Economic Contribution of BC Colleges

Analysis of Investment Effectiveness and Economic Growth

Volume 1: Main Report

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INTRODUCTION

BC Colleges employed 10,558 full and part-time faculty and staff in fiscal year 2006. Their combined payroll amounted to $494.7 million. Other operating expenditures, including purchases of supplies and services, made up an additional $206.6 million. These budget data appear in Column 1 of Table 2.2. Column 2 apportions that spending to local (i.e., in-province) 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 colleges are "good neighbors" in the province, evidenced by the fact that 83% of all college expenditures benefit provincial vendors ($581.8 million / $701.3 million = 83%).

SPENDING CATEGORIES	TOTAL DOLLAR AMOUNT (1)	% IN-PROV. (2)	NET IN-PROV. SPENDING (3)
Salaries, wages and benefits	$494,684,340	90%	$443,859,780
Other non-pay expenditures	$206,585,359	67%	$137,937,1

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).

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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 2.7: 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		5,283
		Subtotal	$47,097,221
		Net of household income[1]	($13,738,491)
		TOTAL SPENDING	**$33,358,730**

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

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 province upon exiting college also contribute to economic growth through their higher earnings and improved lifestyles. As shown in Table 2.8, 96% of students stay in the province upon exiting college. This retention rate only applies to the first year, however. The model also assumes that 5% of students, and thus associated benefits, will leave the province over the next thirty years due to attrition (e.g., retirement, out-migration, or death).

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.

REGIONAL PROFILE

Since BC Colleges first opened their doors to students, the colleges have 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 province, thereby generating new businesses and expanding the availability of public investment funds.

The regional backdrop used in this analysis is the entire province of British Columbia. The added income generated by the colleges as a result of their daily operatituc4.13313(r)8.84251(l)-2.ier

SOCIAL BENEFITS

Higher education is statistically correlated with a variety of lifestyle changes that generate social savings, also known as or 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 BC Colleges. 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 jus

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 BC College student body. The analysis identifies

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 BC College student body).[8]

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.

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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

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.

Multiplying the value per CHE times the corresponding number of CHEs completed

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.

Estimating the direct effect of BC Colleges 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 BC Colleges 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 province. For BC Colleges, this variable is set at 11%, meaning that 11% of the student body could have obtained an education elsewhere absent BC Colleges and other publicly-funded colleges and universities in the province. The model assumes that

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that, unlike streams of benefits that go on into the future, the provincial and local government contribution of $468.6 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 19.1 (= $9.0 billion worth of benefits / $468.6 million worth of provincial and local government support). Recall that this ratio reflects the measure of 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 ret

rate for which governments, as relatively safe borrowers, can obtain funds. A rate of return of 4.0% would mean that the colleges just pay their own way. In principle, governments could borrow monies used to support the colleges and repay the loans out of the resulting added taxes and reduced government expenditures. A rate of return of 14.4%, on the other hand, means that BC Colleges not only pay their own way, but also generate 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.

Note that returns reported in Table 3.7

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 BC Colleges.

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	$8,942,281	$8,576,604	$1,800,040	$1,758,986
Internal rate of return	-	-	14.4%	14.0%
Benefit/cost ratio	19.1	18.3	3.8	3.8
Payback period (years)	-	-	9.6	9.9

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.

	PER CHE[1]	PER FTE STUDENT[1]
STUDENT BENEFITS		
Increased student earnings, **gross**	$111	$3,335
Increased student earnings, **after tax**	$87	$2,611
PUBLIC BENEFITS		
Income growth	$195	$5,861
Health-related savings[2]	$9	$280
Crime savings[3]	<$1	$6
Welfare/unempl. savings[4]	<$1	$6
TOTAL	**$205**	**$6,153**

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:

As indicated in the first row, the annual average income of BC College students increases roughly $111 for every hour of credit or non-credit instruction they complete. The $111 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 $87 – this is the figure that might

therefore, the public stands to benefit far more from the education provided by BC Colleges than students do.

CONCLUSIONS

This chapter has shown that BC Colleges are an attractive investment to their 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 BC College education, provincial and local government would have to raise taxes to make up for lost revenues and added costs.

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 monies withdrawn from the provincial economy to support the colleges. Such monies would have been spent in the province anyway and are thus not credited to BC Colleges.

