Economic Contribution of Camosun College

Analysis of Investment Effectiveness and Economic Growth

Volume 1: Main Report

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ACRONYMS

ABE	Adult Basic Education
B/C	Benefit/Cost Ratio
CHE	Credit Hour Equivalent
ESL	English as a Second Language
GED	General Equivalency Diploma
HS	High School
IO	Input-Output Analysis
NCF	Net Cash Flow
NPV	Net Present Value
RR	Rate of Return

SUMMARY

This report presents the economic impacts generated by Camosun College in its service area and in the province. The study presents two analyses: 1) investment analysis from the perspectives of students and taxpayers, and 2) economic growth analysis to determine the relative contribution of Camosun to regional income. Major findings are as follows:

INVESTMENT ANALYSIS

1. **Students:** The analysis recognizes Camosun College as an investment on the part of students. Compared to a high school graduate, a student with a two-year diploma will see an increase in earnings of approximately $351,000 over the course of a working lifetime, equal to about $9,000 per year. This figure does not capture personal incidental benefits from education, including increased job satisfaction, improved health, and others. All in all, it is estimated that students will receive a 15.3% annual rate of return on their education investment.

2. **Taxpayers:** The analysis considers Camosun as an investment on the part of provincial and local government taxpayers. The economic growth effect of Camosun translates into increased provincial and local government revenues, plus an assortment of social savings stemming from reductions in crime, welfare, health care support, and others. Altogether, provincial and local government support of Camosun yields an investor rate of return equal to 16%, exceeding the assumed 4% opportunity cost of funds. This means that Camosun returns more to taxpayers than it costs. The college not only pays for itself but also provides a surplus that supports other government programs.

ECONOMIC GROWTH ANALYSIS

1. **College Operations Effect:** Direct earnings of Camosun faculty and staff plus college operations spending increase regional income in the Camosun Service Area economy by $61.0 million. This is a conservative estimate discounted to account for monies withdrawn from the local economy to support the college.

2. **Student Spending Effect:** About 11% of Camosun's students come from outside the region to attend college in the Camosun Service Area. The spending effects of these

out-of-region students account for about $7.7 million in added income in the Camosun Service Area economy.

3. **Past Student Productivity Effect:** Newly skilled college-trained workers deepen the provincial and local economy's human capital. This results in higher wages for students, greater returns to property owners, increased tax revenues, and added incomes due to economy-wide multiplier effects. Altogether it is estimated that the productivity effects of Camosun's past and present students whose higher earnings and increased skills have been accumulating in the regional workforce for the past 30 years yield a grand total of $748.0 million in added income to the current Camosun Service Area economy.

4. **Total Effect:** Adding college operations, student spending, and past student productivity effects together, Camosun accounts for approximately $816.6 million of labour and non-labour income in the Camosun Service Area. This is equal to about 5.7% of total income in the regional economy.

Chapter 1
INTRODUCTION

OVERVIEW

Camosun generates a wide array of benefits. Students benefit from higher personal earnings, and society benefits from cost savings associated with reduced welfare and unemployment, improved health, and reduced crime. Higher education, however, requires a substantial investment on the part of students and taxpayers. All education stakeholders, therefore, want to know if they are getting their money's worth. In this study, Camosun College investigates the attractiveness of its returns relative to alternative public investments. Two main analyses are presented: 1) investment analysis, and 2) economic growth analysis.

The investment analysis captures private and public benefits that accrue to students and taxpayers in return for their educational support. Private benefits include higher earnings of students, while public benefits include growth in income plus an assortment of positive externalities such as improved health and lifestyle habits, lower crime, and lower incidences of welfare and unemployment. All of these annual benefits continue and accrue into the future, for as long as students are in the workforce. To determine the feasibility of the investment, the model projects benefits into the future, discounts them back to the present, and compares them with present costs. Results are displayed in four ways: 1) net present value, 2) rate of return, 3) benefit/cost ratio, and 4) payback period.

The economic growth analysis focuses on the contribution of Camosun to economic development by increasing consumer spending and raising the skill level of the labour force. This in turn leads to more jobs, increased business efficiency, greater availability of public investment funds, and eased tax burdens. In general, college-linked income falls under three categories: 1) income generated by annual Camosun operating expenditures; 2) income generated by the spending of Camosun students; and, 3) income generated by Camosun skills embodied in the workforce.

A note of importance: although the reports generated for Camosun are similar to those prepared for other colleges, the results differ widely. **These differences, however, do not necessarily indicate that some colleges are doing a better job than others.** Results are a reflection of location, student body profile, and other factors that have little or

nothing to do with the relative efficiency of the colleges. For this reason, comparing results between colleges is strongly discouraged.

The report has five chapters and three appendices. **Chapter 1** is an overview of benefits measured. **Chapter 2** presents data and assumptions underlying the analysis. **Chapter 3** presents investment analysis results from the student and taxpayer perspectives. **Chapter 4** considers the impact of Camosun on economic growth in the region. **Chapter 5** provides sensitivity analyses of some of the softer variables. **Appendix 1** is a glossary of terms. **Appendix 2** provides a detailed explanation of the shutdown point, an adjustment factor used to discount benefits. Finally, **Appendix 3** is a short primer on the investment analysis results.

Chapter 2
DATA SOURCES AND ASSUMPTIONS

INTRODUCTION

Estimating the benefits and costs of higher education requires three types of information: (1) the profile of the college and its student body, (2) economic profile of the region, and (3) statistics relating higher education to improved social behavior. For the purposes of this study, information on the college and its students was obtained from Camosun, data on the regional and provincial economy were drawn from public databases, and statistics on social behavior were provided by national studies and surveys.

COLLEGE PROFILE

Revenues and Expenditures

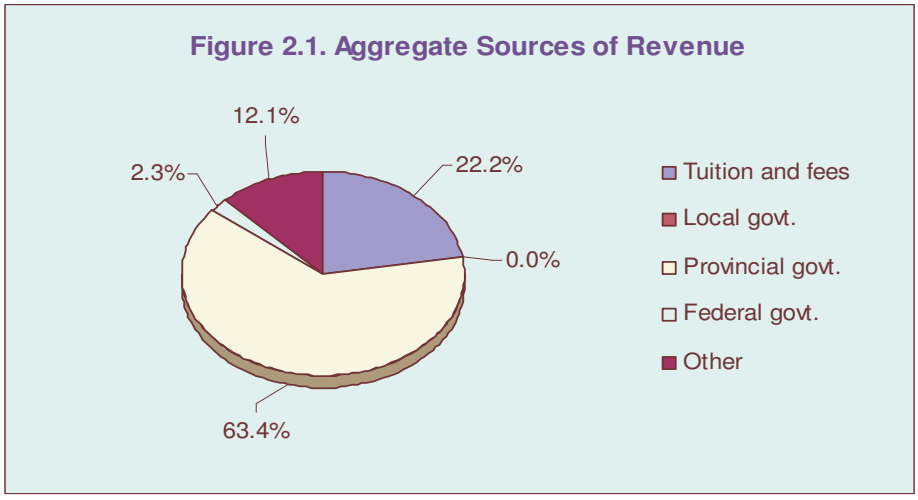
Table 2.1 shows Camosun's annual revenues by funding source: a total of $88.2 million. Two main revenue sources—private and public—are indicated. Private sources include tuition and fees (22.2%) plus 12.1% from other private sources such as training agreements with private businesses, donations, interest payments and the like. Public funding is comprised of grants and contracts from provincial and local government (63.4%) and federal government (2.3%). These data are critical in identifying the annual costs of education from the perspectives of students and taxpayers alike.

Table 2.1: Revenues by Source (FY 2005-06)

SOURCE	AMOUNT	TOTAL	%
Private Funding			
Tuition and fee payments[1]	$19,580,138		22.2%
Other sources of revenues	$10,676,287	$30,256,425	12.1%
Public Funding			
Local grants and contracts[2]	$37,163		0.0%
Provincial grants and contracts	$55,943,118		63.4%
Federal grants and contracts	$1,993,898	$57,974,179	2.3%
TOTAL REVENUES		**$88,230,604**	**100%**

1. Includes both domestic and international tuition; Total figure is net of grants, scholarships, and bursaries awarded to students during analysis year.
2. Includes funding from local municipalities.

Source: Adapted from data supplied by Camosun and Student Aid BC.



Camosun employed 1,200 full and part-time faculty and staff in fiscal year 2006. Their combined payroll amounted to $64.7 million. Other operating expenditures, including purchases of supplies and services, made up an additional $21.1 million. These budget data appear in Column 1 of **Table 2.2**. Column 2 apportions that spending to local (i.e., in-region) vendors, while the net local portion is derived in Column 3.

Table 2.2, by itself, might provide useful information to local audiences—Chambers of Commerce, local business establishments, Rotary clubs, and the like. The table indicates that the college is a "good neighbor" in the region, evidenced by the fact that 75% of all college expenditures benefit local vendors ($64.2 million / $85.8 million = 75%).

Table 2.2: Profile of College Spending In and Out of Regional Economy

SPENDING CATEGORIES	TOTAL DOLLAR AMOUNT (1)	% LOCAL (2)	NET LOCAL SPENDING (3)
Salaries, wages and benefits	$64,707,195	84%	$54,412,660
Other non-pay expenditures	$21,121,114	46%	$9,788,190
TOTAL EXPENSES	**$85,828,309**	**75%**	**$64,200,850**

Source: Total dollar amounts provided by the college. Estimated percent of spending that occurs locally calculated internally in the model based on regression analyses conducted for some 200 colleges analyzed to date.

Student Demographics

Camosun served 12,736 credit students and 4,670 non-credit students during the 2005-06 academic year, a total of 17,406 students (unduplicated). Of these students, 47% were males and 53% were females. The average age of the student body was 26.

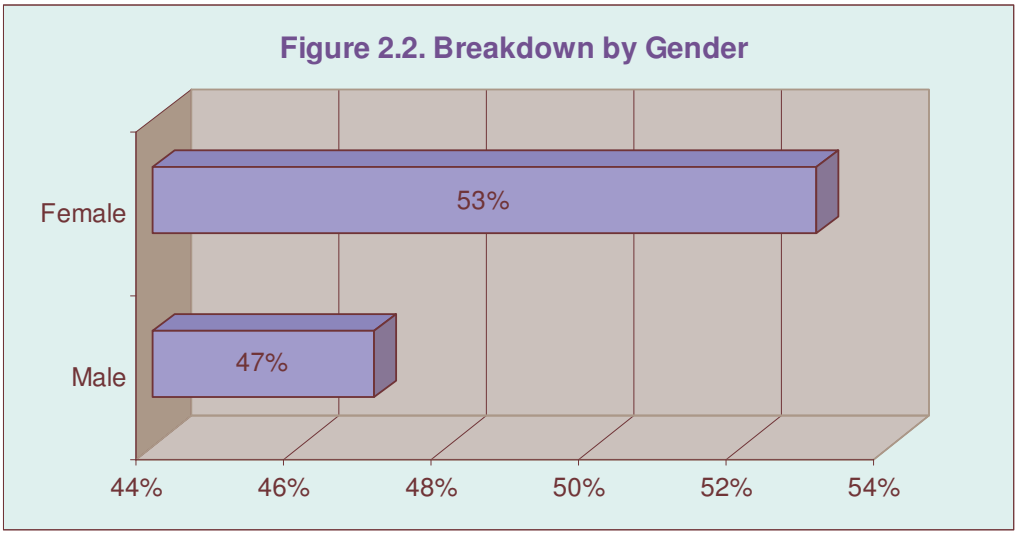


Table 2.3 provides information on the students' entry level of education by broad education category ranging from less than high school to greater than two years post high school. However, not all students currently studying at Camosun are in their first year of college – some may have enrolled two or more years ago and furthered their education beyond the level reflected in their enrolment applications. Because of this, the breakdown of the student body by entry level of education may be different from the students' education level at the start of the analysis year, so a new distribution of students is needed. To do this the model applies a utility that begins with the students' level of education at entry, then moves them through their college career all the way up to the start of the analysis year. Results appear in **Table 2.3**.

Note that the "Entry Level" and "Analysis Year" columns in **Table 2.3** add to the same total. Differences between the columns reflect the redistribution of students as they move from one education level to the next, based on a bell curve distribution with a mean value equal to the average number of steps completed per student. The redistribution is measured and analyzed separately for males and females, though only weighted averages are shown here.

Table 2.3: Redistribution of Students by Level of Education

EDUCATION LEVEL	ENTRY LEVEL[1]	% OF TOTAL	ANALYSIS YEAR[2]	% OF TOTAL
< HS/GED	4,121	24%	3,305	19%
HS/GED equivalent	7,359	42%	3,126	18%
One year post HS or less	2,038	12%	4,557	26%
Two years post HS or less	3,171	18%	5,679	33%
> Two years post HS	717	4%	738	4%
TOTAL	**17,406**	**100%**	**17,406**	**100%**

1. Refers to the level of education of the student body upon entry.

2. Refers to the redistribution of students by education level at the start of the analysis year.

Source: Adapted from data supplied by Camosun based on parameters internal to the model.

An important component of the analysis is an estimation of the number of credit hour equivalents, or CHEs, achieved by the student body during the single academic year. For the purposes of this analysis, CHEs were derived based on the instructional and practica hours generated by the Camosun student body and converted to credit hour equivalents using a divisor of 20 and 45, respectively. **Table 2.4** shows the breakdown of the student body by educational achievement, along with the corresponding average number of CHEs completed per student during the analysis year. Note that the numbers that appear in **Table 2.4** are based on headcounts rather than FTE.[1]

As indicated, students who achieved their goals during the analysis year included those who earned degrees, diplomas or certificates (total 9% in Categories 1 through 3). Apprenticeship students comprised 6%, while transfer students and first, second or third-year students who did not complete their programs during the analysis year made up another 46% of the student body. Other students fulfilled credits for reasons of professional development, either to improve their skills or advance their career (26% in the workforce category). Retired and leisure students (1%) are simply backed out of the analysis altogether under the assumption that they do not attend Camosun to acquire skills that will increase their earnings.

Academic upgrade students, developmental students, and students enrolled in English as a Second Language (ESL) courses made up an additional 12% of the student

[1] The student population may look vastly different when analyzing it in terms of headcounts rather than FTEs. For example, a single student category could comprise 40% or more of the student population, but only 5% of total FTEs. For this reason, it is important to interpret the student breakdown in **Table 2.4** as based on headcounts, not FTEs.

population. These students are assumed to have a lower percentage impact relative to that of other students, because some, particularly those in ESL programs, are already educated and are taking courses to obtain the skills they need to enter the workforce (e.g., foreign nationals who are already credentialed but need to learn English before finding employment). As such, these students cannot claim the full benefit of moving from one education level to the next, so the economic value attributable to their education is assumed to be roughly 75% (relative to a 100% attribution for other students).

In sum, Camosun students generated 259,993 CHEs during the 2005-06 academic year, for an average of 15 CHEs per student. The last column of the table shows the average time students are actually in attendance relative to a full year. This is calculated by dividing average CHEs by 30, the assumed number of CHEs required to complete a full time equivalent, or FTE.

Table 2.4: Levels of Achievement

STUDENT CATEGORY	STUDENT DISTRIBUTION	HEAD-COUNT[3]	AVG CHEs	TOTAL CHEs	% FTE[4]
Cat. 1 - Three-year diploma/degree graduates	0%	0	0	0	0%
Cat. 2 - Two-year diploma graduates	3%	565	28	15,853	94%
Cat. 3 - Certificate graduates	6%	967	35	34,016	117%
Cat. 4 - Apprenticeship students	6%	1,008	13	13,112	43%
Cat. 5 - Transfer track and continuing	46%	8,029	19	154,999	64%
Cat. 6 - ABE/ESL/GED	12%	2,102	17	36,278	58%
Cat. 7 - Workforce students[1]	26%	4,602	1	5,611	4%
Cat. 8 - Retired and/or leisure students	1%	133	1	123	3%
TOTAL/WGHTD AVG[2]	**100%**	**17,406**	**15**	**259,993**	**50%**

1. Includes a mix of credit and non-credit students taking business contract and/or professional development courses to enhance their career or improve their skills.
2. Average credit hour equivalents (CHEs) do not include retired/leisure students as these are backed out of the study. Their total CHEs, however, are included because they comprise a portion of the total number of CHEs produced by Camosun.
3. Student breakdown based on headcounts rather than FTEs.
4. Calculated by dividing average CHEs by 30, the assumed number of CHEs required to complete an FTE.

