a flat tax at a 10% rate. British Columbia had five brackets, with the top one beginning at $86,785.

Table 1 provides detail on the Ontario PIT system, which is used in the calculations reported in the next section, but also reports the Canadian Tax Foundation's estimates for full marginal tax rates in 2002 (the latest available), including federal surtaxes as well as a stylized representative provincial PIT. The CTF figures echo both the reduced tax rates seen at the federal level and reduced progressivity. *Both* of these factors should act to reduce human capital ETRs, as discussed in the previous section.

In terms of the overall PIT rate structure, note from the CTF estimates that the bottom mtr declined from 26% in 1998 to 24% in 2003, and the top rate fell from 46 to 44%. In between, for incomes in about the $30,000 - $100,000 range, the total mtr declined by about 6.5 percentage points. Thus the decline in progressivity centred on a

broad middle income range, where it should have a large effect on tax rates faced by most university graduates.[17]

The Ontario system shows reduced nominal mtr's in each tax bracket over the period 1998 - 2003, but a reduction in surtax thresholds and an increase in the top surtax rate. Thus, changes in the Ontario system increased progressivity somewhat.[18] Reduced rates tend to lower ETRs, while increased progressivity does the opposite. The net impact of the Ontario changes is therefore not clear. One thing that is clear, however, is that ETR's would be lower in Ontario in 2003 if its conservative government had opted for a flat provincial income tax along with Alberta's when it got the opportunity.

Payroll Taxes

In 1998 employees and employers each paid Canada Pension Plan (CPP) contributions at a rate of 3.2 % on earnings between the basic exemption of $3,500 and ceiling of $36,900. Employment insurance (EI) contributions were paid at a rate of 2.7% by the employee and 3.78 % by the employer, on earnings up to $39,000. As of 2003 the weight of CPP contributions had increased considerably, with the basic exemption unchanged, a higher earnings ceiling at $39,900, and an employee contribution rate of 4.95%. On the other hand, the EI earnings ceiling was unchanged and the contribution rate had gone down to 2.1%. Adding together the two payroll taxes, the total employee contribution rate where both contributions are payable rose from 5.9% in 1998 to 7.05% in 2003.

In the overall scheme of things both CPP and EI are regressive. They increase average tax rates on forgone earnings of university students significantly, but have a weaker impact on the earnings gain achieved by graduates, most of whom will have earnings above the CPP and EI earnings ceilings over much of their working lives. These impacts *reduce* ETRs. The rising trend of payroll taxes in Canada hence should strengthen the trend for human capital ETRs to decline. This effect will be largest for those workers with incomes above the EI and CPP contribution ceilings for the longest

portion of their working lives. For less successful university graduates, the effect will be weaker or could even be reversed. If one spent one's entire working life below the CPP and EI earnings ceilings, CPP + EI contributions would have the same effect as a flat tax. For these people, Result 2 discussed in the previous section applies, and CPP/EI would increase the ETR.

It could be objected that CPP and EI contributions are not taxes, but benefit-related charges. In principle, we should take the expected benefits into account in our equation (2), allowing them to affect the calculation of before- and after-tax rates of return on human capital. In practice, both the takeup rate of EI for university graduates and the discounted value of CPP pension benefits are low, so that this would have little effect on our calculations.

IV. Effective Tax Rates on Undergraduate University Education in Canada

Data and Assumptions

In order to gauge the size of *ETR's* in Canada we compute representative values of the net- and gross-of-tax rates of return, r_n and r_g. To do this we use Statistics Canada's 1998 Survey of Consumer Finance (SCF) to model actual and potential earnings, E_t and E_t^*, before- and after-tax. As explained earlier, and in keeping with previous studies, we perform our calculations as if the 1998 cross-section was a snapshot from an economy in steady state. From this dataset we took median earnings, and other quantiles, of full-time male and female workers conditioned on the highest completed level of schooling being high school or a bachelor's degree, as the basis for E_t^* and E_t respectively. We have used median rather than mean earnings since we wish to investigate rates of return and ETRs for an "average" student. Since earnings are positively skewed the mean is above the median and is not representative for the typical student.

To adjust earnings to 2003, we first scaled up earnings by the % difference between mean full-time earnings of males and females in the 2001 SLID and 1998 SCF (8.44% and 4.89% for females and males respectively). We then scaled up further by 2.73%, the increase in the average weekly earnings of full-time workers between 2001 and 2003. (Figures on average weekly earnings by sex do not appear to be available.) This gave total increases of 11.17% and 7.62% for females and males respectively from 1998 to 2003. For both genders note that there is an implied decline in real earnings, as the CPI rose 13.4% from 1997 to 2003.

