OCTOBER 2020

BLACKHAWK TECHNICAL COLLEGE

The Economic Value of Blackhawk Technical College

MAIN REPORT

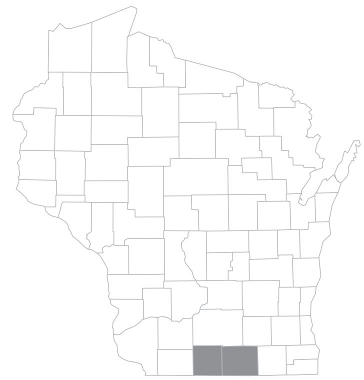
Emsi

Contents

Executive Summary

This report assesses the impact of Blackhawk Technical College (BTC) on the district's economy and the benefits generated by the college for students, taxpayers, and society. The results of this study show that BTC creates a positive net impact on the district's economy and generates a positive return on investment for students, taxpayers, and society.

Economic impact analysis



THE BTC DISTRICT

During the analysis year, BTC spent $23.9 million on payroll and benefits for 592 full-time and part-time employees and spent another $12.7 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 district's economy, resulting in the commonly referred to multiplier effects. This analysis estimates the net economic impact of BTC that directly takes into account the fact that state and local dollars spent on BTC could have been spent elsewhere in the district if not directed towards BTC 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 BTC.

The additional income of ***$85.9 million*** *created by BTC is equivalent to supporting* ***1,564 jobs*** *in the BTC District.*

This analysis shows that in fiscal year (FY) 2018-19, operations and student spending of BTC, together with the enhanced productivity of its alumni, generated **$85.9 million** in added income for the BTC District[1] economy. The impact of **$85.9 million** is equivalent to supporting **1,564 jobs**. For further perspective, this means that **one out of every 71 jobs** in the BTC District is supported by

1 For the purposes of this analysis, the BTC District is comprised of Green and Rock Counties.

the activities of BTC and its students. These economic impacts break down as follows:

Operations spending impact

Payroll and benefits to support BTC's day-to-day operations amounted to $23.9 million. The college's non-pay expenditures amounted to $12.7 million. The net impact of operations spending by the college in the BTC District during the analysis year was approximately **$28.2 million** in added income, which is equivalent to supporting **651 jobs**.

Student spending impact

Around 24% of credit students attending BTC originated from outside the district. Some of these students relocated to the BTC District to attend the college. In addition, some students are residents of the BTC District who would have left the district if not for the existence of BTC. The money that these students, referred to as retained students, spent toward living expenses in the BTC District is attributable to BTC.

The expenditures of relocated and retained students in the district during the analysis year added approximately **$8.3 million** in income for the BTC District economy, which is equivalent to supporting **194 jobs**.

Alumni impact

Over the years, students gained new skills, making them more productive workers, by studying at BTC. Today, thousands of these former students are employed in the BTC District.

The accumulated impact of former students currently employed in the BTC District workforce amounted to **$49.5 million** in added income for the BTC District economy, which is equivalent to supporting **720 jobs**.

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, as well as money that leaks out of the district as it is spent at out-of-district businesses. Income, on the other hand, is a net measure that excludes these intermediary costs and leakages, 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 or not it is profitable. This study considers BTC as an investment from the perspectives of students, taxpayers, and society.

Student perspective

Students invest their own money and time in their education to pay for tuition, books, and supplies. Many take out student loans to attend the college, which they will pay back over time. While some students were employed while attending the college, students overall forewent earnings that they would have generated had they been in full employment instead of learning. Summing these direct outlays, opportunity costs, and future student loan costs yields a total of **$28.5 million** in present value student costs.

In return, students will receive a present value of **$136.5 million** in increased earnings over their working lives. This translates to a return of **$4.80** in higher future earnings for every dollar that students invest in their education at BTC. The corresponding annual rate of return is **20.8%**.

Taxpayer perspective

Taxpayers provided **$29 million** of state and local funding to BTC in FY 2018-19. In return, taxpayers will receive an estimated present value of **$46.1 million** in added tax revenue stemming from the students' higher lifetime earnings and the increased output of businesses.

Savings to the public sector add another estimated **$3.2 million** in benefits due to a reduced demand for government-funded social services in Wisconsin. For every tax dollar spent educating students attending BTC, taxpayers will receive an average of **$1.70** in return over the course of the students' working lives. In other words, taxpayers enjoy an annual rate of return of **4.9%**.

For every tax dollar spent educating students attending BTC, taxpayers will receive an average of **$1.70** *in return over the course of the students' working lives.*

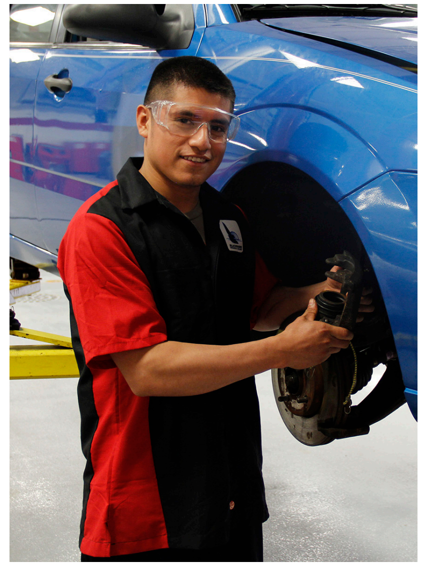
Social perspective

People in Wisconsin invested **$61 million** in BTC in FY 2018-19. This includes the college's expenditures, student expenses, and student opportunity costs. In return, the state of Wisconsin will receive an estimated present value of **$472.6 million** in added state revenue over the course of the students' working lives. Wisconsin will also benefit from an estimated **$7.9 million** in present value social savings related to reduced crime, lower welfare and unemployment, and increased health and well-being across the state. For every dollar society invests in BTC, an average of **$7.90** in benefits will accrue to Wisconsin over the course of the students' careers.

Acknowledgments

Emsi gratefully acknowledges the excellent support of the staff at Blackhawk Technical College in making this study possible. Special thanks go to Dr. Tracy Pierner, President, who approved the study, and to Dr. Jon Tysse, Executive Director, Office of Institutional Research & Effectiveness (OIRE); Brittany Wierzba, Analyst, OIRE; Renea Ranguette, Vice President, Administrative Services; and Jennifer Moore, Benefits & Compensation Specialist, Human Resources, who collected much of the data and information requested. Any errors in the report are the responsibility of Emsi and not of any of the above-mentioned individuals.

Introduction



Blackhawk Technical College (BTC), established in 1911, has today grown to serve 6,194 credit and 2,050 non-credit students. The college is led by Dr. Tracy Pierner, President. The college's service region, for the purpose of this report, is referred to as the BTC District and consists of Green and Rock Counties.

While BTC affects the district in a variety of ways, many of them difficult to quantify, this study is concerned with considering its economic benefits. The college naturally helps students achieve their individual potential and develop the knowledge, skills, and abilities they need to have fulfilling and prosperous careers. However, BTC impacts the BTC District beyond influencing the lives of students. The college's program offerings supply employers with workers to make their businesses more productive. The college, its day-to-day operations, its construction activities, and the expenditures of its students support the district's economy through the output and employment generated by district vendors. The benefits created by the college extend as far as the state treasury in terms of the increased tax receipts and decreased public sector costs generated by students across the state.

BTC impacts the BTC District beyond influencing the lives of students.

This report assesses the impact of BTC as a whole on the district's economy and the benefits generated by the college for students, taxpayers, and society. The approach is twofold. We begin with an economic impact analysis of the college on the BTC District economy. To derive results, we rely on a specialized Multi-Regional Social Accounting Matrix (MR-SAM) model to calculate the added income created in the BTC District economy as a result of increased consumer spending and the added knowledge, skills, and abilities of students. Results of the economic impact analysis are broken out according to the following impacts: 1) impact of the college's day-to-day operations, 2) impact of student spending, and 3) impact of alumni who are still employed in the BTC District workforce.

The second component of the study measures the benefits generated by BTC for the following stakeholder groups: students, taxpayers, and society. For students, we perform an investment analysis to determine how the money spent by students on their education performs as an investment over time. The students' investment in this case consists of their out-of-pocket expenses, the cost of interest incurred on student loans, and the opportunity cost of attending the college as opposed to working. In return for these investments, students receive a lifetime of higher earnings. For taxpayers, the study measures the benefits to state taxpayers in the form of increased tax revenues and public sector savings stemming from a reduced demand for social services. Finally, for society, the study assesses how the students' higher earnings and improved quality of life create benefits throughout Wisconsin as a whole.

The study uses a wide array of data that are based on several sources, including the FY 2018-19 academic and financial reports from BTC; industry and employment data from the Bureau of Labor Statistics and Census Bureau; outputs of Emsi's impact model and MR-SAM model; and a variety of published materials relating education to social behavior.

CHAPTER 1:

Profile of Blackhawk Technical College and the Economy

BLACKHAWK Technical College (BTC) is a comprehensive college providing a wide range of affordable and relevant higher education to students in southern Wisconsin. Focusing on the service region of Rock and Green Counties, BTC's four campuses and online education options make it easy for students to pursue their careers and dreams close to home. In FY 2018-19, the college had an enrollment of more than 8,200 credit and non-credit students.

BTC has been providing educational opportunities to members of its community for over 100 years. In addition to its four campuses, BTC has additional branch services at the Center for Transportation Studies and the Advanced Manufacturing Center. BTC purchased a tract of land in 2019 with the intention of building a new Public Safety and Transportation Training Center. The construction of this center will improve student, staff, and visitor safety; reduce operational costs from the rental of/travel to other facilities; and increase professional development and new training offerings for community partners.

With more than 60 academic program offerings and 70 college transfer agreements, BTC's flexible learning models and hands-on approach make it easy for students to gain skills. The college's program offerings include two-year degrees in traditional fields like nursing, accounting, and culinary arts, as well as shorter-term certificates and technical diplomas in areas like automotive repair, dental assisting, and phlebotomy. BTC also emphasizes non-traditional pathways, like welding programs for women and healthcare occupations for men, to ensure its students have the best chance at pursuing fulfilling careers.

BTC has been providing educational opportunities to members of its community for over 100 years.

BTC offers a variety of non-credit programs and classes that enhance the lives of community members. These include basic education classes like General Educational Development and High School Equivalency Diploma prep, as well as numerous professional training course and other business services to directly support the growth of the local economy. The college also facilitates a variety of health and public safety training classes, like Fire Service, Emergency Medical Services, and Motorcycle Rider Safety.

BTC employee and finance data

The study uses two general types of information: 1) data collected from the college and 2) district economic data obtained from various public sources and Emsi's proprietary data modeling tools.[2] This chapter presents the basic underlying information from BTC used in this analysis and provides an overview of the BTC District economy.

Employee data

Data provided by BTC include information on faculty and staff by place of work and by place of residence. These data appear in Table 1.1. As shown, BTC employed 205 full-time and 387 part-time faculty and staff in FY 2018-19 (including student workers). Of these, 100% worked in the district and 67% lived in the district. These data are used to isolate the portion of the employees' payroll and household expenses that remains in the district's economy.

Revenues

Figure 1.1 shows the college's annual revenues by funding source—a total of $41.4 million in FY 2018-19. As indicated, tuition and fees comprised 11% of total revenue, and revenues from local, state, and federal government sources comprised another 82%. All other revenue (i.e., auxiliary revenue, sales and services, interest, and donations) comprised the remaining 6%. These data are critical in identifying the annual costs of educating the student body from the perspectives of students, taxpayers, and society.

Expenditures

Figure 1.2 displays BTC's expense data. The combined payroll at BTC, including student salaries and wages, amounted to $23.9 million. This was equal to 56% of the college's total expenses for FY 2018-19. Other expenditures, including capital construction, operation and maintenance of plant, depreciation, and purchases of supplies and services, made up $18.9 million. When we calculate the impact of these expenditures in Chapter 2, we exclude expenses for depreciation and interest, as they represent a devaluing of the college's assets rather than an outflow of expenditures.