Source: Adapted from data supplied by Camosun.

Opportunity Cost

Opportunity cost refers to the value of time and earnings foregone by students who choose to attend college rather than work full-time. It is derived by establishing the full

earning potential of students, then comparing this to what they are actually earning while attending college. Full earning potential is assumed to be the expected earnings of students given their current age, gender, and level of education. Average statistical earnings at the midpoint of the students' career (not at their current age) appear in **Table 2.5**.

Table 2.5: Expected Earnings at Midpoint of Individual's Working Career (Weighted Average)[1]

EDUCATION LEVEL	AVERAGE EARNINGS	DIFFERENCE
One year short of HS/GED	$26,400	-
HS/GED equivalent	$31,700	$5,300
Certificate	$35,700	$4,000
Diploma	$40,700	$5,000
Greater than diploma	$45,500	$4,800
AVERAGE EARNINGS	**$34,200**	**-**

1. Reflects earnings at the midpoint of the individual's working career, not immediately upon exiting college; Results are weighted to reflect the specific demographic profile of the student body.

Source: Adapted from national percentages of earnings by gender and level of education from Statistics Canada, then regionalized to reflect earnings prevalent in the college region using socio-economic data provided by BC Stats.

Average earnings in the bottom row of the table ($34,200) represent the overall average annual income of the students, weighted according to gender. This defines the midpoint of a working life trajectory that begins with low entry-level wages, culminates with a typical worker's highest wages sometime after the career midpoint, then starts tapering off as the worker approaches retirement around age 65.[2] To accurately determine the full earning potential of the Camosun student body, the $34,200 must be conditioned to the age of the students (26) using a scalar defined by the well-known and tested Mincer equation. The result – $18,464 – is assumed to be the full earning potential of the student body while enrolled, assuming full-time employment.

[2] This profile of lifetime earnings is well documented in labour economics literature. For example, see Robert J. Willis, "Wage Determinants: A Survey and Reinterpretation of Human Capital Earnings Function" in *Handbook of Labor Economics, Vol. 1* (Amsterdam: Elsevier Science Publishers, 1986): 525-602; Gary S. Becker, *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education* (NewYork: Columbia University Press for NBER, 1964); and Jacob Mincer, "Investment in Human Capital and Personal Income Distribution," *Journal of Political Economy* 66 no. 4 (August 1958): 281-302.

Students do not forego the entire $18,464, however. Many of them work full or part-time when class is not in session, thus making up some of their foregone earnings. The model estimates that students attend, on average, 50% relative to a full-time year of study, equal to the average CHEs per student (15) divided by 30, the number of CHEs required to achieve a full time equivalent (see last column of **Table 2.4**). Accordingly, the model discounts the $18,464 by all but 50%, assuming that students are free to work the rest of the year and thus do not accrue any opportunity cost when they are not actually attending Camosun. The resulting figure, $9,260, serves as the gross annual opportunity cost per student.

Student opportunity cost is further adjusted to match the employment patterns of the Camosun student body. For example, some students are retired or are attending strictly for reasons of personal enrichment, so they are giving up 0% of their full earning potential. Other students are not working at all and are thus giving up all (100%) of their full earning potential. Other students are employed, but many of them hold jobs that pay less than statistical averages because they can only find work that accommodates their college schedule. The model estimates that working students are giving up, on average, 43% of their full earning potential.[3] Working students also forego a substantial amount of their leisure time to attend college, which has an assumed value equal to 20% of the students' gross opportunity cost.[4] All of these adjustments are tallied up and applied to the $9,260 in gross opportunity cost for the Camosun student body.

Table 2.6 displays the grand total opportunity cost of education from the student perspective. Included are earnings foregone by employment status, equal to $119.6 million. Also included is a reduction to account for grants and scholarships given directly to students after all tuition and fees have been paid. Such funds represent a net gain to students and are thus discounted from the cost calculations. In sum, it is estimated that the costs of education for the Camosun student population amounted to $118.9 million in the 2005-06 analysis year.

[3] Earnings foregone by working students relative to their full earning potential is calculated internally in the model based on data supplied by some 200 colleges analyzed to date.

[4] Elementary consumer theory presents a tradeoff between income and leisure. Students able to work while attending college maintain all or part of their incomes, but give up a significant amount of their leisure time. Failing to impute value to leisure foregone underestimates the cost of education. See James M. Henderson and Richard E. Quandt, *Microeconomic Theory: A Mathematical Approach* (New York: McGraw-Hill Book Company, 1971).

Table 2.6: Total Opportunity Cost by Employment Status

EMPLOYMENT STATUS	HEAD-COUNT	OPP. COST	% ADJUST-MENT[1]	TOTAL
Retired/leisure	133	$9,260	0%	$0
Non-working	5,622	$9,260	100%	$52,055,196
Working[2]	11,651	$9,260	63%	$67,517,322
			Subtotal	$119,572,518
			Net of unrestricted grants and bursaries[3]	($624,068)
			TOTAL	**$118,948,449**

1. Includes the percent of earnings foregone relative to full earning potential, plus the value of leisure time given up (for working students only).
2. Net of students who are taking leisure courses while working.
3. An assumed 40% of total grants and bursaries awarded during the analysis year were paid out directly to students to cover their living expenses.

Source: Adapted from data supplied by Camosun. See also Table 2.5.

Origin and Settlement Patterns

About 11% of Camosun' students come from outside the region to attend college (net of long distance students who are not physically present while attending). These students spend money while in the area, whether for textbooks, food, rent, transportation, and so on. Their annual expenditures create jobs and incomes for local businesses, thereby contributing to economic growth in the region. A study commissioned by the Canada Millennium Scholarship Foundation estimates that students spend, on average, $4,303 for living expenses and $1,359 in transportation each year while attending college. Added to this is another $6,501 for room and board and $1,500 for books and supplies. These figures are discounted to account for the estimated portion that leaks from the economy,[5] then multiplied times the number of students from outside the region (1,857) to determine their gross expenditures. Results are further adjusted downward by the estimated portion of room and board that goes to the consumption sector (e.g., for rent and other forms of household income). As shown, students from outside the region spent a net total of $11.7 million while in the area. This figure serves as the basis from which the model calculates the impact of student spending on regional economic growth.

[5] In arranging data for inclusion in the impact model, only the trade margin is allocated to the trade sector. Modelers customarily assume a 25% mark-up. Accordingly, an item with a retail selling price of $100 but costing the retailer $80 will enter the economic model as $20 (= $80 x 25%) to the retail trade sector, and $80 to the manufacturer of the item. If the manufacturer is located outside the region, only the $20 trade margin is added: in this case the $80 is spending that is said to "leak" from the regional economy.

Table 2.7: Student Spending by Major Item, AY 2005-06

BUDGET ITEM	GROSS SPENDING	% AFTER LEAKAGE	NET SPENDING
Books and supplies	$1,500	40%	$600
Room and board	$6,501	80%	$5,201
Personal expenses	$4,303	55%	$2,367
Transportation	$1,359	55%	$747
TOTAL	**$13,663**	**65%**	**$8,915**
	Multiply times no. of students from outside region		1,857
		Subtotal	$16,557,129
		Net of household income[1]	($4,829,796)
		TOTAL SPENDING	**$11,727,333**

1. An assumed 40% of room and board goes to the consumption sector and is thus excluded from total spending.

Source: Adapted from data supplied by Sean Junor and Alex Usher, "The Price of Knowledge 2004: Access and Student Finance in Canada" (Canada Millennium Scholarship Foundation, Millennium Research Series, 2004). Room and board calculated by multiplying the weekly living allowance for students by province times the assumed number of weeks in an academic year (30), net of transportation costs.

Students who remain in the area upon exiting college also contribute to the economic growth of the region, while students who settle in the province (whether inside or outside of regional boundaries) benefit provincial and local taxpayers through their higher earnings and improved lifestyles. **Table 2.8** presents the settlement patterns of Camosun's students by region and by province. As shown in the table, 86% of students stay in the region upon exiting college, while 97% stay in the province (inclusive of students who remain in-region). The retention rates only apply to the first year, however. The model also assumes that 33% of students, and thus associated benefits, will leave the region over the next thirty years due to attrition (e.g., retirement, out-migration, or death). For the province, the assumed thirty-year attrition rate is 5%.

The last five items in **Table 2.8** are settling-in factors, the time needed by students to settle into their careers and start accruing benefits. For example, for transfer track students it is assumed that the onset of benefits will be delayed by 2.5 years to account for time spent at other institutions. Settling-in factors for the other student categories also appear in the table.

Table 2.8: Student Settlement Patterns

	VALUES
Students remaining in region after leaving college	86%
Students remaining in province after leaving college	97%
Thirty-year attrition rate (leaving region)	33%
Thirty-year attrition rate (leaving province)	5%
"Settling-in" factors (years):	
Diploma graduates	2.0
Certificate graduates	0.5
Transfer track students	2.5
Workforce students	0.0
ABE/ESL/GED students	0.5

Source: Student retention variables supplied by the college. Thirty-year attrition internal to analytical model. Settling-in factors adapted from Norton Grubb, "The Economic Benefits of Sub-Baccalaureate Education," CCRC Brief No. 2, ISSN 1526-2049 (New York, NY: Community College Research Center, June 1999).

REGIONAL PROFILE

Since Camosun first opened its doors to students, the college has been serving the local community by creating jobs and income, providing area residents with easy access to higher education opportunities, and preparing students for highly-skilled, technical professions. The availability of quality education and training also attracts new industry to the region, thereby generating new businesses and expanding the availability of public investment funds.

The regional backdrop used in this analysis is the Camosun Service Area, as defined by the BC Ministry of Advanced Education. The added income generated by the college as a result of its daily operations and the productivity effects of its students are measured against total income in the region to determine the college's relative impacts in the area, as part of the economic growth analysis discussed in greater detail in the subsequent chapters of this report. Economic growth analysis is a measure of the increase in value of goods and services produced in an economy. It is traditionally reported in terms of added regional income or gross domestic product (GDP), which reflects all factors of production, i.e,. labour, land and capital, net of otherwise double-counted inter-industry sales. Included are wages, salaries and proprietors' income (labour income) and profits, rents and other (non-labour income). Labour and non-labour income estimates for the Camosun Service Area appear in **Table 2.9**.

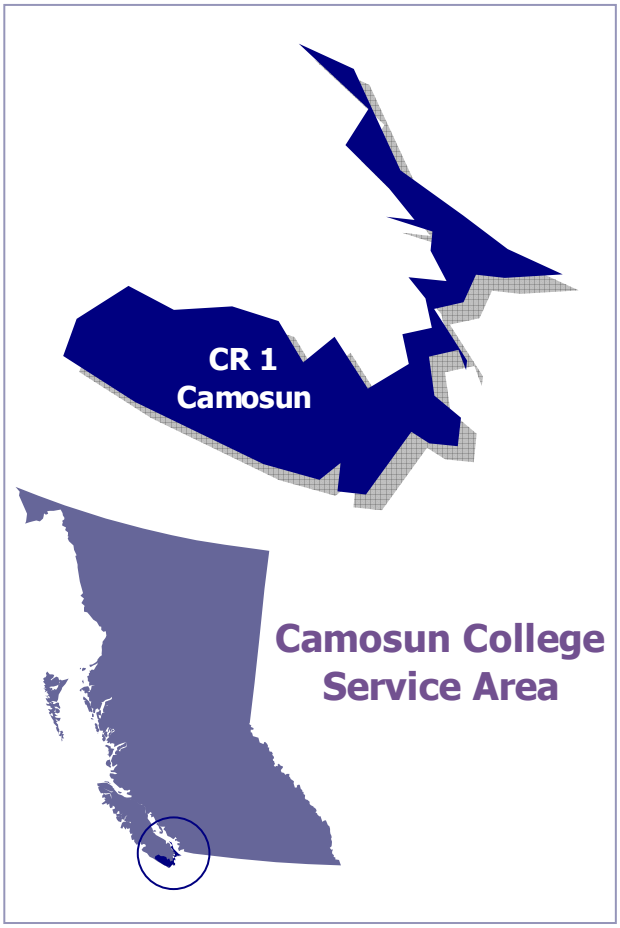


Table 2.9: Total Income in Regional Economy, 2006

	TOTAL INCOME ($ Thousands)	% OF TOTAL
Labour income[1]	$8,516,500	59%
Non-labour income[2]	$5,933,500	41%
TOTAL	**$14,450,000**	**100%**

1. Earnings; Includes Camosun faculty and staff wages and salaries.

2. Dividends, interests, and rents; Does not include transfers

Source: BC Stats, Socio-economic Profiles, College Regions (CRs); Statistics Canada, 2001 and 2004 Canadian Business Patterns (Catalogue no. 61F0040XCB, semi-annual); and outputs of the EMSI IO model.

SOCIAL BENEFITS

Higher education is statistically correlated with a variety of lifestyle changes that generate social savings, also known as *external* or *incidental* benefits of education (see "Beekeeper Analogy" box). These social savings represent avoided costs that would have otherwise drained public resources absent the education provided by Camosun. Data relating higher education to improved social comportment are available from a number of sources, including Statistics Canada and a variety of studies and surveys analyzing the impacts of substance abuse, crime, and unemployment on society.

Beekeeper Analogy

A classic example of positive externalities (sometimes called "neighborhood effects") in economics is the private beekeeper. The beekeeper's intention is to make money by selling honey. Like any other business, the beekeeper's receipts must at least cover his operating costs. If they don't, his business will shut down.

But from society's standpoint there is more. Flower blossoms provide the raw input bees need for honey production, and smart beekeepers locate near flowering sources such as orchards. Nearby orchard owners, in turn, benefit as the bees spread the pollen necessary for orchard growth and fruit production. This is an uncompensated external benefit of beekeeping, and economists have long recognized that society might actually do well to subsidize positive externalities such as beekeeping.

Colleges are in some ways like beekeepers. Strictly speaking, their business is in providing education and raising people's incomes. Along the way, however, external benefits are created. Students' health and lifestyles are improved, and society indirectly enjoys these benefits just as orchard owners indirectly enjoy benefits generated by beekeepers. Aiming at an optimal expenditure of public funds, the analytical model tracks and accounts for many of these external benefits and compares them to public costs (what taxpayers agree to pay) of college education.

Social benefits break down into three main categories: 1) health savings, 2) crime savings, and 3) welfare and unemployment savings. Health savings include avoided medical costs associated with reduced absenteeism and fewer incidents of alcohol and tobacco abuse. Crime savings comprise the sum total of avoided police, incarceration, prosecution and victim costs, while welfare and unemployment benefits include avoided costs due to the reduced number of social assistance and unemployment insurance claims.

Tables 2.10 through **2.12** present calculated reductions in the probability that an individual will incur social costs related to health, crime, or welfare and unemployment with each year of higher education. Costs per individual per year are also shown. The model translates these expenditures into avoided costs to the public by applying cost

data to the number of incidents where individuals manifest improved social behavior, then adjusting downward to net out benefits that are statistically correlated with other factors besides higher education (such as socioeconomic status and family background).[6] Results of the analysis are gauged from two perspectives, 1) a *broad* perspective that tallies all benefits, and 2) a *narrow* perspective that tallies only benefits to provincial and local government.

Health Savings

In general, statistics show a positive correlation between higher education and improved health habits, which means reduced health-related expenditures to the public. **Table 2.10** presents calculated reductions in worker absenteeism, smoking, and alcohol abuse as a function of higher education. These data are linked to the gender profile of the Camosun student body.