The estimation of E_t, E_t^*, and their differential is clearly critical. This requires specification of a counterfactual scenario. How much would the university graduate have earned if he/she had stopped formal education after high school? Our counterfactual says they would have received the amount earned by high school graduates of the same age and gender and at the same quantile among high school grads.[19] Some authors have argued that university graduates have greater ability and that a differential (typically 10 or 15%) therefore needs to be applied to the earnings of high school graduates when forming the counterfactual. (See e.g. Stager, 1996.) We take a comparative advantage view, in which it is not necessarily clear that the median university graduate would have earned more than the median high school grad if his/her education had been terminated after high school.[20] We therefore do not apply an ability differential.

We have specified costs and tax features, as far as possible to be those prevailing in the academic years 1998-99 and 2003-04 respectively. In 1998-99 undergraduate tuition fees averaged $3,253, and additional fees $342, according to Statistics Canada. Other direct expenses (books, supplies, and return transportation to the educational institution) were assumed to be $1,000 per year. Thus we estimate total direct expenses to have averaged $4,595. In 2003-04 tuition had risen to $4,025, and additional fees had shot ahead to $623. If other direct expenses had kept pace with inflation they would be $1,122 in 2003, giving total direct expenses of $5,770.

The calculations we report below are for full-time students.[21] Full-time students are assumed to work the equivalent of four months per year, during which they would earn the same amount as a high school graduate. As in previous studies we reduce these earnings somewhat (by 20%) to allow for unemployment and job search.[22]

In modelling the taxes paid by workers after graduation we have assumed that they do not claim a credit for a dependant spouse. We also ignore the tax consequences of having children. The incidence of dependant spouses has been declining rapidly in recent years, and we expect will be very low over the lifetimes of recent graduates. Ignoring children leads to an overstatement of tax burdens over the working lifetime, but only a small error in the calculation of the taxes paid on the incremental earnings due to education.

While we of course take account of "personal amount" credits, we make no allowance in our main results for deductions from income after graduation. The principal deduction that could potentially be modelled is that for RRSP/RPP contributions. However, this would be misleading since our calculations only consider earnings over the working lifetime. If we took the tax relief on RRSP/RPP contributions into account we would have to also model the tax paid on withdrawals. Ignoring both contributions and withdrawals should be approximately offsetting.

Results

Results from our base case are shown in Table 2. This case assumes a single student with no dependants who finances his/her education without the help of a student loan or an RESP. The estimated rates of return are lower than those found e.g. by Stager (1996) and Vaillancourt and Bourdeau-Primeau (2002) using 1991 and 1991 & 1995 Census data respectively. Whereas we find the net-of-tax private rate of return was 8.9% for male students in 1998 for example, and 12.5% for female, Vaillancourt and Bourdeau-Primeau found figures of 16 and 19% in 1991, and 17 and 20% in 1995. Stager obtained private rates of return of 13.8% for men and 17.6% for women in 1991. Rathje and Emery (2002) also found lower rates of return than Vaillancourt and

Bourdeau-Primeau and Stager, believing a principal reason was the use of more recent, and higher, tuition fees - - from the 1998-99 school year.[23] We also use more recent fees, in our 2003 calculations bringing them right up to 2003-04. In addition, we differ from Vaillancourt and Bourdeau-Primeau, and Stager, by using 1998 SCF rather than 1991 or 1996 Census data, excluding the self-employed, and by using median rather than mean earnings.[24]

[Table 2 to appear about here.]

A notable feature of these results is that, as in previous studies, the rate of return is considerably higher for females than for males. The reason is that the earnings of women with a university degree are much closer to those of their male counterparts than is the case for workers with only high school.

Table 2 shows a relatively small difference between gross and net private rates of return for university graduates. The proportional difference is, of course, the effective tax rate. At 18.9% and 10.6% for male and female students respectively in 1998, the ETRs indicate that, in the no-loan no-RESP case, human capital investment is not taxed as heavily as e.g. McKenzie et al. (1998) find physical capital is taxed. The difference in ETRs for men and women reflects the impact of progressivity. Male university graduates still earn more than women, and on their earnings increments due to education are therefore taxed more heavily on average.

The most interesting result in Table 2 is the large drop in ETRs from 1998 to 2003. For males there is a decline from 18.9% to 13.0%, and for females there is a drop from 10.6% to 7.6%. As we show later, these declines are largely the result of the flattening of the federal rate structure that took place in 2001. They also owe something to the reduction in overall PIT rates and to the *increase* in CPP and EI contributions. (See the discussion of how these effects operate in the previous section.)