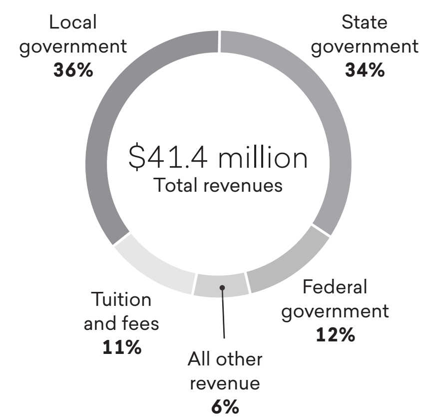
2 See Appendix 5 for a detailed description of the data sources used in the Emsi modeling tools.

TABLE 1.1: EMPLOYEE DATA, FY 2018-19

Full-time faculty and staff	205
Part-time faculty and staff	387
Total faculty and staff	**592**
% of employees who work in the district	100%
% of employees who live in the district	67%

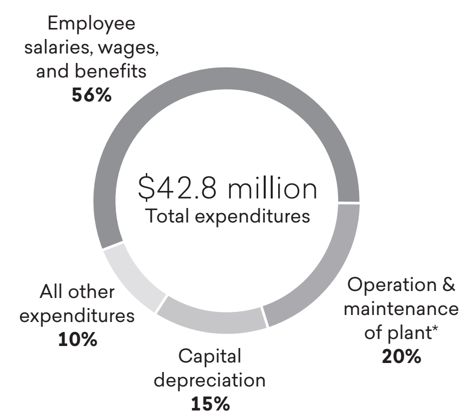
Source: Data provided by BTC.

FIGURE 1.1: BTC REVENUES BY SOURCE, FY 2018-19



Source: Data provided by BTC.
Percentages may not add due to rounding.

FIGURE 1.2: BTC EXPENSES BY FUNCTION, FY 2018-19



* Includes expenditures for capital projects.
Source: Data provided by BTC.
Percentages may not add due to rounding.

Students

BTC served 6,194 students taking courses for credit and 2,050 non-credit students in FY 2018-19. These numbers represent unduplicated student headcounts. The breakdown of the student body by gender was 62% female and 38% male. The breakdown by ethnicity was 74% white, 25% students of color, and 1% unknown. The students' overall average age was 29 years old.[3] An estimated 40% of students remain in the BTC District after finishing their time at BTC, another 56% settle outside the district but in the state, and the remaining 4% settle outside the state.[4]

Table 1.2 summarizes the breakdown of the student population and their corresponding awards and credits by education level. In FY 2018-19, BTC served 214 associate degree graduates and 448 certificate graduates. Another 3,344 students enrolled in courses for credit but did not complete a degree during the reporting year. The college offered dual credit courses to high schools, serving a total of 2,188 students over the course of the year. The college also served 875 basic education students and 572 personal enrichment students enrolled in non-credit courses. Non-degree seeking students enrolled in workforce or professional development programs accounted for 603 students.

We use credit hour equivalents (CHEs) to track the educational workload of the students. One CHE is equal to 15 contact hours of classroom instruction per semester. In the analysis, we exclude the CHE production of personal enrichment students under the assumption that they do not attain knowledge, skills, and abilities that will increase their earnings. The average number of CHEs per student (excluding personal enrichment students) was 8.0.

TABLE 1.2: BREAKDOWN OF STUDENT HEADCOUNT AND CHE PRODUCTION BY EDUCATION LEVEL, FY 2018-19

Category	Headcount	Total CHEs	Average CHEs
Associate degree graduates	214	2,264	10.6
Certificate graduates	448	4,741	10.6
Continuing students	3,344	35,392	10.6
Dual credit students	2,188	9,805	4.5
Basic education students	875	4,723	5.4
Personal enrichment students	572	515	0.9
Workforce/professional development students	603	4,614	7.7
Total, all students	**8,244**	**62,054**	**7.5**
Total, less personal enrichment students	**7,672**	**61,539**	**8.0**

Source: Data provided by BTC.

3 Unduplicated headcount, gender, ethnicity, and age data provided by BTC.
4 Settlement data provided by BTC.

The BTC District economy

BTC serves a district referred to as the BTC District in Wisconsin.[5] Since the college was first established, it has been serving the BTC District by enhancing the workforce, providing local residents with easy access to higher education opportunities, and preparing students for highly-skilled, technical professions. Table 1.3 summarizes the breakdown of the district's economy by major industrial sector ordered by total income, with details on labor and non-labor income. Labor income refers to wages, salaries, and proprietors' income. Non-labor income refers to profits, rents, and other forms of investment income. Together,

TABLE 1.3: INCOME BY MAJOR INDUSTRY SECTOR IN THE BTC DISTRICT, 2019*

Industry sector	Labor income (millions)	Non-labor income (millions)	Total income (millions)**	% of total income	Sales (millions)
Manufacturing	$1,041	$838	$1,878	20%	$5,889
Other Services (except Public Administration)	$124	$914	$1,038	11%	$1,445
Health Care & Social Assistance	$881	$133	$1,014	11%	$1,768
Wholesale Trade	$412	$414	$827	9%	$1,452
Retail Trade	$431	$319	$749	8%	$1,250
Finance & Insurance	$342	$307	$649	7%	$1,145
Construction	$393	$89	$482	5%	$914
Government, Education	$387	$0	$387	4%	$440
Government, Non-Education	$326	$50	$376	4%	$1,329
Transportation & Warehousing	$263	$64	$327	3%	$654
Management of Companies & Enterprises	$288	$26	$314	3%	$509
Information	$105	$152	$256	3%	$433
Professional & Technical Services	$187	$49	$235	2%	$357
Accommodation & Food Services	$138	$71	$209	2%	$408
Utilities	$51	$155	$205	2%	$321
Administrative & Waste Services	$163	$36	$199	2%	$332
Real Estate & Rental & Leasing	$157	$39	$196	2%	$518
Agriculture, Forestry, Fishing & Hunting	$106	$47	$153	2%	$450
Educational Services	$50	$11	$62	1%	$89
Arts, Entertainment, & Recreation	$27	$10	$37	<1%	$64
Mining, Quarrying, & Oil and Gas Extraction	$16	$20	$36	<1%	$63
Total	**$5,887**	**$3,742**	**$9,629**	**100%**	**$19,830**

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

** Numbers may not add due to rounding.

Source: Emsi industry data.

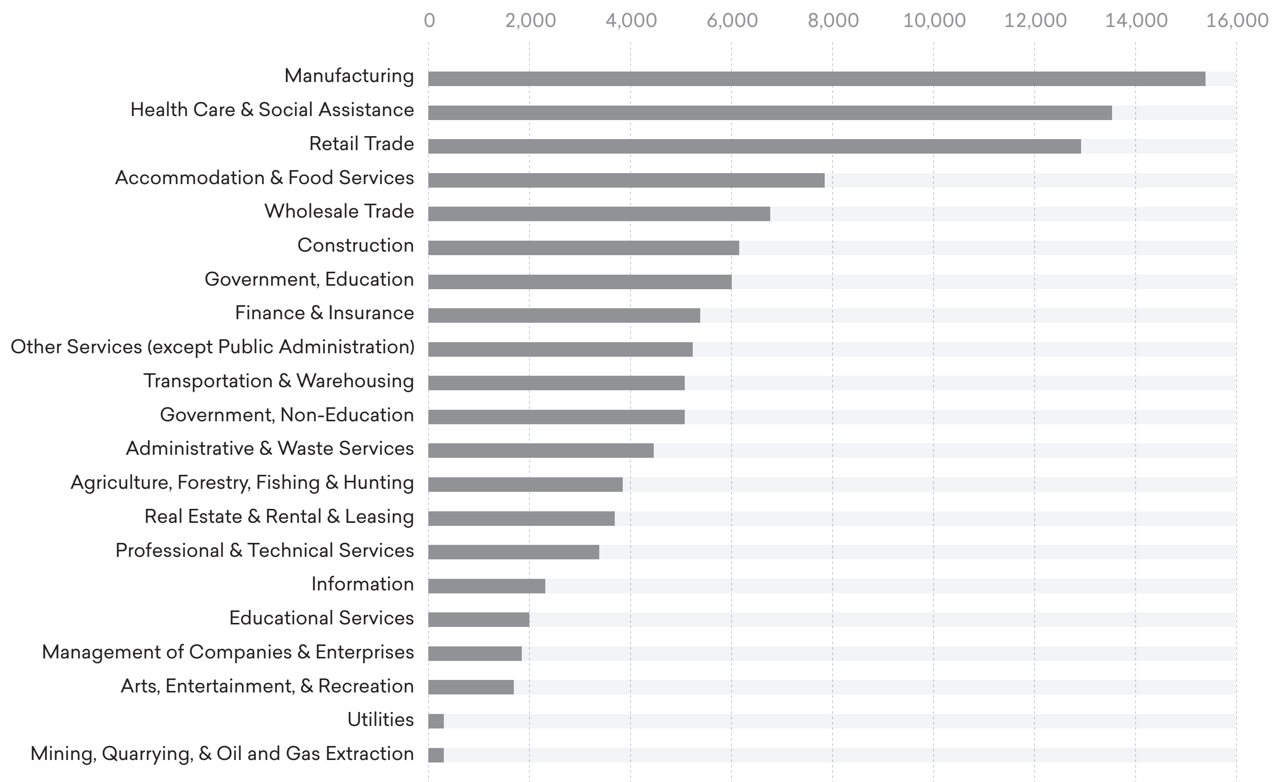
5 The following counties comprise the BTC District: Green and Rock Counties.

labor and non-labor income comprise the district's total income, which can also be considered as the district's gross regional product (GRP).

As shown in Table 1.3, the total income, or GRP, of the BTC District is approximately $9.6 billion, equal to the sum of labor income ($5.9 billion) and non-labor income ($3.7 billion). In Chapter 2, we use the total added income as the measure of the relative impacts of the college on the district's economy.

Figure 1.3 provides the breakdown of jobs by industry in the BTC District. The Manufacturing sector is the largest employer, supporting 15,158 jobs or 13.6% of total employment in the district. The second largest employer is the Health Care & Social Assistance sector, supporting 13,323 jobs or 11.9% of the district's total employment. Altogether, the district supports 111,621 jobs.[6]

FIGURE 1.3: JOBS BY MAJOR INDUSTRY SECTOR IN THE BTC DISTRICT, 2019*



* Data reflect the most recent year for which data are available. Emsi data are updated quarterly.
Source: Emsi employment data.

6 Job numbers reflect Emsi's complete employment data, which includes the following four job classes: 1) employees who are counted in the Bureau of Labor Statistics' Quarterly Census of Employment and Wages (QCEW), 2) employees who are not covered by the federal or state unemployment insurance (UI) system and are thus excluded from QCEW, 3) self-employed workers, and 4) extended proprietors.

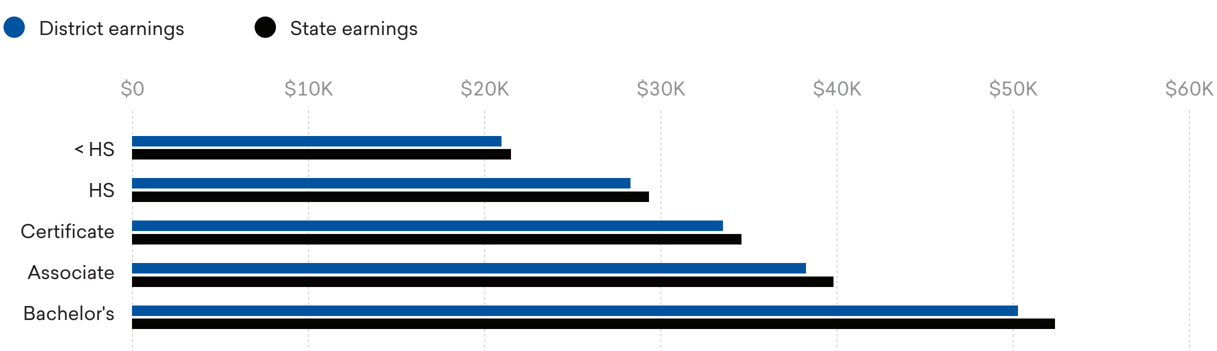
Table 1.4 and Figure 1.4 present the mean earnings by education level in the BTC District and the state of Wisconsin at the midpoint of the average-aged worker's career. These numbers are derived from Emsi's complete employment data on average earnings per worker in the district and the state.[7] The numbers are then weighted by the college's demographic profile, and state earnings are weighted by students' settlement patterns. As shown, students have the potential to earn more as they achieve higher levels of education compared to maintaining a high school diploma. Students who earn an associate degree from BTC can expect approximate wages of $38,200 per year within the BTC District, approximately $9,900 more than someone with a high school diploma.

