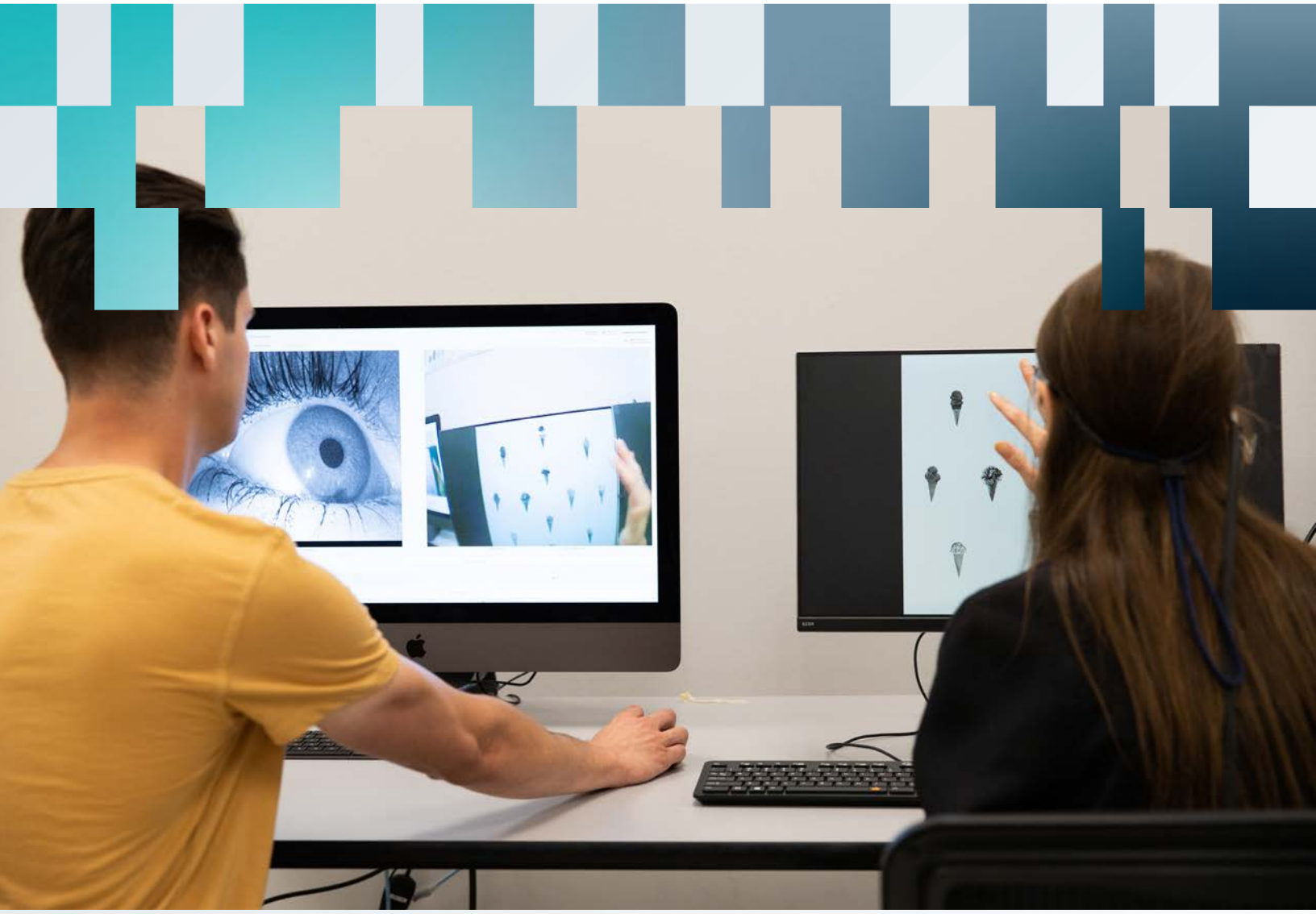
THOMPSON RIVERS UNIVERSITY

Main Report

JUNE 2024



The Regional Economic Value of Thompson Rivers University

Lightcast

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Preface

Lightcast is a leading provider of economic impact studies and labour market data to educational institutions, workforce planners, and regional developers in Canada, the U.S., and internationally. Since 2000, Lightcast has completed over 2,800 economic impact studies for educational institutions in three countries. Along the way we have worked to continuously update and improve our methodologies to ensure that they conform to best practices.

The present study reflects the latest version of our model, representing the most up-to-date theory for conducting human capital economic impact analyses. The current model, as with previous versions, has various external data inputs which reflect the most current economic activity and data. These data include, but are not limited to: average earnings per worker in the province; the taxpayer discount rate; the student discount rate; the consumer price index; national health expenditures; provincial industry earnings as a percent of total industry earnings; income tax brackets and sales tax by province; and unemployment, migration, and life tables. All data sets are maintained quarterly, although most updates occur only once a year. Many of these external data points have changed significantly since TRU's previous study conducted by Lightcast in 2019, especially in the wake of the intervening COVID-19 pandemic. While the full effects of the COVID-19 pandemic are not yet fully realized in the economic data, COVID-19 has impacted the economy and thus, impacted the results of this analysis.

These and other changes mark a considerable upgrade to the Lightcast economic impact model. Our hope is that these improvements will provide a better product to our clients—reports that are more transparent and streamlined, methodology that is more comprehensive and robust, and findings that are more relevant and meaningful to today's audiences.

While this report is useful in demonstrating the current value of TRU, it is not intended for comparison with TRU's previous study conducted by Lightcast in 2019. Due to the extent of the changes to Lightcast's model since 2019, differences between results from the 2019 study and the present study do not necessarily indicate changes in the value of TRU. We encourage our readers to approach Lightcast directly with any questions or comments they may have about the study. This will allow Lightcast to continue to improve its model and keep the public dialogue open about the positive impacts of education.

Executive summary

This report assesses the impact of Thompson Rivers University (TRU) on the regional economy and the benefits generated by the university for its main stakeholder groups: students, taxpayers, and society. The results of this study show that TRU has a significant positive impact on the business community in the regional economy and generates benefits in return for the investments made by students, taxpayers, and society.

Economic impact analysis

The Thompson Rivers College Region, British Columbia

During the analysis year, TRU spent $175.6 million on payroll and benefits for 1,603 full-time equivalent (FTE) employees and spent another $81.4 million on goods and services to carry out its day-to-day operations. This initial round of spending creates more spending across other businesses throughout the regional economy, resulting in the commonly referred to multiplier effects. This analysis estimates the net economic impact of TRU, directly taking into account the fact that local dollars spent on TRU could have been spent elsewhere in the region if not directed towards TRU and would have created impacts regardless. We account for this by estimating the impacts that would have been created from the alternative spending and subtracting the alternative impacts from the spending impacts of TRU.

One out of every 10 jobs in the Thompson Rivers College Region is supported by the activities of TRU and its students.

This analysis shows that in fiscal year (FY) 2023-24, TRU's operations, construction, and student spending, together with the enhanced productivity of its alumni, generated **$885.5 million** in added income for the Thompson Rivers College Region[1] economy. The additional income of $885.5 million is approximately equal to **7.4%** of the region's gross regional product (GRP). For perspective, this impact from the university is greater than the entire manufacturing industry in the region. The impact of $885.5 million is equivalent to supporting **9,510 jobs**. For further perspective, this means that **one out of every 10 jobs** in the Thompson Rivers College Region is

1 This is the region designated for TRU by the Government of British Columbia. It consists of a group of census subdivisions in south central British Columbia.

supported by the activities of TRU and its students. These economic impacts break down as follows:

Operations spending impact

Payroll and benefits to support TRU's day-to-day operations amounted to $175.6 million. The university's non-pay expenditures amounted to $81.4 million. The net impact of TRU's payroll and expenses toward day-to-day operations in the Thompson Rivers College Region was approximately **$234.6 million** in added income in FY 2023-24. This is equivalent to supporting **2,297 jobs**.

Construction spending impact

TRU spends millions of dollars on construction each year to maintain its facilities, create additional capacities, and meet its growing educational demands. While the amount varies from year to year, these quick infusions of income and jobs have a substantial impact on the regional economy. In FY 2023-24, the construction spending of TRU created $19.6 million in added income, which is equivalent to supporting **171 jobs**.

Student spending impact

Around 78% of students, including international students, originated from outside the Thompson Rivers College Region, and many of these students relocated to the region to attend TRU. In addition, some students are residents of the Thompson Rivers College Region who would have left the region if not for the existence of TRU. The money that these relocated and retained students spent at local businesses toward living expenses is attributable to TRU. These expenditures added approximately **$73.2 million** in income to the Thompson Rivers College Region economy in FY 2023-24. This is equivalent to supporting **1,050 jobs**. Of this impact, **$39.5 million** is attributable to international students who relocated to the Thompson Rivers College Region to attend TRU, while another **$2.2 million** is attributable to relocating and retained Indigenous students.

Alumni impact

Over the years, students have studied at TRU and entered or re-entered the regional workforce. Their enhanced skills and abilities bolster the output of local employers, leading to higher regional income and a more robust economy. The accumulated contribution of former students of TRU who were employed in the regional workforce in FY 2023-24 amounted to **$558 million** in added income in the Thompson Rivers College Region economy. This is equivalent to supporting **5,992 jobs**. Of this impact, **$53.3 million** is attributable to former international students who are active in the Thompson Rivers College Region workforce, while another **$176.7 million** is attributable to former Indigenous students.

Important note

When reviewing the impacts estimated in this study, it's important to note that it reports impacts in the form of added income rather than sales. Sales includes all of the intermediary costs associated with producing goods and services. Income, on the other hand, is a net measure that excludes these intermediary costs and is synonymous with gross regional product (GRP) and value added. For this reason, it is a more meaningful measure of new economic activity than sales.

Investment analysis

Investment analysis is the practice of comparing the costs and benefits of an investment to determine whether it is profitable. This study considers TRU as an investment from the perspectives of students, taxpayers, and society.

Student perspective

Students paid a total of **$168.5 million** to cover the cost of tuition and fees and books and supplies at TRU in FY 2023-24. They also forwent **$256.3 million** in earnings that they would have generated had they been working instead of learning.

In return for the monies invested in TRU, students receive a present value of **$586.2 million** in increased earnings over their working lives. This translates to a return of **$1.40** in higher future earnings for every dollar that students pay for their education at TRU. The corresponding average annual internal rate of return is **10.4%**.

Taxpayer perspective

Provincial taxpayers in British Columbia paid **$96.5 million** to support the operations of TRU in FY 2023-24. The net present value of the added tax revenue stemming from the students' higher lifetime earnings and the increased output of businesses amounts to **$486.6 million** in benefits to taxpayers. Savings to the public sector add another **$10.2 million** in benefits due to a reduced demand for government-funded social services in British Columbia.

Dividing the benefits to provincial taxpayers by the amount that they paid to support TRU yields a benefit-cost ratio of **5.1**, *i.e.*, every dollar in costs returns **$5.10** in benefits. In other words, taxpayers fully recover the cost of the original investment and receive a return of **$4.10** in addition to every dollar they paid. The average annual internal rate of return for taxpayers is **38.2%.**

> Taxpayers fully recover the cost of the original investment and receive a return of **$4.10** in addition to every dollar they paid.

Social perspective

Society in the province of British Columbia will receive a present value of **$3.8 billion** in added provincial income over the course of the students' working lives. Society will also benefit from **$25.4 million** in present value social savings related to reduced crime, lower unemployment, and increased health and well-being across the province.

For every dollar that society invested in TRU in FY 2023-24, society as a whole will receive a cumulative value of **$7.20** in benefits, for as long as TRU's FY 2023-24 student population remains active in the provincial workforce.

Acknowledgments

Lightcast gratefully acknowledges the excellent support of the staff at Thompson Rivers University in making this study possible. Special thanks go to Dr. Brett Fairbairn, President and Vice-Chancellor, who approved the study; and to Dorys Crespin Mueller, Associate Vice President, Integrated Planning and Effectiveness, who collected and organized much of the data and information requested. Any errors in the report are the responsibility of Lightcast and not of any of the above-mentioned individuals.

Introduction

Thompson Rivers University (TRU) creates value in many ways. The university plays a key role in helping students increase their employability and achieve their individual potential. With a wide range of program offerings, TRU enables students to earn credentials and develop the skills they need to have fulfilling and prosperous careers. The university also provides an excellent environment for students to meet new people and make friends, while participation in courses improves students' self-confidence and promotes their mental health. These social and employment-related benefits have a positive influence on the health and well-being of individuals.

However, the contribution of TRU consists of more than solely influencing the lives of students. The university's program offerings support a range of industry sectors in the Thompson Rivers College Region, which for the purposes of this report consists of group of census subdivisions in south central British Columbia. The university also supplies employers with the skilled workers they need to make their businesses more productive. Operational expenditures of TRU, along with the spending of its employees and students, further support the regional economy through the output and employment generated by regional businesses. Lastly, and just as importantly, the economic impact of TRU extends as far as the provincial treasury in terms of increased tax receipts and decreased public sector costs.

> The university plays a key role in helping students increase their employability and achieve their individual potential.

This report assesses the economic impact of TRU on the regional economy and the benefits generated by the university in return for the investments made by its key stakeholder groups: students, taxpayers, and society. Our approach is twofold. We begin with an economic impact analysis of TRU on the regional business community in the Thompson Rivers College Region. To derive results, we rely on Lightcast's Canadian Regional Input-Output (CRIO) model to calculate the additional income created in the Thompson Rivers College Region economy as a result of institution-linked input purchases, consumer spending, and the added skills of TRU students. Results of the regional economic impact analysis are broken out by the following four impacts: 1) impact of the university's day-to-day operations, 2) impact of the university's construction spending, 3) impact of student spending, and 4) impact of alumni who are still employed in the Thompson Rivers College Region workforce.

The second component of the study is a standard investment analysis to determine how money spent on TRU performs as an investment over time. The investors in this case are students, taxpayers, and society, all of whom pay a certain amount in costs to support the educational activities at TRU. The students' investment consists of their out-of-pocket expenses and the opportunity cost of attending the university as opposed to working. Provincial taxpayers contribute their investment through government funding. Society invests in education by forgoing the services that it would have received had government not funded TRU and the business output that it would have enjoyed had students been employed instead of studying.

In return for these investments, students receive a lifetime of higher earnings, taxpayers benefit from an expanded tax base and a collection of public sector savings, and society benefits from an enlarged economy and a reduced demand for social services. To determine the feasibility of the investment, the model projects benefits into the future, discounts them back to their present value, and compares them to their present value costs. Results of the investment analysis for students, taxpayers, and society are displayed in the following four ways: 1) net present value of benefits, 2) rate of return, 3) benefit-cost ratio, and 4) payback period.

A wide array of data and assumptions are used in the study based on several sources, including the fiscal year (FY) 2023-24 academic and financial reports from the university, industry and employment data from Statistics Canada, outputs of Lightcast's CRIO model, and a variety of published materials relating education to social behaviour. The study aims to apply a conservative methodology and follows standard practice using only the most recognized indicators of investment effectiveness and economic impact.

Chapter 1:

Profile of TRU and the regional economy

THOMPSON RIVERS UNIVERSITY (TRU) is a comprehensive, learner-centered, environmentally responsible institution that serves its regional, national, and international learners and their communities through high quality and flexible education, training, research, and scholarship. With campuses in Kamloops and Williams Lake, numerous secondary locations, and a variety of online options, the university aims to make quality postsecondary education affordable and accessible. In FY 2023-24, TRU served an enrollment of over 29,000 students. The university's vision is to be community-minded with a global conscience, working to redefine itself as a place of belonging—Kw'seltktnéws (we are all related and interconnected with nature, each other, and all things)—where all people are empowered to transform themselves, their communities, and the world.

TRU has been part of British Columbia's educational landscape for over 50 years, beginning its activities as Cariboo College in 1970. Cariboo College became a university college in 1989, offering its first bachelor's degrees in 1991 and changing its name to University College of the Cariboo (UCC). In 2005, the college merged with British Columbia Open University (BCOU), becoming a province-designated special purpose university. At this time, the university changed its name to Thompson Rivers University, taking its name from its primary location in Kamloops, where the North Thompson and South Thompson Rivers converge.

Today, TRU offers more than 140 different programs. These include bachelor's degrees and pre-professional degrees in fields like accounting, arts, healthcare, and social work, as well as many other shorter-term diplomas and certificates in dozens of fields. TRU also offers graduate programs in nine fields, including business administration, environmental science, education, and nursing, as well as trades courses in more than a dozen different areas. Approximately 60 of the university's programs are available online through TRU Open Learning.

The university makes a concerted effort to welcome and involve Indigenous peoples and their culture into its programs and environment. TRU's campuses are on the traditional lands of the Tk'emlúps te Secwépemc (Kamloops campus) and the T'exelc (Williams Lake campus) within Secwépemcúl'ecw, the traditional and unceded territory of the Secwépemc, a relationship honoured by the territorial marker installed on campus. The university has partnered with the Secwépemc to indigenize its programs, ensuring that opportunities are made available to Indigenous students. The university's Coyote Project works to create an environment that welcomes all Indigenous students and staff. TRU also houses a variety of digitized materials from the Secwépemc Cultural Education Society, including documents, videos, and sound recordings, and offers free Secwépemc language classes.

Employee and finance data

Estimating the economic value of TRU requires three types of information: 1) employee and finance data, 2) student demographic and achievement data, and 3) the economic profile of the region. For this study, information on the university and its students was obtained from TRU, and data on the regional economy were drawn from Lightcast's proprietary data modeling tools.

Employee data

Data provided by TRU include information on the university's employees by place of work and by place of residence. These data appear in Table 1.1. As shown, 1,603 full-time equivalent employees worked at TRU in FY 2023-24. Of these, 92% worked in the Thompson Rivers College Region and 92% lived in the region. These data are used to isolate the portion of the employees' household expenses that remains in the regional economy.

Revenues

Figure 1.1 shows TRU's annual revenues by funding source—a total of $290.9 million in FY 2023-24. As indicated, tuition and mandatory fees comprised 51% of total revenue, revenue from provincial grants and contracts 33%, revenue from federal grants and contracts 2%, and all other non-government revenue (*i.e.*, sales, donations, and non-government grants and contracts) the remaining 14%. These data are critical in identifying annual costs of educating the university's students from the perspectives of students and taxpayers.

Expenditures

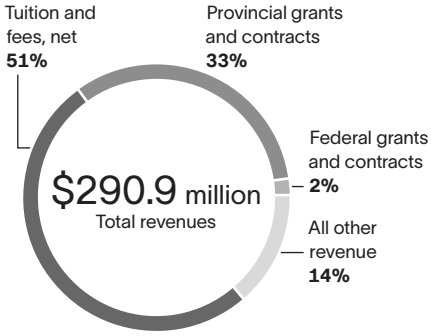
Figure 1.2 displays TRU's expense data for FY 2023-24. TRU's combined payroll amounted to $175.6 million, equal to 58% of the university's total expenses. Other expenditures, including construction, amortization, operation & maintenance of plant, and purchases of supplies and services, made up $126.8 million. When we calculate the impact of these expenditures in Chapter 2, we exclude expenses for amortization, as they represent a devaluing of the university's assets rather than an outflow of expenditures.

Table 1.1: Employee data, FY 2023-24

Total full-time equivalent employees	**1,603**
% of employees that work in region	92%
% of employees that live in region	92%

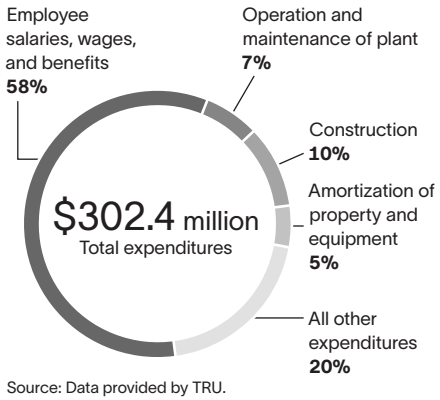
Source: Data provided by TRU.

Figure 1.1: TRU revenues by source, FY 2023-24



Source: Data provided by TRU.

Figure 1.2: TRU expenses by function, FY 2023-24



Source: Data provided by TRU.

Student profile data

TRU served 27,086 credit students and 2,165 non-credit students in FY 2023-24. The breakdown of the student body by gender was 42% male, 55% female and 3% other, unspecified, or unknown. The students' overall average age was 29 years old.[2] An estimated 39% of students remain in the Thompson Rivers College Region after finishing their time at TRU, another 36% remain in British Columbia but outside the region, and the remaining 25% settle outside the province.[3]

Table 1.2 summarizes the breakdown of the student population by credential type and the corresponding number of full-time equivalents (FTEs). FTEs are used to standardize actual course loads against normal course loads to combine full-time and part-time student counts. FTE data combined with the number of credentials issued are key to determining how far students advance in their education during the analysis year and the associated value of their achievements. For programs where students do not generate FTEs, an approximate equivalent was used in order to determine the extent of students' education at TRU.

Table 1.2: Breakdown of student population by credential type, FY 2023-24

Category	Headcount	FTEs	Average FTEs per student	Number of credentials issued
Master's degree	1,508	966	0.64	429
Graduate and post-degree	2,510	1,942	0.77	569
Bachelor's degree	9,574	5,669	0.59	1,068
Diploma	1,611	975	0.61	354
Certificate	1,857	1,028	0.55	560
Apprenticeship	1,137	1,232	1.08	281
Developmental	152	61	0.40	31
Workforce and all other	10,902	1,762	0.16	0
Total, all students	**29,251**	**13,635**	**0.47**	**3,292**

Source: Data provided by TRU.