Turning to Table 3, for 1998 we see the effects not only of taxes, but also of subsidies to universities. The second column shows, again, the gross-of-tax private rate of return, which does not take subsidies into account. The first column figures in the direct costs of university education which are funded by government and which do not enter the private calculation.[25] An effective subsidy rate (ESR) can be calculated as the proportional difference between these rates of return. We find that the subsidy rates obtained are greater than the effective tax rates for 1998 shown in Table 2 for both males and females. We thus find a negative net effective tax rate, ETR – ESR, as shown in the last column of the table. This would imply that overall the public sector *encourages* human capital investment - - a conclusion that is in line with the results of earlier studies and that would be strengthened by taking into account student loans, bursary programs, and the Millenium scholarships.

The most recent available national data for university finances are for 2001. Since changes have been occuring fairly rapidly in university budgets over the last few years, we do not think it is safe to apply 2001 patterns to 2003 in order to estimate the ESR. Still, it is clear that the ESR must have been declining, since tuition fees have been rising quite sharply. Casual empiricism suggests that the drop in the ESR is likely of the same order of magnitude as the decline in the ETR.

[Table 3 about here]

Next we study the effects of Canada Education Savings Grants (CESG's).[26] CESGs add 20% to RESP contributions annually, up to a grant limit of $400 per child. Net-of-tax rates of return rise and effective tax rates decline. In the case of full-time male university students, Table 4 indicates that the 1998 ETR drops from 18.9% to 15.2% when parents make annual contributions of just $650 over a 15 year period. If annual contributions of $2,000 are made, the ETRs fall much further - - to just 6.5% for males and –10.2% for females. CD (forthcoming) found that the effects for part-time students were also large. Table 4 shows smaller absolute reductions due to CESGs in the ETR in 2003 than in 1998 (for males, 6.0 vs. 12.4 % points; for women 6.4 vs. 20.8 % points).

This is due to the fact that the maximum benefit from CESGs was not increased between 1998 and 2003.

[Table 4 about here]

Table 5 replicates the base case of Table 2 for graduates at the 25th and 75th percentile of the earnings distribution, rather than at the median. We see that for both sexes there is a drop in the ETR (but an increase in rates of return) of going to the 25th percentile case from the median; and there is an increase in the ETR going to the 75th percentile. In 1998 females' ETRs were 7.9, 10.6 and 17.8 % at the 25th percentile, median, and 75th percentile respectively. The figures for men were 12.2, 18.9 and 23.4 % respectively, In 2003, the range of values is - - 5.6, 7.6 and 12.4% for women and 8.2, 13.0 and 16.5% for men. These results again echo the progressivity of the tax system. As we move to higher percentiles we encounter people who not only have higher, but more peaked age-earnings profiles over the lifetime. They will see a much larger portion of their lifetime earnings taxed at high marginal rates than those earning at low quantiles of the distribution, and will accordingly suffer more from the negative effect of income tax progressivity on their net rate of return on human capital.

[Table 5 about here]

In order to get a complete assessment of the incentive effect on human capital formation one must of course deduct the *ESR* from the *ETR*. Looking back at Table 3 we see that if the graduates at the 75th percentile in 1998 had the same *ESRs* as median workers, the *ETR – ESR* figures would be -5.6% and -3.3% for males and females respectively. However, the assumption that the *ESRs* at higher percentiles are the same as at the median may be incorrect. The highest paid graduates are those in professional programs like engineering and medicine, which in 1998 were still more heavily subsidized than general arts and science programs. Vaillancourt (1997) finds that the difference is sufficient that the net subsidy rates (i.e. *ESR* - *ETR*) in 1990 were highest in science, engineering and medicine and lowest in the humanities and social science.[27]

Finally, in order to get a better idea of what is causing the substantial decline in ETRs, we decompose the effects. Table 6 reports the results. We start from the 1998 results and change individual tax aspects, and tuition fees, in turn. The increase in tuition fees reduces both before- and after-tax rates of return to education, but does so close to equi-proportionally, so there is no change in the ETR for males, and a very slight decline for women. The change in CPP/EI rates, first, increases after-tax rates of return for both men and women, and as expected reduces their ETRs slightly - - from 18.9% for men to 18.3% and from 10.6% for women to 9.1%. The increase in tuition and education amount credits also raises ETR's a little. These changes by themselves would reduce the male ETR to 17.7% and the female to 9.3%. In contrast to these small effect, the change to the 2003 tax rate structure has a very dramatic impact. It cuts the male ETR down to 9.6%, and reduces the female ETR to just 3.7%. Clearly, it is the flattening of the PIT tax structure over the period 1998-2003 that has had the biggest impact on human capital ETRs.

[Table 6 about here]

V. Conclusion

In past work we have argued that effective tax rates are a useful device for summing up the effects of the tax system on the incentive to invest in human capital, and have illustrated the approach for undergraduate university level education in Canada. Here we have continued that work, examining two broad features of ETRs in 1998 and 2003 - - how high they are for the median person, and how they vary across individuals.