TABLE 1.4: AVERAGE EARNINGS BY EDUCATION LEVEL AT A BTC STUDENT'S CAREER MIDPOINT

Education level	District earnings	Difference from next lowest degree	State earnings	Difference from next lowest degree
Less than high school	$20,700	n/a	$21,500	n/a
High school or equivalent	$28,300	$7,600	$29,500	$8,000
Certificate	$33,400	$5,100	$34,800	$5,300
Associate degree	$38,200	$4,800	$39,800	$5,000
Bachelor's degree	$50,300	$12,100	$52,400	$12,600

Source: Emsi employment data.

FIGURE 1.4: AVERAGE EARNINGS BY EDUCATION LEVEL AT A BTC STUDENT'S CAREER MIDPOINT



Source: Emsi employment data.

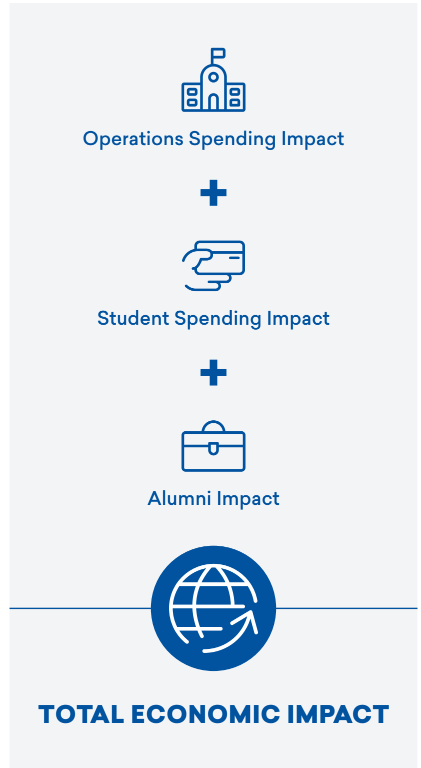
7 Wage rates in the Emsi MR-SAM model combine state and federal sources to provide earnings that reflect complete employment in the state, including proprietors, self-employed workers, and others not typically included in district or state data, as well as benefits and all forms of employer contributions. As such, Emsi industry earnings-per-worker numbers are generally higher than those reported by other sources.

CHAPTER 2:

Economic Impacts on the BTC District Economy

BTC impacts the BTC District economy in a variety of ways. The college is an employer and buyer of goods and services. It attracts monies that otherwise would not have entered the district's economy through its day-to-day operations and the expenditures of its students. Further, it provides students with the knowledge, skills, and abilities they need to become productive citizens and add to the overall output of the district.

IN this chapter, we estimate the following economic impacts of BTC: 1) the operations spending impact, 2) the student spending impact, and 3) the alumni impact, measuring the income added in the district as former students expand the BTC District 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 BTC District if BTC and all its alumni did not exist in FY 2018-19?

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 college; however, net impacts reflect a truer measure of economic impact since they demonstrate what would not have existed in the district's economy if not for the college.

Economic impact analyses use different types of impacts to estimate the results. The impact focused on in this study assesses the change in income. This measure is similar to the commonly used gross regional product (GRP). Income may be further broken out into the **labor income impact**, also known as earnings, which assesses the change in employee compensation; and the **non-labor income impact**, which assesses the change in business profits. Together, labor income and non-labor income sum to total income.

Another way to state the impact is in terms of **jobs**, a measure of the number of full- and part-time jobs that would be required to support the change in income. Finally, a frequently used measure is the **sales impact**, which comprises the change in business sales revenue in the economy as a result of increased economic activity. It is important to bear in mind, however, that much of this sales revenue leaves the district's economy through intermediary transactions and costs.[8] All of these measures—added labor and non-labor 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

8 See Appendix 4 for an example of the intermediary costs included in the sales impact but not in the income impact.

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.

***Net impacts** reflect a truer measure of economic impact since they demonstrate what would not have existed in the district's economy if not for the college.*

The terminology used to describe the economic effects listed above differs slightly from that of other commonly used input-output models, such as IMPLAN. For example, the initial effect in this study is called the "direct effect" by IMPLAN, as shown in the table below. Further, the term "indirect effect" as used by IMPLAN refers to the combined direct and indirect effects defined in this study. To avoid confusion, readers are encouraged to interpret the results presented in this chapter in the context of the terms and definitions listed above. Note that, regardless of the effects used to decompose the results, the total impact measures are analogous.

Emsi	Initial	Direct	Indirect	Induced
IMPLAN	Direct	Indirect		Induced

Multiplier effects in this analysis are derived using Emsi's Multi-Regional Social Accounting Matrix (MR-SAM) input-output model that captures the interconnection of industries, government, and households in the district. The Emsi MR-SAM contains approximately 1,000 industry sectors at the highest level of detail available in the North American Industry Classification System (NAICS) and supplies the industry-specific multipliers required to determine the impacts associated with increased activity within a given economy. The multi-regional capacity of the MR-SAM allows impacts to be measured in the district and state simultaneously, taking into account BTC's activity in each area, as well as each area's economic characteristics. In this analysis, impacts on the district include impacts from the college's district activity, as well as the indirect and induced multiplier effects that reach the district from the college's activity in the rest of the state. For more information on the Emsi MR-SAM model and its data sources, see Appendix 5.

Operations spending impact

Faculty and staff payroll is part of the district's total earnings, and the spending of employees for groceries, apparel, and other household expenditures helps support district businesses. The college itself purchases supplies and services, and many of its vendors are located in the BTC District. These expenditures create a ripple effect that generates still more jobs and higher wages throughout the economy.

Table 2.1 presents college expenditures for the following three categories: 1) salaries, wages, and benefits, 2) operation and maintenance of plant,[9] and 3) all other expenditures (including purchases for supplies and services). In this analysis, we exclude expenses for depreciation and interest due to the way those measures are calculated in the national input-output accounts, and because depreciation represents the devaluing of the college's assets rather than an outflow of expenditures.[10] The first step in estimating the multiplier effects of the college's operational expenditures is to map these categories of expenditures to the approximately 1,000 industries of the Emsi MR-SAM model. Assuming that the spending patterns of college personnel approximately match those of the average consumer, we map salaries, wages, and benefits to spending on industry outputs using national household expenditure coefficients provided by Emsi's national SAM. All BTC employees work in the BTC District (see Table 1.1), and therefore we consider 100% of the salaries, wages, and benefits. For the other two expenditure categories (i.e., operation and maintenance of plant and all other expenditures), we assume the college's spending patterns approximately match national averages and apply the national spending coefficients for NAICS 903612 (Colleges, Universities, and Professional Schools

TABLE 2.1: BTC EXPENSES BY FUNCTION (EXCLUDING DEPRECIATION & INTEREST), FY 2018-19

Expense category	In-district expenditures (thousands)	Out-of-district expenditures (thousands)	Total expenditures (thousands)
Employee salaries, wages, and benefits	$23,859	$0	$23,859
Operation and maintenance of plant	$6,104	$2,454	$8,558
All other expenditures	$837	$3,319	$4,156
Total	**$30,799**	**$5,773**	**$36,572**

Source: Data provided by BTC and the Emsi impact model.

9 Capital construction expenses are included under operation and maintenance of plant.

10 This aligns with the economic impact guidelines set by the Association of Public and Land-Grant Universities. Ultimately, excluding these measures results in more conservative and defensible estimates.

(Local Government)).[11] Operation and maintenance of plant expenditures are mapped to the industries that relate to capital construction, maintenance, and support, while the college's remaining expenditures are mapped to the remaining industries.

We now have three vectors of expenditures for BTC: one for salaries, wages, and benefits; another for operation and maintenance of plant; and a third for the college's purchases of supplies and services. The next step is to estimate the portion of these expenditures that occur inside the district. The expenditures occurring outside the district are known as leakages. We estimate in-district expenditures using regional purchase coefficients (RPCs), a measure of the overall demand for the commodities produced by each sector that is satisfied by district suppliers, for each of the approximately 1,000 industries in the MR-SAM model.[12] For example, if 40% of the demand for NAICS 541211 (Offices of Certified Public Accountants) is satisfied by district suppliers, the RPC for that industry is 40%. The remaining 60% of the demand for NAICS 541211 is provided by suppliers located outside the district. The three vectors of expenditures are multiplied, industry by industry, by the corresponding RPC to arrive at the in-district expenditures associated with the college. See Table 2.1 for a break-out of the expenditures that occur in-district. Finally, in-district spending is entered, industry by industry, into the MR-SAM model's multiplier matrix, which in turn provides an estimate of the associated multiplier effects on district labor income, non-labor income, total income, sales, and jobs.

Table 2.2 presents the economic impact of college operations spending. The people employed by BTC and their salaries, wages, and benefits comprise the initial effect, shown in the top row of the table in terms of labor income, non-labor income, total added income, sales, and jobs. The additional impacts

TABLE 2.2: OPERATIONS SPENDING IMPACT, FY 2018-19

	Labor income (thousands)	Non-labor income (thousands)	Total income (thousands)	Sales (thousands)	Jobs supported
Initial effect	**$23,859**	**$0**	**$23,859**	**$36,572**	**592**
Multiplier effect					
Direct effect	$2,843	$895	$3,739	$6,941	50
Indirect effect	$446	$124	$571	$1,074	8
Induced effect	$3,251	$3,463	$6,714	$10,657	78
Total multiplier effect	**$6,541**	**$4,483**	**$11,023**	**$18,672**	**135**
Gross impact (initial + multiplier)	**$30,399**	**$4,483**	**$34,882**	**$55,244**	**727**
Less alternative uses of funds	-$2,991	-$3,711	-$6,702	-$15,307	-77
Net impact	**$27,409**	**$771**	**$28,180**	**$39,936**	**651**

Source: Emsi impact model.

11 See Appendix 2 for a definition of NAICS.

12 See Appendix 5 for a description of Emsi's MR-SAM model.

created by the initial effect appear in the next four rows under the section labeled *multiplier effect*. Summing the initial and multiplier effects, the gross impacts are $30.4 million in labor income and $4.5 million in non-labor income. This sums to a total impact of $34.9 million in total added income associated with the spending of the college and its employees in the district. This is equivalent to supporting 727 jobs.

The $34.9 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 applying a counterfactual scenario, i.e., what would have happened if a given event—in this case, the expenditure of in-district funds on BTC—had not occurred. BTC received an estimated 48% of its funding from sources within the BTC District. These monies came from the tuition and fees paid by resident students, from the auxiliary revenue and donations from private sources located within the district, from state and local taxes, and from the financial aid issued to students by state and local government. We must account for the opportunity cost of this in-district funding. Had other industries received these monies rather than BTC, income impacts would have still been created in the economy. In economic analysis, impacts that occur under counterfactual conditions are used to offset the impacts that actually occur in order to derive the true impact of the event under analysis.

The total net impact of the college's operations is ***$28.2 million*** *in total added income, which is equivalent to supporting* ***651 jobs****.*

We estimate this counterfactual by simulating a scenario where in-district monies spent on the college are instead spent on consumer goods and savings. This simulates the in-district monies being returned to the taxpayers and being spent by the household sector. Our approach is to establish the total amount spent by in-district students and taxpayers on BTC, map this to the detailed industries of the MR-SAM model using national household expenditure coefficients, use the industry RPCs to estimate in-district spending, and run the in-district spending through the MR-SAM model's multiplier matrix to derive multiplier effects. The results of this exercise are shown as negative values in the row labeled *less alternative uses of funds* in Table 2.2.