2 Unduplicated headcount, gender, and age data provided by TRU.

3 Settlement data provided by TRU.

As shown, TRU served 1,508 master's degree students, 2,510 graduate and post-degree students, and 9,574 bachelor's degree students. The university also served 1,611 diploma students and 1,857 certificate students. Another 1,137 students pursued apprenticeships, and 152 students pursued developmental credentials, such as the high school diploma or ESL certificate. Students not allocated to the other categories—including those enroled in non-credential workforce and professional development courses—comprised the remaining 10,902 students.

Altogether, TRU served 29,251 students and issued 3,292 credentials during the analysis year. The total FTE production for the student population was 13,635 FTEs, for an overall average of 0.47 FTEs per student.

Profile of the Thompson Rivers College Region economy

TRU serves a region referred to as the Thompson Rivers College Region.[4] Since the university was first established, it has been serving the Thompson Rivers College Region by providing local residents with easy access to postsecondary education, preparing students for a variety of professions, and enhancing the workforce. Table 1.3 summarizes the breakdown of the Thompson Rivers College Region economy by major industrial sector, with details on labour income, non-labour income, and total income, also referred to as gross regional product (GRP). Labour income includes the wages and salaries of employees (excluding self-proprietors), and non-labour income

Table 1.3: Income by major industrial sector in the Thompson Rivers College Region, 2023*

Industry sector	Labour income (millions)	Non-labour income (millions)	Total income (millions)**	% of total	Sales (millions)
Construction	$605	$865	$1,470	12%	$3,391
Mining, Quarrying, & Oil and Gas Extraction	$237	$1,227	$1,465	12%	$2,677
Health Care & Social Assistance	$754	$470	$1,224	10%	$1,702
Public Administration	$454	$421	$875	7%	$1,900
Manufacturing	$352	$502	$854	7%	$3,938
Retail Trade	$406	$304	$710	6%	$1,136
Transportation & Warehousing	$270	$414	$685	6%	$1,393
Professional, Scientific, & Technical Services	$344	$304	$648	5%	$1,091
Agriculture, Forestry, Fishing, & Hunting	$168	$425	$593	5%	$1,548
Real Estate & Rental & Leasing	$69	$480	$549	5%	$921
Educational Services	$347	$195	$542	5%	$662
Wholesale Trade	$192	$195	$387	3%	$590
Accommodation & Food Services	$185	$184	$369	3%	$724
Other Services (except Public Administration)	$191	$154	$345	3%	$622
Finance & Insurance	$127	$190	$317	3%	$570
Admin. & Support, Waste Mgt, & Remediation Services	$178	$139	$317	3%	$600
Arts, Entertainment, & Recreation	$131	$151	$282	2%	$598
Utilities	$50	$163	$212	2%	$269
Information & Cultural Industries	$39	$61	$100	<1%	$204
Management of Companies & Enterprises	$20	$1	$21	<1%	$27
Total	**$5,120**	**$6,845**	**$11,965**	**100%**	**$24,564**

* Data reflect the most recent year for which data are available. Lightcast data are updated quarterly.

** Numbers may not add due to rounding.

Source: Lightcast CRIO model.

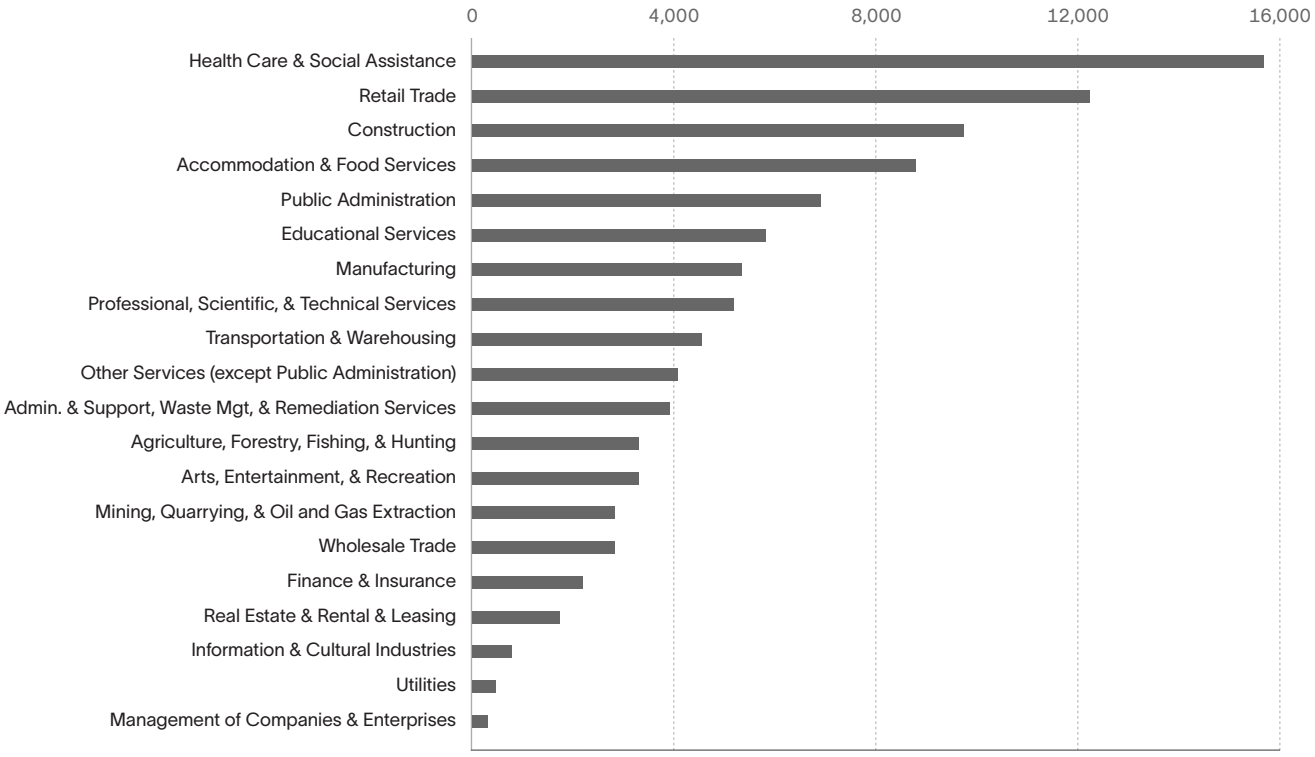
4 For the purposes of this analysis, the Thompson Rivers College Region is defined as group of census subdivisions in south central British Columbia.

includes operating surplus, mixed income, and taxes less subsidies on production, products and imports. Together labour income and non-labour income make up the region's total GRP.

As shown in Table 1.3, total GRP in the Thompson Rivers College Region is approximately $12 billion, equal to the sum of labour income ($5.1 billion) and non-labour income ($6.8 billion). In Chapter 2, we use GRP as the backdrop against which we measure the relative impacts of the university on economic growth in the region.

Figure 1.3 provides the breakdown of jobs by industry sector in the Thompson Rivers College Region. The Health Care & Social Assistance industry is the region's largest employer, supporting 15,543 jobs or 15.7% of total employment. The second largest employer is the Retail Trade industry, supporting 12,064 jobs or 12.2% of total employment. Altogether, the region supports 98,812 jobs.[5]

Figure 1.3: Jobs by major industry sector in the Thompson Rivers College Region, 2023*



* Data reflect the most recent year for which data are available..

Source: Lightcast employment data.

5 Job numbers reflect both wage and salary employees and self-employed workers.

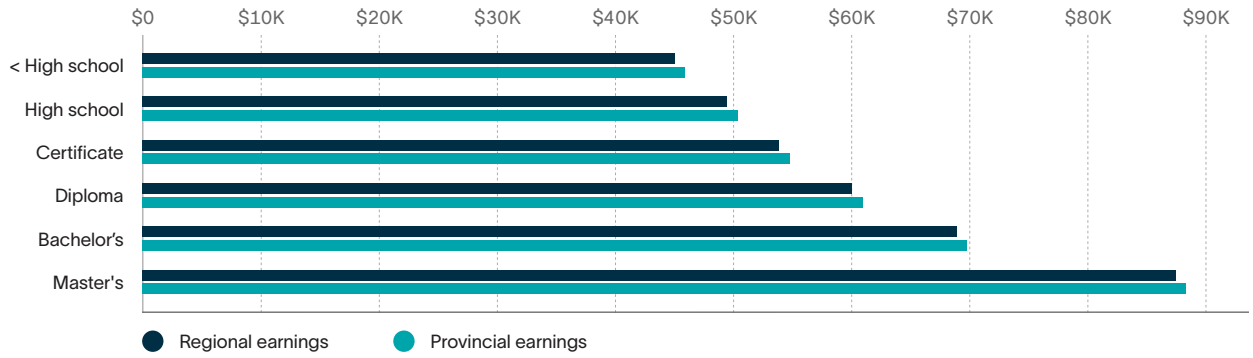
Table 1.4 and Figure 1.4 present the median earnings by education level in the Thompson Rivers College Region and the province, which represent the earnings at students' career midpoint. These numbers are derived from data provided by Statistics Canada and grown to reflect current year dollars. They are then weighted by the university's demographic profile, regionalised using a scalar derived from average earnings per worker in the Thompson Rivers College Region, and weighted by TRU's student settlement patterns. As shown, students who earn a bachelor's degree can expect $68,900 in earnings per year in the Thompson Rivers College Region, approximately $19,200 more than someone with a high school diploma.

Table 1.4: Median earnings by education level for TRU students at career midpoint

Education level	Regional earnings	Difference from next lowest credential	Provincial earnings	Difference from next lowest credential
Less than high school	$45,700	n/a	$46,400	n/a
High school or equivalent	$49,800	$4,100	$50,400	$4,000
Certificate	$54,300	$4,500	$55,000	$4,600
Diploma	$59,800	$5,500	$60,600	$5,600
Bachelor's degree	$68,900	$9,100	$69,800	$9,200
Master's degree	$87,400	$18,500	$88,600	$18,800

Source: Derived from data provided by Statistics Canada and the Lightcast CRIO model.

Figure 1.4: Median earnings by education level for TRU students at career midpoint

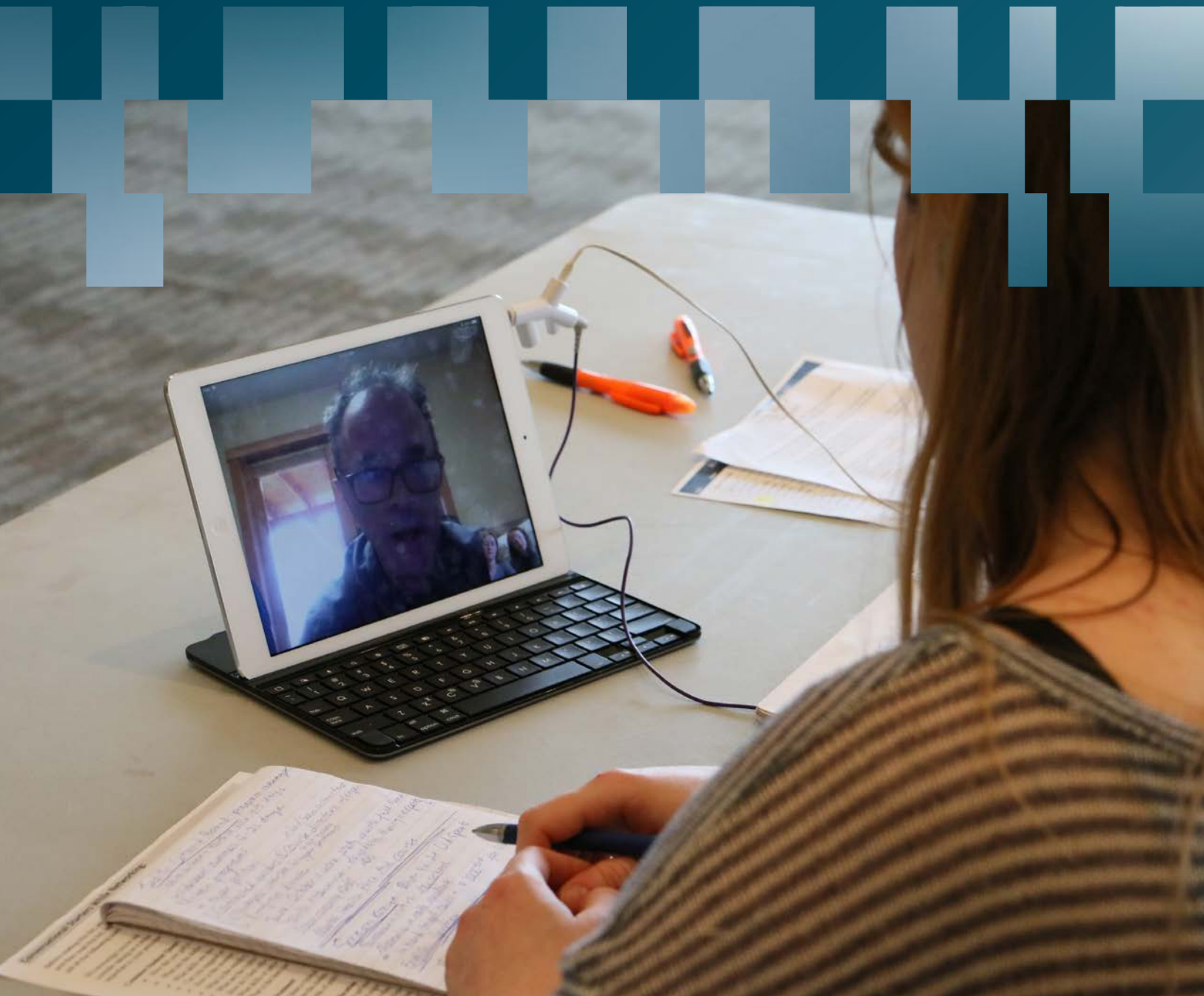


Source: Derived from data provided by Statistics Canada and the Lightcast CRIO model.

Chapter 2:

Economic impact analysis

The Thompson Rivers College Region economy is impacted by TRU in a variety of ways. The university is an employer and a buyer of goods and services. It attracts monies that would not have otherwise entered the regional economy through its day-to-day operations, its construction and the expenditures of students. Further, it provides students with the knowledge, skills, and abilities they need to become productive citizens and contribute to the overall output of the region.



IN THIS CHAPTER, we estimate the following economic impacts of TRU: 1) the operations spending impact, 2) the construction spending impact, 3) the student spending impact, and 4) the alumni impact, measuring the income added in the region as former students expand the regional economy's stock of human capital.

When exploring each of these economic impacts, we consider the following hypothetical question:

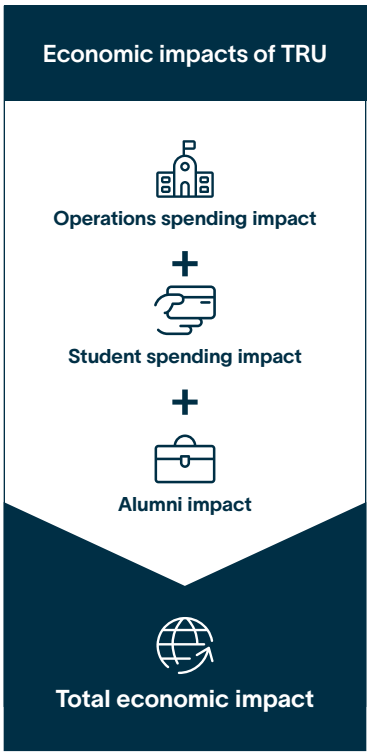
How would economic activity change in the Thompson Rivers College Region if TRU and all its alumni did not exist in FY 2023-24?

Each of the economic impacts should be interpreted according to this hypothetical question. Another way to think about the question is to realize that we measure net impacts, not gross impacts. Gross impacts represent an upper-bound estimate in terms of capturing all activity stemming from the university; however, net impacts reflect a truer measure since they demonstrate what would not have existed in the regional economy if not for the university.

Economic impact analyses use different types of impacts to estimate the results. Frequently used is the **sales** impact, which comprises the change in business sales revenue in the economy as a result of increased economic activity. However, much of this sales revenue leaves the economy and overstates actual impacts. A more conservative measure—and the one employed in this study—is the **income impact**, which assesses the change in gross regional product, or GRP. Income may be further broken out into the **labour income impact**, which assesses the change in employee compensation; and the **non-labour income impact**, which assesses the change in income business profits. Another way to state the income impact is **jobs**, a measure of the number of full- and part-time jobs that would be required to support the change in income. All of these measures—added labour and non-labour income, total income, jobs, and sales—are used to estimate the economic impact results presented in this chapter.

The analysis breaks out the impact measures into different components, each based on the economic effect that caused the impact. The following is a list of each type of effect presented in this analysis:

- The **initial effect** is the exogenous shock to the economy caused by the initial spending of money, whether to pay for salaries and wages, purchase goods or services, or cover operating expenses.
- The initial round of spending creates more spending in the economy, resulting in what is commonly known as the **multiplier effect**. The multiplier effect comprises



the additional activity that occurs across all industries in the economy and may be further decomposed into the following three types of effects:

- The **direct effect** refers to the additional economic activity that occurs as the industries affected by the initial effect spend money to purchase goods and services from their supply chain industries.
- The **indirect effect** occurs as the supply chain of the initial industries creates even more activity in the economy through their own inter-industry spending.
- The **induced effect** refers to the economic activity created by the household sector as the businesses affected by the initial, direct, and indirect effects raise salaries or hire more people.

Calculating multiplier effects requires the use of Lightcast's Canadian Regional Input-Output (CRIO) model that captures the interconnection of industries, government, and households in the region. The Lightcast CRIO model contains 305 industry sectors from the North American Industry Classification System (NAICS) and supplies the industry-specific multipliers required to determine the impacts associated with economic activity within the region. For more information on the Lightcast CRIO model and its data sources, see Appendix 5.

Operations spending impact

Payroll for faculty and staff is part of the region's total earnings, and the spending of employees for groceries, apparel, and other household expenditures helps support regional businesses. The university itself purchases supplies and services, and many of its vendors are located in the Thompson Rivers College Region. These expenditures create a ripple effect that generates more jobs and higher wages throughout the economy.

Table 2.1 presents university expenditures (not including construction) for the following three categories: 1) salaries, wages, and benefits, 2) operation and maintenance of plant, and 3) all other expenditures (including purchases for supplies and services). In this analysis, we exclude expenses for amortization due to the way those measures are calculated in the national input-output accounts, and because amortization represents the devaluing of the university's assets rather than an outflow of expenditures.

The first step in estimating the multiplier effect of the university's expenditures is to map them individually to the 305 industry sectors of the Lightcast CRIO model. Assuming that the spending patterns of university personnel approximately match those of the average consumer, we map university salaries and benefits to spending on industry outputs using national household expenditure coefficients provided by Lightcast's national CRIO model. Approximately 92% of TRU's employees work in the Thompson Rivers College Region, so we consider 92% of the salaries, wages, and benefits. For the other two expenditure categories (*i.e.*, operation and maintenance of plant

Table 2.1: TRU operational expenses by function (excluding amortization), FY 2023-24

Expense category	In-region expenditures (thousands)	Out-of-region expenditures (thousands)	Total expenditures (thousands)
Employee salaries, wages, and benefits	$161,592	$14,051	$175,643
Operation and maintenance of plant	$14,768	$6,225	$20,993
All other expenditures	$28,303	$32,149	$60,452
Total	**$204,662**	**$52,426**	**$257,088**

This table does not include expenditures for construction, as they are presented separately in the following section.

Source: Data provided by TRU and the Lightcast impact model.

and all other expenditures), we again assume that the university's spending patterns approximately match national averages and apply the national spending coefficients for the Educational Services (Universities) industry sector (NAICS 6113). Operation and maintenance of plant expenditures are mapped to the industries that relate to capital construction, maintenance, and support, while the university's remaining expenditures to the remaining industries.

We now have three vectors detailing the spending of TRU: one for salaries, wages, and benefits; another for operation and maintenance of plant; and a third for TRU's purchases of supplies and services. The next step is to estimate the portion of these expenditures that occur inside the region. The expenditures occurring outside the region are known as leakages. We estimate in-region expenditures using regional purchase coefficients (RPCs), a measure of the overall demand for the commodities produced by each sector that is satisfied by regional suppliers, for each of the approximately 305 sectors in the CRIO model. For example, if 40% of the demand for NAICS 5241 (Insurance carriers) is satisfied by regional suppliers, the RPC for that sector is 40%. The remaining 60% of the demand for NAICS 5241 is provided by suppliers located outside the region. The three university spending vectors are multiplied, sector by sector, by the corresponding RPC to arrive at the in-region spending associated with the university. Finally, in-region spending is entered, industry by industry, into the CRIO model's multiplier matrix, which in turn provides an estimate of the associated multiplier effects on regional labour income, non-labour income, total income, sales, and jobs.

Table 2.2 presents the economic impact of TRU's operations spending. The people employed by TRU and their salaries, wages, and benefits comprise the initial effect, shown in the top row of the table in terms of labour income, non-labour income, total added income, sales, and jobs. The additional impacts created by the initial effect appear in the next four rows under the section labelled *multiplier effect*. Altogether, TRU's spending creates $41.6 million in labour income and another $45.9 million in non-labour income through multiplier effects—a total of $87.5 million. This together with the $161.6 million in initial effects generates a gross total of $249.1 million in impacts associated with the spending of TRU and its employees in the region.

The $249.1 million in gross impact is often reported by researchers as the total impact. We go a step further to arrive at a net impact by considering a counterfactual scenario, *i.e.*, what would have happened if a given event—in this case, the expenditure of in-region funds on TRU—had not occurred. TRU received an estimated 15.7% of its funding from sources in the Thompson Rivers College Region. These monies came from students living in the region, from private sources, and from the local share of provincial taxes.[6] We must account for the opportunity cost of this in-region funding. Had other industries received these monies rather than TRU, income effects would have still been created in the economy. In economic analysis, impacts that occur under

6 Local taxpayers pay provincial taxes, and it is thereby fair to assume that a portion of the provincial funds received by TRU comes from local sources. The portion of provincial taxes paid by local taxpayers is estimated by applying the ratio of regional earnings to total earnings in the province.

counterfactual conditions are used to offset the impacts that actually occur in order to derive the true impact of the event under analysis.