Our main finding has been that ETRs fell between 1998 and 2003. In our base case there was a decline from 10.6 % to 7.6% for females and a drop from 18.9% to 13.0% for males. These declines are partly the result of the drop in personal income tax rates over this period, but they are mainly due to the decline in progressivity of the PIT system in a broad middle income range. Increases in CPP and EI contribution rates,

which are regressive, have also helped to reduce ETRs a little by eroding overall tax progressivity. Finally, increased tuition and education amount tax credits have reduced ETRs somewhat.

It seems of some interest to us that the main reduction in tax disincentives for human capital accumulation in the last five years has not come from the measures explicitly aimed at this goal, such as the doubling of the monthly education amount credit from $200 to $400 for full-time university students, but from quite a different source. While it is possible that reducing tax disincentives to education was a motive for the flattening of the federal PIT rate structure, that was not one of the reasons for the change that the government highlighted. This echoes our earlier result, in CD (forthcoming), that the targeted measure of making interest on student loans deductible, introduced in 1998, had a very small quantitative effect on human capital ETRs.

We have also seen that, as of 1998, effective subsidy rates, ESRs, were larger than ETRs and resulted in a negative net "tax" rate, ETR - ESR, on human capital. In the last five years we know that ESRs have decreased, offsetting to some degree the decline in ETRs that has occurred. We do not have good enough information on university finances for 2003 yet to be able to judge reliably whether ETR - ESR rose or fell over the last five years. However, our intuition suggests that the decline in ESRs has likely been of a similar size to the reduction in ETRs. Thus the good that has come from the flattening of the PIT rate structure has probably been undone by the falling government support for university operating budgets. This creates a policy dilemma for governments that want to avoid discouraging university enrolment in the future. As explained e.g. by Boothe (2003), provincial budgets are under extraodinary, relentless, and ever worsening pressure from health care spending. This is reducing the amount available for spending in all other areas. Since universities have private as well as public sources of funding they are especially vulnerable targets for provincial spending reductions. The prognosis therefore seems to be that ESRs are likely to continue declining in Canada, unless initiatives such as the first-year university grants announced in the recent federal Throne Speech prove strong enough to counter the trend.

There has recently been considerable controversy over Registered Education Savings Plans, and the 20% subsidy to the first $2,000 of saving per beneficiary per year that are provided through them. Studies by Kesselman and Poschmann (2001) and Milligan (2002) have shown that the benefits are concentrated among high income groups. At the same time, the recent survey work reported by Corak et al. (2003) has shown that while the university participation rates of students from both low and high income families have trended upward over the last 20 years, there has been a decline in the last ten years for the hard-pressed middle group. This group includes many families in which students cannot qualify for student loans because they fail the means test. These families apparently get little benefit from RESPs or CESGs since they have little discretionary income to allocate to education saving.

Our results show that CESGs have a very dramatic impact on the tax disincentive effect of going to university. When maximum CESGs are received for 15 years, for example, the ETR for a median female earner in our base case was reduced from 7.6% to 1.2% and from 13.0% to 7.0% for males. It can be asked whether it is appropriate to put such a powerful instrument in the hands of high income families without providing comparable assistance to lower income families.

There would seem to be one possible argument *in favor of* CESGs that emerges from our work. In addition to looking at the situation of the median earner we have examined results for people consistently at the 25th and 75th percentiles of the earnings distribution over their lifetimes. It turns out that the ETR at the 75th percentile is about twice as large as at the 25th percentile for males, and slightly greater than that for females. This is a result of tax progressivity. Even larger differentials can be expected as one goes further into the extremes of the earnings distribution. If it was the case that high earning students always came from high income families then CESGs could be seen as a "magic bullet" - - a targetted tax break designed to offset the extraordinary tax disincentives to human capital accumulation for high earners.

While CESGs may help to overcome high ETRs for some high earners, the bullet is blunt rather than magic. Corak and Heisz (1999) have found, using longitudinal Canadian tax data, that the intergenerational correlation of income in Canada between fathers and sons is actually quite low - - about 0.2. This implies that there are more high earners from middle or low income backgrounds than from high income families. Hence CESGs help some people faced with high ETRs but probably only a small minority.

A related argument that could be made in favor of CESGs is that low and middle income families could save for their children's university education via RRSPs. They could do this without reducing their retirement savings, given that they are likely not at their RRSP contribution limits. High income families, on the other hand, are likely to be at those limits and able to save only a fraction of the amount they would like to save for retirement in this sheltered form. Hence, it would be much less advantageous for them to take funds out of RRSPs to fund their children's education. This argument works better than arguing on the basis of children's earning potential, since it is based on the income status of the parent not that of the child (which is only weakly related to parental income).