Table 2.10: Absenteeism, Tobacco and Alcohol Abuse by Level of Education

	ABSENTEEISM		TOBACCO		ALCOHOL	
EDUCATION LEVEL	DAYS[1]	%/YEAR[2]	PROB.[3]	% REDUCT.[4]	PROB.[3]	% REDUCT.[4]
< HS/GED	12.0	4.6%	26.6%	-	6.7%	-
HS/GED equivalent	11.1	4.3%	24.7%	7.1%	6.0%	9.4%
One year post HS or less	10.7	4.1%	22.9%	7.1%	5.5%	9.4%
Two years post HS or less	10.1	3.9%	19.9%	13.2%	4.5%	17.3%
> Two years post HS	9.8	3.8%	17.9%	9.9%	3.9%	13.0%
Annual costs per alcohol abuser[5]		**$7,000**				
Annual costs per tobacco abuser[5]		**$3,000**				
Prov. and local govt. health subsidy		**40%**				

1. Shows the average number of days of absenteeism by education level, weighted according to the gender breakdown of the student body.
2. Calculated by dividing absenteeism days by the number of working days per year (260).
3. Shows the probability that an individual will be a smoker or an alcoholic, weighted according to the gender breakdown of the student body.
4. Shows the calculated reduction in the probability that an individual will abuse tobacco or alcohol.
5. Smoking and alcohol related costs include health care, prevention and research, property damage, workplace losses, worker's compensation, and productivity losses. They do not include law enforcement and social welfare costs, as these are implicitly included in crime and welfare costs, respectively.

Source: See Volume 2: Detailed Results, Tables 2 through 7.

Broad Perspective: Benefits from reduced absenteeism are equal to average earnings per day multiplied by number of days saved. Smoking and alcohol-related savings are

[6] This adjustment, also known as the "ability bias" is described more fully in **Chapter 3**.

calculated by multiplying the number of individuals who will *not* have to incur health-related costs times associated costs of smoking and alcohol abuse per year. In the broad taxpayer perspective, all health-related benefits, including those that accrue solely to employers and individuals, are considered public benefits.

Narrow Perspective: Taxpayers benefit from reduced absenteeism to the extent that provincial and local government is an employer. Accordingly, the model assumes a taxpayer's portion of absenteeism savings at 2.9%, equal to the estimated public portion of employment in the region.[7] As for smoking and alcohol-related savings, taxpayers benefit to the extent that provincial and local health subsidies (to hospitals, for example) are reduced. Altogether, the model assumes that 13.1% of total health benefits can be counted as taxpayer savings.

Crime Savings

Table 2.11 shows crime rates by education level. As indicated, crime drops on a sliding scale as education levels rise. The implication is, as people achieve higher education levels, they are statistically less likely to commit crimes. These statistical patterns are calibrated to the gender profile of the Camosun student body. The analysis identifies two types of crime-related expenses: 1) policing, courts, legal aid, corrections, and prosecution, and 2) victim costs, including those associated with pain and suffering.

Table 2.11: Crime Rates by Level of Education

EDUCATION LEVEL	PROBABILITY[1]	% REDUCTION[2]
< HS/GED	16.4%	-
HS/GED equivalent	13.7%	16.9%
One year post HS or less	12.2%	10.9%
Two years post HS or less	10.2%	16.6%
> Two years post HS	9.1%	10.4%
Annual cost per criminal offence[3]		**$5,724**
Annual cost per victim		**$5,490**
Prov. & local govt. justice expenditures (%)[4]		**75%**

1. Shows the probability that an individual will commit a criminal offence by education level, weighted according to the gender breakdown of the student body.
2. Shows the calculated reduction that an individual will commit a crime.
3. Crime costs include police, court, legal aid, adult correction, and prosecution costs.
4. Refers to the percent of total justice expenditures covered by provincial and local government.

Source: See Volume 2: Detailed Results, Tables 8 through 10.

Broad Perspective: Crime savings are determined first by multiplying the number of criminal offences that will *not* occur times the average cost per offence. Savings to victims are calculated in a similar fashion. From the broad taxpayer perspective, all reductions in crime-related expenses are counted as a benefit.

Narrow Perspective: The model assumes that nearly all crime savings accrue to provincial and local taxpayers—federal funding covers the remainder. Crime victim savings are avoided costs to potential victims, not to taxpayers. As such, none of these are claimed as taxpayer savings.

Welfare and Unemployment Savings

Table 2.12 relates the probabilities of individuals applying for social assistance and/or employment insurance to education levels (linked to the gender profile of the Camosun student body).[8]

Table 2.12: Social Assistance and Unemployment by Level of Education

	WELFARE		UNEMPLOYMENT	
EDUCATION LEVEL	PROB.[1]	% REDUCT.[2]	PROB.[1]	% REDUCT.[2]
< HS/GED	5.1%	NA	7.7%	NA
HS/GED equivalent	3.8%	25.6%	6.5%	15.9%
One year post HS or less	3.1%	18.4%	5.8%	10.1%
Two years post HS or less	2.1%	30.6%	4.9%	15.3%
> Two years post HS	1.6%	23.1%	4.5%	9.5%
Average social assistance per individual, per year[3]				**$6,930**
Average duration on social assistance (no. of months)				**18**
Average employment insurance benefits per individual, per year[4]				**$300**
Average duration on unemployment (no. of months)				**4**

1. Shows the probability that an individual will go on welfare or claim unemployment by education level, weighted according to the specific gender profile of the student body.
2. Shows the calculated reduction that an individual will be go on welfare or claim unemployment.
3. Social assistance costs based on total provincial government social assistance transfers (income maintenance and other) divided by total number of persons on welfare during the analysis year.
4. Annual unemployment costs based on average duration on unemployment (in weeks) times average weekly employment insurance benefits

Source: See Volume 2: Detailed Results, Tables 11 through 14.

[7] Ratio of provincial and local government earnings over total provincial earnings.
[8] The model assumes that average duration on welfare and unemployment is 18 and 4 months, respectively. This means that, over the next thirty years or so, the cumulative incidence of welfare and/or unemployment will be spread evenly over the time horizon—it is not necessarily a consecutive period.

Broad Perspective: Reduced welfare and unemployment claims multiplied by the average cost per year are counted in full as benefits in the broad taxpayer perspective.

Narrow Perspective: All benefits stemming from reduced social assistance are claimed as taxpayer benefits, while none is claimed for unemployment, because these costs are not borne by provincial taxpayers.

SUMMARY

This chapter presents the broader elements of the database and some key assumptions needed to determine the results. In general, data are drawn from four sources: 1) the institutional research and financial departments at the college, 2) public databases, 3) studies and surveys, and 4) the economic literature. Additional detail on data sources, assumptions, and general methods underlying the analyses are conveyed in the remaining chapters and appendices. The core of the findings is presented in the next two chapters – **Chapter 3** looks at Camosun as an investment, while **Chapter 4** considers Camosun's role in regional economic growth. The appendices detail a collection of miscellaneous theory and data issues.

Chapter 3
INVESTMENT ANALYSIS

INTRODUCTION

Investment analysis is the process of evaluating total costs and measuring these against total benefits to determine whether or not a proposed venture will be profitable. If benefits outweigh costs, then the investment is worthwhile. If costs outweigh benefits, then the investment will lose money and is thus considered infeasible.

This chapter considers Camosun as an investment from the perspectives of its major stakeholders, students and taxpayers. Two important measures are presented: 1) annual benefits, and 2) future benefits expressed in present value terms. The backdrop for the analysis is the entire province of British Columbia.

STUDENT PERSPECTIVE

Analyzing the benefits of higher education from the perspective of students is most obvious – they give up time and money to go to college in return for a lifetime of higher earnings. The benefit component of the analysis thus focuses on the extent to which student earnings increase as a result of their education, while costs comprise the monies they put up.

Table 3.1 displays the total cost of education from the student perspective. Included are tuition and fees from **Table 2.1** ($19.6 million) plus student opportunity cost from **Table 2.6** ($118.9 million). Also included is a reduction to account for tuition and fees paid by retired and leisure students. In sum, it is estimated that the costs of education amounted to $138.5 million in the 2005-06 analysis year.

Table 3.1: Student Costs

COST COMPONENT	TOTAL
Tuition and fees	$19,580,138
Opportunity cost	$118,948,449
Subtotal	$138,528,587
Net of revenue from retired/leisure students[1]	($9,284)
TOTAL	**$138,519,303**

1. Equal to the number of CHEs generated by retired and leisure students times the cost of tuition and fees per CHE.

Source: See Tables 2.1 and 2.6.

Estimating benefits from the student perspective requires information on the value of each CHE they achieve during the single analysis year. Determining this value makes use of another utility that takes average earnings by education level from **Table 2.5** and allocates the differences to the CHEs completed within each level. For example, students who move from a high school diploma to a Certificate may expect $4,000 in higher annual earnings, equal to the difference between average earnings of someone with a Certificate and those of a high school graduate. This defines the marginal value of moving from one education level to the next, which is spread out and allocated to the individual CHEs required to complete the award.[9]

Other factors come into play when calculating the value per CHE. For example, ability, family background, and socioeconomic status are proven to correlate with higher earnings, and failure to take these into account when estimating the benefits of higher education results in what is known as an "ability bias." Nevertheless, the simple correlation between benefits and education defines the *upper limit* of the effect measured. A literature review by Chris Molitor and Duane Leigh indicates that upper limit benefits defined by correlation should be discounted by 10%.[10]As such, the gross value per CHE is adjusted downward by 10%.

Another adjustment is needed to account for retired and leisure students and ABE/ESL/GED students. Retired and leisure students do not attend college to acquire skills that will increase their earnings, so the marginal values attached to the CHEs they achieve are backed out of the analysis altogether. For ABE/ESL/GED students, the economic value attributable to their educational achievements is estimated to be roughly 75% (relative to a 100% attribution for other students), in recognition of the fact that some of these students may already have credentials and simply need to take college courses to learn English or obtain other skills to enter the workforce.

A final adjustment is applied to account for the students' work experience, which is also statistically proven to correlate with higher earnings. The analytical model calculates the adjustment on the basis of the average age of the students, under the assumption that students older than 21 are likely to have obtained more work experience than younger students. Accounting for this and other adjustments generates a net reduction factor of 21%, which is used to discount the gross value per CHE determined by the analytical

[9] Students who obtain a certificate or degree during the analysis year are granted a "ceremonial boost" in recognition of the fact that an award has greater value than the individual steps required to achieve it.
[10] Chris Molitor and Duane Leigh, "Estimating the Returns to Schooling: Calculating the Difference Between Correlation and Causation" (Pullman, WA: by the authors, March 2001). Report available upon request.

model. Net values are displayed in **Table 3.2**. Note that the individual CHEs required to achieve each education level have their own unique value in the model, but only the weighted averages are shown here.

Table 3.2: Aggregate Higher Earnings at Midpoint, by Education Level

EDUCATION LEVEL	NET CHEs[1]	VALUE PER CHE	AGGREGATE HIGHER EARNINGS
HS/GED equivalent or less	33,347	$158	$5,256,641
One year post HS or less	138,062	$106	$14,646,461
Two years post HS or less	84,617	$132	$11,166,925
> Two years post HS	3,843	$127	$486,455
TOTAL	**259,870**	**$121**	**$31,556,482**

1. Net of retired and leisure students.

Source: See Tables 2.3, 2.4, and 2.5.

Multiplying the value per CHE times the corresponding number of CHEs completed yields the aggregate higher earnings that accrue to Camosun students. This figure reflects earnings at the midpoint of the students' careers, not immediately upon exiting college. The general expectation is that earnings will be lower at the start of an individual's career and higher near the end of it, so earnings at the midpoint serve as a reasonable average.[11] Altogether, it is estimated that the aggregate Camosun student body enjoys, on average, $31.6 million in higher earnings each year as a direct result of their education.

The $31.6 million in higher earnings do not occur in one year alone, however. Higher earnings accrue for years out into the future, long after students make their initial investment of time and money. For this reason, benefits must be projected out into the future before they can be compared to costs to ascertain the feasibility of the investment. The time horizon for the analysis is defined by the students' working career, from the time they enter (or re-enter) the workforce at age 26 all the way up until they retire at age 65. Each year within this timeframe is assigned to a specific scalar derived from the well-known and tested Mincer equation, where average earnings (i.e., $31.6 million) are scaled down for the years prior to the midpoint, then scaled up for the years beyond the

[11] Students are rewarded for their education with higher incomes now and into the future, generally for as long as they remain active in the workforce. At the same time, research indicates that the gap between educated and non-educated workers grows through time and that the income increment from schooling grows as well. The annual increase in student earnings shown in **Table 3.2** refers to the middle of students' careers. A somewhat smaller figure is therefore expected in years immediately following the single year of college operations, and a larger figure in the latter part of students' careers.

midpoint, resulting in a projected array of higher student earnings that gradually increases each year that students remain active in the workforce.[12]

The next step is to discount the projected array of higher student earnings back to the present to reflect the so-called time value of money. For this analysis the assumed discount rate is 4.0% (see "Discount Rate" box). Present values of benefits are then collapsed down to one number and compared to student costs to derive investment analysis results, expressed in terms of benefit/cost ratios, rates of return and payback periods. The investment is feasible if returns match or exceed the minimum threshold values, i.e., a benefit/cost ratio greater than one, a rate of return that exceeds the discount rate, and a reasonably low payback period. Results appear in **Table 3.3**.

Discount Rate

The discount rate is a rate of interest that converts future costs and benefits to present values. For example, $1,000 in higher earnings realized 30 years in the future is worth much less than $1,000 in the present. All future values must therefore be expressed in present value terms in order to compare them with investments (i.e., costs) made today. The selection of an appropriate discount rate, however, can become an arbitrary and controversial undertaking. As suggested in economic theory, the discount rate should reflect the investor's opportunity cost of capital, i.e., the rate of return one could reasonably expect to obtain from alternative investment schemes. If the desired end is to portray the investment as feasible and attractive, the discount rate selected is typically low. On the other hand, if the desired end is to portray the proposed investment as poor and unattractive, then the selected discount rate is high. The 4.0% discount rate used in the CCbenefits impact study is a typical and relatively low rate often applied in public investment projects, since governments are large and can therefore spread their risks over a larger and more diverse investment portfolio than the private sector can.

As shown in the table, the $31.6 million in higher student earnings are projected across the working life of students, discounted to the present, and summed together to yield a cumulative of $657.3 million, the present value of all those future income increments. This may also be interpreted as the gross capital asset value of the students' higher income stream. Accordingly, the aggregate student body is rewarded a capital asset valued at $657.3 million as a result of their attendance at Camosun.

[12] The Mincer equation is computed based on estimated coefficients presented in Willis, 1986. These are adjusted to current year dollars in the usual fashion by applying the GDP implicit price deflator.

Table 3.3: Present Value of Benefits and Costs, Student Perspective

	RESULTS
Present value of future benefit stream [1]	$657,266,957
Present value of costs	$138,519,303
Net present value	**$518,747,654**
Benefit/cost ratio	**4.7**
Internal rate of return	**15.3%**
Payback period (no. of years)	**9.4**

1. Calculated by projecting average annual higher student earnings from Table 3.2 over the established time horizon, discounting the future benefit stream to the present using an assumed rate of 4.0%, then summing final discounted values together.

Source: See Tables 3.1 and 3.2.

Having estimated the students' reward for attending Camosun, the model compares this to associated costs to judge whether attending college is a good investment. Costs are provided in the second row of **Table 3.3**, equal to $138.5 million. Note that costs only occur in the single analysis year and are thus already in current year dollars, so their present value equals what is reported in **Table 3.1**. Comparing costs with the present value of benefits yields a student benefit/cost ratio of 4.7 (equal to $657.3 million in benefits divided by $138.5 million in costs).

The rate of return is perhaps the most recognized indicator of investment effectiveness. Given the cost of college and the stream of associated future benefits, the rate of return indicates how much a bank would have to pay a depositor of like amount to yield an equally rewarding stream of future payments.[13] **Table 3.3** shows Camosun students earning average returns of 15.3% on their investment of time and money. This is indeed an impressive return compared, for example, to 1% on a standard bank savings account, or approximately 8 to 10% on stocks and bonds (thirty-year average return).

The payback period is defined as the length of time it takes to entirely recoup the initial investment.[14] Beyond that point, returns are what economists would call "pure costless

[13] Rates of return are computed using the familiar "internal rate of return" calculation. Note that, with a bank deposit or stock market investment, the depositor puts up a principal, receives in return a stream of periodic payments, and then recovers the principal at the end. A college investor, on the other hand, receives a stream of periodic payments that include the recovery of the principal as part of the periodic payments, but there is no principal recovery at the end. These differences notwithstanding, comparable cash flows for both bank and college investors yield the same internal rate of return.