The total net impact of the college's operations is equal to the gross impact less the impact of the alternative use of funds—the opportunity cost of the district money. As shown in the last row of Table 2.2, the total net impact is approximately $27.4 million in labor income and $771.4 thousand in non-labor income. This sums together to $28.2 million in total added income and is equivalent to supporting 651 jobs. These impacts represent new economic activity created in the district's economy solely attributable to the operations of BTC.

Student spending impact

Both in-district and out-of-district students contribute to the student spending impact of BTC; however, not all of these students can be counted towards the impact. Of the in-district students, only those students who were retained, or who would have left the district to seek education elsewhere had they not attended BTC, are measured. Students who would have stayed in the district anyway are not counted towards the impact since their monies would have been added to the BTC District economy regardless of BTC. In addition, only the out-of-district students who relocated to the BTC District to attend the college are measured. Students who commute from outside the district or take courses online are not counted towards the student spending impact because they are not adding money from living expenses to the district.

While there were 4,018 students attending BTC who originated from the BTC District (not including personal enrichment students and dual credit high school students),[13] not all of them would have remained in the district if not for the existence of BTC. We apply a conservative assumption that 10% of these students would have left the BTC District for other education opportunities if BTC did not exist.[14] Therefore, we recognize that the in-district spending of 402 students retained in the district is attributable to BTC. These students, called retained students, spent money at businesses in the district for everyday needs such as groceries, accommodation, and transportation.

13 Note that because the college was unable to provide origin data for their non-credit students, we assume that all non-credit students originated from within the district.

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

Relocated students are also accounted for in BTC's student spending impact. An estimated 1,349 students came from outside the district and lived off campus while attending BTC in FY 2018-19. The off-campus expenditures of out-of-district students supported jobs and created new income in the district's economy.[15]

The average costs for students appear in the first section of Table 2.3, equal to $9,282 per student. Note that this table excludes expenses for books and supplies, since many of these monies are already reflected in the operations impact discussed in the previous section. We multiply the $9,282 in annual costs by the 1,751 students who either were retained or relocated to the district because of BTC and lived in-district but off campus. This provides us with an estimate of their total spending. Altogether, off-campus spending of relocated and retained students, once net of monies paid to student workers, generated sales of $16.2 million, as shown in the bottom row of Table 2.3.

TABLE 2.3: AVERAGE STUDENT COSTS AND TOTAL SALES GENERATED BY RELOCATED AND RETAINED STUDENTS IN THE BTC DISTRICT, FY 2018-19

Room and board	$5,795
Personal expenses	$1,982
Transportation	$1,505
Total expenses per student	**$9,282**
Number of students retained	402
Number of students relocated	1,349
Gross retained student sales	$3,729,508
Gross relocated student sales	$12,518,819
Total gross off-campus sales	**$16,248,327**
Wages and salaries paid to student workers*	$7,999
Net off-campus sales	**$16,240,327**

* 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 district.

Source: Student costs and wages provided by BTC. The number of relocated and retained students who lived in the district off campus while attending is derived by Emsi from the student origin data and in-term residence data provided by BTC. The data are based on credit students.

Estimating the impacts generated by the $16.2 million in student spending follows a procedure similar to that of the operations impact described above. We distribute the $16.2 million in sales to the industry sectors of the MR-SAM

15 Online students and students who commuted to the BTC District from outside the district are not considered in this calculation because it is assumed their living expenses predominantly occurred where they resided during the analysis year. We recognize that not all online students live outside the district, but keep the assumption given data limitations.

model, apply RPCs to reflect in-district spending, and run the net sales figures through the MR-SAM model to derive multiplier effects.

Table 2.4 presents the results. The initial effect is purely sales-oriented and there is no change in labor or non-labor income. The impact of relocated and retained student spending thus falls entirely under the multiplier effect. The total impact of student spending is $5.2 million in labor income and $3.1 million in non-labor income. This sums together to $8.3 million in total added income and is equivalent to supporting 194 jobs. These values represent the direct effects created at the businesses patronized by the students, the indirect effects created by the supply chain of those businesses, and the effects of the increased spending of the household sector throughout the district's economy as a result of the direct and indirect effects.

The total impact of student spending is ***$8.3 million*** *in total added income and is equivalent to supporting* ***194 jobs****.*

TABLE 2.4: STUDENT SPENDING IMPACT, FY 2018-19

	Labor income (thousands)	Non-labor income (thousands)	Total income (thousands)	Sales (thousands)	Jobs supported
Initial effect	**$0**	**$0**	**$0**	**$16,240**	**0**
Multiplier effect					
Direct effect	$3,518	$2,056	$5,574	$10,101	131
Indirect effect	$653	$379	$1,032	$1,949	26
Induced effect	$1,019	$667	$1,686	$3,011	37
Total multiplier effect	**$5,190**	**$3,102**	**$8,293**	**$15,061**	**194**
Total impact (initial + multiplier)	**$5,190**	**$3,102**	**$8,293**	**$31,302**	**194**

Source: Emsi impact model.

Alumni impact

In this section, we estimate the economic impacts stemming from the added labor income of alumni in combination with their employers' added non-labor income. This impact is based on the number of students who have attended BTC *throughout its history*. We then use this total number to consider the impact of those students in the single FY 2018-19. Former students who earned a degree as well as those who may not have finished their degree or did not take courses for credit are considered alumni.

The greatest economic impact of BTC stems from the added human capital—the knowledge, creativity, imagination, and entrepreneurship—found in its alumni.

While BTC creates an economic impact through its operations and student spending, the greatest economic impact of BTC stems from the added human capital—the knowledge, creativity, imagination, and entrepreneurship— found in its alumni. While attending BTC, students gain experience, education, and the knowledge, skills, and abilities that increase their productivity and allow them to command a higher wage once they enter the workforce. But the reward of increased productivity does not stop there. Talented professionals make capital more productive too (e.g., buildings, production facilities, equipment). The employers of BTC alumni enjoy the fruits of this increased productivity in the form of additional non-labor income (i.e., higher profits).

The methodology here differs from the previous impacts in one fundamental way. Whereas the previous spending impacts depend on an annually renewed injection of new sales into the district's economy, the alumni impact is the result of years of past instruction and the associated accumulation of human capital. The initial effect of alumni is comprised of two main components. The first and largest of these is the added labor income of BTC's former students. The second component of the initial effect is comprised of the added non-labor income of the businesses that employ former students of BTC.

We begin by estimating the portion of alumni who are employed in the workforce. To estimate the historical employment patterns of alumni in the district, we use the following sets of data or assumptions: 1) settling-in factors to determine how long it takes the average student to settle into a career;[16] 2) death, retirement, and unemployment rates from the National Center for Health Statistics, the Social Security Administration, and the Bureau of Labor Statistics; and 3) state migration data from the Census Bureau. The result is the estimated portion of alumni from each previous year who were still actively employed in the district as of FY 2018-19.

The next step is to quantify the skills and human capital that alumni acquired from the college. We use the students' production of CHEs as a proxy for accumulated human capital. The average number of CHEs completed per student in FY 2018-19 was 8.0. To estimate the number of CHEs present in the workforce during the analysis year, we use the college's historical student headcount over the past 30 years, from FY 1989-90 to FY 2018-19.[17] We multiply the 8.0 average CHEs per student by the headcounts that we estimate are still actively employed from each of the previous years.[18] Students who enroll at the college more than one year are counted at least twice in the historical enrollment data. However, CHEs remain distinct regardless of when and by whom they were earned, so there is no duplication in the CHE counts. We estimate there are approximately 397,793 CHEs from alumni active in the workforce.

Next, we estimate the value of the CHEs, or the skills and human capital acquired by BTC alumni. This is done using the *incremental* added labor income stemming from the students' higher wages. The incremental added labor income is the difference between the wage earned by BTC alumni and the alternative wage they would have earned had they not attended BTC. Using the district incremental earnings, credits required, and distribution of credits at each level

16 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 certificate or a degree, and between one and five years for returning students.

17 We apply a 30-year time horizon because the data on students who attended BTC prior to FY 1989-90 is less reliable, and because most of the students served more than 30 years ago had left the district's workforce by FY 2018-19.

18 This assumes the average credit load and level of study from past years is equal to the credit load and level of study of students today.

of study, we estimate the average value per CHE to equal $156. This value represents the district average incremental increase in wages that alumni of BTC received during the analysis year for every CHE they completed.

Because workforce experience leads to increased productivity and higher wages, the value per CHE varies depending on the students' workforce experience, with the highest value applied to the CHEs of students who had been employed the longest by FY 2018-19, and the lowest value per CHE applied to students who were just entering the workforce. More information on the theory and calculations behind the value per CHE appears in Appendix 6. In determining the amount of added labor income attributable to alumni, we multiply the CHEs of former students in each year of the historical time horizon by the corresponding average value per CHE for that year, and then sum the products together. This calculation yields approximately $62.1 million in gross labor income from increased wages received by former students in FY 2018-19 (as shown in Table 2.5).

TABLE 2.5: NUMBER OF CHES IN WORKFORCE AND INITIAL LABOR INCOME CREATED IN THE BTC DISTRICT, FY 2018-19

Number of CHEs in workforce	397,793
Average value per CHE	$156
Initial labor income, gross	**$62,069,368**
Adjustments for counterfactual scenarios	
Percent reduction for alternative education opportunities	15%
Percent reduction for adjustment for labor import effects	50%
Initial labor income, net	**$26,379,481**

Source: Emsi impact model.

The next two rows in Table 2.5 show two adjustments used to account for counterfactual outcomes. As discussed above, counterfactual outcomes in economic analysis represent what would have happened if a given event had not occurred. The event in question is the education and training provided by BTC and subsequent influx of skilled labor into the district's economy. The first counterfactual scenario that we address is the adjustment for alternative education opportunities. In the counterfactual scenario where BTC does not exist, we assume a portion of BTC alumni would have received a comparable education elsewhere in the district or would have left the district and received a comparable education and then returned to the district. The incremental added labor income that accrues to those students cannot be counted towards the added labor income from BTC alumni. The adjustment for alternative education opportunities amounts to a 15% reduction of the $62.1 million in added labor income. This means that 15% of the added labor income from BTC alumni would have been generated in the district anyway, even if the college did not exist. For more information on the alternative education adjustment, see Appendix 7.

The other adjustment in Table 2.5 accounts for the importation of labor. Suppose BTC did not exist and in consequence there were fewer skilled workers in the district. Businesses could still satisfy some of their need for skilled labor by recruiting from outside the BTC District. We refer to this as the labor import effect. Lacking information on its possible magnitude, we assume 50% of the jobs that students fill at district businesses could have been filled by workers recruited from outside the district if the college did not exist.[19] Consequently, the gross labor income must be adjusted to account for the importation of this labor, since it would have happened regardless of the presence of the college. We conduct a sensitivity analysis for this assumption in Appendix 1. With the 50% adjustment, the net added labor income added to the economy comes to $26.4 million, as shown in Table 2.5.

The $26.4 million in added labor income appears under the initial effect in the labor income column of Table 2.6. To this we add an estimate for initial non-labor income. As discussed earlier in this section, businesses that employ former students of BTC see higher profits as a result of the increased productivity of their capital assets. To estimate this additional income, we allocate the initial increase in labor income ($26.4 million) to the six-digit NAICS industry sectors where students are most likely to be employed. This allocation entails a process that maps completers in the district to the detailed occupations for which those completers have been trained, and then maps the detailed occupations to the six-digit industry sectors in the MR-SAM model.[20] Using a crosswalk created by National Center for Education Statistics (NCES) and the Bureau of Labor Statistics, we map the breakdown of the college's completers to the approximately 700 detailed occupations in the Standard Occupational Classification (SOC) system. Finally, we apply a matrix of wages by industry and by occupation from the MR-SAM model to map the occupational distribution of the $26.4 million in initial labor income effects to the detailed industry sectors in the MR-SAM model.[21]

Once these allocations are complete, we apply the ratio of non-labor to labor income provided by the MR-SAM model for each sector to our estimate of initial labor income. This computation yields an estimated $6.4 million in added non-labor income attributable to the college's alumni. Summing initial labor and

19 A similar assumption is used by Walden (2014) in his analysis of the Cooperating Raleigh Colleges.

20 Completer data comes from the Integrated Postsecondary Education Data System (IPEDS), which organizes program completions according to the Classification of Instructional Programs (CIP) developed by the National Center for Education Statistics (NCES).