For TRU, we calculate counterfactual outcomes by simulating a scenario where in-region monies spent on the university are instead spent on goods or are saved by consumers. This simulates the in-region monies being returned to the taxpayers and being spent by the household sector. We establish the total amount spent by in-region students and taxpayers on TRU, map this to the detailed industries of the CRIO model using national household expenditure coefficients, use the industry RPCs to estimate in-region spending, and run the in-region spending through the CRIO model's multiplier matrix to derive multiplier effects. The effects of this exercise are shown as negative values in the row labelled *less alternative uses of funds* in Table 2.2.

The operations spending impact totals to **$234.6 million**, representing the added income created in the regional economy as a result of TRU operations.

The net total income impact of TRU's operations spending is equal to the gross impact less the impact of the alternative use of funds—the opportunity cost of the regional money. As shown in the last row of Table 2.2, the net impact is approximately $196.4 million in labour income and $38.1 million in non-labour income. This sums to $234.6 million in total added income and is equivalent to supporting 2,297 jobs. These impacts represent the new economic activity created in the regional economy as a result of TRU operations.

Table 2.2: Operations spending impact, FY 2023-24

	Labour income (thousands)	Non-labour income (thousands)	Total income (thousands)	Sales (thousands)	Jobs supported
Initial effect	**$161,592**	**$0**	**$161,592**	**$257,088**	**1,475**
Multiplier effect					
Direct effect	$11,766	$12,151	$23,917	$43,070	241
Indirect effect	$2,460	$2,732	$5,192	$9,868	50
Induced effect	$27,396	$31,012	$58,408	$104,596	712
Total multiplier effect	**$41,622**	**$45,895**	**$87,518**	**$157,534**	**1,003**
Gross impact (initial + multiplier)	**$203,214**	**$45,895**	**$249,109**	**$414,622**	**2,478**
Less alternative uses of funds	-$6,766	-$7,762	-$14,528	-$26,180	-181
Net impact	**$196,448**	**$38,133**	**$234,581**	**$388,443**	**2,297**

Source: Lightcast impact model.

Construction spending impact

In this section, we estimate the economic impact of the construction spending of TRU. Because construction funding is separate from operations funding in the budgeting process, it is not captured in the operations spending impact estimated earlier. However, like the operations spending, the construction spending creates subsequent rounds of spending and multiplier effects that generate still more jobs and income throughout the region. During FY 2023-24, TRU spent a total of $29.6 million on various construction projects, including construction on the Coyote Den, the Low Carbon District Energy System, and the Research and Emergency Management Centre.

The methodology used here is similar to that used when estimating the impact of capital spending under the operations spending impact. Assuming TRU's construction spending approximately matches national construction spending patterns of universities, we map TRU's construction spending to the construction industries of the CRIO model. Next, we use the RPCs to estimate the portion of this spending that occurs in-region. Finally, the in-region spending is run through the multiplier matrix to estimate the direct, indirect, and induced effects. Because construction is so labour intensive, the non-labour income impact is relatively small.

To account for the opportunity cost of any in-region construction money, we estimate the impacts of a similar alternative uses of funds as found in the operations spending impact. This is done by simulating a scenario where in-region monies spent on construction are instead spent on consumer goods. These impacts are then subtracted from the gross construction spending impacts.

Table 2.3 presents the impact of TRU's construction spending during FY 2023-24. Note the initial effect is purely a sales effect, so there is no initial change in labour or non-labour income. The FY 2023-24 construction spending of TRU creates a net total short-run impact of $11.6 million in labour income and $8 million in non-labour income. This is equal to $19.6 million in added income—the equivalent of supporting 171 jobs—for the Thompson Rivers College Region.

Table 2.3: Construction spending impact, FY 2023-24

	Labour income (thousands)	Non-labour income (thousands)	Total income (thousands)	Sales (thousands)	Jobs supported
Initial effect	**$0**	**$0**	**$0**	**$29,559**	**0**
Multiplier effect					
Direct effect	$8,346	$5,916	$14,261	$27,250	128
Indirect effect	$1,857	$1,316	$3,173	$6,063	29
Induced effect	$2,132	$1,511	$3,643	$6,960	33
Gross impact	**$12,334**	**$8,743**	**$21,077**	**$69,832**	**190**
Less alternative uses of funds	-$688	-$789	-$1,476	-$2,660	-18
Net impact	**$11,647**	**$7,954**	**$19,601**	**$67,172**	**171**

Source: Lightcast impact model.

Student spending impact

Both in-region and out-of-region students, domestic and international, contribute to the student spending impact of TRU; however, not all of these students can be counted towards the impact. First, the out-of-region students who relocated to the Thompson Rivers College Region to attend TRU are measured. Students who commute from outside the region or take courses online are not counted towards the student spending impact because they are not adding money from living expenses to the region. Of the in-region students, only those students who were retained, or who would have left the region to seek education elsewhere had TRU not existed, are measured. Students who would have stayed in the region anyway are not counted towards the impact since their monies would have been added to the Thompson Rivers College Region economy regardless of TRU.

An estimated 7,942 students originated from either outside the region or outside Canada and lived off campus while attending TRU in FY 2023-24. These students spent money at regional businesses to purchase groceries, rent accommodation, pay for transportation, and so on. Another estimated 1,802 out-of-region students lived on campus while attending the university. While these students spend money while attending the university, we exclude most of their spending for room and board since these expenditures are already reflected in the impact of the university's operations.

Although there were 6,318 students attending TRU who originated from the Thompson Rivers College Region, not all of them would have remained in the region if not for the existence of the university. We apply a conservative assumption that 10% of these in-region students would have left the Thompson Rivers College Region for

other education opportunities if TRU did not exist.[7] Therefore, we recognize that the in-region spending of 632 students is attributable to TRU. Collectively, the expenditures of TRU's relocated and retained students supported regional jobs and created new income in the regional economy.

The average living expenses of students in the Thompson Rivers College Region appears in the first section of Table 2.4, equal to $14,656 per student. Note that this table excludes expenses for books and supplies, since many of these monies are already reflected in the operations spending impact discussed in the previous section. We multiply the $14,656 in annual costs by the number of students who either relocated to the region or were retained in the region because of TRU and lived in-region but off campus. For students living on campus, we multiply the per-student cost of personal expenses, transportation, and off-campus food purchases (assumed to be equal to 25% of room and board) by the number of students who lived in the region but on campus while attending (1,802 students). Altogether, off-campus spending of relocated and retained students generated gross sales of $144.2 million. This figure, once net of the monies paid to student workers, yields net off-campus sales of $143.7 million, as shown in the bottom row of Table 2.4.

Table 2.4: Average annual student costs and total sales generated by TRU's relocated and retained students in the Thompson Rivers College Region, FY 2023-24

Room and board	$5,790
Personal expenses	$7,675
Transportation	$1,191
Total expenses per student	**$14,656**
Number of students who relocated to region	*9,744*
Number of students retained in region	*632*
Gross sales generated by students who relocated	$134,984,259
Gross sales generated by retained students	$9,259,750
Total gross off-campus sales	**$144,244,009**
Wages and salaries paid to student workers*	$565,189
Net off-campus sales	**$143,678,820**

* This figure reflects only the portion of payroll that was used to cover the living expenses of relocated and retained student workers who lived in the region.

Source: Data on the number of students who relocate provided by TRU and derived using Statistics Canada data along with a report by Roslyn Kunin and Associates.

Estimating the impacts generated by the $143.7 million in student spending follows a procedure similar to that of the operations impact described above. We begin by mapping the $143.7 million in sales to the industry sectors in the CRIO model, apply RPCs to reflect regional spending only, and run the net sales figures through the CRIO model to derive multiplier effects. Finally, we convert the results to income through the application of income-to-sales ratios.

7 See Appendix 1 for a sensitivity analysis of the retained student variable.

Table 2.5 presents the results. The initial income effect is $0 because the impact of relocated and retained students only occurs when they spend part of their earnings to make a purchase at a regional business. The income impact of relocated and retained student spending thus falls entirely under the multiplier effect, equal to a total of $73.2 million in added regional income. This value represents the direct added income created at the businesses patronized by the students, the indirect added income created by the supply chain of those businesses, and the increased spending of the household sector throughout the regional economy as a result of the direct and indirect effects. This is equivalent to supporting 1,050 jobs.

The total impact of student spending is **$73.2 million** in added income and is equivalent to supporting **1,050 jobs**.

Table 2.5: Student spending impact, FY 2023-24

	Labour income (thousands)	Non-labour income (thousands)	Total income (thousands)	Sales (thousands)	Jobs supported
Initial effect	**$0**	**$0**	**$0**	**$143,679**	**0**
Multiplier effect					
Direct effect	$21,406	$28,133	$49,539	$86,260	712
Indirect effect	$4,398	$6,328	$10,726	$18,668	155
Induced effect	$5,587	$7,391	$12,978	$21,870	184
Total multiplier effect	**$31,391**	**$41,852**	**$73,243**	**$126,798**	**1,050**
Total impact (initial + multiplier)	**$31,391**	**$41,852**	**$73,243**	**$270,476**	**1,050**

Source: Lightcast impact model.

International and Indigenous student spending impact

In FY 2023-24, 5,690 international students relocated to the Thompson Rivers College Region to attend TRU. These students spent money at local businesses to purchase groceries, rent accommodation, pay for transportation, and so on. Many Indigenous students also relocated to or were retained within to the Thompson Rivers College Region because of TRU. Using the average living expenses of $14,656 per student from Table 2.4 and adjusting for monies paid to international student workers yields net sales of approximately **$77.8 million**, along with net sales of **$8.3 million** due to Indigenous students.

Similar to the student spending impact across all students, we map the **$77.8 million** in sales to the industry sectors in the CRIO model and the **$8.3 million** from Indigenous students to the industry sectors in the CRIO model, apply RPCs to reflect regional spending only, and run the net sales figures through the CRIO model to derive multiplier effects. The total impact of international student spending comes to **$39.5 million** in added income, while the impact of Indigenous student spending comes to **$2.2 million**, both of which are included in the TRU student spending impact in Table 2.5. The international student spending impact of $39.5 million is equivalent to supporting **567 jobs**, while the Indigenous student spending impact of $2.2 million is equivalent to supporting **34 jobs**.

Alumni impact

TRU's greatest economic impact stems from the education, skills training, and career enhancement that it provides. Since it was established, the university has provided skills training to students who have subsequently entered or re-entered the regional workforce. As these skills accumulated, the stock of human capital in the Thompson Rivers College Region expanded, boosting the competitiveness of existing industries, attracting new industries, and generally enlarging overall output. The sum of all these several and varied effects, measured in terms of added regional income, constitutes the total impact of current and past TRU student productivity on the Thompson Rivers College Region economy.

TRU's greatest economic impact stems from the education, skills training, and career enhancement that it provides.

The alumni impact differs from the operations, construction, and student spending impacts in one fundamental way. Whereas the above listed impacts depend on an annually renewed injection of new sales into the regional economy, the alumni impact is the result of years of past instruction and the associated workforce accumulation of TRU skills. Should TRU cease to exist, all impacts except the alumni impact would also immediately cease to exist. The impact of the university's former students would continue, as long as those students remained active in the workforce. Over time, though, students would leave the workforce, and the expanded economic output that they provided through their increased productivity would leave with them.

The initial effect of alumni comprises two main components. The first and largest of these is the added labour income (*i.e.*, wages and salaries) of former TRU students. Higher wages occur as the increased productivity of workers leads to greater business output. The reward to increased productivity does not stop there, however. Skilled workers make capital goods (*e.g.*, buildings, production facilities, equipment, *etc.*) more productive too, thereby increasing the return on capital in the form of higher profits. The second component of the initial effect thus comprises the other (*i.e.*, non-earnings) income generated by the businesses that employ former TRU students.

The first step in estimating the initial effect of alumni is to determine the added labour income that accrues to students. We begin by assembling the record of TRU's historical student headcounts (both credit and non-credit) over the past 30 years,[8] from 1994-95 to 2023-24. From this vector of historical enrolments, we remove the number of students who are not currently active in the regional workforce, whether because they are still enrolled in education, or because they're unemployed, employed but working in a different region, or out of the workforce completely due to retirement or death. We estimate the historical employment patterns of students in the region using the following sets of data or assumptions: 1) a set of settling-in factors to determine how long it takes the average student to settle into a career;[9] 2) death, retirement, and unemployment rates from Statistics Canada; and 3) regional migration data, also from Statistics Canada. The result of these computations is an estimate of the portion of students who were still actively employed in the region in FY 2023-24.

The next step is to transition from the number of students who were still employed in the region to the number of skills they acquired from TRU. The students' course load, measured in terms of full-time equivalents (FTEs), serves as a reasonable proxy for accumulated skills. Table 1.2 in Chapter 1 provides the number of FTEs generated by the TRU student population in FY 2023-24, equal to 13,635 FTEs. This value we convert to credits by multiplying undergraduate FTEs by a factor of 30 and graduate FTEs by 18, the assumed number of credits per FTE.[10] The converted FTEs thus yield 400,469 credits for the year.

The 400,469 credits only represent the total credit production for the FY 2023-24 student population, however. What we need is an estimate of TRU's historical credit production. To derive this, we determine the average number of credits per student during the analysis year—equal to 13.7 credits—and multiply this by the number of former TRU students still active in the workforce during the analysis year. The product—3 million credits—appears in the top row of Table 2.6.

8 We apply a 30-year time horizon because the data on students who attended TRU prior to FY 1994-95 is less reliable, and because most of the students served more than 30 years ago had left the regional workforce by FY 2023-24.

9 Settling-in factors are used to delay the onset of the benefits to students in order to allow time for them to find employment and settle into their careers. In the absence of hard data, we assume a range between one and three years for students who graduate with a credential, and between one and five years for continuing students. Workforce and professional development students are usually already employed while attending university, so they experience no delay in the onset of their benefits.

10 Converting FTEs to credits in this fashion allows us to break down the students' progression into a larger number of smaller increments. Institutions may have different methods for determining credit assignments; however, a general guideline for undergraduates is that since one week of full-time study earns one credit, and since there are 30 weeks in a typical academic year, then one FTE earns 30 credits.

Table 2.6: Number of TRU credits still active in workforce and initial labour income created in region, FY 2023-24

Number of credits in workforce	3,006,136
Average value per credit	$150
Initial labour income, gross	**$450,167,836**
Percent reduction for alternative education opportunities	15%
Percent reduction for adjustment for substitution	50%
Initial labour income, net	**$191,321,330**

Source: Lightcast impact model.

The next row in Table 2.6 shows the average value per credit, equal to $150. This value represents the average increase in wages that former TRU students received during the analysis year for every credit generated at the university. The value per credit varies depending on the students' age, with the highest value applied to the credit production of students who had been employed the longest by FY 2023-24, and the lowest value per credit applied to students who were just entering the workforce. More information on the theory and calculations behind the value per credit appears in Appendix 6. In determining the amount of added labour income that accrues to former students, we multiply the credit production of TRU's former students in each year of the historical time horizon by the corresponding average value per credit for that year, then sum the products together. This calculation yields approximately $450.2 million in gross higher wages received by former students in FY 2023-24 (as shown in Table 2.6).

The next two rows in the table show two adjustments that we make to account for counterfactual outcomes. As discussed above, counterfactual outcomes in economic analysis represent what would have happened if a given event had not happened. The event in this case is the training provided by TRU and subsequent influx of skilled labour into the regional economy. The first counterfactual scenario that we address is the adjustment for alternative education opportunities. Our assumption is that, if a portion of the students could have received training even if TRU and the other publicly-funded institutions in the region did not exist, the higher wages that accrue to those students cannot be counted as added labour income in the region. The adjustment for alternative education opportunities amounts to a 15% reduction of the $450.2 million in added labour income, meaning that 15% of the added labour income would have been generated in the region anyway, even if TRU did not exist. For more information on the calculation of the alternative education variable, see Appendix 7.

The other adjustment in Table 2.6 accounts for the substitution of workers. Suppose TRU did not exist and in consequence there were fewer skilled workers in the region. Businesses could still satisfy some of their need for skilled labour by recruiting from outside the Thompson Rivers College Region. We refer to this phenomenon as the out-of-region worker substitution effect. Lacking exact information on its possible magnitude, we set the value of out-of-region worker substitution at 50%. In other words, of the jobs that students fill at local businesses, we assume 50% of them could have

been filled by workers recruited from outside the region if TRU did not exist.[11] With the 50% adjustment, the net added labour income in the economy comes to $191.3 million, as shown in Table 2.6.

The $191.3 million in added labour income appears under the initial effect in the "Labour income" column of Table 2.7. Estimating the industry-specific effects on non-labour income in the region—and the related multiplier effects—requires information on the specific industries where past students settle. To estimate this, we allocate the initial increase in labour income ($191.3 million) to the four-digit NAICS industry sectors where students are most likely to be employed. This allocation entails a process that maps completers in the region to the detailed occupations for which those completers have been trained, and then maps the detailed occupations to the 305 industry sectors in the CRIO model.[12]

Once students are distributed across the industry sectors, we multiply our estimate of the students' initial labour income effect ($191.3 million) by the ratio of non-labour income to labour income provided by the CRIO model for each sector. This computation yields an estimated $192.9 million in non-labour income attributable to the former TRU students. Summing initial labour income and non-labour income together provides the total initial effect of alumni in the Thompson Rivers College Region economy, equal to approximately $384.3 million.

Table 2.7: Alumni impact, FY 2023-24

	Labour income (thousands)	Non-labour income (thousands)	Total income (thousands)	Sales (thousands)	Jobs supported
Initial effect	**$191,321**	**$192,947**	**$384,268**	**$714,835**	**4,129**
Multiplier effect					
Direct effect	$28,099	$31,959	$60,058	$120,664	614
Indirect effect	$6,214	$7,274	$13,488	$27,404	141
Induced effect	$50,905	$49,320	$100,225	$171,968	1,108
Total multiplier effect	**$85,218**	**$88,553**	**$173,771**	**$320,035**	**1,863**
Total impact (initial + multiplier)	**$276,539**	**$281,500**	**$558,039**	**$1,034,870**	**5,992**

Source: Lightcast impact model.

The next few rows of Table 2.7 show the multiplier effects of alumni. Multiplier effects occur as students generate an increased demand for consumer goods and services through the expenditure of their higher wages. Further, as the industries where TRU students are employed increase their output, there is a corresponding increase in the demand for input from the industries in the employers' supply chain. Together, the incomes generated by the expansions in business input purchases and household spending constitute the multiplier effect of the increased productivity of former TRU students.

11 For a sensitivity analysis of the substitution variable, see Appendix 1.

12 Completer data comes from the Postsecondary Student Information System (PSIS), which organizes program completions according to the Classification of Instructional Programs (CIP).

To estimate multiplier effects, we convert the industry-specific income figures generated through the initial effect to regional sales using sales-to-income ratios from the CRIO model. We then run the values through the CRIO model's multiplier matrix to determine the corresponding increases in industry output that occur in the region. Finally, we convert all increases in regional sales back to income using the income-to-sales ratios provided by the CRIO model. The results are $85.2 million in labour income and $88.6 million in non-labour income, for an overall total of $173.8 million in multiplier effects. The total impact of alumni comes to $558 million, the sum of all initial and multiplier effects. This is equivalent to supporting 5,992 jobs. The total figures appear in the last row of Table 2.7.

International and Indigenous student alumni impact

International and Indigenous students are an important part of the TRU community. In FY 2023-24, TRU served 7,719 international students, 74% of whom relocated to the Thompson Rivers College Region, along with 2,276 Indigenous students.

It is estimated that 35% of international students and 87% of Indigenous students remain in the province after finishing their time at TRU. Today, thousands of these students are employed in the Thompson Rivers College Region, receiving higher earnings and increasing the productivity of the businesses that employ them. In FY 2023-24, these active international alumni generated **$53.3 million** in added income for the regional economy, along with Indigenous alumni generating another **$176.7 million**. This is equivalent to supporting **573 jobs** and **1,898 jobs** respectively. These impacts are included in TRU's total alumni impact reported in Table 2.7.

Total TRU impact

The total impact of TRU on the Thompson Rivers College Region can be generalized into two broad types of impacts. First, on an annual basis, TRU generates a flow of spending that has a significant impact on the Thompson Rivers College Region economy. The impacts of this spending are captured by the operations, construction, and student spending impacts. While not insignificant, these impacts do not capture the true purpose of TRU. The basic mission of TRU is to foster human capital. Every year, a new cohort of TRU former students adds to the stock of human capital in the Thompson Rivers College Region, and a portion of alumni continues to add to the Thompson Rivers College Region economy.

Table 2.8: Total TRU impact, FY 2023-24

	Labour income (thousands)	Non-labour income (thousands)	Total income (thousands)	Sales (thousands)	Jobs supported
Operations spending	$196,448	$38,133	$234,581	$388,443	2,297
Construction spending	$11,647	$7,954	$19,601	$67,172	171
Student spending	$31,391	$41,852	$73,243	$270,476	1,050
Alumni	$276,539	$281,500	$558,039	$1,034,870	5,992
Total impact	**$516,025**	**$369,439**	**$885,464**	**$1,760,962**	**9,510**
% of Thompson Rivers College Region economy	10.1%	5.4%	7.4%	8.5%	9.6%

Source: Lightcast impact model.