[14] Payback analysis is generally used by the business community to rank alternative investments when safety of investments is an issue. Its greatest drawback is that it takes no account of the time value of money.

rent." As indicated in **Table 3.3**, students at Camosun see, on average, a payback period of 9.4 years on their foregone earnings and out-of-pocket costs.

TAXPAYER PERSPECTIVE

Benefits from the taxpayer perspective are further subdivided into two main components: broad and narrow. The broad taxpayer perspective focuses on society as a whole, whether employers, homeowners, students or whoever else stands to benefit from the educational activities of Camosun. Under the broad perspective *all* benefits generated by the college are counted, regardless of beneficiary. The narrow taxpayer perspective, on the other hand, restricts benefits to those that result in actual monetary gain to provincial and local government, whether in the form of added tax revenue or reduced government expenditures. In both cases (broad and narrow), costs comprise provincial and local government support of the college.

Broad Taxpayer Perspective

Benefits from the broad or "social" perspective consist of added income and avoided social costs. Income growth refers to the increase in economic activity as higher earnings and added skills of Camosun students stimulate the production of income in the province. Avoided social costs comprise reductions in both private and public expenditures as Camosun students manifest improved lifestyles in the form of reduced health care costs, lower crime, and reduced welfare and unemployment.

Students earn more because of the skills they learned while attending college, and businesses earn more because student skills make capital more productive (i.e., buildings, machinery and everything else).[15] This in turn raises profits and other business property income. Together, increases in labour and capital income are considered the *direct effect* of a skilled workforce. *Indirect effects* occur when the higher incomes of educated workers enable them to spend more money on consumer goods, while the increased output of businesses that employ them also creates a demand for more inputs and, consequently, input spending. The effect of these two spending items (consumer and business spending) leads to still more spending and more income creation, and so on. The sum total of these several rounds of spending effects constitutes the indirect income effects of a skilled workforce.

[15] In the production process, skilled labour and capital complement each other (i.e., they have a relatively low elasticity of substitution). Accordingly, an increase in skilled labour increases the productivity and income of existing capital, while encouraging additional capital investment.

Estimating the direct effect of Camosun on income growth in the province begins with the present value of projected higher student earnings from **Table 3.3**. This must be adjusted downward to account for students who leave the province, in accordance with the out-migration and attrition variables shown in **Table 2.8**. The model then calculates the indirect effect of higher student earnings on labour income using a multiplier derived from a specialized input-output (IO) model described more fully in **Chapter 4**. Total labour income growth attributable to Camosun is then inflated by a ratio of gross domestic product to total earnings to factor out the growth of non-labour income (i.e., dividends, interest, and rent).

The next step is to apply a reduction factor that takes into account alternative education opportunities such as private trade schools and colleges, correspondence schools, and so on. The alternative education variable is derived using a ratio of private to public colleges in the province, then conditioning this to the average earnings per worker in the region. For Camosun, this variable is set at 5%, meaning that 5% of the student body could have obtained an education elsewhere absent Camosun and other publicly-funded colleges and universities in the province. The model assumes that benefits generated by such students are not directly attributable to Camosun and discounts results accordingly.

Another adjustment called the "shutdown point" accounts for the fact that a certain portion of benefits generated by the college may not be directly linked to the provincial and local government costs of supporting it. The overall approach includes a sub-model that simulates the students' demand curve for education by reducing provincial and local support to zero and progressively increasing tuition. As tuition increases, enrolment declines (see **Appendix 2**). Below some minimum level of enrolment (35%), it is assumed that the college would have to shut down. In the case of Camosun, the analysis shows that without provincial and local government support the college would have to cease its operations, so the reduction is zero.

Applying these adjustment factors yields the net effect of Camosun on income growth in the provincial economy. Results appear with labour and non-labour income detail in the top rows of **Table 3.4**. Altogether, it is estimated that a representative year of Camosun operations annually adds about $61.4 million in income to the provincial economy.

Table 3.4: Aggregate Annual Benefits, Broad Taxpayer Perspective

BENEFIT COMPONENT	UNITS	TOTAL
Income Growth		
Labour income	-	$34,883,700
Non-labour income	-	$26,509,100
Subtotal, Income Growth		$61,392,800
Social Savings		
Health Benefits		
Absenteeism savings (no. days)	6,000	$816,200
Fewer smokers (no. persons)	260	$1,082,200
Fewer alcohol abusers (no. persons)	80	$805,500
Crime Benefits		
Fewer criminal offences	210	$30,400
Crime victim savings	-	$29,200
Welfare/Unemployment Benefits		
Social assistance (no. claims)	100	$26,400
Employment insurance (no. claims)	90	$24,100
Subtotal, Social Savings		$2,814,000
TOTAL PUBLIC BENEFITS		**$64,206,800**

Source: Adapted from data supplied by Tables 18 and 19 in Volume 2: Detailed Results.

The next section of **Table 3.4** outlines the social savings stemming from the activities of Camosun and its students. Statistics generally indicate positive behavioral changes as individuals reach higher levels of education, while data on the social costs of behavior are also relatively abundant (see **Tables 2.10** through **2.12**). By combining these data sets the model measures a reduction in social costs as a by-product of education. The several items of social savings shown in **Table 3.4** are all calculated in this manner—relating incremental increases in education to improved social behavior, then adjusting downward to account for retired and leisure students, out-migration, and the ability bias.[16] Additional detail appears in **Chapter 2** and in **Volume 2: Detailed Results**.

As indicated in the table, one year's worth of Camosun operations reduces health-related absenteeism from work by approximately 6,000 days per year, resulting in an annual average savings of otherwise lost productivity equal to roughly $816,200. There are also about 260 fewer smokers incurring average smoking-related costs, with an

[16] The ability bias specifically relates to higher earnings. Absent any similar research for the social variables, the model assumes that the same discounting factor applies as well to the public benefits. See the text surrounding **Table 3.2** for more information about the ability bias.

annual average savings to society of some $1.1 million. Finally, there are 80 fewer alcohol abusers per year, providing an annual average savings of $805,500.

Camosun operations also result in an estimated 210 fewer criminal offences over the course of the students' working career, with corresponding annual of $30,400 in direct crime savings, and $29,200 in savings to otherwise would-be crime victims.[17] Estimated average annual reduction of social assistance and employment insurance claims is approximately 100 and 90 respectively. The corresponding annual dollar savings amount to roughly $26,400 for welfare and about $24,100 in unemployment savings.

All told, a year's operation of Camosun annually generates around $2.8 million in avoided social costs, equal to the sum of all health, crime, and welfare and unemployment savings. Added to this are income growth benefits, for a grand total of $64.2 million. This sum represents the average annual benefits that accrue to the provincial and local community as a result of Camosun.

As with the student perspective, annual benefits in **Table 3.4** must be projected out into the future before they can be compared to costs. The time horizon for the analysis is again defined by the students' working career, equal to the assumed retirement age of 65 minus the average age of the student body. The present value of benefits and costs are displayed in **Table 3.5**, using an assumed discount rate of 4.0%. As shown, the present value of future additions to income growth sums to $1.3 billion, while the present value of future social savings sums to $51.3 million. Altogether, the present value of all public benefits equals roughly $1.3 billion.

Table 3.5: Present Value of Benefits and Costs, Broad Perspective

	RESULTS
Present value of future added income	$1,275,988,800
Present value of future avoided social costs	$51,253,900
Total benefits, present value	$1,327,242,700
Total costs, present value	$55,980,300
Benefit/cost ratio	**23.7**

Source: See Tables 2.1 and 3.4.

Provincial and local government support of Camosun also appears in **Table 3.5**, listed as the present value of total costs. While this is technically correct, it is important to note that, unlike streams of benefits that go on into the future, the provincial and local

[17] Crime costs are defined broadly to include spending associated with police, prosecution, courts, legal aid, and adult corrections.

government contribution of $56.0 million was made in the single analysis year alone. Its present value and nominal dollar value are thus the same.

Having now defined present values of costs and benefits, the model forms a benefit/cost ratio of roughly 23.7 (= $1.3 billion worth of benefits / $56.0 million worth of provincial and local government support). Recall that this ratio reflects the measure of *all* benefits generated regardless of to whom they may accrue. Students are the beneficiaries of higher earnings, employers are beneficiaries of lower absenteeism, still others are beneficiaries of improved health, and so on. These are widely dispersed benefits that do not necessarily return to provincial and local taxpayers who pay costs at full measure. Inasmuch as investors and beneficiaries are not the same individuals, measures common to standard investment analyses such as rate of return, payback period, and net present value no longer apply. From the broad taxpayer perspective, therefore, the benefit/cost ratio should be viewed strictly as a comparison between public benefits and taxpayer costs.

Narrow Taxpayer Perspective

With the narrow taxpayer perspective the situation is different, since investors and beneficiaries are one and the same. The pivotal step here is to limit overall public benefits shown in **Table 3.4** to those that specifically accrue to provincial and local government. For example, benefits resulting from income growth are limited to higher provincial and local tax payments. Similarly, savings related to improved health, reduced crime and fewer welfare/unemployment claims are limited to those received strictly by provincial and local government, while benefits to private residents, local businesses or the federal government are excluded altogether.

Table 3.6 presents annual benefits that accrue to provincial and local taxpayers in terms of added tax revenue and reduced government expenditures. For example, **Table 3.4** shows annual income growth in the province equal to some $61.4 million. **Table 3.6** applies prevailing provincial and local government tax rates to this figure to compute annual higher government revenue associated with growth, equal to approximately $12.6 million. Also shown are reduced government expenditures related to absenteeism and substance abuse. Absenteeism savings are restricted to the portion that accrues to provincial and local government employers, while savings from reduced tobacco and alcohol abuse are computed based on provincial and local government's subsidy of general health care. This yields savings of $22,000 and $219,300, respectively, to provincial and local government each year.

The provincial and local government portion of crime savings shown in **Table 3.4** is computed by deducting victim costs and the cost of federal crimes, as none of these accrue to taxpayers. All told, provincial and local government sees reduced justice expenditures equal to $20,200 each year. Reduced social assistance expenditures of $23,400 complete the estimation of annual provincial and local government savings from Camosun support.

Table 3.6: Aggregate Annual Benefits, Narrow Taxpayer Perspective

BENEFIT COMPONENT	TOTAL
Added Tax Revenue	$12,564,100
Reduced Government Expenditures	
Health Benefits	
Absenteeism savings	$22,000
Substance abuse savings[1]	$219,300
Crime Benefits	
Justice savings	$20,200
Welfare Benefits	
Social assistance savings	$23,400
Subtotal, Reduced Government Expenditures	$262,900
TOTAL GOVERNMENT BENEFITS	**$12,827,000**

1. Inclusive of reduced government expenditures related to reduced tobacco and alcohol abuse.

Source: Adapted from data supplied by Tables 18 and 19 in Volume 2: Detailed Results.

Projecting annual benefits in **Table 3.6** out to the future then discounting them back to the present gives the time value of all future benefit increments that accrue strictly to provincial and local government. Results appear in **Table 3.7**. As indicated, the future stream of benefits provides an overall asset value of $266.9 million stemming from a year's support of Camosun. Costs, on the other hand, come to only $56.0 million, equal to the annual contribution of provincial and local government to Camosun (note that this number is repeated from **Table 3.5**). In return for their support, therefore, provincial and local government is rewarded with an investment benefit/cost ratio of 4.8 (= $266.9 million / $56.0 million), indicating a most profitable investment.

At 15.8%, the rate of return to provincial and local taxpayers is similarly impressive. Economists typically assume a 4.0% rate of return when dealing with government investments and public finance issues. This is the return governments are assumed to be able to earn on generally safe investments of unused funds, or alternatively the interest

rate for which governments, as relatively safe borrowers, can obtain funds. A rate of return of 4.0% would mean that the college just pays its own way. In principle, governments could borrow monies used to support the college and repay the loans out of the resulting added taxes and reduced government expenditures. A rate of return of 15.8%, on the other hand, means that Camosun not only pays its own way, but also generates a significant surplus that provincial and local government can use to fund other programs. It is unlikely that other government programs could make such a claim.

Table 3.7: Present Value of Benefits and Costs, Narrow Perspective

	RESULTS
Present value of increased provincial and local government tax revenue	$261,132,500
Present value of reduced provincial and local government expenditures	$5,774,900
Total benefits, present value	$266,907,400
Total costs, present value	$55,980,300
Net present value	**$210,927,100**
Benefit/cost ratio	**4.8**
Internal rate of return	**15.8%**
Payback period (no. of years)	**9.1**

Source: See Tables 2.1 and 3.6.

Note that returns reported in **Table 3.7** are real returns, not nominal. When a bank promises to pay a certain rate of interest on a savings account, it employs an implicitly nominal rate. Bonds operate in a similar manner. If it turns out that the inflation rate is higher than the stated rate of return, then money is lost in real terms. In contrast, a real rate of return is on top of inflation. For example, if inflation is running at 3.0% and a nominal percent of 5.0% is paid, then the real rate of return on the investment is only 2.0%. In **Table 3.7**, the 15.8% taxpayer rate of return is a real rate. With an inflation rate of 2.7% (the average rate as per the Statistics Canada, Consumer Price Index), the corresponding nominal rate of return is 18.9%, substantially higher than what is reported in this analysis.

With and Without Social Benefits

In **Chapter 2** social benefits attributable to college education (reduced crime, welfare and unemployment, and improved health) are defined as *external benefits*, incidental to the operations of the college. Some would question the legitimacy of including these benefits in the calculation of rates of return to higher education, arguing that only direct benefits, i.e., higher earnings, should be counted. **Tables 3.5** and **3.7** are inclusive of

social benefits reported here as attributable to the college. Recognizing the other point of view, **Table 3.8** shows rates of return for both broad and narrow perspectives exclusive of social benefits. As indicated, returns are still well above threshold values (a benefit/cost ratio greater than 1 and a rate of return greater than 4.0%) confirming that taxpayers receive great value from investing in Camosun.

Table 3.8: Taxpayer Perspectives Without Social Externalities ($ Thousands)

	BROAD PERSPECTIVE With Social Savings…		NARROW PERSPECTIVE With Social Savings…	
	Included	Excluded	Included	Excluded
Net present value	$1,327,243	$1,275,989	$266,907	$261,132
Internal rate of return	-	-	15.8%	15.3%
Benefit/cost ratio	23.7	22.8	4.8	4.7
Payback period (years)	-	-	9.1	9.4

Source: See Tables 3.5 through 3.7.

ANNUAL PRIVATE AND PUBLIC BENEFITS COMPARED

To get a different perspective on the results, aggregate annual benefits reported in **Tables 3.2** and **3.4** are expressed in **Table 3.9** on per CHE and per full time equivalent (FTE) student bases. The upper two rows of the table refer to student benefits. The remainder of the table summarizes public benefits, with the bottom row showing total public benefits.

Table 3.9: Annual Benefits Per CHE and Per FTE Student

	PER CHE[1]	PER FTE STUDENT[1]
STUDENT BENEFITS		
Increased student earnings, **gross**	$121	$3,643
Increased student earnings, **after tax**	$95	$2,858
PUBLIC BENEFITS		
Income growth	$236	$7,087
Health-related savings[2]	$10	$312
Crime savings[3]	<$1	$7
Welfare/unempl. savings[4]	<$1	$6
TOTAL	**$247**	**$7,412**

1. Annualized values exclude benefits from retired students.
2. Inclusive of savings due to reduced absenteeism and tobacco and alcohol abuse.
3. Inclusive of savings due to reduced crime and victim costs.
4. Inclusive of savings due to reduced social assistance and employment insurance claims.
Source: See Table 3.2 and 3.4.