21 For example, if the MR-SAM model indicates that 20% of wages paid to workers in SOC 51-4121 (Welders) occur in NAICS 332313 (Plate Work Manufacturing), then we allocate 20% of the initial labor income effect under SOC 51-4121 to NAICS 332313.

non-labor income together provides the total initial effect of alumni productivity in the BTC District economy, equal to approximately $32.8 million. To estimate multiplier effects, we convert the industry-specific income figures generated through the initial effect to sales using sales-to-income ratios from the MR-SAM model. We then run the values through the MR-SAM's multiplier matrix.

TABLE 2.6: ALUMNI IMPACT, FY 2018-19

	Labor income (thousands)	Non-labor income (thousands)	Total income (thousands)	Sales (thousands)	Jobs supported
Initial effect	**$26,379**	**$6,398**	**$32,777**	**$70,049**	**480**
Multiplier effect					
Direct effect	$3,637	$915	$4,553	$9,501	66
Indirect effect	$812	$204	$1,016	$2,128	15
Induced effect	$9,031	$2,076	$11,107	$25,899	158
Total multiplier effect	**$13,480**	**$3,196**	**$16,676**	**$37,529**	**240**
Total impact (initial + multiplier)	**$39,859**	**$9,594**	**$49,453**	**$107,578**	**720**

Source: Emsi impact model.

Table 2.6 shows the multiplier effects of alumni. Multiplier effects occur as alumni generate an increased demand for consumer goods and services through the expenditure of their higher wages. Further, as the industries where alumni 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 the college's alumni. The final results are $13.5 million in added labor income and $3.2 million in added non-labor income, for an overall total of $16.7 million in multiplier effects. The grand total of the alumni impact is $49.5 million in total added income, the sum of all initial and multiplier labor and non-labor income effects. This is equivalent to supporting 720 jobs.

Total BTC impact

The total economic impact of BTC on the BTC District can be generalized into two broad types of impacts. First, on an annual basis, BTC generates a flow of spending that has a significant impact on the district's economy. The impacts of this spending are captured by the operations and student spending impacts. While not insignificant, these impacts do not capture the true purpose of BTC. The basic mission of BTC is to foster human capital. Every year, a new cohort of former BTC students adds to the stock of human capital in the district, and a portion of alumni continues to add to the district's economy. Table 2.7 displays the grand total impacts of BTC on the BTC District economy in FY 2018-19. For context, the percentages of BTC compared to the total labor income, total non-labor income, combined total income, sales, and jobs in the BTC District, as presented in Table 1.3 and Figure 1.3, are included. The total added value of BTC is **$85.9 million**, which is equivalent to supporting **1,564 jobs** in FY 2018-19. For perspective, this means that **one out of every 71 jobs** in the BTC District is supported by the activities of BTC and its students.

TABLE 2.7: TOTAL BTC IMPACT, FY 2018-19

	Labor income (thousands)	Non-labor income (thousands)	Total income (thousands)	Sales (thousands)	Jobs supported
Operations spending	$27,409	$771	$28,180	$39,936	651
Student spending	$5,190	$3,102	$8,293	$31,302	194
Alumni	$39,859	$9,594	$49,453	$107,578	720
Total impact	**$72,459**	**$13,467**	**$85,926**	**$178,816**	**1,564**

Source: Emsi impact model.

These impacts from the college and its students stem from different industry sectors and spread throughout the district's economy. Table 2.8 displays the total impact of BTC by each industry sector based on their two-digit NAICS code. The table shows the total impact of operations, students, and alumni, as shown in Table 2.7, broken down by each industry sector's individual impact on the district's economy 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 district's economy from the college's spending and from where BTC alumni are employed. For example, BTC's spending and alumni in the Health Care & Social Assistance industry sector generated an impact of $25.7 million in FY 2018-19.

TABLE 2.8: TOTAL BTC IMPACT BY INDUSTRY, FY 2018-19

Industry sector	Total income (thousands)	Jobs supported
Health Care & Social Assistance	$25,725	393
Government, Education	$24,365	600
Government, Non-Education	$9,771	128
Construction	$5,566	75
Accommodation & Food Services	$4,671	176
Retail Trade	$3,796	60
Manufacturing	$2,819	24
Utilities	$1,668	2
Wholesale Trade	$1,488	13
Information	$1,254	11
Management of Companies & Enterprises	$946	6
Other Services (except Public Administration)	$816	26
Professional & Technical Services	$706	10
Administrative & Waste Services	$660	14
Transportation & Warehousing	$629	10
Finance & Insurance	$567	4
Educational Services	$195	6
Arts, Entertainment, & Recreation	$110	5
Mining, Quarrying, & Oil and Gas Extraction	$99	1
Real Estate & Rental & Leasing	$45	1
Agriculture, Forestry, Fishing, & Hunting	$30	1
Total impact	**$85,926**	**1,564**

Source: Emsi impact model.

CHAPTER 3:

Investment Analysis

The benefits generated by BTC affect the lives of many people. The most obvious beneficiaries are the college's students; they give up time and money to go to the college in return for a lifetime of higher wages and improved quality of life. But the benefits do not stop there. As students earn more, communities and citizens throughout Wisconsin benefit from an enlarged economy and a reduced demand for social services. In the form of increased tax revenues and public sector savings, the benefits of education extend as far as the state and local government.

Investment analysis is the process of evaluating total costs and measuring these against total benefits to determine whether or not a proposed venture will be profitable. If benefits outweigh costs, then the investment is worthwhile. If costs outweigh benefits, then the investment will lose money and is thus considered infeasible. In this chapter, we consider BTC as a worthwhile investment from the perspectives of students, taxpayers, and society.

Student perspective

To enroll in postsecondary education, students pay money for tuition and forego monies that otherwise they would have earned had they chosen to work instead of attend college. From the perspective of students, education is the same as an investment; i.e., they incur a cost, or put up a certain amount of money, with the expectation of receiving benefits in return. The total costs consist of the monies that students pay in the form of tuition and fees and the opportunity costs of foregone time and money. The benefits are the higher earnings that students receive as a result of their education.

STUDENT COSTS

Out-of-Pocket Expenses

Opportunity Costs

STUDENT BENEFITS

Higher Earnings from Education

Calculating student costs

Student costs consist of three main items: direct outlays, opportunity costs, and future principal and interest costs incurred from student loans. Direct outlays include tuition and fees, equal to $4.7 million from Figure 1.1. Direct outlays also include the cost of books and supplies. On average, full-time students spent $1,784 each on books and supplies during the reporting year.[22] Multiplying this figure by the number of full-time equivalents (FTEs) produced by BTC in FY 2018-19[23] generates a total cost of $2.8 million for books and supplies.

In order to pay the cost of tuition, many students had to take out loans. These students not only incur the cost of tuition from the college but also incur the interest cost of taking out loans. In FY 2018-19, students received a total of $3 million in federal loans to attend BTC.[24] Students pay back these loans along with interest over the span of several years in the future. Since students pay off these loans over time, they accrue no initial cost during the analysis year. Hence, to avoid double counting, the $3 million in federal loans is subtracted from the costs incurred by students in FY 2018-19.

In addition to the cost of tuition, books, and supplies, students also experienced an opportunity cost of attending college during the analysis year. Opportunity cost is the most difficult component of student costs to estimate. It measures the value of time and earnings foregone by students who go to the college 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 college.

22 Based on the data provided by BTC.
23 A single FTE is equal to 30 CHEs, so there were 2,051 FTEs produced by students in FY 2018-19, equal to 62,054 CHEs divided by 30 (excluding personal enrichment students).
24 Due to data limitations, only federal loans are considered in this analysis.

We derive the students' full earning potential by weighting the average annual earnings levels in Table 1.4 according to the education level breakdown of the student population when they first enrolled.[25] However, the earnings levels in Table 1.4 reflect what average workers earn at the midpoint of their careers, not while attending the college. Because of this, we adjust the earnings levels to the average age of the student population (29) to better reflect their wages at their current age.[26] This calculation yields an average full earning potential of $26,137 per student.

In determining how much students earn while enrolled in postsecondary education, an important factor to consider is the time that they actually spend on postsecondary education, since this is the only time that they are required to give up a portion of their earnings. We use the students' CHE production as a proxy for time, under the assumption that the more CHEs students earn, the less time they have to work, and, consequently, the greater their foregone earnings. Overall, students attending BTC earned an average of 9.4 CHEs per student (excluding personal enrichment students and dual credit high school students), which is approximately equal to 31% of a full academic year.[27] We thus include no more than $8,219 (or 31%) of the students' full earning potential in the opportunity cost calculations.

Another factor to consider is the students' employment status while enrolled in postsecondary education. It is estimated that 72% of students are employed.[28] For the remainder of students, we assume that they are either seeking work or planning to seek work once they complete their educational goals (with the exception of personal enrichment students, who are not included in this calculation). By choosing to enroll, therefore, non-working students give up everything that they can potentially earn during the academic year (i.e., the $8,219). The total value of their foregone earnings thus comes to $12.6 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. These jobs tend to be at entry level, such as restaurant servers or cashiers. To account for this, we assume that working students hold jobs that pay 70% of what they would have earned had they chosen to work full-time rather than go to college.[29] The remaining 30% comprises the percentage of

25 This is based on students who reported their prior level of education to BTC. The prior level of education data was then adjusted to exclude dual credit high school students.

26 Further discussion on this adjustment appears in Appendix 6.

27 Equal to 9.4 CHEs divided by 30, the assumed number of CHEs in a full-time academic year.

28 Based on data provided by BTC. This figure excludes dual credit high school students, who are not included in the opportunity cost calculations.

29 The 70% assumption is based on the average hourly wage of jobs commonly held by working students divided by the national average hourly wage. Occupational wage estimates are published by the Bureau of Labor Statistics (see http://www.bls.gov/oes/current/oes_nat.htm).

their full earning potential that they forego. Obviously this assumption varies by person; some students forego more and others less. Since we do not know the actual jobs that students hold while attending, the 30% in foregone earnings serves as a reasonable average.

Working students also give up a portion of their leisure time in order to attend higher education institutions. According to the Bureau of Labor Statistics American Time Use Survey, students forego up to 0.5 hours of leisure time per day.[30] 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 is $11.8 million, equal to the sum of their foregone earnings ($9.7 million) and foregone leisure time ($2.1 million).

Thus far we have discussed student costs during the analysis year. However, recall that students take out student loans to attend college during the year, which they will have to pay back over time. The amount they will be paying in the future must be a part of their decision to attend the college today. Students who take out loans are not only required to pay back the principal of the loan but to also pay back a certain amount in interest. The first step in calculating students' loan interest cost is to determine the payback time for the loans. The $3 million in loans was awarded to 797 students, averaging $3,739 per student in the analysis year. However, this figure represents only one year of loans. Because loan payback time is determined by total indebtedness, we assume that since BTC is a two-year college, students will be indebted twice that amount, or $7,477 on average. According to the U.S. Department of Education, this level of indebtedness will take 10 years to pay back under the standard repayment plan.[31]

This indebtedness calculation is used solely to estimate the loan payback period. Students will be paying back the principal amount of $3 million over time. After taking into consideration the time value of money, this means that students will pay off a discounted present value of $2.2 million in principal over the 10 years. In order to calculate interest, we only consider interest on the federal loans awarded to students in FY 2018-19. Using the student discount rate of 5.1%[32] as our interest rate, we calculate that students will pay a total discounted present value of $679.3 thousand in interest on student loans

30 "Charts by Topic: Leisure and Sports Activities," American Time Use Survey, Last modified December 2016. http://www.bls.gov/tus/charts/leisure.htm.

31 Repayment period based on total education loan indebtedness, U.S. Department of Education, 2017. https://studentaid.ed.gov/sa/repay-loans/understand/plans/standard.