Table 2.8 displays the grand total of TRU's impact on the Thompson Rivers College Region in FY 2023-24. For context, the percentages of TRU's impact compared to the total labour income, total non-labour income, combined total income, sales, and jobs in the Thompson Rivers College Region, as presented in Table 1.3 and Figure 1.3, are included. The total impact of TRU is **$885.5 million**, equivalent to **7.4%** of the GRP of the Thompson Rivers College Region. By comparison, this contribution that the university provides on its own is its own is greater than the entire manufacturing industry in the Thompson Rivers College Region. TRU's total impact supported **9,510 jobs** in

the Thompson Rivers College Region in FY 2023-24. For perspective, this means that **one out of every 10 jobs** in the Thompson Rivers College Region is supported by the activities of TRU and its students.

These impacts from the university and its students stem from different industry sectors and spread throughout the regional economy. Table 2.9 displays the total impact of TRU by each major industry sector based on their two-digit NAICS code. The table shows the total impact of operations, construction, students, and alumni as shown in Table 2.8, broken down by industry sector using processes outlined earlier in this chapter. By showing the impact from individual industry sectors, it is possible to see in finer detail the industries that drive the greatest impact on the regional economy due to TRU. For example, TRU's activities and alumni in the Health Care & Social Assistance industry sector generated an impact of $122.3 million in FY 2023-24.

Table 2.9: Total TRU impact by industry, FY 2023-24

Industry sector	Total income (thousands)	Jobs supported
Educational Services	$195,686	1,834
Health Care & Social Assistance	$122,257	1,629
Retail Trade	$91,974	1,777
Construction	$65,817	473
Public Administration	$62,630	500
Real Estate & Rental & Leasing	$55,404	150
Professional, Scientific, & Technical Services	$49,584	391
Accommodation & Food Services	$40,299	980
Other Services (except Public Administration)	$28,671	364
Arts, Entertainment, & Recreation	$25,624	337
Admin. & Support, Waste Management, & Remediation Services	$23,330	284
Manufacturing	$20,845	152
Transportation & Warehousing	$17,978	159
Finance & Insurance	$17,898	117
Wholesale Trade	$16,647	128
Utilities	$16,458	41
Information & Cultural Industries	$13,728	79
Mining, Quarrying, & Oil and Gas Extraction	$10,629	22
Agriculture, Forestry, Fishing, & Hunting	$7,490	56
Management of Companies & Enterprises	$2,515	38
Total impact	**$885,464**	**9,510**

Source: Lightcast impact model.

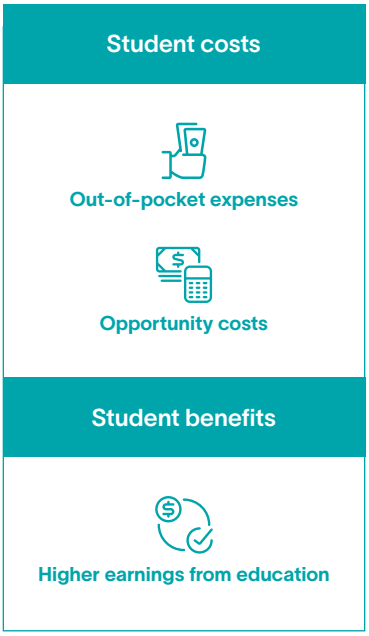
Chapter 3:

Investment analysis

Investment analysis is the process of evaluating total costs and measuring these against total benefits to determine whether 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. In this chapter, we consider TRU as an investment from the perspectives of students, taxpayers, and society. Because students will reap the benefits of their TRU education no matter where they reside, their benefits are not limited to a specific region, although earnings are weighted by regional and provincial levels based on students' settlement patterns. The backdrop for the investment analysis for taxpayers and society is the entire province.

Student perspective

Analyzing the benefits and costs of education from the perspective of students is the most obvious form of investment analysis this study considers. Generally, students enter postsecondary institutions because their goal is to improve their career pathway and therefore lifetime earning potential. They realize this is their future payoff for giving up time and money to go to the institutions today. The cost component of the analysis thus comprises the monies students pay (in the form of tuition and fees and forgone time and money), and the benefit component focuses on the extent to which the students' earnings increase as a result of their education.



Calculating student costs

Student costs consist of two main items: direct outlays and opportunity costs. Direct outlays include tuition and fees, equal to $148 million from Figure 1.1.[13] Direct outlays also include the cost of books and supplies. On average, full-time students spent $1,500 each on books and supplies during the reporting year.[14] Multiplying this figure by the number of full-time equivalents (FTEs) produced by TRU in FY 2023-24 (see Table 1.2) generates a total cost of $20.5 million for books and supplies.

Opportunity cost is the most difficult component of student costs to estimate. It measures the value of time and earnings forgone by students who go to the university rather than work. To calculate it, we need to know the difference between the students' full earning potential and what they actually earn while attending the university.

We derive the students' full earning potential by weighting the average annual earnings in Table 1.4 according to the education level breakdown of the student population at the start of the analysis year.[15] The earnings in Table 1.4 reflect the midpoint of the average worker's career, however, not his or her earnings while attending the university. Because of this, we adjust the earnings to the average age of the student population (29) to

13 Due to data limitations, this figure may include non-repayable student aid such as scholarships, bursaries, and grants. Thus, it may overestimate students' out-of-pocket costs and result in more conservative calculations for students' return on investment.

14 Data provided by TRU.

15 This is based on the students who reported their prior level of education to TRU.

better reflect their earnings at their current age.[16] This calculation yields an average full earning potential of $40,022 per student.

In determining what students earn while attending the university, an important factor to consider is the time that they spend at the university, since this is the only time that they are required to give up a portion of their earnings. We use the students' FTE production as a proxy for time, under the assumption that the more FTEs students earn, the less time they have to work, and consequently, the greater their forgone earnings. Overall, TRU students earned an average of 0.47 FTEs per student, which is equal to 47% of a full academic year.

Another factor to consider is the students' employment status while attending the university. TRU estimates that 63% of its students are employed.[17] For the 37% who are not working, we assume that they are either seeking work or planning to seek work once they complete their educational goals. By choosing to go to the university, therefore, non-working students give up everything that they can potentially earn during the academic year. While non-working students are able to work over the summer, the temporary nature of these jobs restricts earning potential as well; these jobs pay, on average, 69% of what students could expect to earn during the same time period had they sought full employment year-round. The remaining 31% comprises the percent of their full earning potential that they forgo. Obviously, this assumption varies by person—some students forego more and others less. Without knowing the actual jobs that students hold over the summer, however, the 31% in forgone earnings serves as a reasonable average. Thus, non-working students give up what they can potentially earn during the academic year during their time outside of class, plus the 31% of their full earning potential that they forego in the summer. The total value of non-working students' forgone earnings comes to $179.3 million.

Working students are able to maintain all or part of their earnings while enrolled. However, many of them hold jobs that pay less than statistical averages, usually because those are the only jobs they can find that accommodate their course schedule To account for this, we use the same assumption for non-working students' summer employment, assuming that working students hold jobs that pay 69% of what they would have earned had they chosen to work full-time rather than go to the university, giving up 31% of their full earning potential.

Working students also give up a portion of their leisure time in order to go to school, and mainstream theory places a value on this.[18] The amount of leisure time that students

16 We use the lifecycle earnings function identified by Jacob Mincer to scale the earnings levels to the students' current age. See Jacob Mincer, "Investment in Human Capital and Personal Income Distribution," *Journal of Political Economy* 66, no. 4 (August 1958): 281–302. Further discussion on the Mincer function and its role in calculating the students' return on investment appears later in this chapter and in Appendix 5.

17 Based on students who reported their employment status to TRU.

18 See James M. Henderson and Richard E. Quandt, *Microeconomic Theory: A Mathematical Approach* (New York: McGraw-Hill Book Company, 1971).

forgo is approximately 1.9 hours per day.[19] Assuming that an hour of leisure is equal in value to an hour of work, we derive the total cost of leisure by multiplying the number of leisure hours foregone during the academic year by the average hourly pay of the students' full earning potential. For working students, therefore, their total opportunity cost comes to $77 million, equal to the sum of their foregone earnings ($22.5 million) and forgone leisure time ($54.5 million).

The steps leading up to the calculation of student costs during the reporting year appear in Table 3.1. Direct outlays amount to $168.5 million, the sum of tuition and fees ($148 million) and books and supplies ($20.5 million). Opportunity costs for working and non-working students amount to $256.3 million. Summing all values together yields a total of $424.7 million in student costs.

Table 3.1: TRU student costs (thousands), FY 2023-24

Direct outlays	
Tuition and fees	$148,014
Books and supplies	$20,453
Less direct outlays personal enrichment students	$0
Total direct outlays	**$168,467**
Opportunity costs	
Earnings forgone by non-working students	$179,280
Earnings forgone by working students	$22,531
Value of leisure time forgone by working students	$54,466
Total opportunity costs	**$256,278**
Total student costs	**$424,744**

Source: Based on data provided by TRU and outputs of the Lightcast impact model.

Linking education to earnings

Having estimated the costs of education to students, we weigh these against the benefits that students receive in return. The relationship between education and earnings is well documented and forms the basis for determining student benefits. As shown in Table 1.4, mean earnings levels at the midpoint of the average-aged worker's career increase as people reach higher levels of education. The differences in earnings define the upper bound benefits of moving from one education level to the next.[20]

19 Equal to the difference between the average number of leisure hours per day for students and the average number of leisure hours per day for non-students. See Human Resources and Skills Development Canada, "Leisure—Total Leisure Time," HRSDC Indicators of Well-being in Canada. http://www4.hrsdc.gc.ca/.3ndic.1t.4r@-eng.jsp?iid=52 and Bureau of Labor Statistics, "Charts by Topic: Leisure and sports activities," BLS American Time Use Survey, last modified November 2012. http://www.bls.gov/tus/charts/leisure.htm.

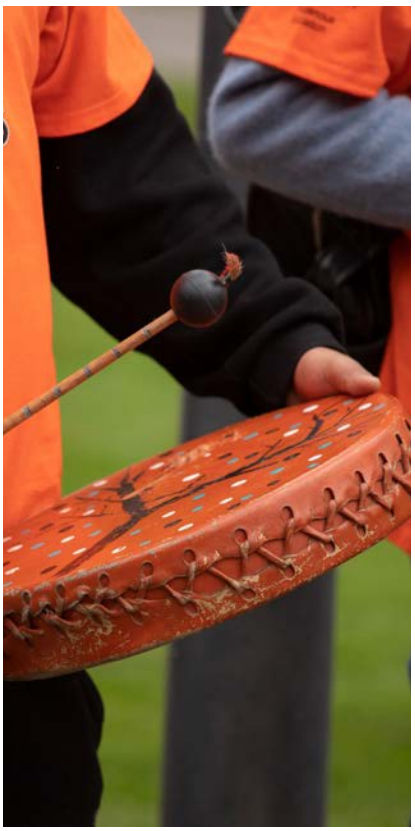
20 As discussed in Appendix 5, the upper bound benefits of education must be controlled for participant characteristics that also correlate with future wage increases, including inherent ability, socioeconomic status, and family background.

A key component in determining the students' return on investment is the value of their future benefits stream, *i.e.*, what they can expect to earn in return for the investment they make in education. We calculate the future benefits stream to TRU's FY 2023-24 students first by determining their average annual increase in earnings, equal to $67.7 million. This value represents the higher earnings that accrue to students at the midpoint of their careers and is calculated based on the marginal wage increases of the credits that students complete while attending the university. For a full description of the methodology used to derive the $67.7 million, see Appendix 6.

The second step is to project the $67.7 million annual increase in earnings into the future, for as long as students remain active in the workforce. We do this by applying a set of scalars derived from the slope of the earnings function developed by Jacob Mincer to predict the change in earnings at each age in an individual's working career.[21] Appendix 6 provides more information on the Mincer function and how it is used to predict future earnings growth. With the $67.7 million representing the students' higher earnings at the midpoint of their careers, we apply scalars from the Mincer function to yield a stream of projected future benefits that gradually increase from the time students enter the workforce, come to a peak shortly after the career midpoint, and then dampen slightly as students approach retirement at age 65. This earnings stream appears in Column 2 of Table 3.2.

The final step in calculating the students' future benefits stream is to net out the potential benefits generated by students who are either not yet active in the workforce or who leave the workforce over time. This adjustment appears in Column 3 of Table 3.2 and represents the percentage of the total FY 2023-24 student population that will be employed in the workforce in a given year. Note that the percentages in the first five years of the time horizon are relatively lower than those in subsequent years. This is because many students delay their entry into the workforce, either because they are still enrolled at the university or because they are unable to find a job immediately upon graduation. Accordingly, we apply a set of "settling-in" factors to account for the time needed by students to find employment and settle into their careers. As discussed in Chapter 2, settling-in factors delay the onset of the benefits by one to three years for students who graduate with a bachelor's degree, certificate, or diploma, and by one to five years for continuing students. We do not apply settling-in factors to the benefits for workforce students because the majority of them are employed while attending.

Beyond the first five years of the time horizon, students will leave the workforce over time for any number of reasons, whether because of death, retirement, or unemployment. We estimate the rate of attrition using the same data and assumptions applied in the calculation of the attrition rate in the economic impact analysis in Chapter 2. The likelihood that students leave the workforce increases as they age, so the attrition rate is more aggressive near the end of the time horizon than in the beginning. Column 4 of Table 3.2 shows the net added earnings to students after accounting for both the settling-in patterns and attrition.



21 See Mincer, 1958.

Table 3.2: **Projected benefits and costs, student perspective**

1	2	3	4	5	6
Year	Gross higher earnings to students (millions)	% active in workforce*	Net higher earnings to students (millions)	Student costs (millions)	Net cash flow (millions)
0	$41.8	39%	$16.3	$424.7	-$408.4
1	$43.5	46%	$19.8	$0.0	$19.8
2	$45.2	51%	$22.9	$0.0	$22.9
3	$46.9	61%	$28.4	$0.0	$28.4
4	$48.6	76%	$36.7	$0.0	$36.7
5	$50.2	93%	$46.9	$0.0	$46.9
6	$51.9	94%	$48.5	$0.0	$48.5
7	$53.5	94%	$50.1	$0.0	$50.1
8	$55.2	94%	$51.7	$0.0	$51.7
9	$56.7	94%	$53.2	$0.0	$53.2
10	$58.3	94%	$54.7	$0.0	$54.7
11	$59.8	94%	$56.1	$0.0	$56.1
12	$61.3	94%	$57.4	$0.0	$57.4
13	$62.7	94%	$58.7	$0.0	$58.7
14	$64.0	94%	$59.9	$0.0	$59.9
15	$65.3	94%	$61.1	$0.0	$61.1
16	$66.5	93%	$62.1	$0.0	$62.1
17	$67.7	93%	$63.1	$0.0	$63.1
18	$68.7	93%	$63.9	$0.0	$63.9
19	$69.7	93%	$64.7	$0.0	$64.7
20	$70.6	93%	$65.4	$0.0	$65.4
21	$71.4	92%	$66.0	$0.0	$66.0
22	$72.2	92%	$66.4	$0.0	$66.4
23	$72.8	92%	$66.8	$0.0	$66.8
24	$73.3	91%	$67.1	$0.0	$67.1
25	$73.8	74%	$54.9	$0.0	$54.9
26	$74.1	60%	$44.2	$0.0	$44.2
27	$74.3	47%	$34.9	$0.0	$34.9
28	$74.5	36%	$26.8	$0.0	$26.8
29	$74.5	27%	$19.9	$0.0	$19.9
30	$74.4	19%	$14.1	$0.0	$14.1
31	$74.2	13%	$9.5	$0.0	$9.5
32	$73.9	8%	$6.0	$0.0	$6.0
33	$73.5	5%	$3.5	$0.0	$3.5
34	$73.0	3%	$1.9	$0.0	$1.9
35	$72.5	1%	$0.9	$0.0	$0.9
Present value			**$586.2**	**$424.7**	**$161.5**

* Includes the "settling-in" factors and attrition.

Source: Lightcast impact model.

Benefit-cost ratio	Return on investment	Internal rate of return	Payback period (years)
1.4	0.4	10.4%	9.9

Return on investment to students

Having estimated the students' costs and their future benefits stream, the next step is to discount the results to the present to reflect the time value of money. For the student perspective, we assume a discount rate of 7.2%[22] (see the "Discount Rate" box). The present value of the benefits is then compared to student costs to derive the investment analysis results, expressed in terms of a benefit-cost ratio, return on investment, rate of return, and payback period. The investment is feasible if returns match or exceed the minimum threshold values, *i.e.*, a benefit-cost ratio greater than 1, a return on investment greater than 0, a rate of return that exceeds the discount rate, and a reasonably short payback period.

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. In this study we assume a 7.2% discount rate from the student perspective and a 2.0% discount rate from the taxpayer and social perspectives.

In Table 3.2, the higher earnings of TRU's students are projected across their working lives by applying the Mincer curve, adjusted to account for students who are not active in the workforce, and discounted to the present. This yields a cumulative sum of approximately $586.2 million, the present value of all of the future earnings increments (see Column 4 of Table 3.2). This may also be interpreted as the gross capital asset value of the students' higher earnings stream. In effect, the aggregate FY 2023-24 student body is rewarded for their investment in TRU with a capital asset valued at $586.2 million.

The students' cost of attending TRU is shown in Column 5 of Table 3.2, equal to a present value of $424.7 million. Note that costs only occur in the single analysis year and are thus already in current year dollars. Comparing the cost with the present value of benefits yields a student benefit-cost ratio of 1.4 (equal to $586.2 million in benefits divided by $424.7 million in costs).

The return on investment—or frequently referred to as ROI—is similar to the benefit-cost ratio except that the numerator used in the calculation is the net present value of the benefits, as opposed to the present value. This removes the cost of the investment from the numerator to derive the net return, *i.e.*, the amount that investors receive over

22 We use student loan rates to approximate the students' discount rate. Floating interest rates for Canada student loans are 2.5% plus the prime rate. See Government of Canada, "Interest Rates for Canada Student Loans," Student Loans & Grants. The prime rate—equal to 4.7%—is drawn from Bank of Canada, "Canadian interest rates and monetary policy variables: 10-year lookup," Bank of Canada Rates & Statistics. We thus have a student discount rate of 2.5% + 4.7% = 7.2%.

and above each dollar of their original investment. ROI can also be derived simply by subtracting one from the benefit-cost ratio. A positive ROI means that the investment is profitable. In the case of TRU students, an ROI of 0.4 means that the students receive an additional $0.40 in present value terms for every dollar they invest in the university.

Another way to compare the same benefits stream and associated cost is to compute the internal rate of return. The internal rate of return indicates the interest rate that a bank would have to pay a depositor to yield an equally attractive stream of future payments.[23] Table 3.2 shows TRU's students earning average returns of 10.4% on their investment of time and money. This is a favourable return compared, for example, to approximately 1% on a standard bank savings account, or 10% on stocks and bonds (thirty-year average return).

An ROI of **0.4** means that the students receive an additional **$0.40** in present value terms for every dollar they invest in the university.

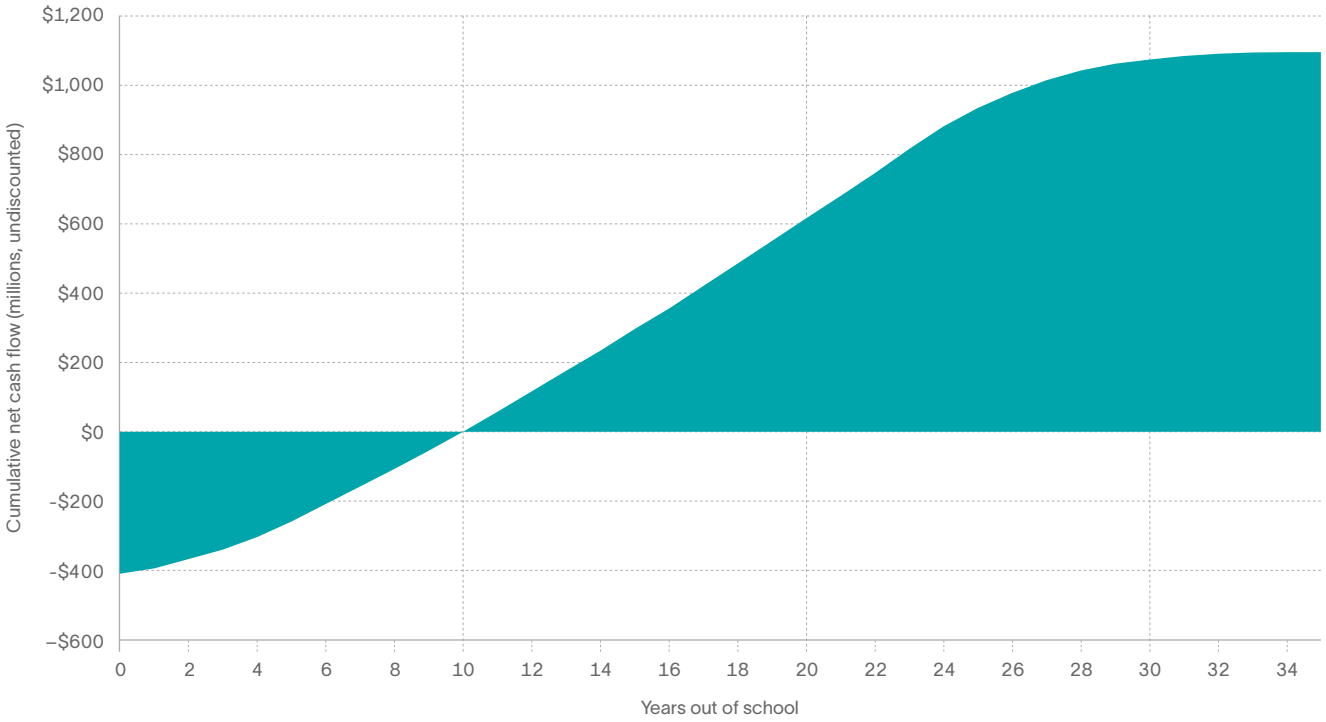
Note that returns reported in this study are real returns, not nominal. When a bank promises to pay a certain rate of interest on a savings account, it employs an implicitly nominal rate. Bonds operate in a similar manner. If it turns out that the inflation rate is higher than the stated rate of return, 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% and a nominal percentage of 5% is paid, then the real rate of return on the investment is only 2%. In Table 3.2, the 10.4% student rate of return is a real rate. With an inflation rate of 1.9% (the average rate reported over the past 20 years as per the Statistics Canada, Consumer Price Index), the corresponding nominal rate of return is 12.2%, higher than what is reported in Table 3.2.