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	Student headcount[2]	Non-retired students (%)[3]	Students remaining in prov. (%)[3]	Students who have left college (%)	Students settled into jobs (%)	Thirty-year attrition (%)	Students active in workforce	Average CHEs[3]	CHEs active in workforce
	1	2	3	4	5	6	7	8	9
	95,736	91%	96%	100%	100%	95%	78,786	14	1,091,458
	97,650	91%	96%	100%	100%	95%	80,499	14	1,111,802
	130,082	91%	96%	100%	100%	95%	107,418	10	1,042,446
	132,087	91%	96%	100%	100%	95%	109,260	10	1,066,356
	136,696	91%	96%	100%	100%	96%	113,266	10	1,118,379
	137,224	91%	96%	100%	100%	96%	113,897	10	1,123,790
1983	137,601	91%	96%	100%	100%	96%	114,406	10	1,127,918
1984	140,306	91%	96%	100%	100%	96%	116,855	10	1,154,089
1985	142,099	91%	96%	100%	100%	96%	118,551	10	1,177,889
1986	144,313	91%	96%	100%	100%	96%	120,603	10	1,202,690
1987	149,464	91%	96%	100%	100%	97%	125,122	10	1,255,548
1988	152,684	91%	96%	100%	100%	97%	128,036	10	1,289,740
1989	157,909	91%	96%	100%	100%	97%	132,645	10	1,348,879
1990	160,047	91%	96%	100%	100%	97%	134,671	10	1,372,737
1991	164,374	91%	96%	100%	100%	97%	138,548	10	1,420,618
1992	172,365	91%	96%	100%	100%	97%	145,532	10	1,523,704
1993	164,609	91%	96%	100%	100%	98%	139,221	10	1,454,064
	166,870	91%	96%	100%	100%	98%	141,375	11	1,485,112
	169,656	91%	96%	100%	100%	98%	143,982	10	1,499,326
	172,577	91%	96%	100%	100%	98%	146,711	11	1,541,211
	177,892	91%	96%	100%	100%	98%	151,488	11	1,605,574
	181,059	91%	96%	100%	100%	98%	154,449	11	1,641,586
	189,164	91%	96%	100%	100%	99%	161,639	11	1,721,046
	188,730	91%	96%	100%	100%	99%	161,544	11	1,779,779
	196,839	91%	96%	100%	100%	99%	168,774	11	1,827,295
	198,051	91%	96%	100%	100%	99%	170,103	11	1,917,888
	193,061	91%	96%	100%	100%	99%	166,101	11	1,903,166
	188,672	91%	96%	98%	100%	99%	159,714	11	1,819,416
	186,439	91%	96%	87%	64%	100%	89,020	11	943,596
	192,034	91%	96%	63%	61%	100%	64,748	10	668,446
							Subtotal		41,235,546
					Net of alternative education variable			11%	(4,354,772)
							NET CHEs IN WORKFORCE		**36,880,774**

1. Numbers may not add due to rounding.

2.

3. In the absence of better data, the model assumes that the same data and assumptions for the current year also apply to the

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

TOTAL EFFECT

Table 4.5 displays the grand total of BC Colleges' impact on British Columbia, including

5.1, and 8.1 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 30.0%, 10.2, and 5.1 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.

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 [illegible] much more attractive,

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:

Alternative Education Opportunity

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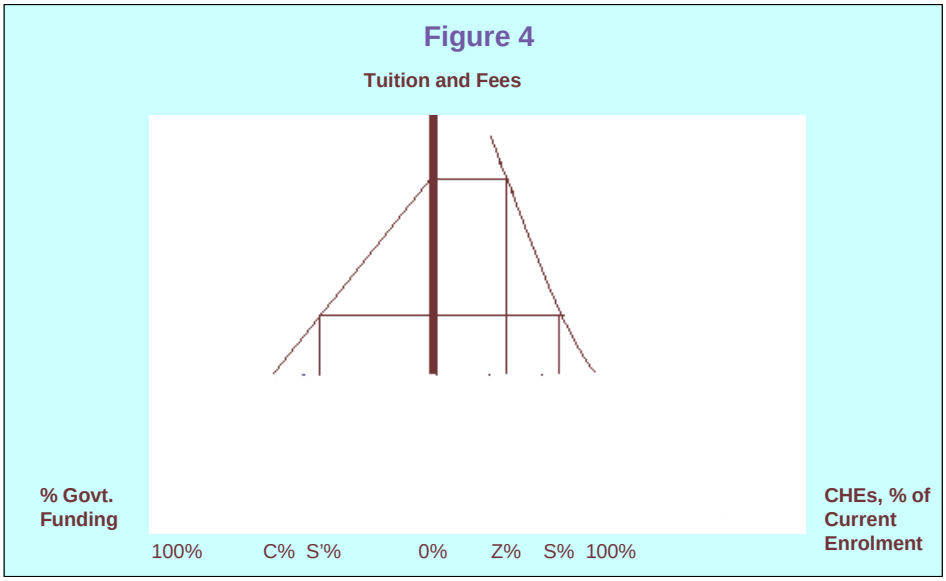
APPENDIX 1: GLOSSARY OF TERMS

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.**

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**

FROM ENROLMENT TO BENEFITS



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

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.[30]

Table 1. Costs and Benefits

Year 1	Tuition 2	Opportunity Cost 3	Total Cost 4	Higher Earnings 5	Net Cash Flow 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 c**

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 w**

present value terms.[31] 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

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 r(e)1.50577.327r4 10 0 0 10 0 0 cm B