32 The student discount rate is derived from the baseline forecasts for the 10-year discount rate published by the Congressional Budget Office. See the Congressional Budget Office, Student Loan and Pell Grant Programs – May 2019 Baseline. https://www.cbo.gov/system/files?file=2019-05/51310-2019-05-studentloan.pdf.

throughout the first 10 years of their working lifetime. The stream of these future interest costs together with the stream of loan payments is included in the costs of Column 5 of Table 3.2.

The steps leading up to the calculation of student costs appear in Table 3.1. Direct outlays amount to $4.4 million, the sum of tuition and fees ($4.7 million) and books and supplies ($2.8 million), less federal loans received ($3 million) and $39.1 thousand in direct outlays of personal enrichment students (those students are excluded from the cost calculations). Opportunity costs for working and non-working students amount to $21.2 million, excluding $3.3 million in offsetting residual aid that is paid directly to students.[33] Finally, we have the present value of future student loan costs, amounting to $2.9 million between principal and interest. Summing direct outlays, opportunity costs, and future student loan costs together yields a total of $28.5 million in present value student costs.

TABLE 3.1: PRESENT VALUE OF STUDENT COSTS, FY 2018-19 (THOUSANDS)

Direct outlays in FY 2018-19	
Tuition and fees	$4,712
Less federal loans received	-$2,980
Books and supplies	$2,756
Less direct outlays of personal enrichment students	-$39
Total direct outlays	**$4,450**
Opportunity costs in FY 2018-19	
Earnings foregone by non-working students	$12,620
Earnings foregone by working students	$9,707
Value of leisure time foregone by working students	$2,134
Less residual aid	-$3,309
Total opportunity costs	**$21,152**
Future student loan costs (present value)	
Student loan principal	$2,249
Student loan interest	$679
Total present value student loan costs	**$2,928**
Total present value student costs	**$28,530**

Source: Based on data provided by BTC and outputs of the Emsi impact model.

33 Residual aid is the remaining portion of scholarship or grant aid distributed directly to a student after the college applies tuition and fees.

Linking education to earnings

Having estimated the costs of education to students, we weigh these costs 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, state mean earnings levels at the midpoint of the average-aged worker's career increase as people achieve higher levels of education. The differences between state earnings levels define the incremental benefits of moving from one education level to the next.

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 the college's FY 2018-19 students first by determining their average annual increase in earnings, equal to $10.4 million. This value represents the higher wages that accrue to students at the midpoint of their careers and is calculated based on the marginal wage increases of the CHEs that students complete while attending the college. Using the state of Wisconsin earnings, the marginal wage increase per CHE is $169. For a full description of the methodology used to derive the $10.4 million, see Appendix 6.

The second step is to project the $10.4 million annual increase in earnings into the future, for as long as students remain in the workforce. We do this using the Mincer function to predict the change in earnings at each point in an individual's working career.[34] The Mincer function originated from Mincer's seminal work on human capital (1958). The function estimates earnings using an individual's years of education and post-schooling experience. 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 labor economics. Card (1999 and 2001) addresses a number of these criticisms using U.S. based research over the last three decades and concludes that any upward bias in the Mincer parameters is on the order of 10% or less. We use state-specific and education level-specific Mincer coefficients. To account for any upward bias, we incorporate a 10% reduction in our projected earnings, otherwise known as the ability bias. With the $10.4 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, peak shortly after the career midpoint, and then dampen slightly as students approach retirement at age 67. This earnings stream appears in Column 2 of Table 3.2.

34 Appendix 6 provides more information on the Mincer function and how it is used to predict future earnings growth.

TABLE 3.2: PROJECTED BENEFITS AND COSTS, STUDENT PERSPECTIVE

1 Year	2 Gross higher earnings to students (millions)	3 % active in workforce*	4 Net higher earnings to students (millions)	5 Student costs (millions)	6 Net cash flow (millions)
0	$6.4	10%	$0.6	$25.6	-$25.0
1	$6.8	20%	$1.3	$0.4	$1.0
2	$7.1	29%	$2.0	$0.4	$1.7
3	$7.5	40%	$3.0	$0.4	$2.6
4	$7.8	53%	$4.2	$0.4	$3.8
5	$8.2	96%	$7.8	$0.4	$7.4
6	$8.5	95%	$8.1	$0.4	$7.8
7	$8.9	95%	$8.5	$0.4	$8.1
8	$9.2	95%	$8.8	$0.4	$8.4
9	$9.5	95%	$9.1	$0.4	$8.7
10	$9.8	95%	$9.3	$0.4	$9.0
11	$10.1	95%	$9.6	$0.0	$9.6
12	$10.4	95%	$9.9	$0.0	$9.9
13	$10.7	94%	$10.1	$0.0	$10.1
14	$10.9	94%	$10.3	$0.0	$10.3
15	$11.1	94%	$10.5	$0.0	$10.5
16	$11.3	94%	$10.6	$0.0	$10.6
17	$11.5	94%	$10.8	$0.0	$10.8
18	$11.7	93%	$10.9	$0.0	$10.9
19	$11.8	93%	$11.0	$0.0	$11.0
20	$11.9	93%	$11.0	$0.0	$11.0
21	$11.9	92%	$11.0	$0.0	$11.0
22	$12.0	92%	$11.0	$0.0	$11.0
23	$12.0	92%	$11.0	$0.0	$11.0
24	$12.0	91%	$10.9	$0.0	$10.9
25	$11.9	91%	$10.8	$0.0	$10.8
26	$11.9	90%	$10.7	$0.0	$10.7
27	$11.8	89%	$10.5	$0.0	$10.5
28	$11.6	89%	$10.3	$0.0	$10.3
29	$11.5	88%	$10.1	$0.0	$10.1
30	$11.3	87%	$9.9	$0.0	$9.9
31	$11.1	87%	$9.6	$0.0	$9.6
32	$10.9	86%	$9.4	$0.0	$9.4
33	$10.7	85%	$9.1	$0.0	$9.1
34	$10.4	84%	$8.7	$0.0	$8.7
35	$10.1	83%	$8.4	$0.0	$8.4
36	$9.8	82%	$8.1	$0.0	$8.1
37	$9.5	81%	$7.7	$0.0	$7.7
Present value			**$136.5**	**$28.5**	**$108.0**

Internal rate of return	Benefit-cost ratio	Payback period (no. of years)
20.8%	4.8	6.1

* Includes the “settling-in” factors and attrition.

Source: Emsi impact model.

As shown in Table 3.2, the $10.4 million in gross higher earnings occurs around Year 12, which is the approximate midpoint of the students' future working careers given the average age of the student population and an assumed retirement age of 67. In accordance with the Mincer function, the gross higher earnings that accrue to students in the years leading up to the midpoint are less than $10.4 million and the gross higher earnings in the years after the midpoint are greater than $10.4 million.

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 FY 2018-19 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 college 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 certificate or a degree and by one to five years for degree-seeking students who do not complete during the analysis year.

Beyond the first five years of the time horizon, students will leave the workforce for any number of reasons, whether 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 of Chapter 2.[35] The likelihood of leaving the workforce increases as students 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 higher earnings to students after accounting for both the settling-in patterns and attrition.

Return on investment for 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 5.1% (see above). Because students tend to rely upon debt to pay for education—i.e. they are negative savers—their discount rate is based upon student loan interest rates.[36]

35 See the discussion of the alumni impact in Chapter 2. The main sources for deriving the attrition rate are the National Center for Health Statistics, the Social Security Administration, and the Bureau of Labor Statistics. Note that we do not account for migration patterns in the student investment analysis because the higher earnings that students receive as a result of their education will accrue to them regardless of where they find employment.

36 The student discount rate is derived from the baseline forecasts for the 10-year Treasury rate published by the Congressional Budget Office. See the Congressional Budget Office, Student Loan and Pell Grant Programs – May 2019 Baseline. https://www.cbo.gov/system/files?file=2019-06551310-2019-05-studentloan.pdf.

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 5.1% discount rate from the student perspective and a 1.5% discount rate from the perspectives of taxpayers and society.

In Appendix 1, we conduct a sensitivity analysis of this discount rate. 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, 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 1.0, a rate of return that exceeds the discount rate, and a reasonably short payback period.

In Table 3.2, the net higher earnings of students yield a cumulative discounted sum of approximately $136.5 million, the present value of all of the future earnings increments (see the bottom section of Column 4). This may also be interpreted as the gross capital asset value of the students' higher earnings stream. In effect, the aggregate FY 2018-19 student body is rewarded for its investment in BTC with a capital asset valued at $136.5 million.

The students' cost of attending the college is shown in Column 5 of Table 3.2, equal to a present value of $28.5 million. Comparing the cost with the present value of benefits yields a student benefit-cost ratio of 4.8 (equal to $136.5 million in benefits divided by $28.5 million in costs).

Another way to compare the same benefits stream and associated cost is to compute the rate of return. The 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.[37] Table 3.2 shows students of BTC earning average returns of 20.8% on their investment of time and money. This is a favorable return compared, for example, to approximately 1% on a standard bank savings account, or 10% on stocks and bonds (30-year average return).

BTC students see an average rate of return of ***20.8%*** *for their investment of time and money.*

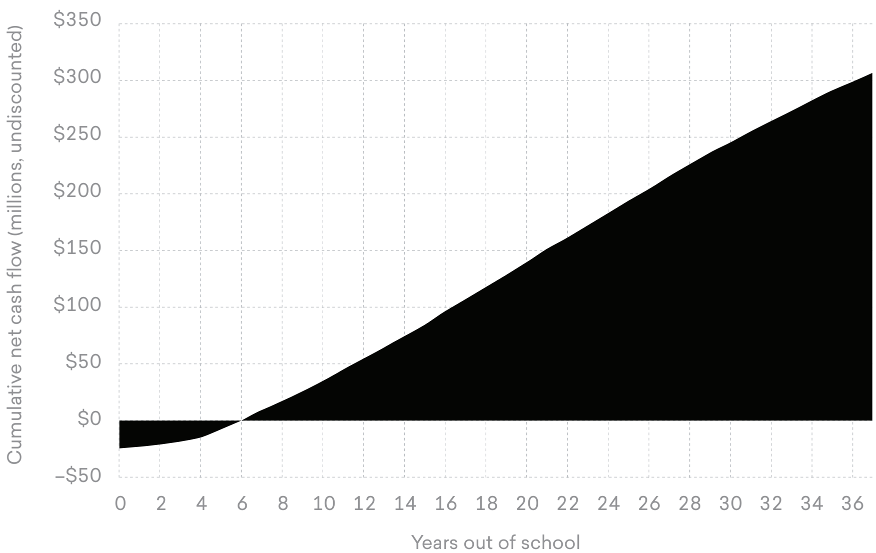
Note that returns reported in this study are real returns, not nominal. When a bank promises to pay a certain rate of interest on a savings account, it employs an implicitly nominal rate. Bonds operate in a similar manner. If it turns out that the inflation rate is higher than the stated rate of return, 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 20.8% student rate of return is a real rate. With an inflation rate of 2.2% (the average rate reported over the past 20 years as per

37 Rates of return are computed using the familiar internal rate-of-return calculation. Note that, with a bank deposit or stock market investment, the depositor puts up a principal, receives in return a stream of periodic payments, and then recovers the principal at the end. Someone who invests in education, 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.

the U.S. Department of Commerce, Consumer Price Index), the corresponding nominal rate of return is 22.9%, 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.[38] Beyond that point, returns are what economists would call pure costless rent. As indicated in Table 3.2, students at BTC see, on average, a payback period of 6.1 years, meaning 6.1 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).

FIGURE 3.1: STUDENT PAYBACK PERIOD



Source: Emsi impact model.

38 Payback analysis is generally used by the business community to rank alternative investments when safety of investments is an issue. Its greatest drawback is it does not take into account 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 take into account student living expenses.

Taxpayer perspective

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

TAXPAYER COSTS

State/Local Funding

TAXPAYER BENEFITS

Increased Tax Revenue

Avoided Costs to State/Local Government

Growth in state tax revenues

As a result of their time at BTC, students earn more because of the skills they learned while attending the college, 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 labor and non-labor (i.e., capital) income are considered the effect of a skilled workforce. These in turn increase tax revenues since state and local government is able to apply tax rates to higher earnings.