As indicated in the first row, the annual average income of Camosun students increases roughly $121 for every hour of credit or non-credit instruction they complete. The $121 figure is "gross earnings," e.g., the gross figure that might appear on a student's pay stub. The "after tax" figure is shown as $95 – this is the figure that might appear on the student's actual paycheque.[18]

For public benefits, **Table 3.9** indicates that an hour of instruction adds an average of $236 per year to provincial income. The other "social benefits" shown are mainly avoided social costs. These range from less than $1 per CHE in welfare/unemployment savings, to roughly $10 per CHE from health-related savings. All told, each hour of Camosun instruction creates $247 in annual public benefits.

The last column in **Table 3.9** expresses results on a full time equivalent (FTE) basis. The model assumes that an FTE student takes the equivalent of 30 credit hours of class work to complete a full year of study. On average, a full-time year of study rewards the average Camosun student with $3,643 in higher annual income (before tax). It also increases regional income by $7,087 and provides other social benefits as indicated in the table. The total of all social benefits, economic growth plus social savings, provides $7,412 to the public annually. These results are all annual averages of benefits that will accrue for years into the future, for at least as long as students remain in the workforce.

Who Benefits Most from Education?

Who benefits most from education, students or the public? This is a currently hotly debated question and is an obviously fundamental issue in higher education funding. The popular view in many circles is that students benefit most, yet the results presented in **Table 3.9** indicate otherwise. Because the money students pay in taxes does not benefit students as such, but rather the taxpaying public, the appropriate figure for judging student benefits is increased earnings after tax (shown in the second row of **Table 3.9**).

Total public benefits are shown in the bottom row of **Table 3.9**. The comparison can now be made: students benefit from one CHE of Camosun attendance with a $95 annual increase in their after-tax earnings. At the same time, public benefits from that same hour of instruction sum to about $236 in added annual income growth and assorted social savings per CHE. Looking at the results strictly in monetary terms, therefore, the

[18] The tax adjustment is based on federal and provincial/territorial tax rates for 2006. See the Canada Revenue Agency at http://www.cra-arc.gc.ca/tax/individuals/faq/2006_rate-e.html.

public stands to benefit far more from the education provided by Camosun than students do.

CONCLUSIONS

This chapter has shown that Camosun is an attractive investment to its major stakeholders, students as well as provincial and local government. Rates of return to students invariably exceed alternative investment opportunities. At the same time, provincial and local government can take comfort in knowing that its expenditure of taxpayer funds creates a wide range of positive social benefits and, perhaps more importantly, actually returns more to government budgets than it costs. Absent increased tax receipts and avoided costs provided by Camosun education, provincial and local government would have to raise taxes to make up for lost revenues and added costs.

Chapter 4
ECONOMIC GROWTH ANALYSIS

INTRODUCTION

The previous chapter considers Camosun as an investment, first on the part of students, then on the part of provincial and local government. This chapter focuses on the Camosun Service Area and considers the impact of Camosun on regional economic growth. Impact estimates are reported in terms of labour income (i.e., earnings) and non-labour income (i.e., sum of all dividends, interests, and rents).

Estimating the impacts of Camosun requires use of a specialized input-output (IO) model that shows the interconnection of industries, government and households in the area. IO theory has been around since the 1930s and has won the Nobel Prize in economics for its inventor, Wassily Leontief. Textbooks on IO theory and practice are numerous, although the most widely known is Miller and Blair (1985). The model employed in the present study is managed by software developed by Economic Modeling Specialists, Inc. (EMSI) of Moscow, Idaho, which uses common "data-reduction" techniques to generate regional multipliers that are similar in magnitude to those of other popular regional IO modeling products, such as the IMPLAN and RIO models. EMSI regional IO modeling software was used to develop the Utah Multiregional IO (UMRIO) model, the Idaho Economic Modeling Project (IDAEMP), and the Oregon Economic Modeling System (OREMS).[19]

To bring the level of sophistication in the EMSI model to the present study, the model derives the regional backdrop figures from the socio-economic profile data provided by BC Stats and controls these to the total labour and non-labour income in the province (as published by Statistics Canada). The model then identifies the regional districts that

[19] EMSI IO modeling software employs a standard regional-purchase-coefficient (RPC) non-survey IO modeling technique similar to that used in constructing the Utah Multiregional IO (UMRIO) model (Governor's Office of Planning and Budget et al. [Salt Lake City, UT: Demographic and Economic Analysis, 1994]), Idaho Economic Modeling Project (IDAEMP) (M. H. Robison, R. Coupal, N. Meyer, and eds [Moscow, ID: University of Idaho, College of Agriculture, 1991]), and Oregon Economic Modeling System (OREMS) (M. H. Robison, Proceeding at the 29th Annual Pacific Northwest Economic Conference [Missoula, MT: 1995]). Other similar models include IMPLAN IO modeling software (Stillwater, MN: Minnesota IMPLAN Group, annual), regional IO models (RIO models) constructed by Rutgers University, Center for Urban Policy Research (New Brunswick, NJ: Rutgers University, 2002), and models chronicled for small areas (see M. H. Robison, "Community Input-Output Models," *Annals of Regional Science* 31 no. 3 [1997]: 325-351).

most closely conform to the college region and uses these to track the so-called "ripple" or "multiplier" effects of a given direct economic event, in this case, the effects stemming from the daily activities of Camosun and the increased incomes of students. For example, students with higher incomes have more money to spend, while businesses that hire them are more productive, purchasing additional inputs and rewarding business owners with greater incomes. All of this affects earnings in other industries, thereby generating multiplier effects and expanding the size of the economy.[20]

It has been argued that multiplier effects such as those described overstate net effects by as much as 80%.[21] The reason is that while the economy is stimulated and incomes increase, factors of production receiving these increased incomes abandon lower paying next-best opportunities. At some level jobs and uses of capital that are left behind are simply left undone, or perhaps outsourced overseas. The result is that gross multiplier effects need to be reduced to reflect this opportunity cost of taking a newly created job. Accordingly, the model applies the maximum downward adjustment suggested by the literature and discards all but 20% of the indicated indirect impact. This adjustment is unique to this analysis and enhances the conservative nature of the results.

In general, Camosun impacts the economy in three ways: (1) from its day-to-day operations, (2) from the spending of students who come from outside the region to attend college, and (3) from students who enter the workforce with increased skills. The *college operations effect* includes direct earnings of faculty and staff plus additional earnings and income generated through the action of regional multiplier effects. The *student spending effect* focuses on new monies entering the economy as Camosun attracts students from outside the region. Finally, the *past student productivity effect* comprises income growth that occurs as students deepen the economy's stock of human capital, attract new industry to the region, and make existing industry more productive.

College Operations Effect

Each year Camosun pays wages and salaries to its employees, which become part of overall local earnings. At the same time, Camosun purchases supplies and services, and a portion of this spending is also made locally. These expenditures create a ripple effect

[20] Multipliers are generally defined as the total effect divided by the direct effect – or the direct and indirect effects divided by the direct effect. An impact effect described as 150% of the direct effect would be associated with a multiplier of 2.5 (direct effect = 1.0; indirect effect = 1.5).
[21] See J.R. Hamilton, N.K. Whittlesey, M.H. Robison and J. Ellis, "Economic Impacts, Value Added and Benefits in Regional Project Analysis," *American Journal of Agricultural Economics* 31 no. 2 (1991): 334-344.

that generates additional income and business revenue throughout the regional economy. The net effect of college spending is obtained by adding direct and indirect (i.e., multiplier) effects together, then applying a reduction factor to account for local monies withdrawn from the economy to support the college. Such monies would have been spent in the region anyway and are thus not credited to Camosun.

Table 4.1 summarizes the effect of college operations spending in the regional economy. Total regional income appears in the top row and provides the backdrop against which the relative impacts of college operations are measured. As shown, the Camosun Service Area generated about $8.5 billion in labour income and another $5.9 billion in non-labour income – a total $14.5 billion altogether (see **Table 2.9**). The next item in the table is the direct effect of faculty and staff wages and salaries, equal to $64.7 million (see **Table 2.2**). Note that the associated figure for non-labour income is $0. This is because, in contrast to private sector businesses, the direct contribution of government sectors is only measured in terms of labour income.

Table 4.1: College Operations Effect

	LABOUR INCOME ($ Thousands)	% OF TOTAL	NON-LABOUR INCOME[1] ($ Thousands)	% OF TOTAL	TOTAL INCOME ($ Thousands)	% OF TOTAL
Total income in Camosun Service Area	$8,516,500	100%	$5,933,500	100%	$14,450,000	100%
Direct effect of faculty and staff	$64,707	0.8%	$0	<0.1%	$64,707	0.4%
Indirect effect	$4,190	<0.1%	$1,539	<0.1%	$5,730	<0.1%
Gross total	$68,897	0.8%	$1,539	<0.1%	$70,437	0.5%
Adjustment for alternative use of funds[2]	($7,081)	<0.1%	($2,358)	<0.1%	($9,439)	<0.1%
TOTAL	**$61,816**	**0.7%**	**($819)**	**<0.1%**	**$60,998**	**0.4%**

1. Includes all dividends, interest, and rents generated in the Camosun Service Area. Does not include earnings.

2. Negative numbers represent income that would have been generated in the region anyway had monies used to fund college operations been used instead for consumer spending.

Source: Adapted from data supplied by the EMSI regional IO model. See also Tables 2.2 and 2.9.

Indirect effects appear next and amount to another $4.2 million in labour income and $1.5 million in non-labour income. These represent income generated in other industries (i.e., off-campus effects) as a result of direct college spending.[22] Estimating indirect effects requires a model that takes college expenditures, deducts spending that leaks from the economy, and bridges what is left to the sectors of the input-output (IO) model constructed for the Camosun Service Area. Adding these effects to direct effects gives

[22] As described earlier, actual multiplier effects indicated by the IO model are discounted by all but 20% to account for the shift of resources from next-best uses.

the gross (i.e., unadjusted) effect of college operations spending, equal to approximately $70.4 million.

Here a qualification must be made. Camosun receives about 31% of its funding from local sources, whether from students, private businesses,[23] property owners, and the estimated portion of provincial funding originating from local taxpayers.[24] Devoting these funds to Camosun means they are not available for other uses, e.g., consumer spending on the part of students, public projects on the part of government. Monies that are injected into the regional economy on one hand are thus withdrawn on the other. Because of this, a portion of Camosun's spending effect cannot be considered as new monies brought to the region, since much of this spending was funded by local sources.

To determine the amount by which the gross effect should be reduced, the model analyzes what would have been the effect on regional income had the funding received by Camosun from local sources been redirected elsewhere and used instead for purposes of consumer spending. To measure this effect, any local funding, whether from students, private residents, or taxpayers, is bridged to the sectors of the IO model and converted to income. In the case of Camosun, this comes to about $9.4 million, shown as a negative number in **Table 4.1**. These represent monies that would have been generated in the region even without Camosun, and are thus subtracted from the gross effect of college operations. The net effect is $61.0 million in added regional income attributable to the operations of Camosun.

STUDENT SPENDING EFFECT

About 11% of Camosun students come from outside the region to attend college, net of long distance students who are not physically present in the area while attending. These students spend monies that would not have otherwise entered the regional economy absent the college, which means increased revenue for local businesses. To determine the effect of these expenditures, the model begins with total dollar amounts listed in **Table 2.7** (net of leakage and household income) and converts these to direct added

[23] Private sources of revenue vary widely, from a scholarship sponsored by a local resident to contract revenue received from businesses that send employees to the college to attend training seminars. The wide variety of these revenues makes it difficult to determine whether they come from within or outside the region. For this reason, the model assumes a strict 50% breakdown, where 50% comes from outside the region, and the remaining 50% comes from within the region.

[24] Local taxpayers must pay provincial taxes as well, so it is fair to assume that a certain portion of provincial appropriations received by the college comes from local sources. This portion is derived by applying a ratio of provincial earnings to total earnings in the province.

income through the action of earnings-to-sales and value added-to-sales ratios. Indirect effects are derived by bridging the increase in regional sales to the industrial sectors of the IO model, running them through an indirect multiplier matrix and then discounting results by all but 20% to avoid overstatement of multiplier impacts. As shown in **Table 4.2**, the spending of Camosun's out-of-region students has a direct effect equal to $6.5 million and an indirect effect equal to $1.2 million, for a sum total of $7.7 million in added regional income in the Camosun Service Area economy.

Table 4.2: Student Spending Effect

	LABOUR INCOME ($ Thousands)	% OF TOTAL	NON-LABOUR INCOME[1] ($ Thousands)	% OF TOTAL	TOTAL INCOME ($ Thousands)	% OF TOTAL
Total income in Camosun Service Area	$8,516,500	100%	$5,933,500	100%	$14,450,000	100%
Direct effect of student spending	$4,485	<0.1%	$1,985	<0.1%	$6,470	<0.1%
Indirect effect	$885	<0.1%	$341	<0.1%	$1,226	<0.1%
TOTAL	**$5,370**	**<0.1%**	**$2,326**	**<0.1%**	**$7,696**	**<0.1%**

1. Includes all dividends, interest, and rents generated in the Camosun Service Area. Does not include earnings.

Source: Adapted from data supplied by the EMSI regional IO model. See also Tables 2.7 and 2.9.

PAST STUDENT PRODUCTIVITY EFFECT

Camosun's impact on the economy is most prevalent in its capacity to provide skills training and career enhancement opportunities to area residents for high demand, high paying occupations in the region. Since Camosun was established students have studied at Camosun and entered the regional workforce, bringing with them skills they acquired while in attendance. Over time these skills have built up and accumulated, steadily increasing the training level and experience of the workforce. This sparks a chain reaction wherein higher student earnings generate additional rounds of consumer spending, while new skills and training translate to increased business output and higher property income, causing still more consumer purchases and regional multiplier spending. The sum of all these direct and indirect effects comprises the total impact of past student productivity on labour and non-labour income in the economy.

The first step in calculating the effect of past student productivity is to estimate the number of Camosun skills currently active in the workforce, measured in terms of CHEs. Data and assumptions behind the calculation of this number appear in **Table 4.3**.

Table 4.3: Estimating CHEs of Instruction Embodied in the Workforce[1]

Year	Student headcount[2] 1	Non-retired students (%)[3] 2	Students remaining in region (%)[3] 3	Students who have left college (%) 4	Students settled into jobs (%) 5	Thirty-year attrition (%) 6	Students active in workforce 7	Average CHEs[3] 8	CHEs active in workforce 9
1977	7,547	99%	86%	100%	100%	67%	4,327	15	65,104
1978	7,905	99%	86%	100%	100%	68%	4,594	15	69,114
1979	8,264	99%	86%	100%	100%	69%	4,867	15	73,220
1980	8,622	99%	86%	100%	100%	70%	5,146	15	77,424
1981	8,981	99%	86%	100%	100%	71%	5,432	15	81,727
1982	9,339	99%	86%	100%	100%	72%	5,725	15	86,132
1983	9,698	99%	86%	100%	100%	73%	6,025	15	90,641
1984	10,057	99%	86%	100%	100%	74%	6,331	15	95,256
1985	10,415	99%	86%	100%	100%	75%	6,645	15	99,978
1986	10,774	99%	86%	100%	100%	76%	6,966	15	104,810
1987	11,132	99%	86%	100%	100%	77%	7,295	15	109,753
1988	11,491	99%	86%	100%	100%	78%	7,631	15	114,811
1989	11,849	99%	86%	100%	100%	79%	7,975	15	119,985
1990	12,208	99%	86%	100%	100%	80%	8,327	15	125,277
1991	12,566	99%	86%	100%	100%	81%	8,687	15	130,690
1992	13,599	99%	86%	100%	100%	82%	9,527	15	143,331
1993	13,325	99%	86%	100%	100%	83%	9,461	15	142,333
1994	13,907	99%	86%	100%	100%	84%	10,006	15	150,543
1995	15,557	99%	86%	100%	100%	85%	11,344	15	170,663
1996	16,042	99%	86%	100%	100%	86%	11,855	15	178,354
1997	16,539	99%	86%	100%	100%	88%	12,386	15	186,346
1998	17,077	99%	86%	100%	100%	89%	12,961	15	194,995
1999	17,705	99%	86%	100%	100%	90%	13,618	15	204,886
2000	17,422	99%	86%	100%	100%	91%	13,580	15	204,312
2001	17,764	99%	86%	100%	100%	92%	14,033	15	211,130
2002	17,202	99%	86%	100%	100%	94%	13,772	15	207,199
2003	17,222	99%	86%	100%	100%	95%	13,973	15	210,228
2004	17,504	99%	86%	99%	100%	96%	14,231	15	214,102
2005	17,058	99%	86%	89%	54%	97%	6,801	15	102,326
2006	17,406	99%	86%	67%	50%	100%	5,049	15	75,961
							Subtotal		4,040,631
							Net of alternative education variable	5%	(202,032)
							NET CHEs IN WORKFORCE		**3,838,599**

1. Numbers may not add due to rounding.
2. Column 1 shows the combined total of credit and non-credit students. In the case that enrolment data is unavailable, the missing information is calculated internally in the analytical model.
3. In the absence of better data, the model assumes that the same data and assumptions for the current year also apply to the other years in the timeframe.