Finally we would comment that the strong ETR gradient as one goes up students' earnings scale should be a serious concern for policymakers who care about the efficiency, and not only the equity, of university education in Canada. Investing more in high quality university education, and directing students to areas where there is strong demand for graduates, have been seen as key factors in achieving a higher rate of productivity growth in numerous official and other reports and studies. This thrust is also part of the federal government's official innovation policy, and is reflected in major federal programs like the Canada Millenium Scholarships, the Canada Fund for Innovation (CFI), and Canada Research Chairs (CRCs). If the tax system is discouraging the "best and brightest" from investing in university education then it may be having a counter-productive effect on human capital accumulation.

Concerns over high ETRs on high ability students also need to be seen against the backdrop of the expenditure side of government operations. Provincial grants are

declining as a funding source for universities, and the burden of funding is being thrown increasingly onto tuition fees. This means that ESRs are almost certainly going down. Further, they are likely declining the most in those areas that produce disproportionate numbers of high earners. In Ontario and some of the other provinces, while tuition fees are still regulated for general Arts and Science programs, they have been completely de-regulated in some high demand areas, like Business Administration and Medicine. Tuition fees have also been allowed to rise more quickly in other cases (engineering and computer science for example), than they have in Arts and Science. We believe it is likely that the net tax rate on human capital investment, ETR - ESR, has been rising in areas like Business, Engineering and Computer Science - - certainly relative to general university programs, but perhaps also in absolute terms.

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Appendix

A.1. Basic Data

1) Our estimates of tuition and additional expenses are based on Statistics Canada data for 200X-Y. See http://www.statcan.ca/Daily/English/970825/d970825.htm#art2. An average was taken over arts degrees across the country.

2) Data on "other expenses" were taken from a variety of sources- Statistics Canada databases, university web sites, and university calendars. "Other expenses" refers to items that are only required for schooling (e.g. books and supplies for schooling).

3) The earnings data come from Statistics Canada's 1998 Survey of Consumer Finance microdata tape.

4) Part-time earnings for full-time students are assumed to be summer earnings and therefore comprise a maximum of four months of earnings potential. To account for unemployment and job search the value is reduced by 20%.

A.2. Public Rates of Return

1) Data on government spending and enrollment for male and female, full-time and part-time students were obtained from the Statistics Canada website.

2) Current and capital expenditures on undergraduate instruction are assumed to to equal one half of operating expenditures. The justification for this assumption is given in the text of the paper.

3) Public expenditures per student are calculated as in Vaillancourt (1995). Operating expenditure on universities is divided by full-time equivalent (FTE) enrollment, where a part-time student counts as one third of a full-time student.

A.3. Tax Features

A.3.i) Tax Credits

In addition to basic personal amounts, students are eligible for non-refundable credits on tuition and certain additional fees. They may also be eligible for non-refundable credits in the form of the education amount, and on interest paid on student loans. As outlined in the paper, the federal education amount for full-time students was $200 per month in 1998 and $400 per month in 2003. Part-time students were first allowed to claim an education amount, of $60 per month at the

federal level, in 1998; in 2003 this had risen to $120. In 1998 students received the same education amounts at the federal and Ontario levels. In 2003 the Ontario amount for part-time students was $126 per month, and the full-time amount was $421. The taxpayer earned a net credit applicable to federal tax equal to 17% of the amount claimed in 1998 and 16% in 2003. There is a further credit against provincial tax. The sum of these equalled 25% in Ontario in 1998 and 22.05% in 2003.

A.3.ii) Registered Education Savings Plans (RESPs) and Canada Education Savings Grants (CESG's)

1) In both 1998 and 2003 the federal government allowed taxpayers to contribute up to $4,000 per child to an RESP.

2) Since January 1, 1998 the federal government has been providing a CESG, equal to 20% of the first $2,000 of RESP contributions per child. We assume alternative RESP contribution values of $650/year and $2000+/year in calculating the amount of CESG awarded.

3) The calculation for the CESG amount is based on an example in the 1998 federal budget documents, which assumed a 5% rate of return and a contribution rate of $650/year. For a contribution rate of $2000/year the CESG amount increases proportionally.

Notes

[1] See Collins (2004) for an illustration of how the different fields are treated in the funding formulas. Vaillancourt (1997) also has estimates of net subsidy rates by field of study.

[2] The situation for on-the-job training is different. (This is one of the reasons that we do not deal with OJT in this paper. It would require a separate study.) One can imagine OJT being provided in quite small units, and the sensitivity of results to the size of the investment becomes less of a problem. This is because the relevant tax on the employer's side, i.e. the corporate tax, is levied at a flat rate, and provided investments are not too large individuals' marginal tax rates will also not be strongly affected by OJT.

[3] An alternative is to define the ETR as the ratio of the present value of net taxes on labour income over the lifetime to the present value of lifetime earnings. (See Mintz, 2001.) While the two approaches will often produce similar results, this is not always the case. We prefer the approach followed here in part because it does not require any assumption to be made about individuals' discount rates.