Estimating the effect of BTC 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 these net higher earnings, we apply a multiplier derived from Emsi's MR-SAM model to estimate the added labor income created in the state as students and businesses spend their higher earnings.[39] As labor income increases, so does non-labor income, which consists of monies gained through investments. To calculate the growth in non-labor income, we multiply the increase in labor income by a ratio of the Wisconsin gross state product to total labor income in the state. We also include the spending impacts discussed in Chapter 2 that were created in FY 2018-19 from operations and student spending, measured at the state level. To each of these, we apply the prevailing tax rates so we capture only the tax revenues attributable to state and local government from this additional revenue.

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

39 For a full description of the Emsi MR-SAM model, see Appendix 5.

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 BTC does not exist. The assumption in this case is that any benefits generated by students who could have received an education even without the college cannot be counted as new benefits to society. For this analysis, we assume an alternative education variable of 15%, meaning that 15% of the student population at the college would have generated benefits anyway even without the college. For more information on the alternative education variable, see Appendix 7.

We apply a final adjustment factor to account for the "shutdown point" that nets out benefits that are not directly linked to the state and local government costs of supporting the college. As with the alternative education variable discussed under the alumni impact, the purpose of this adjustment is to account for counterfactual scenarios. In this case, the counterfactual scenario is where state and local government funding for BTC did not exist and BTC had to derive the revenue elsewhere. To estimate this shutdown point, we apply a sub-model that simulates the students' demand curve for education by reducing state and local support to zero and progressively increasing student tuition and fees. As student tuition and fees increase, enrollment declines. For BTC, the shutdown point adjustment is 0%, meaning that the college 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 state, equal to $46.1 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 use the discount rate of 1.5%. This is the real treasury interest rate recommended by the Office of Management and Budget (OMB) for 30-year investments, and in Appendix 1, we conduct a sensitivity analysis of this discount rate.[40]

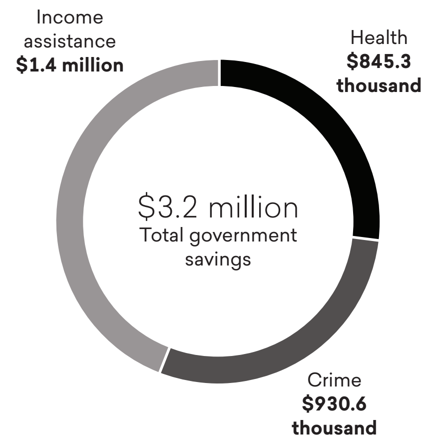
Government savings

In addition to the creation of higher tax revenues to the state and local government, education is statistically associated with a variety of lifestyle changes

40 Office of Management and Budget. "Discount Rates for Cost-Effectiveness Analysis of Federal Programs." *Real Interest Rates on Treasury Notes and Bonds of Specified Maturities (in Percent)*. Last modified May 2019. https://www.whitehouse.gov/wp-content/uploads/2018/12/Discount-History.pdf.

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 BTC. Government savings appear in Figure 3.2 and Table 3.3 and break down into three main categories: 1) health savings, 2) crime savings, and 3) income assistance savings. Health savings include avoided medical costs that would have otherwise been covered by state and local government. Crime savings consist of avoided costs to the justice system (i.e., police protection, judicial and legal, and corrections). Income assistance benefits comprise avoided costs due to the reduced number of welfare and unemployment insurance claims.

FIGURE 3.2: PRESENT VALUE OF GOVERNMENT SAVINGS



Source: Emsi impact model.

The model quantifies government savings by calculating the probability at each education level that individuals will have poor health, commit crimes, or claim welfare and unemployment benefits. 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 state level. We spread the probabilities across the education ladder and multiply the marginal differences by the number of students who achieved CHEs 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 the college, will not have poor health, commit crimes, or demand income assistance. We dampen these results by the ability bias adjustment discussed earlier in the student perspective section and in Appendix 6 to account for factors (besides education) that influence individual behavior. We then multiply the marginal effects of education times the associated costs of health, crime, and income assistance.[41] Finally, we apply the same adjustments for attrition, alternative education, and the shutdown point to derive the net savings to the government. Total government savings appear in Figure 3.2 and sum to $3.2 million.

In addition to the creation of **higher tax revenues** *to the state and local government, education is statistically associated with a variety of lifestyle changes that generate* **social savings***.*

Table 3.3 displays all benefits to taxpayers. The first row shows the added tax revenues created in the state, equal to $46.1 million, from students' higher earnings, increases in non-labor income, and spending impacts. The sum of the government savings and the added income in the state is $49.3 million, as shown in the bottom row of Table 3.3. These savings continue to accrue in the future as long as the FY 2018-19 student population of BTC remains in the workforce.

41 For a full list of the data sources used to calculate the social externalities, see the Resources and References section. See also Appendix 10 for a more in-depth description of the methodology.

TABLE 3.3: PRESENT VALUE OF ADDED TAX REVENUE AND GOVERNMENT SAVINGS (THOUSANDS)

Added tax revenue	**$46,117**
Government savings	
Health-related savings	$845
Crime-related savings	$931
Income assistance savings	$1,394
Total government savings	**$3,170**
Total taxpayer benefits	**$49,287**

Source: Emsi impact model.

Return on investment for taxpayers

Taxpayer costs are reported in Table 3.4 and come to $29 million, equal to the contribution of state and local government to BTC. In return for their public support, taxpayers are rewarded with an investment benefit-cost ratio of 1.7 (= $49.3 million ÷ $29 million), indicating a profitable investment.

*A rate of return of **4.9%** means that BTC not only pays its own way, but also generates a surplus that the state and local government can use to fund other programs.*

At 4.9%, the rate of return to state and local taxpayers is favorable. Given that the stakeholder in this case is the public sector, we use the discount rate of 1.5%, the real treasury interest rate recommended by the Office of Management and Budget for 30-year investments.[42] 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 1.5% would mean that the college just pays its own way. In principle, governments could borrow monies used to support BTC and repay the loans out of the resulting added taxes and reduced government expenditures. A rate of return of 4.9%, on the other hand, means that BTC not only pays its own way, but also generates a surplus that the state and local government can use to fund other programs. It is unlikely that other government programs could make such a claim.

42 Office of Management and Budget. "Discount Rates for Cost-Effectiveness Analysis of Federal Programs." *Real Interest Rates on Treasury Notes and Bonds of Specified Maturities (in Percent)*. Last modified May 2019. https://www.whitehouse.gov/wp-content/uploads/2018/12/Discount-History.pdf.

TABLE 3.4: PROJECTED BENEFITS AND COSTS, TAXPAYER PERSPECTIVE

1 Year	2 Benefits to taxpayers (millions)	3 State and local gov't costs (millions)	4 Net cash flow (millions)
0	$2.9	$29.0	-$26.1
1	$0.3	$0.0	$0.3
2	$0.4	$0.0	$0.4
3	$0.6	$0.0	$0.6
4	$0.8	$0.0	$0.8
5	$1.5	$0.0	$1.5
6	$1.6	$0.0	$1.6
7	$1.6	$0.0	$1.6
8	$1.7	$0.0	$1.7
9	$1.7	$0.0	$1.7
10	$1.8	$0.0	$1.8
11	$1.8	$0.0	$1.8
12	$1.9	$0.0	$1.9
13	$1.9	$0.0	$1.9
14	$1.9	$0.0	$1.9
15	$2.0	$0.0	$2.0
16	$2.0	$0.0	$2.0
17	$2.0	$0.0	$2.0
18	$2.0	$0.0	$2.0
19	$2.0	$0.0	$2.0
20	$2.0	$0.0	$2.0
21	$2.0	$0.0	$2.0
22	$2.0	$0.0	$2.0
23	$2.0	$0.0	$2.0
24	$2.0	$0.0	$2.0
25	$2.0	$0.0	$2.0
26	$1.9	$0.0	$1.9
27	$1.9	$0.0	$1.9
28	$1.9	$0.0	$1.9
29	$1.8	$0.0	$1.8
30	$1.8	$0.0	$1.8
31	$1.7	$0.0	$1.7
32	$1.7	$0.0	$1.7
33	$1.6	$0.0	$1.6
34	$1.6	$0.0	$1.6
35	$1.5	$0.0	$1.5
36	$1.4	$0.0	$1.4
37	$1.4	$0.0	$1.4
Present value	**$49.3**	**$29.0**	**$20.3**

Internal rate of return	Benefit-cost ratio	Payback period (no. of years)
4.9%	1.7	17.2

Source: Emsi impact model.

Social perspective

Wisconsin benefits from the education that BTC provides through the earnings that students create in the state and through the savings that they generate through their improved lifestyles. To receive these benefits, however, members of society must pay money and forego services that they otherwise would have enjoyed if BTC did not exist. Society's investment in BTC stretches across a number of investor groups, from students to employers to taxpayers. We weigh the benefits generated by BTC to these investor groups against the total social costs of generating those benefits. The total social costs include all BTC expenditures, all student expenditures (including interest on student loans) less tuition and fees, and all student opportunity costs, totaling a present value of $61 million.

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

SOCIAL COSTS

BTC Expenditures

Student Out-of-Pocket Expenses

Student Opportunity Costs

SOCIAL BENEFITS

Increased State Earnings

Avoided Costs to Society

Growth in state economic base

In the process of absorbing the newly acquired skills of students who attend BTC, not only does the productivity of the Wisconsin 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 college, 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 labor and non-labor (i.e., capital) income are considered the effect of a skilled workforce.

Estimating the effect of BTC on the state's economic base follows a similar 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 and business output. First, we calculate the students' future higher earnings stream. We factor in student attrition and alternative education opportunities to arrive at net higher earnings. We again apply multipliers derived from Emsi's MR-SAM model to estimate the added labor and non-labor income created in the state as students and businesses spend their higher earnings and as businesses generate additional profits from this increased output. We also include the operations and student spending impacts discussed in Chapter 2 that were created in FY 2018-19, measured at the state level. The shutdown point does not apply to the growth of the economic base because the social perspective captures not only the state and local taxpayer support to the college, but also the support from the students and other non-government sources.

Using this process, we calculate the present value of the future added income that occurs in the state, equal to $472.6 million. Recall from the discussion of the student and taxpayer 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 stated in the taxpayer perspective, given that the stakeholder in this case is the public sector, we use the discount rate of 1.5%.

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 BTC. 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, depression, and drug abuse. 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 welfare and unemployment insurance claims.

Table 3.5 displays the results of the analysis. The first row shows the increased economic base in the state, equal to $472.6 million, from students' higher earnings and their multiplier effects, increases in non-labor income, and spending impacts. Social savings appear next, beginning with a breakdown of savings related to health. These include 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. Although the prevalence of these health conditions generally declines as individuals attain higher levels of education, prevalence rates are sometimes higher for individuals with certain levels of education. For example, adults with college degrees may be more likely to

Beekeeper analogy

Beekeepers provide a classic example of positive externalities (sometimes called "neighborhood effects"). The beekeeper's intention is to make money selling honey. Like any other business, receipts must at least cover operating costs. If they don't, 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 actually 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 they create an array of external benefits. 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 generated by education, the model tracks and accounts for many of these external social benefits.

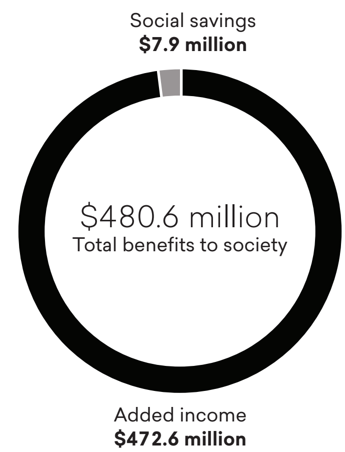
spend more on alcohol and become dependent on alcohol. Thus, in some cases the social savings associated with a health factor can be negative. Nevertheless, the overall health savings for society are positive, amounting to $5.5 million. Crime savings amount to $1.1 million, including savings associated 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 $1.4 million, stemming from a reduced number of persons in need of welfare or unemployment benefits. All told, social savings amounted to $7.9 million in benefits to communities and citizens in Wisconsin.