The payback period is defined as the length of time it takes to entirely recoup the initial investment.[24] Beyond that point, returns are what economists would call "pure costless rent." As indicated in Table 3.2, students at TRU see, on average, a payback period of 9.9 years, meaning 9.9 years after their initial investment of foregone earnings and out-of-pocket costs, they will have received enough higher future earnings to fully recover those costs (Figure 3.1).

23 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. An education 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 education investors yield the same internal rate of return.

24 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. The payback period is calculated by dividing the cost of the investment by the net return per period. In this study, the cost of the investment includes tuition and fees plus the opportunity cost of time—it does not account for student living expenses or interest on loans.

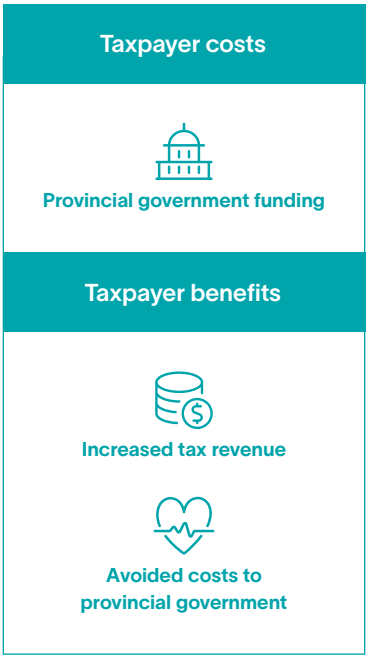
Figure 3.1: Student payback period



Source: Lightcast impact model.

Taxpayer perspective

From the taxpayer perspective, the pivotal step is to home in on the public benefits that specifically accrue to the provincial government. For example, benefits resulting from income growth are limited to increased provincial tax payments. Similarly, savings related to improved health, reduced crime, and fewer income assistance claims, discussed below, are limited to those received strictly by provincial government. In all instances, benefits to private residents, provincial businesses, or the federal government are excluded.



Growth in provincial tax revenues

As a result of their time at TRU, students earn more because of the skills they learned while attending the university, and businesses earn more because student skills make capital more productive (buildings, machinery, and everything else). This in turn raises profits and other business property income. Together, increases in labour and non-labour (i.e., capital) income are considered the effect of a skilled workforce. These in turn increase tax revenues since the provincial government is able to apply tax rates to higher earnings.

Estimating the effect of TRU on increased tax revenues begins with the present value of the students' future earnings stream, which is displayed in Column 4 of Table 3.2. To this, we apply a multiplier derived from Lightcast's CRIO model to estimate the added labour income created in the province as students and businesses spend their higher earnings.[25] As labour income increases, so does non-labour income, which consists of monies gained through investments. To calculate the growth in non-labour income, we multiply the increase in labour income by a ratio of the British Columbia gross provincial product to total labour income in the province. We also include the spending impacts discussed in Chapter 2 that were created in FY 2023-24 from operations, construction, and student spending. To each of these, we apply the prevailing tax rates so we capture only the tax revenues attributable to provincial government from this additional revenue.

25 For a full description of the Lightcast CRIO model, see Appendix 5.

Not all of these tax revenues may be counted as benefits to the province, however. Some students leave the province during the course of their careers, and the higher earnings they receive as a result of their education leaves the province with them. To account for this dynamic, we combine student settlement data from the university with data on migration patterns from the Statistics Canada to estimate the number of students who will leave the provincial workforce over time.

We apply another reduction factor to account for the students' alternative education opportunities. This is the same adjustment that we use in the calculation of the alumni impact in Chapter 2 and is designed to account for the counterfactual scenario where TRU does not exist. The assumption in this case is that any benefits generated by students who could have received an education even without the university cannot be counted as new benefits to taxpayers and society. For this analysis, we assume an alternative education variable of 15%, meaning that 15% of the student population at TRU would have generated benefits anyway even without the university. For more information on the alternative education variable, see Appendix 7.

We apply a final adjustment—the "shutdown point"—to net out benefits that are not directly linked to the provincial government costs of supporting the university. As with the alternative education variable, the purpose of this adjustment is to account for counterfactual scenarios. In this case, the counterfactual scenario is where provincial government funding for TRU did not exist, and TRU had to derive the revenue elsewhere by increasing tuition. To estimate this shutdown point, we apply a sub-model that simulates the students' demand curve for education by reducing provincial government support to zero and progressively increasing student tuition and fees. As student tuition and fees increase, enrolment declines. For TRU, the shutdown point adjustment is 0%, meaning that TRU could not operate without taxpayer support. As such, no reduction applies. For more information on the theory and methodology behind the estimation of the shutdown point, see Appendix 9.

After adjusting for attrition, alternative education opportunities, and the shutdown point, we calculate the present value of the future added tax revenues that occur in the province, equal to $486.6 million. Recall from the discussion of the student return on investment that the present value represents the sum of the future benefits that accrue each year over the course of the time horizon, discounted to current year dollars to account for the time value of money. Given that the stakeholder in this case is the public sector, we assume a 2.0% discount rate, which is the real treasury interest rate recommended by the Bank of Canada for long-term investments.[26]

26 Bank of Canada. "Government of Canada benchmark bond yields—long-term." Bank of Canada Selected Bond Yields. http://www.bankofcanada.ca/rates/interest-rates/canadian-bonds/.

Government savings

In addition to the creation of higher income in the province, education is statistically associated with a variety of lifestyle changes that generate social savings, also known as external or incidental benefits of education. These represent the avoided costs to the government that otherwise would have been drawn from public resources absent the education provided by TRU. Government savings appear in Figure 3.2 and break down into three main categories: 1) health savings, 2) crime savings, and 3) income assistance savings. Health savings include avoided medical costs associated with smoking, alcoholism, obesity, and mental illness. Crime savings consist of avoided costs to the justice system (*i.e.*, police protection, judicial and legal, and corrections). Income assistance savings are comprised of avoided costs due to the reduced number of claims for employment insurance and other forms of employment-related social assistance.

In addition to the creation of **higher income** in the province, education is statistically associated with a variety of lifestyle changes that generate **social savings**.

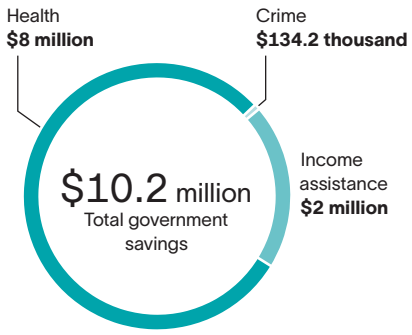
The model quantifies government savings by calculating the probability at each education level that individuals will have poor health, commit crimes, or claim income assistance. Deriving the probabilities involves assembling data from a variety of studies and surveys analyzing the correlation between education and health, crime, and income assistance at the national and provincial level. We spread the probabilities across the education ladder and multiply the marginal differences by the number of students who earned credits at each step. The sum of these marginal differences counts as the upper bound measure of the number of students who, due to the education they received at TRU, will not have poor health, commit crimes, or claim income assistance. We dampen these results by the "ability bias" adjustment discussed earlier in this chapter and in Appendix 6 to account for other factors besides education that influence individual behaviour. We then multiply the marginal effects of education times the associated costs of health, crime, and income assistance.[27] Finally, we apply

Table 3.3: Present value of added tax revenue and government savings (thousands)

Added tax revenue	**$486,574**
Government savings	
Health-related savings	$8,010
Crime-related savings	$134
Income assistance savings	$2,025
Total government savings	**$10,169**
Total taxpayer benefits	**$496,743**

Source: Lightcast impact model.

Figure 3.2: Present value of government savings



Source: Lightcast impact model.

27 For a full list of the data sources used to calculate the social externalities, see Appendix 4. See also Appendix 9 for a more in-depth description of the methodology.

the same adjustments for attrition, alternative education, and the shutdown point to derive the net savings to the provincial government. Total government savings appear in Figure 3.2 and sum to $10.2 million.

Table 3.3 displays all benefits to taxpayers. The first row shows the added tax revenues created in the province, equal to $486.6 million, from students' higher earnings, increases in non-labour income, and spending impacts. The sum of the government savings and the added income in the province is $496.7 million, as shown in the bottom row of Table 3.3. These savings continue to accrue in the future as long as the FY 2023-24 student population of TRU remains in the workforce.

Return on investment

Taxpayer costs are reported in Table 3.4 and come to $96.5 million, equal to the annual contribution of provincial government to TRU. In return for their public support, therefore, taxpayers are rewarded with an investment benefit-cost ratio of 5.1 (= $496.7 million ÷ $96.5 million). The return on investment is 4.1, indicating a profitable investment.

At 38.3%, the rate of return to provincial taxpayers is also favourable. Given that the stakeholder in this case is the public sector, we assume a 2.0% discount rate, which is the real treasury interest rate recommended by the Bank of Canada for long-term investments.[28] 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 2.0% would mean that the university just pays its own way. In principle, governments could borrow monies used to support TRU and repay the loans out of the resulting added taxes and reduced government expenditures. A rate of return of 38.3%, on the other hand, means that TRU not only pays its own way, but it also generates a surplus that provincial government can use to fund other programs. It is unlikely that other government programs could make such a claim.

A rate of return of **38.3%** means that TRU not only pays its own way, but it also generates a surplus that provincial government can use to fund other programs.

28 Bank of Canada. "Government of Canada benchmark bond yields—long-term." Bank of Canada Selected Bond Yields. http://www.bankofcanada.ca/rates/interest-rates/canadian-bonds/.

Table 3.4: **Projected benefits and costs, taxpayer perspective**

1	2	3	4
Year	Benefits to taxpayers (millions)	Provincial government costs (millions)	Net cash flow (millions)
0	$63.7	$96.5	-$32.7
1	$7.8	$0.0	$7.8
2	$9.0	$0.0	$9.0
3	$11.2	$0.0	$11.2
4	$14.5	$0.0	$14.5
5	$18.4	$0.0	$18.4
6	$19.0	$0.0	$19.0
7	$19.6	$0.0	$19.6
8	$20.2	$0.0	$20.2
9	$20.8	$0.0	$20.8
10	$21.3	$0.0	$21.3
11	$21.8	$0.0	$21.8
12	$22.3	$0.0	$22.3
13	$22.8	$0.0	$22.8
14	$23.3	$0.0	$23.3
15	$23.7	$0.0	$23.7
16	$24.1	$0.0	$24.1
17	$24.5	$0.0	$24.5
18	$24.8	$0.0	$24.8
19	$25.1	$0.0	$25.1
20	$25.4	$0.0	$25.4
21	$25.6	$0.0	$25.6
22	$25.8	$0.0	$25.8
23	$25.9	$0.0	$25.9
24	$26.0	$0.0	$26.0
25	$21.3	$0.0	$21.3
26	$17.2	$0.0	$17.2
27	$13.6	$0.0	$13.6
28	$10.4	$0.0	$10.4
29	$7.7	$0.0	$7.7
30	$5.5	$0.0	$5.5
31	$3.7	$0.0	$3.7
32	$2.3	$0.0	$2.3
33	$1.4	$0.0	$1.4
34	$0.7	$0.0	$0.7
35	$0.4	$0.0	$0.4
Present value	**$496.7**	**$96.5**	**$400.3**

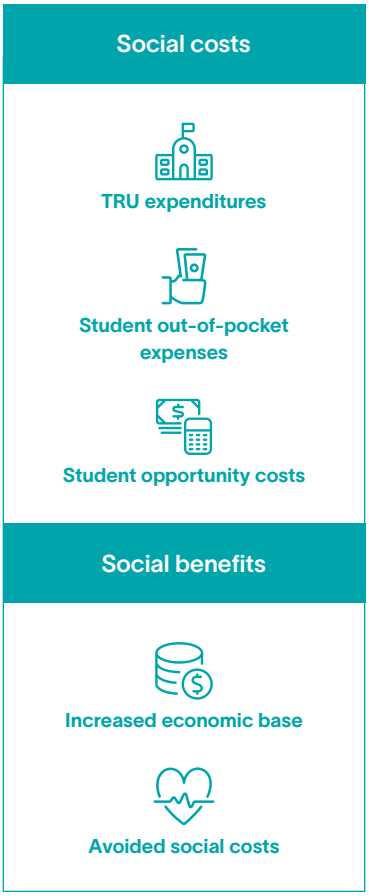
Source: Lightcast impact model.

Benefit-cost ratio	Return on investment	Internal rate of return	Payback period (years)
5.1	4.1	38.3%	3.3

Social perspective

Society as a whole in British Columbia benefits from the education that TRU provides through the income that students create in the province and through the savings that they generate through their improved lifestyles. To receive these benefits, however, members of society must pay money and forgo services that they would have otherwise enjoyed if TRU did not exist. Society's investment in TRU stretches across a number of investor groups, from students to employers to taxpayers. We weigh the benefits generated by TRU to these investor groups against the total social costs of generating those benefits. The total social costs include all TRU expenditures, all student expenditures, and all student opportunity costs. The social costs come to a total present value of $533.8 million.

On the benefits side, any benefits that accrue to British Columbia as a whole—including students, employers, taxpayers, and anyone else who stands to benefit from the activities of TRU—are counted as benefits under the social perspective. We group these benefits under the following broad headings: 1) increased income in the province, and 2) social externalities stemming from improved health, reduced crime, and reduced unemployment in the province (see the "Beekeeper Analogy" box for a discussion of externalities). Both of these benefits components are described more fully in the following sections.



Income growth in the province

In the process of absorbing the newly-acquired skills of TRU's students, not only does the productivity of British Columbia's workforce increase, but so does the productivity of its physical capital and assorted infrastructure. Students earn more because of the skills they learned while attending the university, and businesses earn more because student skills make capital more productive (*i.e.*, buildings, machinery, and everything else). This in turn raises profits and other business property income. Together, increases in earnings and other provincial income are considered the effect of a skilled workforce.

Estimating the effect of TRU on income growth in the follows the same process used when calculating increased tax revenues in the taxpayer perspective. However, instead of looking at just the tax revenue portion, we include all of the added earnings

Beekeeper analogy

Beekeepers provide a classic example of positive externalities (sometimes called "neighbourhood effects"). The beekeeper's intention is to make money selling honey. Like any other business, receipts must at least cover operating costs. If they do not, the business shuts down.

But from society's standpoint there is more. Flowers provide the nectar that 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 do well to subsidize activities that produce positive externalities, such as beekeeping.

Educational institutions are like beekeepers. While their principal aim is to provide education and raise people's earnings, in the process an array of external benefits is created. Students' health and lifestyles are improved, and society indirectly benefits just as orchard owners indirectly benefit from beekeepers. Aiming at a more complete accounting of the benefits of taxpayer expenditures on education, the institution impact model accounts for many of these external social benefits.

and business output. We again factor in student attrition and alternative education opportunities. The shutdown point does not apply to the growth of the economic base because the social perspective captures not only the provincial taxpayer support to the university, but also the support from the students and other non-government sources.

After adjusting for attrition and alternative education opportunities, we calculate the present value of the future added income that occurs in the province, equal to $3.8 billion. Recall from the discussion of the student return on investment that the present value represents the sum of the future benefits that accrue each year over the course of the time horizon, discounted to current year dollars to account for the time value of money. As in the taxpayer perspective, given that the stakeholder in this case is the public sector, we use a discount rate of 2.0%.

Social savings

Similar to the government savings discussed above, society as a whole sees savings due to external or incidental benefits of education. These represent the avoided costs that otherwise would have been drawn from private and public resources absent the education provided by TRU. Social benefits appear in Table 3.5 and break down into three main categories: 1) health savings, 2) crime savings, and 3) income assistance savings. These are similar to the categories from the taxpayer perspective above, although health savings now also include lost productivity and other effects associated with smoking, alcohol dependence, obesity, and mental illness. In addition to avoided costs to the justice system, crime savings also consist of avoided victim costs and benefits stemming from the added productivity of individuals who otherwise would have been incarcerated. Income assistance savings are comprised of the avoided government costs due to the reduced number of claims for employment insurance and other forms of employment-related social assistance. Finally, we apply the same adjustments for attrition and alternative education to derive the net savings to society.

Table 3.5 displays the results of the analysis. The first row shows the added income created in the province, equal to $3.8 billion, from students' higher earnings and their

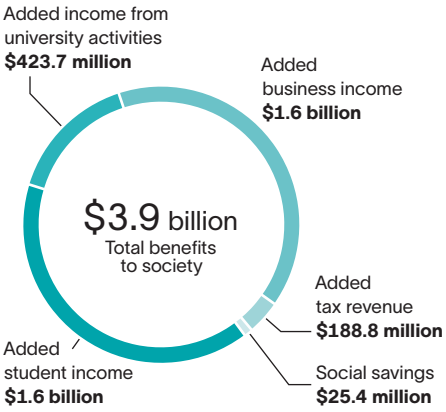
multiplier effects, increases in non-labour income, and spending impacts. Social savings appear next, beginning with a breakdown of savings related to health. These savings amount to a present value of $22.9 million, including savings due to a reduced demand for medical treatment and social services, improved worker productivity and reduced absenteeism, and a reduced number of vehicle crashes and fires induced by alcohol or smoking-related incidents. Crime savings sum to $428 thousand, including savings associated with a reduced number of crime victims, added worker productivity, and reduced expenditures for police and law enforcement, courts and administration of justice, and corrective services. Finally, the present value of the savings related to income assistance amount to $2 million, stemming from a reduced number of persons in need of employment insurance and employment-related social assistance. All told, social savings amounted to $25.4 million in benefits to communities and citizens in British Columbia.

Table 3.5: Present value of the future added income and social savings in the province (thousands)

Added Income	**$3,831,040**
Social Savings	
Health	
Smoking	$16,011
Alcoholism	$4,183
Obesity	$813
Mental illness	$1,896
Total health savings	**$22,903**
Crime	
Criminal Justice System savings	$113
Crime victim savings	$218
Added productivity	$96
Total crime savings	**$428**
Income assistance	
Employment insurance savings	$1,240
Employment-related social assistance savings	$785
Total income assistance savings	**$2,025**
Total social savings	**$25,356**
Total, added income + social savings	**$3,856,397**

Source: Lightcast impact model.

Figure 3.3: Present value of benefits to society



Source: Lightcast impact model.

The sum of the social savings and the added income in the province is $3.9 billion, as shown in the bottom row of Table 3.5 and in Figure 3.3. These savings accrue for years out into the future, for as long as TRU's FY 2023-24 students remain active in the workforce.

Return on investment to society

Table 3.6 presents the stream of benefits accruing to society in British Columbia and the total costs of generating those benefits Comparing the present value of the benefits and the social costs, we have a benefit-cost ratio of 7.2. This means that for every dollar invested in TRU educations, whether it is the money spent on the university's operations or an investment from students, an average of $7.20 in benefits will accrue to society in British Columbia. [29]

With and without social savings

Earlier in this chapter, social benefits attributable to education (reduced crime, fewer income assistance claims, and improved health) were defined as externalities that are incidental to the operations of the university. Some would question the legitimacy of including these benefits in the calculation of rates of return to education, arguing that only the tangible benefits, *i.e.*, higher income, should be counted. Table 3.4 and Table 3.6 are inclusive of social benefits reported as attributable to TRU. Recognizing the other point of view, Table 3.7 shows the results for both the taxpayer and perspectives exclusive of social benefits. As indicated, returns are still above threshold values (a benefit-cost ratio greater than 1.0, a return on investment greater than 0, and a rate of return greater than 2.0%), confirming that taxpayers and society receive value from investing in TRU.

Table 3.7: Taxpayer and social perspectives with and without social savings

	Including social savings	Excluding social savings
Taxpayer perspective		
Net present value (thousands)	$400,284	$390,115
Benefit-cost ratio	5.1	5.0
Return on investment	4.1	4.0
Internal rate of return	38.3%	37.2%
Payback period (no. of years)	3.3	4.4
Social perspective		
Net present value (thousands)	$3,322,578	$3,297,222
Benefit-cost ratio	7.2	7.2
Return on investment	6.2	6.2
Payback period (no. of years)	0.5	1.5

Source: Lightcast impact model.

29 The rate of return is not reported for the social perspective because the beneficiaries of the investment are not necessarily the same as the original investors.

Table 3.6: **Projected benefits and costs, social perspective**

1	2	3	4
Year	Benefits to society (millions)	Social costs (millions)	Net cash flow (millions)
0	$503.0	$533.8	-$30.8
1	$61.8	$0.0	$61.8
2	$71.4	$0.0	$71.4
3	$88.1	$0.0	$88.1
4	$113.8	$0.0	$113.8
5	$144.8	$0.0	$144.8
6	$149.3	$0.0	$149.3
7	$153.7	$0.0	$153.7
8	$157.9	$0.0	$157.9
9	$162.1	$0.0	$162.1
10	$166.1	$0.0	$166.1
11	$169.9	$0.0	$169.9
12	$173.5	$0.0	$173.5
13	$177.0	$0.0	$177.0
14	$180.2	$0.0	$180.2
15	$183.2	$0.0	$183.2
16	$186.1	$0.0	$186.1
17	$188.6	$0.0	$188.6
18	$190.9	$0.0	$190.9
19	$193.0	$0.0	$193.0
20	$194.8	$0.0	$194.8
21	$196.3	$0.0	$196.3
22	$197.5	$0.0	$197.5
23	$198.4	$0.0	$198.4
24	$199.1	$0.0	$199.1
25	$162.8	$0.0	$162.8
26	$131.2	$0.0	$131.2
27	$103.5	$0.0	$103.5
28	$79.5	$0.0	$79.5
29	$58.9	$0.0	$58.9
30	$41.8	$0.0	$41.8
31	$28.2	$0.0	$28.2
32	$17.9	$0.0	$17.9
33	$10.5	$0.0	$10.5
34	$5.7	$0.0	$5.7
35	$2.8	$0.0	$2.8
Present value	**$3,856.4**	**$533.8**	**$3,322.6**

Source: Lightcast impact model.