[4] Note that as in all such studies we are, in fact, computing rates of return to a lifetime investment program that merely *begins* with university attendance. According to human capital theory, earnings rise over most of the working lifetime due to continued human capital accumulation, e.g. via on-the-job training, after graduation. The returns to such post-school investments are implicitly included in the rates of return calculated here.

[5]Note that "neutral" is used here in a special sense. We do not imply, e.g., that a tax system that is neutral with respect to human capital is non-distortionary in its treatment of human vs. physical capital. That depends on the effective tax rate on physical capital, and also on whether there are any relevant non-tax distortions (e.g. capital market imperfections).

[6] See Davies (2002) for a review of the empirical evidence on the size of human capital externalities. The evidence is mixed, with some recent studies, such as Heckman and Klenow (1997) and Acemoglu and Angrist (2001) arguing that human capital externalities that had previously been claimed to be large may in fact be weak or non existent. Doubt has also been cast on the importance of borrowing problems. See e.g. Shea, 2000, and Cameron and Taber, 2000. Note also that Corak et al. (2003) find university participation rates of students from low income families rose substantially in Canada from 1979 to 1997, despite rising tuition fees. (This aspect of the Corak et al. results was reported by Caroline Alphonso in "Fee Hikes Not Forcing Students Away", *Globe and Mail*, Saturday, Oct. 2, 2003, p. A3.) Rathje and Emery (2002) provide estimates of how large the externalities from human capital would have to be to raise social rates of return on university programs with lower market rates of return to an adequate benchmark level.

[7] Since Alberta, alone among the provinces, does not have a provincial sales tax, and since its flat PIT, while raising the ETR above the purely federal level does so less than would a more progressive provincial income tax, it stands out as the province that adds the least to the tax disincentive to invest in human capital in Canada.

[8] It might be suggested that one should attempt to incorporate secular changes that could reasonably be anticipated by individuals. Thirty years ago this would have included secular wage growth. However, over the last two decades in Canada the rate of growth of real wages has been very low, and sometime negative, so that a constant rising path of wages can hardly be confidently anticipated. In the same vein, it is very difficult to predict what will happen to the tax system in the future. One might suppose that tax rates will have to rise to finance the health care and pension costs of an aging population, for example. But if we look at recent history in Canada, despite our new-found high sense of fiscal responsibility the trend is actually towards lower tax rates. So it is very difficult to know what even a very well-informed taxpayer would expect about the future evolution of the tax system.

[9] In a more comprehensive investigation some other taxes would also be taken into account. In the previous section we remarked on the impact of sales taxes. In addition, corporate income taxes have impacts on human capital formed via on-the-job training. See Collins and Davies (forthcoming).

[10] The NCBS was clawed back at rates ranging from 12.1% for one-child families to 26.8% for a family with three or more children. This means that the credit was already clawed back completely for most families at net income of $25,921, where the CCTB clawback kicked in at rates from 2.5% to 5.0%. The latter relatively low rates mean that the CCTB clawback range is very wide. The clawback affects families with incomes up to $67,000 - $75,000. However, since the CCTB clawback rates are relatively low, their impact on human capital *ETRs* would be fairly small.

[11] That is, up to a limit of $5,000 minus the part of the credit used by the student to reduce his/her tax liability to zero.

[12] The current contribution limit for RRSPs plus Registered Pension Plans is the lesser of $13,500 or 18% of earnings per year. The dollar limit is slated to rise to $14,500 in 2004 and to $15,500 in 2005, after which it will be indexed to the average industrial wage. These levels represent a significant retreat, however, from those promised by earlier federal budgets. The 1984 and 1985 budgets promised a limit of $15,500 by 1990, with subsequent indexation.

[13] Since withdrawals are generally taxed at a low rate, RESP's approximate Roth IRA plans in the U.S., which have non-deductible contributions and tax-free withdrawals. Greater use of this type of sheltered saving has been urged for Canada by e.g. Kesselman and Poschmann (2001).

[14] In Canada interest on mortgages and consumer debt is not tax deductible. This makes paying down these forms of debt a popular form of saving for those in the age range of about 25 – 45.

[15] The RESP and RRSP provisions might be seen as raising the rate of return to financial assets. However, the benefits in question are only realized as a result of planned or actual human capital investment. They are therefore regarded here as increasing the net expected return on *human* capital.

[16] In the long run "bracket creep" pushes everyone into the top bracket, giving essentially a flat tax structure with a low ETR. However, in the short run the increase in tax rates that would be paid during the university years by students if they stopped their schooling after high school may be larger than the increase in tax rates over the working lifetime, giving the opposite effect.