Source: Adapted from data supplied by Camosun. See also Tables 2.4 and 2.8.

The analysis begins with the historical enrolment of the college from the beginning of the time horizon in 1977 until the current analysis year in 2006, as provided by Camosun. These figures are then discounted by the percent of retired and leisure students, as these students are not expected to bring new skills to the region upon exiting college. Column 3 nets out students who leave the region upon exiting Camosun, reducing the headcount to include only those who settle in the area. Column 4 accounts for students who have not yet entered the workforce. As shown, it is assumed that all past students have left Camosun and found employment except for the last two to three years, based on the estimated percent of students who are already employed while attending college (67%).

Settling-in factors come into play in Column 5, though only for the last two years of the analysis. By the end of the third year it is assumed that all Camosun students have settled into their jobs. Adjustments are weighted according the breakdown of the student body from **Table 2.4** and their corresponding settling-in factors from **Table 2.8**. Column 6 subtracts students who have out-migrated, retired, or died over time, using a logarithmic decay function based on the thirty-year attrition variable from **Table 2.8** (33%). The net number of students who are active in the workforce appears in Column 7.

Column 8 displays the average number of CHEs generated per student per year back to 1977. Historic information on this variable is generally unavailable, so it is assumed that average CHEs for the analysis year apply though time. These figures are multiplied times the number of students active in the workforce from Column 7 and summed together, yielding a total of 4.0 million CHEs currently embodied by students in the region. This is then reduced by 5% to account for alternative education opportunities (i.e., the percent of students who would have still been able to obtain an education even without Camosun). The approximately 3.8 million CHEs remaining after this calculation are strictly attributed to the existence of Camosun.

The next step is to convert the 3.8 million CHEs embodied in the workforce to direct regional earnings. The net value per CHE – $121 – comes from **Table 3.2** and represents the higher earnings received by students for each CHE of instruction received at Camosun.[25] Multiplying this figure times the 3.8 million net CHEs results in approximately $466.1 million in regional earnings that are directly due to the Camosun

[25] Briefly, the engine that estimates value per CHE does so by combining earnings/education data from **Table 2.5** with information on aggregate student achievements during the analysis year (from **Table 2.4**), adjusted downward to account for the ability bias and other factors discussed in **Chapter 2**.

skills currently active in the workforce. This figure reappears in **Table 4.4** as the direct effect of past student productivity on labour income.

Added to this is another $183.8 million in non-labour income, representing the higher property values and increased investment income stemming from the direct earnings of students and enhanced productivity of the businesses that employ them. Non-labour income attributable to past student skills is obtained by disaggregating higher student earnings to the industrial sectors of the IO model and multiplying them times their associated value added-to-earnings ratios.[26] Summing labour and non-labour income together gives a direct effect of past student productivity equal to approximately $649.9 million.

Table 4.4: Past Student Productivity Effect

	LABOUR INCOME ($ Thousands)	% OF TOTAL	NON-LABOUR INCOME[1] ($ Thousands)	% OF TOTAL	TOTAL INCOME ($ Thousands)	% OF TOTAL
Total income in Camosun Service Area	$8,516,500	100%	$5,933,500	100%	$14,450,000	100%
Direct effect of past student productivity	$466,129	5.5%	$183,790	3.1%	$649,919	4.5%
Indirect effect	$70,451	0.8%	$27,582	0.5%	$98,034	0.7%
TOTAL	**$536,580**	**6.3%**	**$211,373**	**3.6%**	**$747,953**	**5.2%**

1. Includes all dividends, interest, and rents generated in the Camosun Service Area. Does not include earnings.

Source: Adapted from outputs supplied by EMSI regional IO model. See also Tables 2.9 and 4.3.

Economic growth stemming from a skilled workforce does not stop with the direct effect. To calculate the indirect effect the model allocates increases in regional income to specific industrial sectors and augments these to account for both demand and supply-side multiplier effects. Demand-side effects refer to the increased demand for consumer goods and services as the higher incomes of skilled workers and their employers are spent in the local economy. For example, the increased output of businesses is associated with an increased demand for inputs, which in turn produces a set of regional economic

[26] Direct earnings effects of past students initially appear with no industry detail, thus requiring an aggregation that would reduce all industries to a single aggregate. By any measure, use of such an aggregated multiplier would court an unacceptable aggregation error. This occurs whenever a model with many industrial sectors is reduced through industry combination to a model with many fewer "aggregated industries" (see chapter 5 in Ron Miller and Peter Blair, *Input-Output Analysis: Foundations and Extensions* [Englewood Cliffs, NJ: Prentice Hall, 1985). At the same time, however, the EMSI IO modeling system conveys industry detail at roughly the NAICS 4-digit level, and disaggregating the direct earnings effects at this fine level of detail is not realistic. To resolve these problems, the model disaggregates past student earnings effects to eighteen different industrial sectors, which avoids aggregation error while still maintaining a level of detail that remains within reasonable limits.

multiplier effects that are all captured as part of demand-side indirect effects. In the model these are estimated by converting higher student earnings into direct increased industry sales, running these through an indirect multiplier matrix, and converting them to regional income by applying earnings-sales and value added-sales ratios supplied by the regional IO model.

Supply-side effects occur through a process of "cumulative causation," or "agglomeration," whereby growth becomes in some degree self-perpetuating. The presence of one industry, for example, attracts other industries that use the first industry's outputs as inputs, which produces subsequent rounds of industry growth, and so on.[27] To estimate agglomeration effects, the model converts direct earnings of past students to industry value added and applies this to a set of supply-driven multipliers provided by the regional IO model. To increase the plausibility of this assumption, the model applies only direct effects associated with industries in the highest stages of development.[28]

Summing demand and supply-side effects together constitutes the indirect effect of Camosun education, equal to $70.5 million in labour income and approximately $27.6 million in non-labour income (**Table 4.4**). Adding these to the direct effects of past student productivity yields a grand total of $748.0 million in added income attributable to the accumulation of Camosun skills in the regional workforce. Note that this figure omits altogether the effect of educated workers on innovation and technical progress. This effect is generally labeled as "external" because it is uncertain in nature and spills beyond businesses employing skilled workers. For this reason it is excluded from the analysis. To the extent there are such effects, and theory suggests that there are, overall results can be considered conservative.

[27] For a more complete discussion of agglomeration and cumulative causation, see Masahisa Fujita, Paul Krugman, and Anthony Venables, *The Spatial Economy: Cities, Regions, and International Trade* (Cambridge: Massachusetts Institute of Technology, 1999).

[28] Parr (1999) describes four stages of economic development: primary production, process manufacturing, fabricative manufacturing, and producer services and capital export. The model applies a "development score" to Parr's stages: low scores for lower stage sectors and higher scores for higher development sectors. Only those industries with the highest scores are applied to the supply-driven multipliers of the IO model. For additional detail on the use of this approach for classifying industries by industrial stage, see Rutgers et al, 2002.

TOTAL EFFECT

Table 4.5 displays the grand total of Camosun's impact on the Camosun Service Area, including the college operations effect, student spending effect, and past student productivity effect. These results depend on, first, the number of Camosun employees working in the region, second, the percent of Camosun students coming from outside the region, and third, the accumulation of skills (or CHEs) currently active in the regional workforce.

Table 4.5: Total Effect

	TOTAL INCOME ($ Thousands)	% OF TOTAL
Total income in Camosun Service Area	$14,450,000	100%
College operations effect	$60,998	0.4%
Student spending effect	$7,696	<0.1%
Past student productivity effect	$747,953	5.2%
TOTAL	**$816,646**	**5.7%**

Source: See Tables 4.1 through 4.4.

As shown, Camosun accounts for $816.6 million, or 5.7%, of all regional income in the Camosun Service Area. These results demonstrate several important points. First, Camosun promotes regional economic growth through its own operations spending, through the spending of its out-of-region students, and through the increase in productivity as past students remain active in the regional workforce. Second, the past student productivity effect is by far the largest and most important impact of Camosun, stemming from the higher incomes of students and their employers. And third, regional income in the Camosun Service Area would be substantially lower without the educational activities of Camosun.

Chapter 5
SENSITIVITY ANALYSIS

INTRODUCTION

This study concludes with a sensitivity analysis of some key variables on both the investment and economic growth sides. The purpose of the sensitivity analysis is twofold:

1. *To set the approach apart from "advocacy" education impact analyses that promote higher education.* These studies often use assumptions that do not stand up to rigorous peer scrutiny and generate results that grossly overstate benefits. The approach here is to account for all relevant variables on both the benefit and cost sides as reflected in the conservatively estimated base case assumptions laid out in **Chapter 2**. The sensitivity tests include: a) the impacts associated with changes in the student employment variables for the investment analysis, and b) the addition of sales (as opposed to income only) to the regional economic development analysis.

2. *To test the sensitivity of results associated with assumptions internal to the analytical model.* The two assumptions analyzed in this chapter include the alternative education and attrition rate variables.

STUDENT EMPLOYMENT VARIABLES

Student employment variables are difficult to estimate because colleges generally do not collect this kind of information. These variables include: 1) percent of students employed, and 2) of those employed, what percent they earn relative to earnings they would have received if not attending Camosun. Both employment variables relate to earnings foregone by students—the opportunity cost of time—and they affect the investment analysis results (net present value, rate of return, benefit/cost ratio, and payback period).

Percent of Students Employed

Students incur substantial expense by attending Camosun because of time they spend not gainfully employed. Some of that cost is recaptured if the student remains partially

(or fully) employed while attending. It is estimated that 67% of the current student body is employed. This variable is tested in the sensitivity analysis by changing it to 100%. This change means that *all* students are employed, reducing the average opportunity cost of time accordingly.

Percent of Earnings Relative to Full Earnings

The second opportunity cost variable is more difficult to estimate. For Camosun it is estimated that students working while attending classes earn only 57%, on average, of earnings they would have statistically received if not attending Camosun. This suggests that many students hold part-time jobs that accommodate their Camosun attendance, but at an additional cost in terms of receiving a wage that is less than what they might otherwise make. The model captures these differences and counts them as part of opportunity cost of time. As above, this variable is tested in the sensitivity analysis by changing the assumption to 100%. This means that students are fully employed, and the average opportunity cost of time reduces accordingly.

Results

The changed assumptions generate results summarized in **Table 5.1**. Here, base case assumptions taken appear in the two shaded rows—67% for the portion of students employed, and 57% for their earnings relative to statistical averages. These base case assumptions are held constant in the shaded rows for the student perspective. Sensitivity analysis results are shown in non-shaded rows—the extent to which investment analysis results would change if the two base case variables were increased to 100%, first separately, and second, together. Changing both assumptions to 100% (all students fully employed) automatically increases benefits because the opportunity cost of time reduces to zero.

1. Increasing the percent of students employed from 67% to 100% first (holding all other assumptions constant), the rate of return, benefit/cost ratio, and payback period results improves to 17.0%, 5.5, and 8.6 years, respectively, relative to base case results. Improved results are attributable to a lower opportunity cost of time—all students are employed in this case.

2. Increasing earnings relative to statistical averages from 57% to 100% second (holding the second employment assumption constant at the base case level), the rate of return, benefit/cost ratio, and payback period results improves to 20.3%,

7.1, and 7.3 years, respectively, relative to the base case results—a strong improvement, again attributable to a lower opportunity cost of time.

3. Finally, increasing both assumptions to 100% simultaneously, rate of return, benefit/cost ratio, and payback period results improves yet further to 31.6%, 12.9, and 4.9 years, respectively, relative to base case results. This scenario assumes that all students are fully employed and earning full salaries (equal to statistical averages) while attending classes.

Table 5.1: Sensitivity Analysis of Student Perspective

VARIABLES	ASSUMPTIONS	RATE OF RETURN	BENEFIT/ COST	PAYBACK
1. Percent	67%	15.3%	4.7	9.4
Employed	100%	17.0%	5.5	8.6
2. Percent of	57%	15.3%	4.7	9.4
Earnings	100%	20.3%	7.1	7.3
1 = 100%, 2 = 100%		31.6%	12.9	4.9

A final note to this section—it is strongly emphasized that base case results are very attractive—results are all well above their threshold levels, and payback periods are short. As clearly demonstrated here, advocacy results *appear* much more attractive, although they overstate benefits. Results presented in **Chapter 3** are *realistic,* indicating that investments in Camosun generate excellent returns, well above the long-term average percent rates of return of roughly 7% in stock and bond markets.

Regional Economic Development

Economic impacts of higher education can be calculated in different ways. The approach is to estimate regional economic impacts of Camosun based on college operations and capital spending, spending effects of Camosun's out-of-region students, and increased productivity effects of past Camosun students in the regional workforce. Impacts are expressed in terms of regional *labour income* (i.e., earnings) and in terms of *non-labour income* (i.e., dividends, interests, and rent). Others often express results in terms of sales instead of income, which tends to inflate impacts so that they appear larger than they really are. This issue is addressed in the next section.

Economic Impacts Reported as Gross Sales

Advocates sometimes favor gross sales as an impact measure because sales are always larger than income. This method has notable drawbacks, however. An immediate drawback is that, unlike earnings, there is generally no published total against which a sales impact can be measured. The most troublesome aspect of gross sales impact measures is captured in the following example:

> Two visitors spend $50,000 each in the economic region. One visits a local auto dealer and purchases a new luxury automobile. The other undergoes a medical procedure at the local hospital. In terms of direct economic impact, both have spent $50,000. However, the expenditures have very different meanings to the local economy. Of the $50,000 spent for the luxury automobile, perhaps $10,000 remains in the county as salesperson commissions and auto dealer income (part of the economic region's overall earnings), while the other $40,000 leaves the area for Detroit or somewhere else as wholesale payment for the new automobile. Contrast this to the hospital expenditure. Here perhaps $40,000 appears as physician, nurse, and assorted hospital employee wages (part of the county's overall earnings), while only $10,000 leaves the area, to pay for hospital supplies, or to help amortize building and equipment loans. In terms of sales, both have the same impact, while in terms of earnings, the former has one-fourth the impact of the latter.

Table 5.2 expresses Camosun impacts in terms of gross sales rather than income. Gross sales measures are estimated by the economic model to be $33.2 billion, obtained by multiplying sector-specific earnings by a sales-to-earnings ratio derived from the regional IO model. Note that direct local expenditures of the college and students from outside the region reflect their total spending, reduced by the estimated portion that leaks out-of-region to purchase goods produced elsewhere.[29] In the usual fashion, indirect effects reflect the action of local economic multiplier effects, also estimated by the economic model. All told, the operation of Camosun is estimated to explain some $1.5 billion in regional gross sales, a number substantially larger than the $816.6 million explained by the college in regional income shown in **Table 4.5**.

While gross sales impacts shown in **Table 5.2** are not incorrect, this analysis reports college impacts in terms of income (**Table 4.5**) rather than gross sales, because this reflects economic realities in the local community much more accurately. Advocacy studies, on the other hand, often opt to express results in terms of sales because numbers

[29] Students purchase gasoline for their cars, for example, and while the trade margin stays in the area, in most cases the producer price of gasoline itself will leak out to the oil-producing region.

are much more impressive. Such results, however, are not likely to stand up to rigorous peer scrutiny in the economics profession.