Benefit-cost ratio	Return on investment	Payback period (years)
7.2	6.2	0.5

Chapter 4:

Conclusion

WHILE TRU'S VALUE to the region is larger than simply its economic impact, understanding that dollars and cents value is an important asset to understanding the university's value. In order to fully assess TRU's value to the Thompson Rivers College Region economy, this report has evaluated the university from the perspectives of economic impact analysis and investment analysis.

From an economic impact perspective, we calculated that TRU generates a total economic impact of **$885.5 million** in added income for the regional economy. This represents the sum of several different impacts, including the university's:

- Operations spending impact (**$234.6 million**);
- Construction spending impact (**$19.6 million**);
- Student spending impact (**$73.2 million**); and
- Alumni impact (**$558.0 million**).

These results indicate that TRU is an **attractive investment to students** with rates of return that exceed alternative investment opportunities.

This impact means that TRU is responsible for supporting **9,510** jobs in the Thompson Rivers College Region. For perspective, this means that **one out of every 10 jobs** in the Thompson Rivers College Region is supported by the activities of TRU and its students.

Since TRU's activity represents an investment by various parties, including students, taxpayers, and society as a whole, we also considered the university as an investment to see the value it provides to these investors. For every dollar invested by students, taxpayers, and society, TRU offers a benefit of **$1.40, $5.10, and $7.20,** respectively. These results indicate that TRU is an attractive investment to students with rates of return that exceed alternative investment opportunities. At the same time, the presence of TRU expands the provincial economy and creates a wide range of positive social benefits that accrue to taxpayers and society in general within British Columbia.

Modeling the economic value of the university is subject to many factors, the variability of which we considered in our sensitivity analysis (Appendix 1). With this variability accounted for, we present the findings of this study as a robust picture of the economic value of TRU.

Lightcast

Lightcast is a labour market analytics firm that integrates data from a wide variety of sources to serve professionals in postsecondary education, economic development, workforce development, talent acquisition, and site selection. Lightcast is a leading provider of economic impact studies and labour market data to educational institutions in Canada, the U.S. and internationally. Since 2000, Lightcast has completed over 2,800 economic impact studies for institutions across three countries. For more information about Lightcast's products and services, visit lightcast.io/solutions/education.

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Appendix 1: Sensitivity analysis

Sensitivity analysis is the process by which researchers determine how sensitive the outputs of the model are to variations in the background data and assumptions, especially if there is any uncertainty in the variables. Sensitivity analysis is also useful for identifying a plausible range wherein the results will fall should any of the variables deviate from expectations. In this chapter, we test the sensitivity of the model to the following input factors: 1) the alternative education variable, 2) the substitution effect variable, 3) the student employment variables, 4) the discount rate, and 5) the retained student variable.

Alternative education variable

The alternative education variable (15%) accounts for the counterfactual scenario where students would have to seek a similar education elsewhere absent the publicly-funded training providers in the region. Given the difficulty in accurately specifying the alternative education variable, we test the sensitivity of the taxpayer and social investment analysis results to its magnitude. Variations in the alternative education assumption are calculated around base case results listed in the middle column of Table A1.1. Next, the model brackets the base case assumption on either side with a plus or minus 10%, 25%, and 50% variation in assumptions. Analyses are then repeated introducing one change at a time, holding all other variables constant. For example, an increase of 10% in the alternative education assumption (from 15% to 17%) reduces the taxpayer perspective rate of return from 23.9% to 23.1%. Likewise, a decrease of 10% (from 15% to 14%) in the assumption increases the rate of return from 23.9% to 24.8%.

Table A1.1: Sensitivity analysis of alternative education variable, taxpayer and social perspectives

% variation in assumption	-50%	-25%	-10%	Base case	10%	25%	50%
Alternative education variable	**8%**	**11%**	**14%**	**15%**	**17%**	**19%**	**23%**
Taxpayer perspective							
Net present value (millions)	$275	$260	$251	$245	$239	$230	$215
Benefit-cost ratio	3.8	3.7	3.6	3.5	3.5	3.4	3.2
Return on investment	2.8	2.7	2.6	2.5	2.5	2.4	2.2
Rate of return	28.4%	26.0%	24.8%	23.9%	23.1%	22.0%	20.3%
Social perspective							
Net present value (millions)	$2,309	$2,194	$2,125	$2,079	$2,033	$1,963	$1,848
Benefit-cost ratio	5.3	5.1	5.0	4.9	4.8	4.7	4.5
Return on investment	4.3	4.1	4.0	3.9	3.8	3.7	3.5

Based on this sensitivity analysis, the conclusion can be drawn that TRU's investment analysis results from the taxpayer and social perspectives are not very sensitive to relatively large variations in the alternative education variable. As indicated, results are still 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 2.0%), even when the alternative education variable is increased by as much as 50% (from 15% to 23%). The conclusion is that although the assumption is difficult to specify, its impact on overall investment analysis results for the taxpayer and social perspectives is not very sensitive.

Substitution effect variable

The substitution effect variable only affects the alumni calculation in Table 2.6. In the model, we assume a substitution effect variable of 50%, which means that we claim only 50% of the region's labour demands would have been satisfied without the presence of TRU. In other words, businesses that hired TRU students could have substituted some of these workers with equally-qualified people from outside the region had there been no TRU students to hire. Therefore, we attribute only the remaining 50% of the initial labour income generated by the increased alumni productivity to the university.

Table A1.2 presents the results of the sensitivity analysis for the substitution effect variable. As above, the assumption increases and decreases relative to the base case of 50% by the increments indicated in the table. Alumni impacts attributable to TRU, for example, range from a high of $725.5 million at a -30% variation to a low of $390.6 million at a +30% variation from the base case assumption. This means that if the substitution variable increases, the impact that we claim as attributable to student productivity decreases. Nonetheless, the impact of alumni still remains a sizeable factor in the Thompson Rivers College Region economy, even under the most conservative assumptions.

Table A1.2: Sensitivity analysis of substitution effect variable

% variation in assumption	-30%	-20%	-10%	Base case	10%	20%	30%
Substitution effect variable	35%	40%	45%	50%	55%	60%	65%
Alumni impact (millions)	$725.5	$669.6	$613.8	$558.0	$502.2	$446.4	$390.6

Student employment variables

Student employment variables are difficult to estimate because many students do not report their employment status or because postsecondary institutions generally do not collect this kind of information. Employment variables include the following: 1) the percentage of students who are employed while attending the university, and 2) the percentage of earnings that working students receive relative to the earnings they would have received had they not chosen to attend the university. Both employment variables affect the investment analysis results from the student perspective.

Students incur substantial expense by attending TRU because of the time they spend not gainfully employed. Some of that cost is recaptured if students remain partially (or fully) employed while attending. It is estimated that 63% of students are employed,

based on data provided by TRU.[30] This variable is tested in the sensitivity analysis by changing it first to 100% and then to 0%.

The second student employment variable is more difficult to estimate. In this study we estimate that students who are working while attending the university earn only 47%, on average, of the earnings that they would have statistically received if not attending TRU. This suggests that many students hold jobs that accommodate their attendance at TRU, though it is at an additional cost in terms of receiving a wage that is less than what they might otherwise make. The model captures this difference in wages and counts it as part of the opportunity cost of time. As above, the estimate is tested in the sensitivity analysis by changing it to 100% and then to 0%.

The changes generate results summarized in Table A1.3, with "*A*" defined as the percent of students employed and "*B*" defined as the percent that students earn relative to their full earning potential. Base case results appear in the shaded row—here the assumptions remain unchanged, with *A* equal to 63% and *B* equal to 69%. Sensitivity analysis results are shown in non-shaded rows. Scenario 1 increases *A* to 100% while holding *B* constant, Scenario 2 increases *B* to 100% while holding *A* constant, Scenario 3 increases both *A* and *B* to 100%, and Scenario 4 decreases both *A* and *B* to 0%.

Table A1.3: Sensitivity analysis of student employment variables

Variations in assumptions	Net present value (millions)	Benefit-cost ratio	Return on investment	Internal rate of return
Base case: A = 63%, B = 69%	$159.2	1.4	0.4	10.4%
Scenario 1: A = 100%, B = 69%	$292.4	2.0	1.0	14.9%
Scenario 2: A = 63%, B = 100%	$226.0	1.6	0.6	12.3%
Scenario 3: A = 100%, B = 100%	$327.9	2.3	1.3	16.8%
Scenario 4: A = 0%, B = 0%	$52.4	1.1	0.1	8.1%

Note: A = percent of students employed; B = percent earned relative to statistical averages.

- **Scenario 1:** Increasing the percent of students employed (*A*) from 63% to 100%, the net present value, benefit-cost ratio, return on investment, and internal rate of return improve to $292.4 million, 2.0, 1.0, and 14.9%, respectively, relative to base case results. Improved results are attributable to a lower opportunity cost of time—all students are employed in this case.
- **Scenario 2:** Increasing earnings relative to statistical averages (*B*) from 69% to 100%, the net present value, benefit-cost ratio, return on investment, and internal rate of return improve to $226 million, 1.6, 0.6, and 12.3%, respectively, relative to base case results—a strong improvement, again attributable to a lower opportunity cost of time.
- **Scenario 3:** Increasing both assumptions *A* and *B* to 100% simultaneously, the net present value, benefit-cost ratio, return on investment, and internal rate of return improve yet further to $327.9 million, 2.3, 1.3, and 16.8%, 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.

30 Lightcast provided an estimate of the percentage of students employed because the university was unable to provide the data.

- **Scenario 4:** Finally, decreasing both *A* and *B* to 0% reduces the net present value, benefit-cost ratio, return on investment, and internal rate of return to $52.4 million, 1.1, 0.1, and 8.1%, respectively, relative to base case results. These results are reflective of an increased opportunity cost—none of the students are employed in this case.[31]

It is strongly emphasized in this section that base case results are very attractive in that results are all above their threshold levels. As is clearly demonstrated here, results of the first three alternative scenarios appear much more attractive, although they overstate benefits. Results presented in Chapter 3 are realistic, indicating that investments in TRU generate excellent returns, well above the long-term average percent rates of return in stock and bond markets.

Discount rate

The discount rate is a rate of interest that converts future monies to their present value. In investment analysis, the discount rate accounts for two fundamental principles: 1) the time value of money, and 2) the level of risk that an investor is willing to accept. Time value of money refers to the value of money after interest or inflation has accrued over a given length of time. An investor must be willing to forgo the use of his money in the present if he wishes to receive compensation for it in the future. The discount rate also addresses the investors' risk preferences by serving as a proxy for the minimum rate of return that the proposed risky asset must be expected to yield before the investors will be persuaded to invest in it. Typically, this minimum rate of return is determined by the known returns of less risky assets where the investors might alternatively consider placing their money.

In this study, we assume a 7.2% discount rate for students and a 2.0% discount rate for taxpayers and society.[32] Like the sensitivity analysis of the alternative education variable, we vary the base case discount rates for students, taxpayers, and society on either side by increasing the discount rate by 10%, 25%, and 50%, and then reducing it by 10%, 25%, and 50%. Note that, because the rate of return and the payback period are both based on the undiscounted cash flows, they are unaffected by changes in the discount rate. As such, only variations in the net present value, benefit-cost ratio, and return on investment are shown for students, taxpayers, and society in Table A1.4.

As demonstrated in the table, an increase in the discount rate leads to a corresponding decrease in the expected returns, and vice versa. For example, increasing the student discount rate by 50% (from 7.2% to 10.8%) reduces the students' benefit-cost ratio from 1.4 to 1.0. Conversely, reducing the discount rate for students by 50% (from 7.2% to 3.6%) increases the benefit-cost ratio from 1.4 to 2.1. The sensitivity analysis results for taxpayers and society show the same inverse relationship between the discount rate and the benefit-cost ratio, with the variance in results being the greatest under the

31 Note that reducing the percent of students employed to 0% automatically negates the percent they earn relative to full earning potential, since none of the students receive any earnings in this case.

32 These values are based student loan rates from the Government of Canada and benchmark yields for long-term bonds from the Bank of Canada. See the Government of Canada, Student Loans & Grants and the Bank of Canada, Selected Bond Yields.

social perspective (from a benefit-cost ratio of 5.6 at a -50% variation from the base case to a benefit-cost ratio of 4.4 at a 50% variation from the base case).

Table A1.4: Sensitivity analysis of discount rate

% variation in assumption	-50%	-25%	-10%	Base case	10%	25%	50%
Student perspective							
Discount rate	3.6%	5.4%	6.5%	7.2%	7.9%	9.0%	10.8%
Net present value (millions)	$475.8	$293.1	$208.0	$159.2	$115.8	$59.3	-$16.7
Benefit-cost ratio	2.1	1.7	1.5	1.4	1.3	1.1	1.0
Return on investment	1.1	0.7	0.5	0.4	0.3	0.1	0.0
Taxpayer perspective							
Discount rate	1.0%	1.5%	1.8%	2.0%	2.2%	2.5%	3.0%
Net present value (millions)	$290.3	$266.5	$253.2	$244.8	$236.7	$225.1	$207.2
Benefit-cost ratio	4.0	3.8	3.6	3.5	3.5	3.3	3.1
Return on investment	3.0	2.8	2.6	2.5	2.5	2.3	2.1
Social perspective							
Discount rate	1.0%	1.5%	1.8%	2.0%	2.2%	2.5%	3.0%
Net present value (millions)	$2,424.4	$2,243.3	$2,142.9	$2,079.1	$2,017.8	$1,930.0	$1,794.4
Benefit-cost ratio	5.6	5.2	5.0	4.9	4.8	4.6	4.4
Return on investment	4.6	4.2	4.0	3.9	3.8	3.6	3.4

Retained student variable

The retained student variable only affects the student spending calculation in Table 2.4. In the model, we assume a retained student variable of 10%, which means that 10% of TRU's students who originated from the Thompson Rivers College Region would have left the region for other education opportunities if TRU did not exist. The money these retained students spent in the region for accommodation and other personal and household expenses is attributable to TRU.

Table A1.5 presents the results of the sensitivity analysis for the retained student variable. The assumption increases and decreases relative to the base case of 10% by the increments indicated in the table. The student spending impact is recalculated at each value of the assumption, holding all else constant. Student spending impacts attributable to TRU range from a high of $75.5 million at a 50% variation to a low of $71 million at a -50% variation from the base case assumption. This means as the retained student variable decreases, the student spending attributable to TRU decreases. Even under the most conservative assumptions, the student spending impact on the Thompson Rivers College Region economy remains substantial.

Table A1.5: Sensitivity analysis of retained student variable

% variation in assumption	-50%	-25%	-10%	Base case	10%	25%	50%
Retained student variable	5%	7.5%	9%	10%	11%	12.5%	15%
Student spending impact (thousands)	$71,013	$72,128	$72,797	$73,243	$73,689	$74,358	$75,473

Appendix 2: 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 educational institutions in the region. An estimate of 10%, for example, means that 10% of students do not depend directly on the existence of the university in order to obtain their education.

Alternative use of funds: A measure of how monies that are currently used to fund the university might have otherwise been used if the university did not exist.

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 regional or provincial workforce 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 1, then benefits exceed costs, and the investment is feasible.

Credit: A measure of course value generally equal to 15 contact hours of instruction. In general, it requires 450 contact hours or 30 credits to complete one full-time equivalent, or FTE.

Demand: Relationship between the market price of education and the 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.

Earnings: Income which is received as a result of labour, *i.e.*, wages and salaries.

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 fees increases or decreases total enrolment by a significant amount, demand is elastic. If enrolment remains the same or changes only slightly, demand is inelastic.

Externalities: Impacts (positive and negative) for which there is no compensation. Positive externalities of education include improved social behaviours such as lower crime, reduced unemployment, and improved health. Educational institutions do not receive compensation for these benefits, but benefits still occur because education is statistically proven to lead to improved social behaviours.

Full-time equivalent: The full-time equivalent (FTE) measure is a method of standardizing the actual course loads of students against their normal course loads in order to normalize and combine the institution's full-time and part-time student counts.

Gross regional product: Measure of the final value of all goods and services produced in a region after netting out the cost of goods used in production. Alternatively, gross regional product (GRP) equals the combined incomes of all factors of production, *i.e.*, labour, land and capital. These include wages, salaries, profits, rents, and other earnings. Gross regional product is also sometimes called "value added."

Initial effect: Income generated by the initial injection of monies into the economy through the expenditures of the university and its students.

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 that this requires. In an educational setting, when institutions pay wages and salaries and spend money for supplies in the 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: The number of times a dollar cycles through the economy, generating additional income and jobs, before leaving the economy. Therefore, a multiplier of 1.7 estimates that a dollar will generate an additional $0.70 in the economy before leaving.

Multiplier effect: Additional income created in the economy through multipliers. It consists of the income created by the supply chain of the industries initially affected by the spending of the university and its students (*i.e.*, the direct effect), income created by the supply chain of the initial supply chain (*i.e.*, the indirect effect), and the income created by the increased spending of the household sector (*i.e.*, the induced effect).

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 collapsed into one number, which, if positive, indicates feasibility. The result is expressed as a monetary measure.

Opportunity cost: Benefits forgone from alternative B once a decision is made to allocate resources to alternative A. Or, if individuals choose not to attend university, they forgo earnings that they would have received had they chose instead to work full-time. Forgone earnings, therefore, are the "price tag" of choosing to attend university.

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*.

Return on investment: Net present value of benefits divided by present value of costs. If the return on investment (also referred to as the "ROI") is greater than 0, then the investment is feasible.

Appendix 3: Frequently asked questions (FAQs)

This appendix provides answers to some frequently asked questions about the results.

What is economic impact analysis?

Economic impact analysis quantifies the impact from a given economic event—in this case, the presence of the university—on the economy of a specified region.

What is investment analysis?

Investment analysis is a standard method for determining whether or not an existing or proposed investment is economically viable. This methodology is appropriate in situations where a stakeholder puts up a certain amount of money with the expectation of receiving benefits in return, where the benefits that the stakeholder receives are distributed over time, and where a discount rate must be applied in order to account for the time value of money.

Do the results differ by region, and if so, why?

Yes. Regional economic data are drawn from Lightcast's proprietary CRIO model, Statistics Canada, and other sources to reflect the specific earnings levels, jobs numbers, unemployment rates, population demographics, and other key characteristics of the region served by the university. Therefore, model results for the university are specific to the given region.

Are the funds transferred to the university increasing in value, or simply being re-directed?

Lightcast's approach is not a simple "rearranging of the furniture" where the impact of operations spending is essentially a restatement of the level of funding received by the university. Rather, it is an impact assessment of the additional income created in the region as a result of institutional spending on payroll and other non-pay expenditures, net of any impacts that would have occurred anyway if the university did not exist.

Lightcast conducted an economic impact study for the university a few years ago. Why have results changed?

Lightcast is a leading provider of economic impact studies and labour market data to educational institutions, workforce planners, and regional developers in the U.S. and internationally. Since 2000, Lightcast has completed over 2,800 economic impact studies for educational institutions in three countries. Along the way we have worked to continuously update and improve our methodologies to ensure that they conform to best practices and stay relevant in today's economy. The present study reflects the latest version of our model, representing the most up-to-date theory, practices, and data for conducting economic impact and investment analyses. Many of our former assumptions have been replaced with observed data, and we have researched the latest sources in order to update the background data used in our model. Additionally, changes in the data the university provides to Lightcast can influence the results of the study.

How does the university's rate of return compare to that of other institutions?

In general, Lightcast discourages comparisons between institutions since many factors, such as regional economic conditions, institutional differences, and student demographics are outside of the institutions' control. It is best to compare the rate of return to the discount rates of 7.2% (for students) and 2.0% (for taxpayers and society), which can also be seen as the opportunity cost of the investment (since these stakeholder groups could be spending their time and money in other investment schemes besides education). If the rate of return is higher than the discount rate, the stakeholder groups can expect to receive a positive return on their educational investment.

Lightcast recognizes that some institutions may want to make comparisons. As a word of caution, if comparing to an institution that had a study commissioned by a firm other than Lightcast, then differences in methodology will create an "apples to oranges" comparison and will therefore be difficult. The study results should be seen as unique to each institution.

Net Present Value (NPV): How do I communicate this in laymen's terms?

Which would you rather have: a dollar right now or a dollar thirty years from now? That most people will choose a dollar now is the crux of net present value. The preference for a dollar today means today's dollar is therefore worth more than it would be in the future (in most people's opinion). Because the dollar today is worth more than a dollar in thirty years, you can't add them today as if they have equal value. You need to adjust the values. Not doing so would result in an "apples and oranges" comparison. Adjusting the values for "this time value of money" is called discounting and the result of adding them all up after discounting each value is called net present value.

Internal Rate of Return (IRR): How do I communicate this in laymen's terms?

If students invest $1 in the university today, they will expect a positive return for that dollar now and in the future. So that $1 invested today needs to turn into at least a $1 return for the future. But that dollar will be worth less in the future (due to inflation and so forth). The unknown of what this future $1 will actually be worth compared to the known of what it is worth today means investors need to be assured that they will receive a given return.