[17] An appropriate measure of local progressivity is the ratio of the mtr to the average tax rate: mtr/atr. This ratio declined between 1998 and 2003 in the middle income range, but rose in the $103,000+ top bracket. Thus, while for the bulk of the distribution it is correct to say that progressivity declined over these five years, for the top few percentiles of taxpayers the opposite is true.

[18] Levying fat surtaxes on high income people, and increasing progressivity over time is a curious tack for a radical conservative government like that in power in Ontario during this period. The contrast with the flat tax adopted by Alberta's conservative government is striking.

[19] An alternative to our approach would be to estimate earnings functions and hold more variables constant in forming the counterfactual. We hold constant age, gender, hours of work, and education-specific earnings percentile. A regression approach would allow additional variables, such as region, industry, occupation, marital status and so on to be held constant. We do not believe that is a superior approach, however, since we are interested in the total return to deciding to be a university graduate. This includes earnings gains that come from moving to the regions, industries or occupations where jobs for university graduates are concentrated.

[20] Studies have shown that skill-levels among university graduates are not equivalent and that many have ended up taking jobs which were predominantly held by high school graduates previously. (See, e.g. Pryor and Schaffer, 1997) Therefore, to assume a positive ability differential could be somewhat misleading.

[21] CD (forthcoming) reports results for part-time students as well, showing that their ETRs are somewhat above those of full-time students. For example in the base case full-time males had an ETR of .193, while the ETR for part-time males was .215. The figures for females were .119 and .133 respectively. ETRs for those who attend part-time are lower because they spend more time working while going to school, leading to a higher marginal tax rate (i.e. a higher implicit subsidy) on their forgone earnings.

[22] Morisette (1998, p. 32) reports that the unemployment rate for all men aged 17 to 24 in 1996 was 14.8%. In addition, 5.3% had involuntary part-time employment, for a total of 20.1% who did not have full-time employment.

[23] Rathje and Emery give rates of return by area of study, and do not report average rates of return across those areas. A simple average of their rates of return in the core areas of the humanities, science and social science is 5.3% for males and 25.2% for females.

[24] The use of medians tends to give lower estimated rates of return because the gap between median and mean earnings rises, both absolutely and proportionally, over the lifetime. Thus our estimates of forgone earnings are closer to those of Vaillancourt and Bourdeau-Primeau, and Stager than our estimates of the earnings gain accruing over the working lifetime.

[25] In estimating direct costs one must keep in mind that part of universities' costs are incurred for graduate education, research, and other non-instructional purposes. No estimates are available that separate these functions from undergraduate education. Tenure-track university professors are typically expected to devote 40 - 50% of their time to teaching, including graduate teaching. We think a reasonable guess is that about 30% of operating costs are incurred for undergraduate education. Estimates are also not available for capital costs (interest, depreciation etc.) on a national basis, but Stager (1994) estimates that capital costs are about 60% of operating costs. On this basis we have a figure of 50% ($\cong$ 1.6 X 30%) of operating costs as an estimate of total direct costs of undergraduate university education.

[26] We do not attempt to estimate the impact of RESP's *per se* on the *ETR's* since the effects vary greatly across taxpayers depending on their use of RESP's vs. other saving vehicles. Also, prior to the introduction of CESG's. RESP's were not very popular. Thus we believe the most important effect to study is that of CESG's.

[27] The net subsidy rates implied by Vaillancourt's 1990 results for males are 17.6% in medicine, 10.6% in engineering , 6.0% in natural science, 2.2% in social science and 0.6% in humanities. These figures represent the difference between private and public rates of return in Panel B of Vaillancourt's Table 3, p. 6.

Table 1

Tax Features, 1998 and 2003

1. Federal Personal Income Tax

1998		2003	
Taxable Income	Marginal Tax Rates	Taxable Income	Marginal Tax Rates
0 - $29,590	17%	0 - $32,183	16%
29,591 - 59,180	26	32,184 - 64,368	22
59,181+	29	64,369 - 104,648	26
		104,649+	29
Basic Fed. Tax	Surtax		
0 - $12,500	3%		
$12,501+	8		
Basic Personal Amount:	$6,456	Basic Personal Amount:	$7,756
Education Amounts:	FT 200 per mo.	Education Amounts:	FT 400 per mo.
	PT 60 per mo.		PT 120 per mo.