Table 5.2: Impact of Camosun on Sales in Regional Economy

	GROSS SALES ($ Thousands)	% OF TOTAL
Total gross sales in Camosun Service Area	$33,162,700	100%
Gross sales attributable to college operations		
Direct local spending of Camosun	$9,788	<0.1%
Indirect spending effect	$8,458	<0.1%
Subtotal	$18,246	<0.1%
Gross sales attributable to student spending		
Direct local spending by students	$11,727	<0.1%
Indirect spending effect	$2,339	<0.1%
Subtotal	$14,067	<0.1%
Gross sales attributable to student economic development effects		
Direct gross sales	$1,278,570	3.9%
Indirect gross sales	$190,134	0.6%
Subtotal	$1,468,704	4.4%
GRAND TOTAL	**$1,501,017**	**4.5%**

Source: Adapted from data supplied by Camosun and outputs of the EMSI regional IO model. See also Tables 2.2 and 2.7.

VARIABLES REQUIRING "JUDGMENT"

This section tests the sensitivity of the attrition rate and alternative education opportunity variables. Recall that the attrition rate (33% in **Table 2.8)** characterizes the mobility of exiting students out of the region over the next thirty years or so through retirement, out-migration and/or death. The alternative education opportunity variable (5%) is characterized as a "negative benefit" used to account for students who can obtain a similar education elsewhere absent publicly funded colleges and universities in the province. Given the difficulty in accurately specifying the attrition rate and alternative education opportunity variables, the obvious question is: how great a role do they play in the magnitudes of the results? Results appear in **Table 5.3**.

Table 5.3: Sensitivity Analysis of Alternative Education and Attrition Rate Variables ($ Thousands)

	-75%	-50%	-25%	BASE CASE	25%	50%	75%
Alternative Education Variable	1.3%	2.5%	3.8%	5.0%	6.3%	7.5%	8.8%
Narrow Taxpayer Perspective							
Net present value	$221,463	$217,951	$214,439	$210,927	$207,415	$203,903	$200,391
Rate of return	16.2%	16.0%	15.9%	15.8%	15.6%	15.5%	15.3%
Benefit/cost ratio	5.0	4.9	4.8	4.8	4.7	4.6	4.6
Payback period (years)	8.9	9.0	9.0	9.1	9.2	9.3	9.3
	-75%	**-50%**	**-25%**	**BASE CASE**	**25%**	**50%**	**75%**
Attrition Rate Variable	8.3%	16.5%	24.8%	33%	41.3%	49.5%	57.8%
Regional Economic Development							
Added income	$929,130	$893,146	$855,735	$816,646	$775,545	$731,968	$685,246
% of total income	6.4%	6.2%	5.9%	5.7%	5.4%	5.1%	4.7%
CHEs embodied in workforce	4,648,294	4,453,901	4,251,799	4,040,631	3,818,590	3,583,178	3,330,774

Alternative Education Opportunity

Variations in the alternative education assumption are calculated around base case results listed in the middle column of **Table 5.3**. Next, the model brackets the base case assumption on either side with plus or minus 25%, 50% and 75% variation in assumptions. Analyses are then redone introducing one change at a time, holding all other variables constant. For example, an increase of 25% in the Alternative Education assumption (from 5.0% to 6.3%) reduces the narrow taxpayer perspective rate of return from 15.8% to 15.6%. Likewise, a decrease of 25% (from 5.0% to 3.8%) in the assumption increases in the rate of return from 15.8% to 15.9%.

Based on this sensitivity analysis, the conclusion can be drawn that Camosun investment analysis results from the narrow taxpayer perspective are not very sensitive to relatively large variations in the alternative education variable. As indicated, results are still well above their threshold levels (net present value greater than 0, benefit/cost ratio greater than 1, and rate of return greater than the discount rate of 4.0%) even when the alternative education assumption is increased by as much as 75% (from 5.0% to 8.8%). The conclusion is that, although the assumption is difficult to specify, its impact on overall investment analysis results for the narrow taxpayer perspective is not very sensitive.

Attrition Variable

The attrition rate variable only affects the regional economic development results (**Table 4.5**). As above, the assumption increases and decreases relative to the base case of 33% (from **Table 2.8**) by increments indicated in the table. Impacts on the results are more pronounced, as indicated in **Table 5.3**. Labour income attributable to the college, for example, ranges from a high of $929.1 million at -75% to a low of $685.2 million at a 75% variation from the base case assumption for this variable. This means that if attrition of ex-students increases over time, the number of CHEs embodied in the current local workforce decreases; hence, income attributable to the college decreases accordingly.

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APPENDIX 1: GLOSSARY OF TERMS

Alternative education	A "with" and "without" measure of the percent of students who would still be able to avail themselves of education absent the publicly funded colleges and universities in the province. An estimate of 20%, for example, means that 20% of students do not depend directly on the existence of the college in order to obtain their education.
Asset value	Capitalized value of a stream of future returns. Asset value measures what someone would have to pay today for an instrument that provides the same stream of future revenues.
Attrition rate	Rate at which students leave the local region after exiting college due to out-migration, retirement, or death.
Benefit/cost ratio	Present value of benefits divided by present value of costs. If the benefit/cost ratio is greater than one, then benefits exceed costs and the investment is feasible.
Credit hour equivalent	Credit hour equivalent, or CHE, is defined as 20 instructional hours or 45 practica hours of educational activity. In general, it requires 30 CHEs complete one full time equivalent, or FTE.
Demand	Relationship between market price of education and volume of education demanded (expressed in terms of enrolment). The law of the downward-sloping demand curve is related to the fact that enrolment increases only if the price (tuition and fees) is lowered, or conversely, enrolment decreases if price increases.
Discounting	Expressing future revenues and costs in present value terms.
Economics	Study of the allocation of scarce resources among alternative and competing ends. Economics is not normative (what *ought* to be done), but positive (describes *what is*, or how people are likely to behave in response to economic changes).

Elasticity of demand	Degree of responsiveness of the quantity of education demanded (enrolment) to changes in market prices (tuition and fees). If a decrease in tuition increases total revenues, demand is elastic. If it decreases total revenues, demand is inelastic. If total revenues remain the same, elasticity of demand is unitary.
Externalities	Impacts (positive and negative) for which there is no compensation. Positive externalities of education include improved social behaviors such as lower crime, reduced welfare and unemployment, and improved health. Colleges do not receive compensation for these benefits, but benefits still occur because education ultimately leads to improved social behaviors.
Gross Domestic Product	Measure of the final value of all goods and services produced. Alternatively, GDP equals the combined incomes of all factors of production, i.e., labour, land and capital. These include wages, salaries, proprietors' incomes, profits, rents and other.
Input-output analysis	Relationship between a given set of demands for final goods and services, and the implied amounts of manufactured inputs, raw materials, and labour this requires. In an educational setting, as colleges pay wages and salaries and spend money for supplies in the local economic region, they also generate earnings in all sectors of the economy, thereby increasing the demand for goods and services and jobs. Moreover, as students enter or rejoin the workforce with higher skills, they earn higher salaries and wages. In turn, this generates more consumption and spending in other sectors of the economy.
Internal rate of return	Rate of interest which, when used to discount cash flows associated with investing in education, reduces its net present value to zero (i.e., where the present value of revenues accruing from the investment are just equal to the present value of costs incurred). This, in effect, is the breakeven rate of return on investment since it shows the highest rate of interest at which the investment makes neither a profit nor a loss.

Multiplier	Measure of overall regional earnings per dollar of faculty and staff earnings (i.e., on- and off-campus earnings divided by on-campus earnings). Multiplier effects are the result of in-area spending for goods and services and of everyday spending by faculty and staff. The analysis also includes added regional earnings attributable to past students still active in the workforce. The regional economy is larger because of student skills, added spending associated with higher student incomes, and enlarged output of industries where past students are employed.
Net cash flow	Benefits minus costs, i.e., the sum of revenues accruing from an investment minus costs incurred.
Net present value	Net cash flow discounted to the present. All future cash flows are, in this way, collapsed into one number, which, if positive, indicates feasibility. The result is expressed as a monetary measure.
Opportunity cost	Benefits foregone from alternative B once a decision is made to allocate resources to alternative A. Or, if an individual chooses not to attend college, he or she foregoes higher future earnings associated with higher education. The benefit of higher education, therefore, is the "price tag" of choosing not to attend college.
Payback Period	Length of time required to recover an investment – the shorter the period, the more attractive the investment. The formula for computing payback period is: Payback period = cost of investment/net return per period

APPENDIX 2: SHUTDOWN POINT

INTRODUCTION

The investment analysis weighs benefits of enrolment (measured in terms of CHEs) against the support provided by provincial and local government. This adjustment factor is unique to the CCbenefits analysis and is used to establish a direct link between the costs of supporting the college and the benefits it generates in return. If benefits accrue without taxpayer support, then it wouldn't be a true investment.[30] The overall approach includes a sub-model that simulates the effect on student enrolment should the college lose its provincial and local funding and have to raise tuition in order to stay open. If the college can still operate without provincial and local support, then any benefits it generates at that level are discounted from total benefit estimates. If the simulation indicates that the college cannot stay open, however, then benefits are directly linked to costs and no discounting applies. This appendix documents the procedure for making these adjustments.

PROVINCIAL AND LOCAL GOVERNMENT SUPPORT VERSUS TUITION

Figure 1 presents a simple model of student demand and provincial and local government support. The right side of the graph is a standard demand curve (D) showing student enrolment as a function of tuition and other student fees. Enrolment is measured in total CHEs and expressed as a percentage of current CHEs. The current tuition rate is p', and provincial and local government support covers C% of all costs. At this point in the analysis, it is assumed that the college has only two sources of revenues: student tuition payments and provincial and local government support.

[30] Of course, as a public college, Camosun would not be permitted to continue without public funding, so the situation in which it would lose all provincial and local support is entirely hypothetical. The purpose of the adjustment factor is to examine Camosun standard investment analysis terms by netting out any benefits it may be able to generate that are not directly linked to the costs of supporting it.

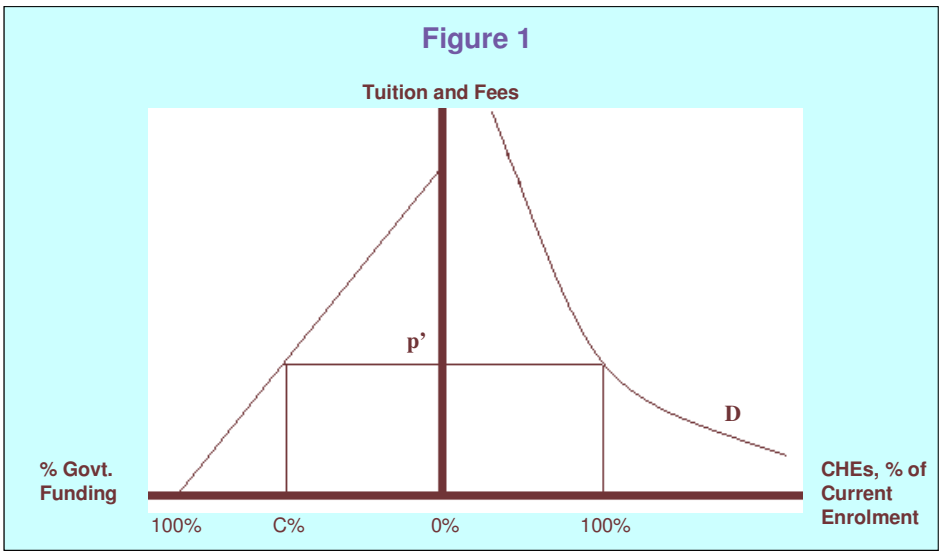
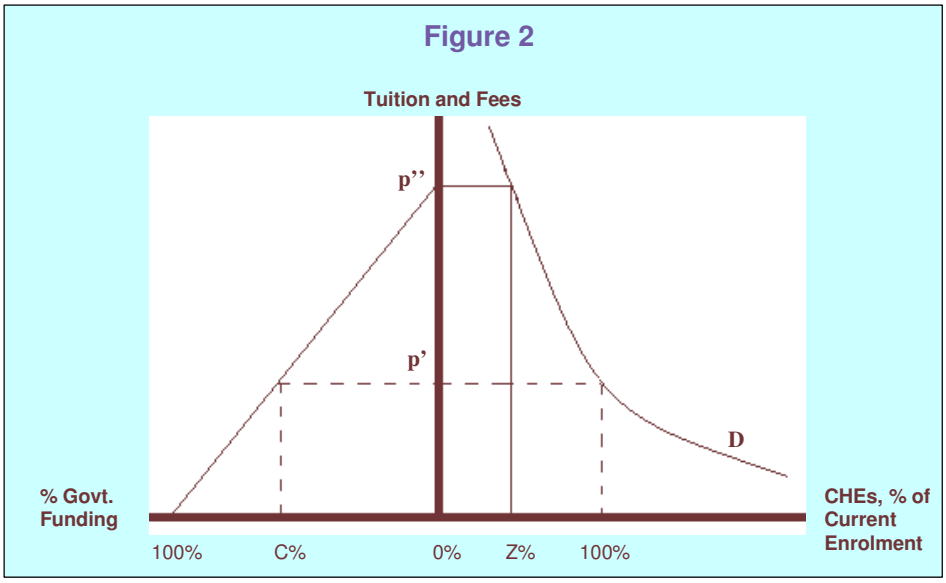


Figure 2 shows another important reference point in the model—where provincial and local government support is 0%, tuition rates are increased to p", and enrolment is Z% (less than 100%). The reduction in enrolment reflects price elasticity in the students' school vs. no-school decision. Neglecting for the moment those issues concerning the college's minimum operating scale (considered below in the section on "College Shutdown Point"), the implication for the investment analysis is that benefits of provincial and local government support must be adjusted to net out benefits associated with a level of enrolment at Z% (i.e., the college can provide these benefits absent provincial and local government support).



FROM ENROLMENT TO BENEFITS

This appendix focuses mainly on the size of enrolment (i.e., production of CHEs) and its relationship to student versus provincial and local government funding. However, to clarify the argument it is useful to briefly consider the role of enrolment in the larger benefit/cost model.

Let B equal the benefits attributable to provincial and local government support. B might be understood as applying to either the broad or narrow taxpayer perspectives. The analysis in the Main Report derives all benefits as a function of student enrolments (i.e., CHEs). For consistency with the graphical exposition elsewhere in this appendix, B is expressed as a function of the percent of current enrolment (i.e., percent of current CHEs). Accordingly, the equation

(1) $B = B(100\%)$

reflects the total benefits generated by enrolments at their current levels, measured in the Main Report and shown in **Table 3.6** for the broad and narrow taxpayer perspectives.

Consider benefits now with reference to **Figure 2**. The point where provincial and local government support is zero nonetheless provides for Z% (less than 100%) of the current enrolment, and benefits are symbolically indicated by:

(2) $B = B(Z\%)$

Inasmuch as the benefits in (2) occur with or without provincial and local government support, the benefits appropriately attributed to provincial and local government support are given by:

(3) $B = B(100\%) - B(Z\%)$

COLLEGE SHUTDOWN POINT

College operations cease when fixed costs can no longer be covered. The shutdown point is introduced graphically in **Figure 3** as S%. The location of point S% indicates that the college can operate at an even lower enrolment level than Z% (the point of zero

provincial and local funding). At point S%, provincial and local government support is still zero, and the tuition rate has been raised to p'''. At tuition rates still higher than p''', the college would not be able to attract enough students the keep the doors open, and it would shut down. In **Figure 3**, point S% illustrates the shutdown point but otherwise plays no role in the estimation of provincial and local government benefits. These remain as shown in equation (3).