Using the bank as an example, an individual must decide between spending all of their paycheck today or putting it into savings. If they spend it today, they know what it is worth: $1 = $1. If they put it into savings, they need to know that there will be some sort of return to them for spending those dollars in the future rather than now. This is why banks offer interest rates and deposit interest earnings into your account. This makes it so an individual can expect, for example, a 3% return in the future for money that they put into savings now.

The same can be said for the university's students. If they spend $1 on the university now, they can expect a future return of 10.4%. This can provide them with the assurance that not only will the dollars they invest in the university now provide increased dollars in the future, but they will yield more than if they were to spend money on other investments that may not yield as high of a return.

Total Economic Impact: How do I communicate this in laymen's terms?

Big numbers are great, but putting it into perspective can be a challenge. Table 1.3 in Chapter 1 can help. Find an industry with roughly the same "percentage of the total" as the university. This percentage represents its portion of the total gross regional product (GRP) in the region. This allows the university to say that their combined brick and mortar campuses do just as much for the region as the entire utility *industry*, for example. This powerful statement can put the large total impact number into perspective.

Appendix 4: Example of sales versus income

Lightcast's economic impact study differs from many other studies because we prefer to report the impacts in terms of income rather than sales (or output). Income is synonymous with value added or gross regional product (GRP). Sales include all the intermediary costs associated with producing goods and services. Income is a net measure that excludes these intermediary costs:

Income = Sales – Intermediary Costs

For this reason, income is a more meaningful measure of new economic activity than reporting sales. This is evidenced by the use of gross domestic product (GDP)—a measure of income—by economists when considering the economic growth or size of a country. The difference is GRP reflects a region and GDP a country.

To demonstrate the difference between income and sales, let us consider an example of a baker's production of a loaf of bread. The baker buys the ingredients such as eggs, flour, and yeast for $2.00. He uses capital such as a mixer to combine the ingredients and an oven to bake the bread and convert it into a final product. Overhead costs for these steps are $1.00. Total intermediary costs are $3.00. The baker then sells the loaf of bread for $5.00.

The sales amount of the loaf of bread is $5.00. The income from the loaf of bread is equal to the sales amount less the intermediary costs:

Income = $5.00 – $3.00 = $2.00

In our analysis, income can be found by summing the labour income and non-labour income. To provide context behind these figures, we also report the number of jobs associated with the income. The impacts are also reported in sales terms for reference.

Appendix 5: Lightcast's Canada Regional Input-Output model

Introduction and data sources

Lightcast's Canada Regional Input-Output (CRIO) modeling tool estimates the economic relationships among a region's industries and households. The model provides a unified source for regional economic information but more importantly, it provides the essential vehicle for estimating regional multiplier effects. Lightcast constructed the CRIO modeling tool using the most disaggregated and up-to-date regional data available for Canada and applying best input-output modeling practices as indicated by the professional literature. The result is a complex automated process capable of creating regionalized models for any geographic area comprised of Census Division and Census Subdivision areas.

Our primary data sources are the following:

- Regional and national jobs-by-industry totals, and national sales-to-jobs ratios (derived from Lightcast's industry employment and earnings data process).
- Statistics Canada, "L Level" industry-by-industry input-output tables.

Creation of the IO coefficients matrix

Table A5.1 illustrates sample amounts that each specific industry purchases from other industries. Industry purchases (inputs) run down the columns, while industry sales (output) run across the rows.

Table A5.1: Sample input-output table (millions)

	Industry 1	Industry 2	...	Households
Industry 1	3.3	1,532.5	...	242.1
Industry 2	9.2	23.0	...	1,982.7
...	...	...	...	...
Households	819.3	2,395.6	...	0

In looking at the table above, the value 1,532.5 means that Industry 2 purchases $1,532,500,000 worth of commodities and/or services from Industry 1. The whole table is an economic double-entry accounting system, configured so that all money inflows have corresponding outflows elsewhere. All regular industries (such as "oil and gas exploration," "machinery manufacturing," "supermarkets," "hospitals," and so on) are captured in the input-output matrix.

Column elements of the input-output table (Table A5.1 above) are "normalized" on column sums (showing the value of total input purchases) to show individual input purchases as percentages of each industry's overall input purchases. Thus, the cell containing .112 In Table A5.2 means that Industry 2 spends 11.2% of its total input purchases to obtain inputs from Industry 1. The matrix can be viewed as a collection of fixed coefficient production functions. In applied work, the IO coefficients matrix is commonly called the "A" matrix.

Table A5.2: Sample "A" matrix

	Industry 1	Industry 2	...	Households
Industry 1	.001	.112	...	.035
Industry 2	.097	0	...	.065
...	...	...	...	...
Households	.002	.076	...	0

Regionalizing the national A matrix

To create a regional input-output model, we "regionalize" a 305-sector version of the Canada national model derived from publicly available Canadian national L level models. Our regionalization method is based on the work of economist A.T. Flegg[33] and involves the creation of region-specific matrices of modified cross-industry location quotients (CILQs). In general, a CILQ indicates the relative importance of the supplying (row) industry to the demanding (column) industry. A CILQ less than 1.0 is taken to indicate a likelihood that the supplying industry's output is insufficient to meet the using industry's overall input demand, and national model IO coefficients are adjusted downward accordingly, with the deficit imported from other regions.[34] Flegg's breakthrough "modification" to the CILQ IO regionalizing approach was the incorporation of a logarithmic term capturing the effects on trade of relative regional size. Flegg's modified CILQ is commonly called the "Flegg LQ," or FLQ formula.

For off-diagonal elements (*i.e.*, where *i* does not equal *j*), the CRIO modeling tool utilizes a standard Flegg formulation as follows:

$$FLQ_{i,j} = \left(\frac{\frac{J_i^R}{J_j^R}}{\frac{J_i^N}{J_j^N}} \right) \times \left(log_2 \left(1 + \frac{\Sigma J^R}{\Sigma J^N} \right) \right)^{\gamma}$$

33 A.T. Flegg and T. Tohmo, "Regional Input-Output Tables and the FLQ Formula: A Case Study of Finland," *Regional Studies* 47, no. 5 (2013): 703-721; A.T. Flegg and C.D. Webber, "Regional Size, Regional Specialization and the FLQ Formula," *Regional Studies* 34, no. 6 (2000): 563-569; A.T. Flegg and C.D. Webber, "Regional Size, Industrial Location and Input-Output Expenditure Coefficients," *Regional Studies* 32, no. 55 (1997):435-444; A.T. Flegg and C.D. Webber, "On the Appropriate Use of Location Quotients in Generating Regional Input-Output Tables: Reply," *Regional Studies* 31, no. 8 (1997): 795-805; A.T. Flegg and C.D. Webber, "On the Appropriate Use of Location Quotients in Generating Regional Input-Output Tables," *Regional Studies* 29, no. 6 (1994): 547-561.

34 For a complete discussion of CILQ IO regionalizing methods, see Chapter 8 in Ronald E. Miller and Peter D. Blair, *Input-Output Analysis: Foundations and Extensions* (New York: Cambridge University Press, 2009).

Where the CILQ (left-hand) multiplicative term has a limiting value of 1.0, and:

J = jobs

i = row industry

j = column industry

R = region

N = nation

γ = calibrating power term

For diagonal elements (*i.e.*, where i equals j) and for the household column, we follow Flegg and apply a standard simple location quotient, again with a ceiling of 1.0:

$$FLQ_{i,j} = \left(\frac{\frac{J_i^R}{\Sigma J^R}}{\frac{J_i^N}{\Sigma J^N}} \right) \times \left(log_2 \left(1 + \frac{\Sigma J^R}{\Sigma J^N} \right) \right)^{\gamma}$$

One final model element needs regionalizing, and that is the household row. The regionalizing term for the household row indicates the proportion of total labour requirements obtained from workers residing in the region. Lacking region specific data on commuting, we assume a household row regionalizing factor of 75%, thereby assuming that 25% of labour needs are provided by regional in-commuters.

Consider next the calibrating power term gamma shown in the Flegg equations above. The most recent empirical tests of the Flegg LQ approach suggest an optimal value for the calibrating term equal to roughly 0.2,[35] although Lightcast comparisons of the Canada Flegg model and the Lightcast IO US model suggest a value of 0.1 is better suited for the more dispersed regional economies of North America.

Let us return again to our illustrative FLQ regionalizing process. Based on the formulation presented above, we create a separate matrix of FLQs for all industries in a region. For example, the cell containing the FLQ of .12 in Table A5.3 was calculated by using Industry 1 as the row industry (or i in the Flegg equation above) and Industry 2 as the column industry (or j in the Flegg equation above). The FLQ is interpreted as measuring the proportion of regional requirements of input i by sector j that is satisfied by firms

Table A5.3: **Sample FLQ matrix**

	Industry 1	Industry 2	...	Households
Industry 1	.88	.12	...	.47
Industry 2	.98	1	...	.09
...	...	...	...	...
Households	.20	.76	...	1

35 Flegg et al., "Regional Input-Output Tables and the FLQ Formula," 703-721.

located in the region. In our example above, 12% of Industry 2's demand for the output of Industry 1 are satisfied by local Industry 1. The remaining 88% (= 100% - 12%) of demand is assumed to be imported. On this definition, the matrix of FLQ's can be interpreted as a matrix of "regional trade coefficients."

The "regionalizing" process is completed by computing the element-by-element product of region-based FLQs, interpreted as regional trade coefficients, and national input-output coefficients, interpreted as technical coefficients. The result is a matrix of regional input-output coefficients.

Consider the mathematics. The regional FLQ matrix is constructed with the same dimensions as the national A matrix. Industries that do not exist in the region appear in the Flegg matrix with zero rows and zero columns. The element-by-element product appears then as follows:

$$A^R = A^N \, o \, F^R$$

Where:

o = Hadamard (element-by-element) multiplication

A^N = national IO coefficients matrix (*i.e.*, technical coefficients)

F^R = FLQ matrix

A^R = regional IO coefficients matrix

Estimating regional input-output multiplier effects

The most important use of regional input-output models is the estimation of regional multiplier effects. Regional IO multiplier analysis has a long tradition in regional science and is nowadays viewed as the exclusive method for estimating regional multiplier effects. Following standard practice, input-output multiplier effects are estimated via the regional IO multiplier matrix derived from identity matrix I and the regional IO coefficients matrix A^R as follows:

$$B^R = (I - A^R)^{-1}$$

Where:

B^R = multiplier matrix for region R

Given a unit change (*i.e.*, dollar change) in column industry activity (called the "initial" change), multiplier matrix elements show the resulting direct, indirect and induced change in row industry sales. "Direct" change refers to resulting input purchases. "Indirect" change refers to additional input purchases created as a result of the direct purchases. "Induced" change refers to sales resulting from the spending of newly created household incomes. Job and income effects are obtained by computing jobs-to-sales and income-to-sales ratios and applying these to regional multiplier matrix elements.

Appendix 6: Value per credit and the Mincer function

Two key components in determining the economic impact and return on investment of education are 1) the value of the students' educational achievements, and 2) the change in that value over the students' working careers. Both of these components are described in detail in this appendix.

Value per credit

Typically, the educational achievements of students are marked by the credentials they earn. However, not all students who attended TRU in the 2023-24 analysis year obtained a degree or certificate. Some returned the following year to complete their education goals, while others took a few courses and entered the workforce without graduating. As such, the only way to measure the value of the students' achievement is through their course load, measured in terms of credits. This approach by correlation should be discounted by 10%.[36] As such, we reduce the marginal differences between education levels by 10%.

Next we map the credit production of TRU's FY 2023-24 student population to the education ladder. Table 1.2 provides information on the credit production of TRU's students broken out by educational achievement. In total, students completed 400,469 credits during the analysis year. We map each of these credits to the education ladder depending on the students' education level and the average number of credits they completed during the year. For example, bachelor's degree graduates are allocated to the stage between the high school diploma and the bachelor's degree, and the average number of credits they complete informs the shape of the distribution curve used to spread out their total credit production within that stage of the progression.

The sum product of the credits earned at each step within the education ladder and their corresponding value yields the students' aggregate annual increase in earnings (ΔE), as shown in the following equation:

$$\Delta E = \sum_{i=1}^{n} e_i h_i \text{ where } i \in 1, 2, \ldots n$$

and n is the number of steps in the education ladder, e_i is the marginal earnings gain at step i, and h_i is the number of credits completed at step i.

36 David Card, "The causal effect of education on earnings," *Handbook of Labor Economics* 3 (1999): 1801-1863. Card acknowledges that ability is unobservable and the instrumental variable techniques for measuring the ability bias are different. He concludes that the "best available" evidence suggests a "small upward bias (on the order of 10%)."

Table A6.1 displays the result for students' aggregate annual increase in earnings (*ΔE)*, a total of $66.8 million. By dividing this value by the students' total production of 400,469 credits during the analysis year, we derive an overall average value of $167 per credit. This allows us to see the benefits to all students who attended TRU, not just those who earned a credential.

To calculate the value per credit, we first determine how many credits are required to complete each education level. For example, assuming that one full-time equivalent (FTE) is equal to 30 credits, a student generally completes 60 credits (or two full-load years' worth of study) in order to move from a high school diploma to a two-year diploma, another 60 credits to move from a two-year diploma to a bachelor's degree, and so on. This progression of credits generates an education ladder beginning at the less than high school level and ending with the completion of a doctoral degree, with each level of education representing a separate stage in the progression.

The second step is to assign a unique value to the credits in the education ladder based on the wage differentials presented in Table 1.4.[37] For example, the difference in earnings between a high school diploma and a bachelor's degree is $19,100. We spread this $19,100 wage differential across the 60 credits that occur between the high school diploma and the bachelor's degree, applying a ceremonial "boost" to the last credit in the stage to mark the achievement of the degree.[38] We repeat this process for each education level in the ladder.

Table A6.1:
Aggregate annual increase in earnings of TRU students and average value per credit

Aggregate annual increase in earnings	$66,774,197
Total credits in FY 2023-24	400,469
Average value per credit	**$167**

Source: Lightcast impact model.

Mincer function

The $167 value per credit in Table A6.1 only tells part of the story, however. Human capital theory holds that earnings levels do not remain constant; rather, they start relatively low and gradually increase as the worker gains more experience. Research also shows that the earnings increment between educated and non-educated workers grows through time. These basic patterns in earnings over time were originally identified by Jacob Mincer, who viewed the lifecycle earnings distribution as a function with the key elements being earnings, years of education, and work experience, with age serving

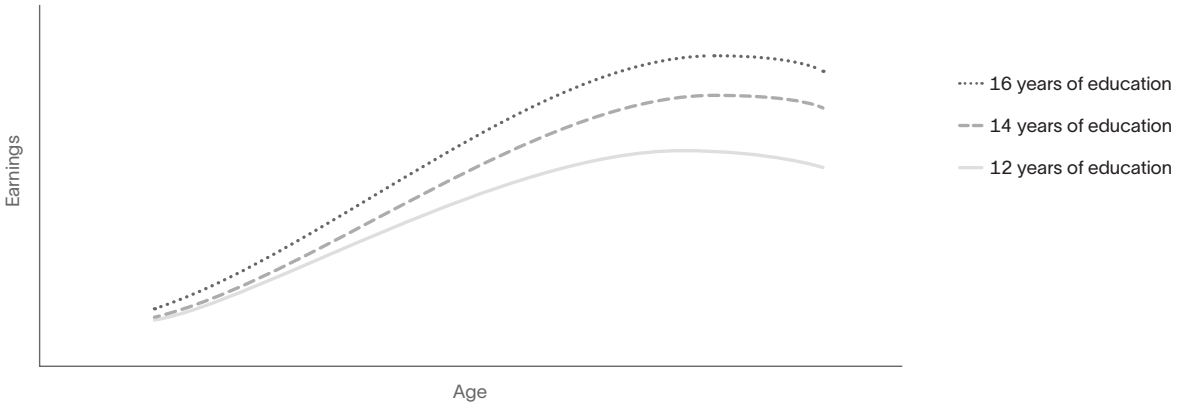
37 The value per CHE is different between the economic impact analysis and the investment analysis. The economic impact analysis uses the region as its background, and therefore uses regional earnings to calculate the value per CHE. The investment analysis uses the province as its backdrop and, therefore, uses province earnings. The methodology outlined in this appendix will use regional earnings; however, the same methodology is followed for the investment analysis when province earnings are used.

38 Economic theory holds that workers that acquire education credentials send a signal to employers about their ability level. This phenomenon is commonly known as the "sheepskin" or "signaling" effect. The ceremonial boosts applied to the achievement of degrees in the Lightcast impact model are derived from Ana Ferrer and Craig Riddell, "The role of credentials in the Canadian labour market," *Canadian Journal of Economics* 35, no. 4 (November 2002): 879-905.

as a proxy for experience.[39] While some have criticized Mincer's earnings function, it is still upheld in recent data and has served as the foundation for a variety of research pertaining to labour economics. Those critical of the Mincer function point to several unobserved factors such as ability, socioeconomic status, and family background also positively correlate with higher earnings. Failure to account for these factors results in what is known as an "ability bias." Research by Card (1999) suggests that the benefits estimated using Mincer's function are biased upwards by 10% or less. As such, we reduce the estimated benefits by 10%.

Figure A6.1 illustrates several important points about the Mincer function. First, as demonstrated by the shape of the curves, an individual's earnings initially increase at an increasing rate, then increase at a decreasing rate, reach a maximum somewhere well after the midpoint of the working career, and then decline in later years. Second, individuals with higher levels of education reach their maximum earnings at an older age compared to individuals with lower levels of education (recall that age serves as a proxy for years of experience). And third, the benefits of education, as measured by the difference in earnings between education levels, increase with age.

Figure A6.1: Lifecycle change in earnings



In calculating the alumni impact in Chapter 2, we use the slope of the curve in Mincer's earnings function to condition the $167 value per credit to the students' age and work experience.[40] To the students just starting their career during the analysis year, we apply a lower value per credit; to the students in the latter half or approaching the end of their careers we apply a higher value per credit. The original $167 value per credit applies only to the credit production of students precisely at the midpoint of their careers during the analysis year.

39 See Mincer, 1958 and Jacob Mincer, "Schooling, Experience and Earnings" (New York: National Bureau of Economic Research, 1974). See also Gary S. Becker, *Human Capital: a Theoretical Analysis with Specific Reference to Education* (New York: Columbia College Press for NBER, 1964).

40 The Mincer equation is computed based on estimated coefficients presented in 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. These are adjusted to current year dollars in the usual fashion by applying the GRP implicit price deflator. The function does not factor in temporary economic volatility, such as high growth periods or recessions. In the long run, however, the Mincer function is a reasonable predictor.

In Chapter 3, we again apply the Mincer function, this time to project the benefits stream of TRU's FY 2023-24 student population into the future. Here too the value per credit is lower for students at the start of their career and higher near the end of it, in accordance with the scalars derived from the slope of the Mincer curve illustrated in Figure A6.1.

Conclusion

This appendix demonstrates the significance of the value per credit and the Mincer function in determining the initial effect of alumni on the regional economy in Chapter 2 and the students' return on their educational investment in 3. Both chapters provide further discussion on the role that the students' credit production and corresponding increase in earnings plays in calculating the study outcomes.

Appendix 7: Alternative education variable

In a scenario where TRU does not exist, some of its students would still be able to avail themselves of an alternative comparable education. These students create benefits in the region even in the absence of the university. The alternative education variable accounts for these students and is used to discount the benefits presented in the analysis.

Recall this analysis considers only relevant economic information regarding TRU. Considering the existence of various other academic institutions surrounding TRU, we must assume that a portion of the students could find alternative educations and either remain in or return to the Thompson Rivers College Region. For example, some students may participate in online programs while remaining in the region. Others may attend an out-of-region institution and return to the Thompson Rivers College Region upon completing their studies. For these students—who would have found an alternative education and produced benefits in the Thompson Rivers College Region regardless of the presence of TRU—we discount the benefits attributed to TRU. An important distinction must be made here: the benefits from students who would find alternative educations outside the region and not return to the Thompson Rivers College Region are *not* discounted. Because these benefits would not occur in the region without the presence of TRU, they must be included.

In the absence of TRU, we assume 15% of students attending TRU would find alternative education opportunities and remain in or return to the Thompson Rivers College Region. We account for this by discounting the alumni impact, the benefits to taxpayers, and the benefits to society in British Columbia in Chapters 2 and 3 by 15%. In other words, we assume 15% of the benefits created by students attending TRU would have occurred anyways in the counterfactual scenario where TRU does not exist. A sensitivity analysis of this adjustment is presented in Appendix 1.

Appendix 8: Overview of investment analysis measures

This appendix provides context to the investment analysis results using the simple hypothetical example summarized in Table A8.1 below. The table shows the projected benefits and costs for a single student over time and associated investment analysis results.[41]

Table A8.1: Example of the benefits and costs of education for a single student

1	2	3	4	5	6
Year	**Tuition**	**Opportunity cost**	**Total cost**	**Higher earnings**	**Net cash flow**
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
Net present value			**$21,500**	**$35,753**	**$14,253**

Benefit-cost ratio	Return on investment	Internal rate of return	Payback period (years)
1.7	0.7	18.0%	4.2

Assumptions are as follows:

- Benefits and costs are projected out ten years into the future (Column 1).
- The student attends the institution for one year, and the cost of tuition is $1,500 (Column 2).
- Earnings forgone while attending university for one year (opportunity cost) come to $20,000 (Column 3).

41 Note that this is a hypothetical example. The numbers used are not based on data collected from an existing institution.

- Together, tuition and earnings forgone cost sum to $21,500. This represents the out-of-pocket investment made by the student (Column 4).
- In return, the student earns $5,000 more per year than he would have otherwise earned without the education (Column 5).
- The net cash flow (NCF) in Column 6 shows higher earnings (Column 5) less the total cost (Column 4).
- The assumed "going rate" of interest is 4%, the rate of return from alternative investment schemes for the use of the $21,500.