2. Combined Federal and Provincial Marginal PIT Rates, Including Federal Surtaxes (Canadian Tax Foundation Estimates)

1998		2002	
Taxable Income	Marginal Tax Rates	Taxable Income	Marginal Tax Rates
0 - $29,590	26%	0 - $31,677	24.3%
29,591 - 59,180	40	31,678 - 63,354	33.4
59,181+	46	63,355 - 103,000	39.5
		103,001+	44.1

3. Ontario Personal Income Tax

1998		2003	
Taxable Income	Marginal Tax Rates	Taxable Income	Marginal Tax Rates
0 - $29,590	7.27%	0 - $32,435	6.05%
29,591 - 59,180	11.12	32,436 - 64,871	9.15
59,181+	12.40	64,872+	11.16
Basic Prov. Tax	Surtax	Basic Prov. Tax	Surtax
$4,057 - 5,217	20%	$3,747 - $4,727	20%
$5,218+	53	$4,728+	56

Table 1 (Continued)

4. Payroll Taxes

		1998	2003
CPP:	Ceiling	$36,900	$39,900
	Basic Exemption	$3,500	$3,500
	Employee Cont'n. Rate	3.2%	4.95%
EI:	Ceiling	$39,000	$39,000
	Employee Cont'n. Rate	2.7%	2.1%

Table 2

Rates of Return and Effective Tax Rates for First University Degree Graduates: 1998 and 2003 Tax System, No Student Loans, No Dependants (Base Case)

	IRR (%) Net-of-Tax (1)	IRR (%) Gross-of-Tax (2)	ETR [(2) - (1)] / (2)
Males			
1998	8.87	10.94	0.189
2003	9.22	10.60	0.130
Females			
1998	12.52	14.01	0.106
2003	12.64	13.68	0.076

Notes: IRR = internal rate of return
ETR = effective tax rate

Source: Authors' calculations using the 1998 SCF and 1998 and 2003 tax systems.

Table 3

Base Case Rates of Return, Effective Subsidy Rates, and Tax Minus Subsidy Rate

	IRR (%) Public (1)	IRR (%) Gross-of-Tax Private (2)	ESR [(2) – (1)]/(2)	ETR – ESR
Males				
1998	7.77	10.94	0.290	-0.101
2003	8.57	10.60	n.a.	n.a.
Females				
1998	11.05	14.01	0.211	-0.105
2003	11.19	13.68	n.a.	n.a.

Table 4

Rates of Return and Effective Tax Rates with CESGs, 1998 and 2003 Tax System, No Student Loans, No Dependants

Sex	Yearly Contribution ($)	IRR (%) Net-of-Tax (1)	IRR (%) Gross-of-Tax (2)	ETR [(2) - (1)] / (2)	ESR*	ETR - ESR
Male						
1998	650	9.27	10.94	0.152	0.290	-0.137
2003	650	9.50	10.74	0.116	n.a.	n.a.
Female						
1998	650	13.90	14.01	0.008	0.211	-0.203
2003	650	13.01	13.83	0.060	n.a.	n.a.
Male						
1998	2000	10.23	10.94	0.065	0.290	-0.224
2003	2000	10.00	10.74	0.070	n.a.	n.a.
Female						
1998	2000	15.44	14.01	-0.102	0.211	-0.313
2003	2000	13.66	13.83	0.012	n.a.	n.a.

Notes: 1) CESG = Canada Educational Study Grant. CESG benefits incorporated here are based on an example provided by Department of Finance (1998, p. 35). Contributions are made over a 15 year period and earn a 5 % rate of return.
2) * ESR = [(2) - Appropriate entry from col. 1 of Table 1.2]/(2)

Source: See Table 2.

Table 5

Rates of Return and Effective Tax Rates for 25th and 75th Quantiles: 1998 and 2003 Tax System, No Student Loans, No Dependants

Sex	Quantile	IRR (%) Net-of-Tax (1)	IRR (%) Gross-of-Tax (2)	ETR [(2) - (1)] / (2)
Male				
1998	25th	10.28	11.71	0.122
2003	25th	10.36	11.29	0.082
Female				
1998	25th	14.56	15.81	0.079
2003	25th	14.46	15.31	0.056
Male				
1998	75th	6.50	8.49	0.234
2003	75th	6.93	8.30	0.165
Female				
1998	75th	9.86	11.99	0.178
2003	75th	10.31	11.77	0.124

Source: See Table 2.

Table 6

Decomposing IRR and ETR Changes from 1998 to 2003 by Changing Tax Aspects and Tuition One at a Time

Case		IRR (%) Net-of-Tax (1)	IRR (%) Gross-of-Tax (2)	ETR [(2) - (1)] / 2
	Males			
	1998	8.87	10.94	0.189
1	2003 CPP/EI	8.94	10.94	0.183
2	2003 Tax Rates	9.89	10.94	0.096
3	2003 Credits	9.01	10.94	0.177
4	2003 Tuition	8.50	10.50	0.189
	2003	9.22	10.60	0.130
	Females			
	1998	12.52	14.01	0.106
1	2003 CPP/EI	12.74	14.01	0.091
2	2003 Tax Rates	13.50	14.01	0.037
3	2003 Credits	12.71	14.01	0.093
4	2003 Tuition	12.02	13.43	0.105
	2003	12.64	13.68	0.076