Figure 3

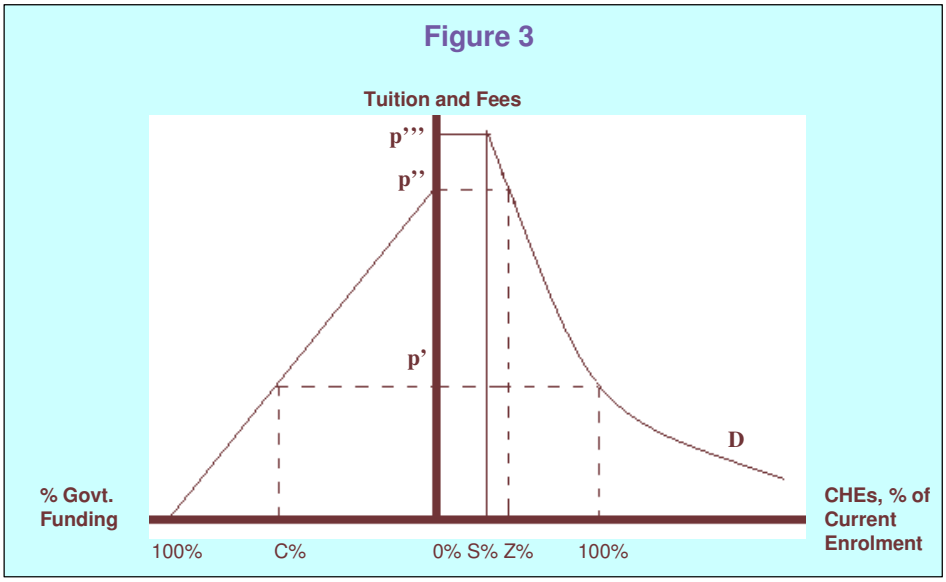
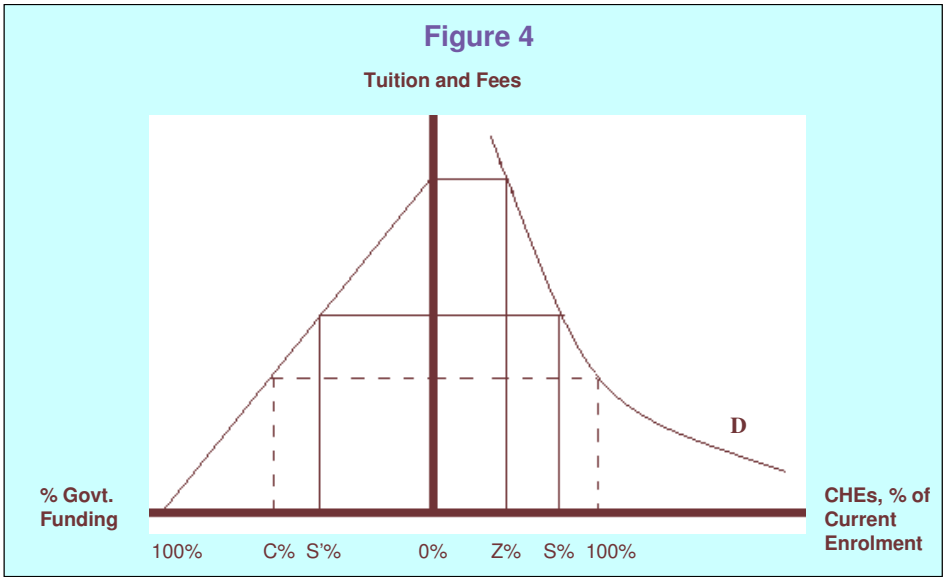


Figure 4 illustrates yet another scenario. Here the shutdown point occurs at an enrolment level greater than Z% (the level of zero provincial and local government support), meaning some minimum level of provincial and local government support is needed for the school to operate at all. This minimum portion of overall funding is indicated by S'% on the left side of the chart, and as before, the shutdown point is indicated by S% on the right side of chart. In this case, provincial and local government support is appropriately credited all the benefits generated by enrolment, or B=B(100%).

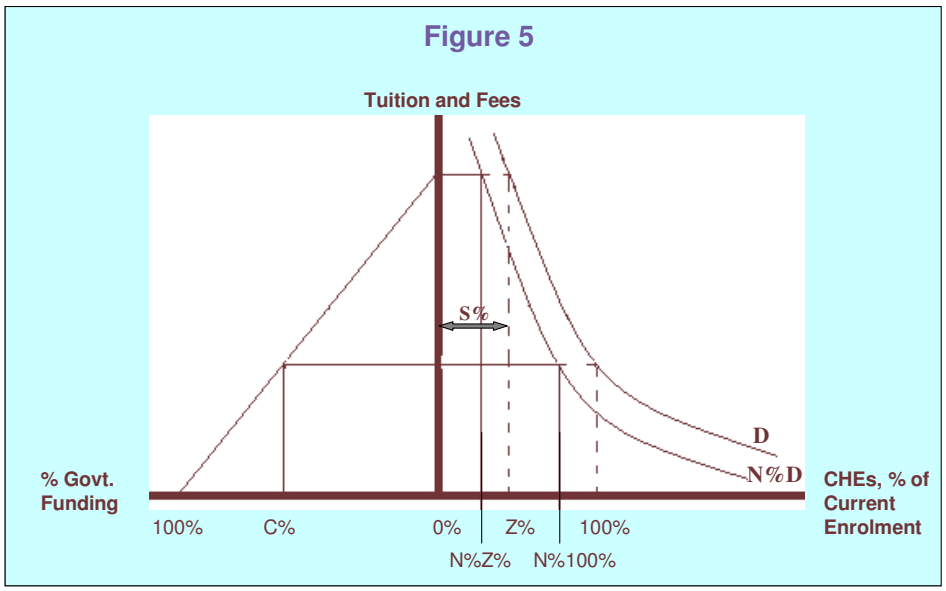


ADJUSTING FOR ALTERNATIVE EDUCATION OPPORTUNITIES

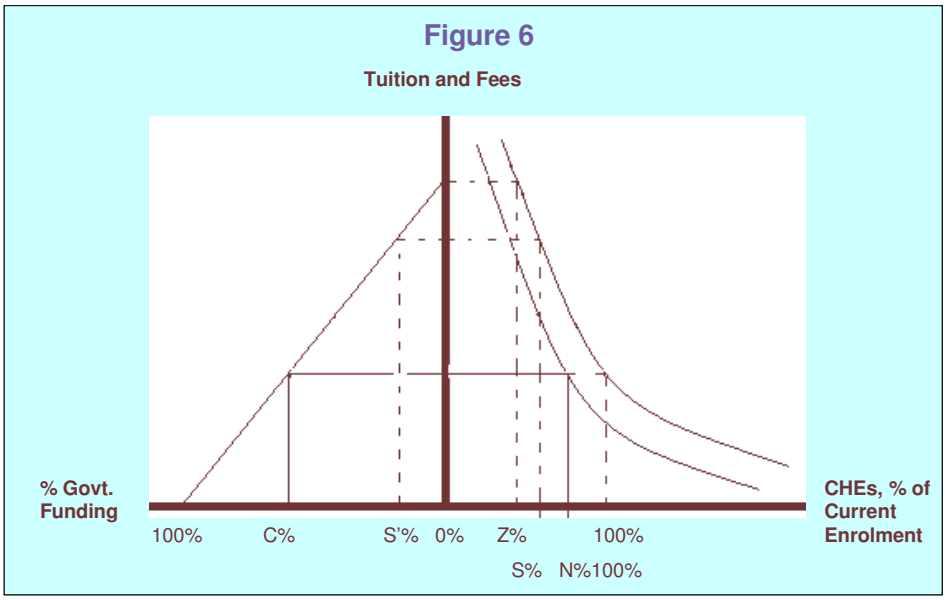
Because there may be education alternatives to the colleges and universities in the province, yet another adjustment is necessary. The question asked is: "Absent the publicly funded colleges and universities in the province, what percentage of the students would be able to obtain their education elsewhere?" Benefits associated with the education of these students are deducted from overall benefit estimates.

The adjustment for alternative education is easily incorporated into the simple graphic model. For simplicity, let A% equal the percent of students with alternative education opportunities, and N% equal the percent of students without an alternative. Note that N% + A% = 100%. **Figure 5** presents the case where the college could operate absent provincial and local government support (i.e., Z% occurs at an enrolment level greater than the shutdown level S%). In this case, the benefits generated by enrolments absent provincial and local government support must be subtracted from total benefits. This case is parallel to that indicated in equation (3), and the net benefits attributable to provincial and local government support is given by:

(4) $B = B(N\%100\%) - B(N\%Z\%)$



Finally, **Figure 6** presents the case where the college cannot remain open absent some minimum S'% level of provincial and local government support. In this case provincial and local government is credited with all benefits generated by current enrolment, less only the percent of students with alternative education opportunities. These benefits are represented symbolically as B(N%100%).



APPENDIX 3: INVESTMENT ANALYSIS RESULTS—A PRIMER

The purpose of this appendix is to provide some context and meaning to investment analysis results in general, using the simple hypothetical example summarized in **Table 1** below. The table shows the projected (assumed) benefits and costs over time for one student and associated investment analysis results.[31]

Table 1. Costs and Benefits

Year	Tuition	Opportunity Cost	Total Cost	Higher Earnings	Net Cash Flow
1	2	3	4	5	6
1	$1,500	$20,000	$21,500	$0	($21,500)
2	$0	$0	$0	$5,000	$5,000
3	$0	$0	$0	$5,000	$5,000
4	$0	$0	$0	$5,000	$5,000
5	$0	$0	$0	$5,000	$5,000
6	$0	$0	$0	$5,000	$5,000
7	$0	$0	$0	$5,000	$5,000
8	$0	$0	$0	$5,000	$5,000
9	$0	$0	$0	$5,000	$5,000
10	$0	$0	$0	$5,000	$5,000
NPV			$21,500	$35,747	$14,247
IRR					18%
B/C Ratio					1.7
Payback Period					4.2 years

Assumptions are as follows:

1) The time horizon is 10 years—i.e., benefits and costs are projected out 10 years into the future (Column 1). Once higher education has been earned, benefits of higher earnings remain with the student into the future. The objective is to measure these future benefits and compare them to costs of education.

2) The student attends college for one year for which he or she pays a tuition of $1,500 (Column 2).

3) The opportunity cost of time (earnings foregone while attending college for one year) for this student is estimated at $20,000 (Column 3).

[31] Note that this is a hypothetical example. The numbers used are not based on data collected from any community or technical college.

4) Together, these two cost elements ($21,500 total) represent the out-of-pocket investment made by the student (Column 4).

5) In return, it is assumed that the student, having completed the one year of study, will earn $5,000 more per year than he would have without the education (Column 5).

6) Finally, the net cash flow column (NCF) in Column 6 shows higher earnings (Column 5) less the total cost (Column 4).

7) The assumed "going rate" of interest is 4%, the rate of return from alternative investment schemes, for the use of the $21,500.

Now the "mechanics"—results are expressed in standard investment analysis terms: the net present value (NPV), the internal rate of return (IRR—or, as referred to in the Main Report, simply the rate of return—RR), the benefit/cost ratio (B/C), and the payback period. Each of these is briefly explained below in the context of the cash flow numbers in **Table 1**.

NET PRESENT VALUE (NPV)

"A bird in hand is worth two in the bush." This simple folk wisdom lies at the heart of any economic analysis of investments lasting more than one year. The student in **Table 1** has choices: 1) attend college, or 2) forego higher education and maintain present employment. If he or she decides to enroll, certain economic implications unfold: tuition must be paid and earnings will cease for one year. In exchange, the student calculates that, with higher education, his or her income will increase by at least the $5,000 per year as indicated in the table.

The question is simple: will the prospective student be economically better off by choosing to enroll? If he/she adds up higher earnings of $5,000 per year for the remaining nine years in **Table 1**, the total will be $45,000. Compared to a total investment of $21,500, this appears to be a very solid investment. The reality, however, is different—benefits are far lower than $45,000 because future money is worth less than present money. Costs (tuition plus foregone earnings) are felt immediately because they are incurred today—in the present. Benefits (higher earnings), on the other hand, occur in the future. They are not yet available. All future benefits must be discounted by the going rate of interest (referred to as the discount rate) to be able to express them in

present value terms.[32] A brief example: at 4%, the present value of $5,000 to be received one year from today is $4,807. If the $5,000 were to be received in year ten, the present value would reduce to $3,377. Or put another way, $4,807 deposited in the bank today earning 4% interest will grow to $5,000 in one year; and $3,377 deposited today would grow to $5,000 in ten years. An "economically rational" person would, therefore, be equally satisfied receiving $3,377 today or $5,000 ten years from today given the going rate of interest of 4%. The process of discounting—finding the present value of future higher earnings—allows the model to express values on an equal basis in future or present value terms.

The goal is to express all future higher earnings in present value terms so that they can be compared to investments incurred today—tuition and foregone earnings. As indicated in **Table 1**, the cumulative present value of $5,000 worth of higher earnings between years 2 and 10 is $35,747 given the 4% interest rate, far lower than the undiscounted $45,000 discussed above.

The net present value of the investment is $14,247. This is simply the present value of the benefits less the present value of the costs, or $35,747 - $21,500 = $14,247. In other words, the present value of benefits exceeds the present value of costs by as much as $14,247. The criterion for an economically worthwhile investment is that the net present value is equal to or greater than zero. Given this result, it can be concluded that, *in this case*, and given these assumptions, this particular investment in education is very strong.

INTERNAL RATE OF RETURN (IRR)

The internal rate of return is another way of measuring the worth of investing in education using the same cash flows shown in **Table 1**. In technical terms—the internal rate of return is a measure of the average earning power of money used over the life of the investment. It is simply the interest rate that makes the net present value equal to zero. In the NPV example above the model applies the "going rate" of interest of 4% and computed a positive net present value of $14,247. The question now is: what would the interest rate have to be in order to reduce the net present value to zero? Obviously it would have to be higher—18% in fact, as indicated in **Table 1**. Or, if a discount rate of

[32] Technically, the interest rate is applied to compounding—the process of looking at deposits today and determining how much they will be worth in the future. The same interest rate is called a discount rate when the process is reversed—determining the present value of future earnings.

18% were applied to the NPV calculations instead of the 4%, then the net present value would reduce to zero.

What does this mean? The internal rate of return of 18% defines a breakeven solution—the point where the present value of benefits just equals the present value of costs, or where the net present value equals zero. Or, at 18%, higher incomes of $5,000 per year for the next nine years will earn back all investments of $21,500 made plus pay 18% for the use of that money ($21,500) in the meantime. Is this a good return? Indeed it is. If it is compared to the 4% "going rate" of interest applied to the net present value calculations, 18% is far higher than 4%. It may be concluded, therefore, that the investment in this case is solid. Alternatively, comparing the 18% rate of return to the long-term 7% rate or so obtained from investments in stocks and bonds also indicates that the investment in education is strong relative to the stock market returns (on average).

A word of caution—the IRR approach can sometimes generate "wild" or "unbelievable" results—percentages that defy the imagination. Technically, the approach requires at least one negative cash flow (tuition plus opportunity cost of time) to offset all subsequent positive flows. For example, if the student works full-time while attending college, the opportunity cost of time would be much lower—the only out-of-pocket cost would be the $1,500 paid for tuition. In this case, it is still possible to compute the internal rate of return, but it would be a staggering 333% because only a negative $1,500 cash flow will be offsetting nine subsequent years of $5,000 worth of higher earnings. The 333% return is technically correct, but not consistent with conventional understanding of returns expressed as percentages. For purposes of this report, therefore, all results exceeding 100% are expressed simply as: "NA" or "> 100%."

BENEFIT/COST RATIO (B/C)

The benefit/cost ratio is simply the present value of benefits divided by present value of costs, or $35,747 / $21,500 = 1.7 (based on the 4% discount rate). Of course, any change in the discount rate will also change the benefit/cost ratio. Applying the 18% internal rate of return discussed above would reduce the benefit/cost ratio to 1.0—or the breakeven solution where benefits just equal costs. Applying a discount rate higher than the 18% would reduce the ratio to less than one and the investment would not be feasible. The 1.7 ratio means that a dollar invested today will return a cumulative $1.70 over the ten-year time period.

PAYBACK PERIOD

This is the length of time from the beginning of the investment (consisting of the tuition plus earnings foregone) until higher future earnings return investments made. In **Table 1**, it will take roughly 4.2 years of $5,000 worth of higher earnings to recapture the student's investment of $1,500 in tuition and the $20,000 earnings he or she foregoes while attending college. Higher earnings occurring *beyond* 4.2 years are the returns that make the investment in education *in this example* economically worthwhile. The payback period is a fairly rough, albeit common, means of choosing between investments. The shorter the payback period is, the stronger the investment.