Results are expressed in standard investment analysis terms, which are as follows: the net present value, the internal rate of return, the benefit-cost ratio, the return on investment, and the payback period. Each of these is briefly explained below in the context of the cash flow numbers presented in Table A8.1.

Net present value

The student in Table A8.1 can choose either to attend university or to forgo postsecondary education and maintain their present employment. If they decide to enrol, certain economic implications unfold. Tuition and fees must be paid, and earnings will cease for one year. In exchange, the student calculates that with postsecondary education, their earnings 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 enrol? If he adds up higher earnings of $5,000 per year for the remaining nine years in Table A8.1, 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 earnings forgone) are felt immediately because they are incurred today, in the present. Benefits, 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.[42]

Let us take 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. 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.

42 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.

The goal is to express all future higher earnings in present value terms so that they can be compared to investments incurred today (in this example, tuition plus earnings forgone). As indicated in Table A8.1, the cumulative present value of $5,000 worth of higher earnings between years 2 and 10 is $35,753 given the 4% interest rate, far lower than the undiscounted $45,000 discussed above.

The net present value of the investment is $14,253. This is simply the present value of the benefits less the present value of the costs, or $35,753 - $21,500 = $14,253. In other words, the present value of benefits exceeds the present value of costs by as much as $14,253. 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

The internal rate of return is another way of measuring the worth of investing in education using the same cash flows shown in Table A8.1. 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 discussion of the net present value above, the model applies the "going rate" of interest of 4% and computes a positive net present value of $14,253. The question now is what the interest rate would 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 A8.1. Or, if a discount rate of 18% were applied to the net present value 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 earnings 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 10% 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 approach for calculating the internal rate of return can sometimes generate wild or unbelievable results that defy the imagination. Technically, the approach requires at least one negative cash flow to offset all subsequent positive flows. For example, if the student works full-time while attending university, 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 would still be possible to compute the internal rate of return, but it would be a staggering 333% because only a negative $1,500 cash flow would be offsetting nine subsequent years of $5,000 worth of higher earnings.

Although the 333% return would technically be correct, it would not be consistent with the conventional understanding of returns expressed as percentages.

Benefit-cost ratio

The benefit-cost ratio is simply the present value of benefits divided by present value of costs, or $35,753 ÷ $21,500 = 1.7 (based on the 4% discount rate). Of course, any change in the discount rate would also change the benefit-cost ratio. Applying the 18% internal rate of return discussed above would reduce the benefit-cost ratio to 1.0, the breakeven solution where benefits just equal costs. Applying a discount rate higher than the 18% would reduce the ratio to lower than 1.0, 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.

Return on investment

The return on investment is similar to the benefit-cost ratio, except that it measures the net (as opposed to gross) benefits of an investment relative to the investment's cost. In terms of dollars, the return on investment represents the benefits received over and above the original investment. It is calculated simply by dividing the net present value of the benefits by the total costs of the investment, or $15,080 ÷ $21,500 = 0.7 (again based on the 4% discount rate). This means that the investment will return the original cost of the investment plus an additional $.70 for every dollar invested. A positive value for the return on investment measure (*i.e.*, any value above 0) indicates that the investment has been profitable.

Payback period

This is the length of time from the beginning of the investment (consisting of tuition and earnings forgone) until higher future earnings give a return on the investment made. For the student in Table A8.1, it will take roughly 4.2 years of $5,000 worth of higher earnings to recapture his investment of $1,500 in tuition and the $20,000 in earnings forgone while attending university. Higher earnings that occur 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, the stronger the investment.

Appendix 9: Shutdown point

The investment analysis in Chapter 3 weighs the benefits generated by the university against the provincial taxpayer funding that the university receives to support its operations. An important part of this analysis is factoring out the benefits that the university would have been able to generate anyway, even without provincial taxpayer support. This adjustment is used to establish a direct link between what taxpayers pay and what they receive in return. If the university is able to generate benefits without provincial taxpayer support, then it would not be a true investment.[43]

The overall approach includes a sub-model that simulates the effect on student enrolment if the university loses its provincial funding and has to raise student tuition and fees in order to stay open. If the university can still operate without provincial support, then any benefits it generates at that level are discounted from total benefit estimates. If the simulation indicates that the university cannot stay open, however, then benefits are directly linked to costs, and no discounting applies. This appendix documents the underlying theory behind these adjustments.

Provincial government support versus student demand for education

Figure A9.1 presents a simple model of student demand and provincial government support. The right side of the graph is a standard demand curve (*D*) showing student enrolment as a function of student tuition and fees. Enrolment is measured in terms of total full-time equivalents (FTEs) and expressed as a percentage of the university's current FTE production. Current student tuition and fees are represented by *p*', and provincial government support covers *C*% of all costs. At this point in the analysis, it is assumed that the university has only two sources of revenues: 1) student tuition and fees and 2) provincial government support.

Figure A9.2 shows another important reference point in the model—where provincial government support is 0%, student tuition and fees are increased to *p*", and the FTE production is at *Z*% (less than 100%). The reduction in FTEs reflects the price elasticity of the students' demand for education, *i.e.*, the extent to which the students' decision to attend university is affected by the change in tuition and fees. Ignoring for the moment those issues concerning the university's minimum operating scale (considered below in the section called "Shutdown Point"), the implication for the investment analysis is that benefits to provincial government must be adjusted to net out the benefits that

43 Of course, as public training providers, TRU would not be permitted to continue without public funding, so the situation in which it would lose all provincial support is entirely hypothetical. The purpose of the adjustment factor is to examine TRU in 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 them.

the university can provide absent provincial government support, represented as *Z%* of the university's current FTE production in Figure A9.2.

Figure A9.1

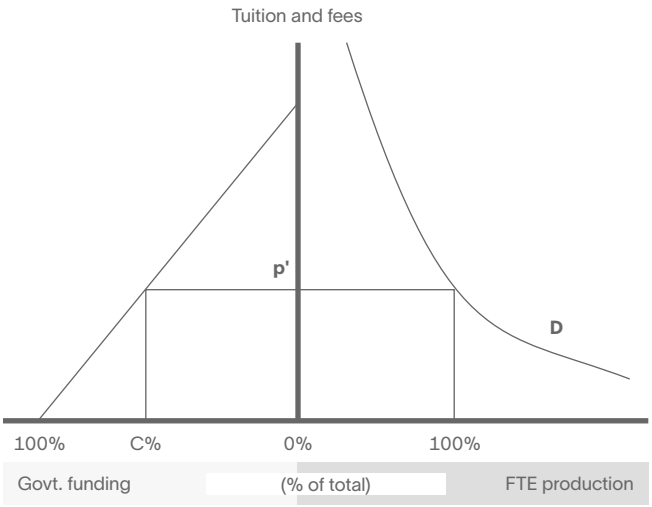
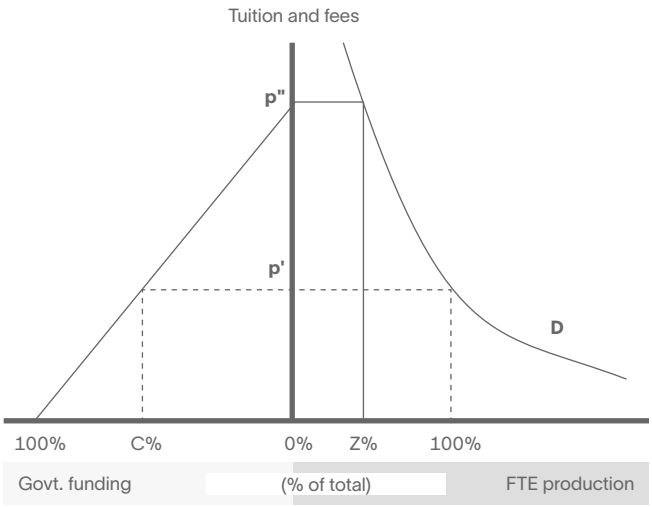


Figure A9.2



To clarify the argument, it is useful to consider the role of enrolment in the larger benefit-cost model. Let *B* equal the benefits attributable to provincial government support. The analysis derives all benefits as a function of student enrolment, measured in terms of FTEs produced. For consistency with the graphs in this appendix, *B* is expressed as a function of the percent of the university's current FTE production. Equation 1 is thus as follows:

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

This reflects the total benefits generated by enrolments at their current levels.

Consider benefits now with reference to Figure A9.2. The point at which provincial government support is zero nonetheless provides for *Z%* (less than 100%) of the current enrolment, and benefits are symbolically indicated by the following equation:

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

Inasmuch as the benefits in equation 2 occur with or without provincial government support, the benefits appropriately attributed to provincial government support are given by equation 3 as follows:

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

Calculating benefits at the shutdown point

Postsecondary institutions cease to operate when the revenue they receive from the quantity of education demanded is insufficient to justify their continued operations. This is commonly known in economics as the shutdown point. The shutdown point is introduced graphically in Figure A9.3 as *S%*. The location of point *S%* indicates that the university can operate at an even lower enrolment level than *Z%* (the point at which the university receives zero provincial government funding). Provincial government support at point *S%* is still zero, and student tuition and fees have been raised to *p'''*. Provincial support is thus credited with the benefits given by equation 3, or $B = B(100\%) - B(Z\%)$. With student tuition and fees still higher than *p'''*, the university would no longer be able to attract enough students to keep the doors open, and it would shut down.

Figure A9.4 illustrates yet another scenario. Here the shutdown point occurs at a level of FTE production greater than *Z%* (the level of zero provincial government support), meaning some minimum level of provincial government support is needed for the university 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 government support is appropriately credited with all the benefits generated by the university's FTE production, or *B = B (100%)*.

Figure A9.3

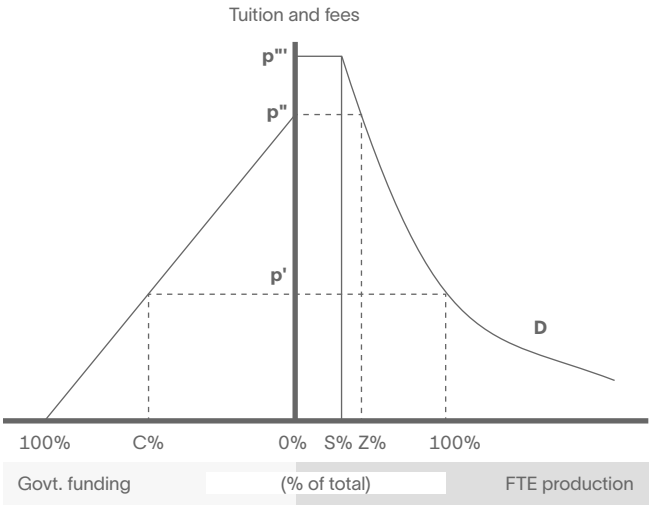
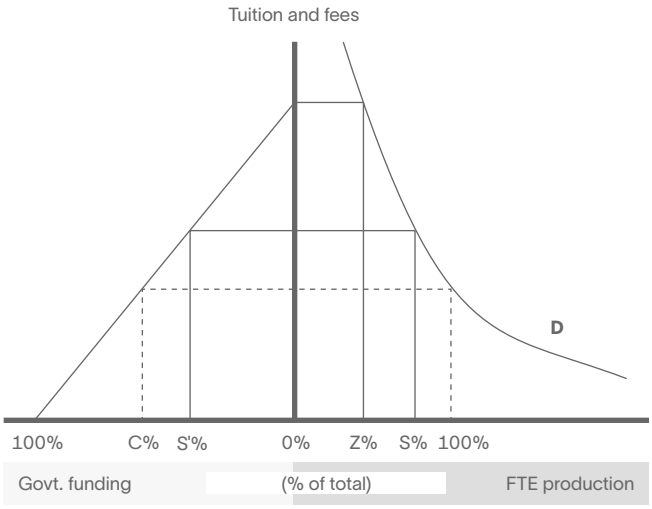


Figure A9.4



Appendix 10: Social externalities

Education has a predictable and positive effect on a diverse array of social benefits. These, when quantified in dollar terms, represent significant social savings that directly benefit society as a whole, including taxpayers. In this appendix, we discuss the following three main benefit categories: 1) improved health, 2) reductions in crime, and 3) reductions in income assistance.

It is important to note that the data and estimates presented here should not be viewed as exact, but rather as indicative of the positive impacts of education on an individual's quality of life. The process of quantifying these impacts requires a number of assumptions to be made, creating a level of uncertainty that should be borne in mind when reviewing the results.

Health

Statistics clearly show the correlation between increases in education and improved health. The manifestations of this are found in four health-related variables: smoking, alcoholism, obesity, and mental illness. There are other health-related areas that link to educational attainment, but these are omitted from the analysis until we can invoke adequate (and mutually exclusive) databases and are able to fully develop the functional relationships between them.

Smoking

Figure A10.1 shows the prevalence of cigarette smoking among adults aged 15 years and over, based on data provided by the Health Canada Canadian Tobacco Use Monitoring Survey (CTUMS). As indicated, the percent of persons who smoke begins to decline beyond the level of less than high school.

The Health Canada CTUMS also reports the percentage of adults who are current smokers by province. We use this information to create an index value by which we adjust the national prevalence data on smoking to each province. For example, 9.9% of British Columbia's adults were smokers in 2011, relative to 12.3% for the nation. We thus apply a scalar of 0.8 to the national probabilities of smoking in order to adjust them to the province of British Columbia.

Alcohol abuse

Alcoholism is difficult to measure and define. There are many patterns of drinking, ranging from abstinence to heavy drinking. Alcohol abuse is riddled with social costs, including healthcare expenditures for treatment, prevention, and support; workplace losses due to reduced worker productivity; and other effects.

Figure A10.1: Prevalence of smoking by education level

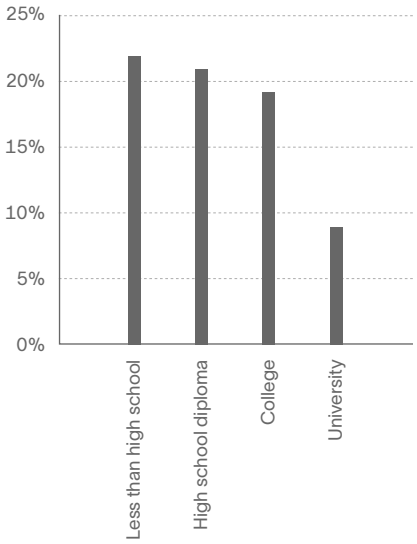


Figure A10.2: Prevalence of heavy drinking by sex and education level

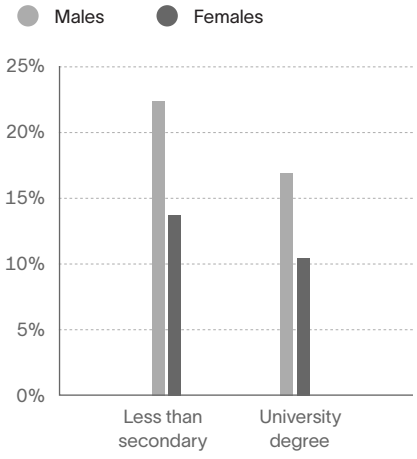


Figure A10.2 compares the prevalence rate of heavy drinking among males and females aged 15 at the less than secondary level to the prevalence rate at the university degree level, based on data provided by Statistics Canada and the Canadian Centre on Substance Abuse Canadian Addiction Survey (CAS). These statistics give an indication of the correlation between education and the reduced probability of alcoholism. As indicated, heavy drinking falls from a 18.1% prevalence rate among males at a less than secondary level to a 13.7% prevalence rate among males with a university degree. Similarly, heavy drinking among females ranges from a 12.1% prevalence rate at the less than secondary level to a 9.2% prevalence rate at the university degree level.

Obesity

The rise in obesity and diet-related chronic diseases has led to increased attention on how expenditures relating to obesity have increased in recent years. The economic burden of obesity consists of both the direct costs to the health care system and the indirect costs to productivity, as defined and measured by a joint report from the Public Health Agency of Canada and the Canadian Institute of Health Information.[44]

Figure A10.3 shows the prevalence of obesity among adults aged 18 years and over by education and sex, based on data provided by Statistics Canada. As indicated, university graduates are less likely to be obese than individuals with a high school diploma. However, the prevalence of obesity among females with some college is actually greater than females with no more than a high school diploma. In general, though, obesity tends to decline with increasing levels of education.

Mental illness

The economic burden of mental health problems in Canada includes the cost of treatment and lost productivity in the workplace. Figure A10.4 summarizes the prevalence rate among adults aged 15 years and older that perceive their mental health to be fair or poor by education level, based on combined data from Statistics Canada and the Government of Canada. As shown, college graduates are less likely to suffer from fair or poor mental health than someone with a secondary or less than secondary education, with the prevalence of mental illness being the highest among people without a high school diploma.

Figure A10.3: Prevalence of obesity by education level

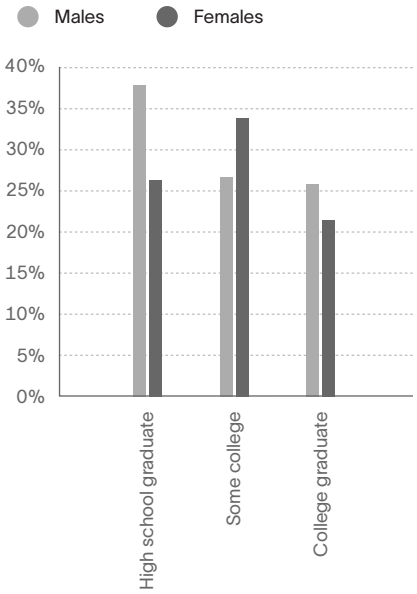
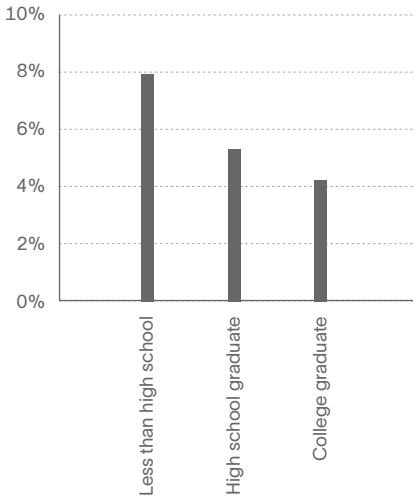


Figure A10.4: Prevalence of fair or poor mental health by education level



44 Public Health Agency of Canada and the Canadian Institute for Health Information, *Obesity in Canada.* https://secure.cihi.ca/free_products/Obesity_in_canada_2011_en.pdf.

Crime

As people reach higher education levels, they are statistically less likely to commit crimes. The analysis identifies the following three types of crime-related expenses: 1) criminal justice expenditures, including police protection, judicial and legal, and corrections, 2) victim costs, and 3) productivity lost as a result of time spent in jail or prison rather than working.

Figure A10.5 displays the probability that an individual will be placed in custody by education level. Data are derived from the breakdown of adults in correctional services by province as provided by combined data from Statistics Canada and the Canadian Centre for Justice Statistics, divided by the total adult population. As indicated, the probability of being placed in custody drops on a sliding scale as education levels rise.

Victim costs comprise health care, productivity losses, stolen/damaged property, and third-party costs (including victim services). Some of these costs are hidden, while others are available in various databases. Estimates of victim costs vary widely, attributable to differences in how the costs are measured. The lower end of the scale includes only tangible out-of-pocket costs, while the higher end includes intangible costs related to pain and suffering.

Yet another measurable benefit is the added economic productivity of people who are now gainfully employed, all else being equal, and not in custody. The measurable productivity benefit is simply the number of additional people employed multiplied by the average earnings of their corresponding education levels.

Income assistance

Statistics show that as education levels increase, the unemployment rate declines, as shown in Figure A10.6. These data are provided by the Statistics Canada Labour Force Survey (LFS). Unemployment rates range from 10% for those with less than a high school diploma to 3% for those at the bachelor's degree level.

Figure A10.7 relates the breakdown of employment-related social assistance recipients by gender and education level, derived from data provided by Statistics Canada, the Centre for Urban and Community Studies, and the Federal-Provincial-Territorial Directors of Income Support. As shown, the demographic characteristics of social assistance recipients are weighted heavily towards the less than high school and high school categories, with a much smaller representation of individuals with greater than a high school education.

Figure A10.5:
Percent of adult population that are in custody by education level

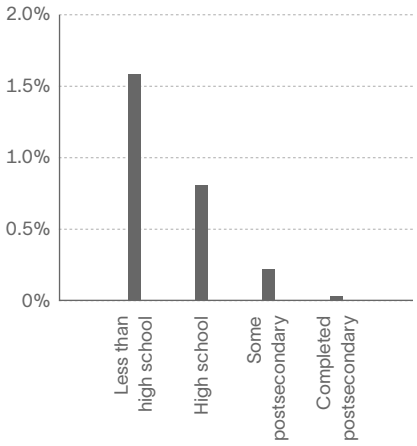


Figure A10.6: Unemployment rates by education level

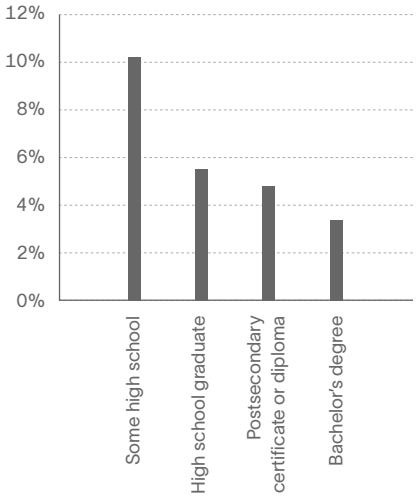


Figure A10.7: Probability of claiming employment-related social assistance by gender and education level