TABLE 3.5: PRESENT VALUE OF THE FUTURE INCREASED ECONOMIC BASE AND SOCIAL SAVINGS IN THE STATE (THOUSANDS)

Increased economic base	$472,607
Social savings	
Health	
Smoking	$7,371
Alcohol dependence	-$1,570
Obesity	$1,932
Depression	-$2,252
Drug abuse	$5
Total health savings*	**$5,486**
Crime	
Criminal justice system savings	$918
Crime victim savings	$20
Added productivity	$130
Total crime savings	**$1,068**
Income assistance	
Welfare savings	$1,097
Unemployment savings	$297
Total income assistance savings	**$1,394**
Total social savings	**$7,948**
Total, increased economic base + social savings	**$480,555**

* In some cases, health savings may be negative. This is due to increased prevalence rates at certain education levels.
Source: Emsi impact model.

FIGURE 3.3: PRESENT VALUE OF BENEFITS TO SOCIETY



Source: Emsi impact model.

The sum of the social savings and the increased state economic base is $480.6 million, as shown in the bottom row of Table 3.5 and in Figure 3.3. These savings accrue in the future as long as the FY 2018-19 student population of BTC remains in the workforce.

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	$31.3	$57.5	-$26.2
1	$2.6	$0.4	$2.2
2	$4.0	$0.4	$3.6
3	$5.8	$0.4	$5.4
4	$8.0	$0.4	$7.6
5	$15.0	$0.4	$14.6
6	$15.5	$0.4	$15.1
7	$16.0	$0.4	$15.6
8	$16.5	$0.4	$16.1
9	$17.0	$0.4	$16.6
10	$17.4	$0.4	$17.0
11	$17.8	$0.0	$17.8
12	$18.2	$0.0	$18.2
13	$18.5	$0.0	$18.5
14	$18.8	$0.0	$18.8
15	$19.1	$0.0	$19.1
16	$19.3	$0.0	$19.3
17	$19.5	$0.0	$19.5
18	$19.6	$0.0	$19.6
19	$19.7	$0.0	$19.7
20	$19.7	$0.0	$19.7
21	$19.7	$0.0	$19.7
22	$19.6	$0.0	$19.6
23	$19.5	$0.0	$19.5
24	$19.3	$0.0	$19.3
25	$19.0	$0.0	$19.0
26	$18.8	$0.0	$18.8
27	$18.4	$0.0	$18.4
28	$18.1	$0.0	$18.1
29	$17.6	$0.0	$17.6
30	$17.2	$0.0	$17.2
31	$16.7	$0.0	$16.7
32	$16.2	$0.0	$16.2
33	$15.6	$0.0	$15.6
34	$15.0	$0.0	$15.0
35	$14.4	$0.0	$14.4
36	$13.8	$0.0	$13.8
37	$13.2	$0.0	$13.2
Present value	**$480.6**	**$61.0**	**$419.6**

Benefit-cost ratio	Payback period (no. of years)
7.9	4.5

Source: Emsi impact model.

Return on investment for society

Table 3.6 presents the stream of benefits accruing to the Wisconsin society and the total social costs of generating those benefits. Comparing the present value of the benefits and the social costs, we have a benefit-cost ratio of 7.9. This means that for every dollar invested in an education from BTC, whether it is the money spent on operations of the college or money spent by students on tuition and fees, an average of $7.90 in benefits will accrue to society in Wisconsin.[43]

With and without social savings

Earlier in this chapter, social benefits attributable to education (improved health, reduced crime, and reduced demand for income assistance) were defined as externalities that are incidental to the operations of BTC. Some would question the legitimacy of including these benefits in the calculation of rates of return to education, arguing that only the tangible benefits (higher earnings) should be counted. Table 3.4 and Table 3.6 are inclusive of social benefits reported as attributable to BTC. Recognizing the other point of view, Table 3.7 shows rates of return for both the taxpayer and social perspectives exclusive of social benefits. As indicated, returns are still above threshold values (a benefit-cost ratio greater than 1.0 and a rate of return greater than 1.5%), confirming that taxpayers receive value from investing in BTC.

TABLE 3.7: TAXPAYER AND SOCIAL PERSPECTIVES WITH AND WITHOUT SOCIAL SAVINGS

	Including social savings	Excluding social savings
Taxpayer perspective		
Net present value (millions)	$20.3	$17.1
Benefit-cost ratio	1.7	1.6
Internal rate of return	4.9%	4.4%
Payback period (no. of years)	17.2	19.2
Social perspective		
Net present value (millions)	$419.6	$411.6
Benefit-cost ratio	7.9	7.8

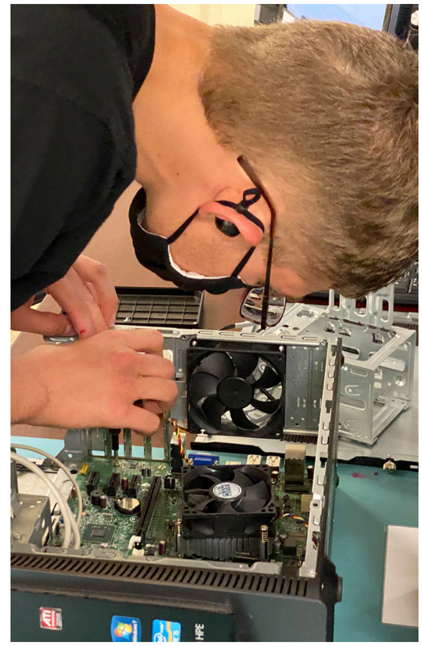
Source: Emsi impact model.

43 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.

CHAPTER 4:

Conclusion

WHILE BTC's value to the BTC District is larger than simply its economic impact, understanding the dollars and cents value is an important asset to understanding the college's value as a whole. In order to fully assess BTC's value to the district's economy, this report has evaluated the college from the perspectives of economic impact analysis and investment analysis.



From an economic impact perspective, we calculated that BTC generates a total economic impact of **$85.9 million** in total added income for the district's economy. This represents the sum of several different impacts, including the college's:

- Operations spending impact (**$28.2 million**);
- Student spending impact (**$8.3 million**); and
- Alumni impact (**$49.5 million**).

The total impact of $85.9 million is equivalent to supporting **1,564 jobs**. For perspective, this means that **one out of every 71 jobs** in the BTC District is supported by the activities of BTC and its students.

One out of every 71 jobs *in the BTC District is supported by the activities of BTC and its students.*

Since BTC's activity represents an investment by various parties, including students, taxpayers, and society as a whole, we also considered the college as an investment to see the value it provides to these investors. For each dollar invested by students, taxpayers, and society, BTC offers a benefit of **$4.80**, **$1.70**, and **$7.90**, respectively. These results indicate that BTC is an attractive investment to students with rates of return that exceed alternative investment opportunities. At the same time, the presence of the college expands the state economy and creates a wide range of positive social benefits that accrue to taxpayers and society in general within Wisconsin.

Modeling the impact of the college 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 BTC.

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Appendix 1: Sensitivity Analysis

Sensitivity analysis measures the extent to which a model's outputs are affected by hypothetical changes in the background data and assumptions. This is especially important when those variables are inherently uncertain. This analysis allows us to identify a plausible range of potential results that would occur if the value of any of the variables is in fact different from what was expected. In this chapter we test the sensitivity of the model to the following input factors: 1) the alternative education variable, 2) the labor import 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 college in the district. 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 4.9% to 4.8%. Likewise, a decrease of 10% (from 15% to 14%) in the assumption increases the rate of return from 4.9% to 5.0%.

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)	$25	$22	$21	$20	$19	$18	$16
Rate of return	5.6%	5.2%	5.0%	4.9%	4.8%	4.6%	4.3%
Benefit-cost ratio	1.8	1.8	1.7	1.7	1.7	1.6	1.5
Social perspective							
Net present value (millions)	$462	$441	$428	$420	$411	$398	$377
Benefit-cost ratio	8.6	8.2	8.0	7.9	7.7	7.5	7.2

Based on this sensitivity analysis, the conclusion can be drawn that BTC 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 zero, benefit-cost ratio greater than 1.0, and rate of return greater than the discount rate of 1.5%), even when the alternative education assumption 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.

Labor import effect variable

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

Table A1.2 presents the results of the sensitivity analysis for the labor import effect variable. As explained earlier, the assumption increases and decreases relative to the base case of 50% by the increments indicated in the table. Alumni productivity impacts attributable to BTC, for example, range from a high of $74.2 million at a -50% variation to a low of $24.7 million at a +50% variation from the base case assumption. This means that if the labor import effect variable increases, the impact that we claim as attributable to alumni decreases. Even under the most conservative assumptions, the alumni impact on the BTC District economy still remains sizeable.

TABLE A1.2: SENSITIVITY ANALYSIS OF LABOR IMPORT EFFECT VARIABLE

% variation in assumption	-50%	-25%	-10%	Base case	10%	25%	50%
Labor import effect variable	25%	38%	45%	50%	55%	63%	75%
Alumni impact (millions)	$74	$62	$54	$49	$45	$37	$25

Student employment variables

Student employment variables are difficult to estimate because many students do not report their employment status or because colleges generally do not collect this kind of information. Employment variables include the following: 1) the percentage of students who are employed while attending the college 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 college. Both employment variables affect the investment analysis results from the student perspective.

Students incur substantial expense by attending BTC 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 72% of students are employed.[44] 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 college earn only 70%, on average, of the earnings that they statistically would have received if not attending BTC. This suggests that many students hold part-time jobs that accommodate their BTC attendance, though it is at an additional cost in terms of receiving a wage that is less than what they otherwise might make. The 70% variable is an estimation based on the average hourly wages of the most common jobs held by students while attending college relative to the average hourly wages of all occupations in the U.S. The model captures this difference in wages and counts it as part of the opportunity cost of time. As above, the 70% 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 72% and B equal to 70%. 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)	Internal rate of return	Benefit-cost ratio
Base case: A = 72%, B = 70%	$108.0	20.8%	4.8
Scenario 1: A = 100%, B = 70%	$116.0	26.7%	6.7
Scenario 2: A = 72%, B = 100%	$117.7	28.5%	7.3
Scenario 3: A = 100%, B = 100%	$129.5	70.0%	19.4
Scenario 4: A = 0%, B = 0%	$87.4	13.7%	2.8

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

44 Based on data provided by BTC. This figure excludes dual credit high school students, who are not included in the opportunity cost calculations.

- **Scenario 1:** Increasing the percentage of students employed (A) from 72% to 100%, the net present value, internal rate of return, and benefit-cost ratio improve to $116 million, 26.7%, and 6.7, 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 70% to 100%, the net present value, internal rate of return, and benefit-cost ratio results improve to $117.7 million, 28.5%, and 7.3, 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, internal rate of return, and benefit-cost ratio improve yet further to $129.5 million, 70.0%, and 19.4, 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.
- **Scenario 4:** Finally, decreasing both A and B to 0% reduces the net present value, internal rate of return, and benefit-cost ratio to $87.4 million, 13.7%, and 2.8, respectively, relative to base case results. These results are reflective of an increased opportunity cost; none of the students are employed in this case.[45]

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 BTC 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 forego the use of money in the present 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

45 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.

returns of less risky assets where the investors might alternatively consider placing their money.

In this study, we assume a 5.1% discount rate for students and a 1.5% discount rate for society and taxpayers.[46] Similar to 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 and the benefit-cost ratio are shown for students, taxpayers, and society in Table A1.4.

TABLE A1.4: SENSITIVITY ANALYSIS OF DISCOUNT RATE

% variation in assumption	-50%	-25%	-10%	Base case	10%	25%	50%
Student perspective							
Discount rate	2.5%	3.8%	4.5%	5.1%	5.6%	6.3%	7.6%
Net present value (millions)	$178	$138	$119	$108	$98	$85	$79
Benefit-cost ratio	7.2	5.8	5.2	4.8	4.4	4.0	3.8
Taxpayer perspective							
Discount rate	0.8%	1.1%	1.4%	1.5%	1.7%	1.9%	2.3%
Net present value (millions)	$27	$24	$22	$20	$19	$17	$14
Benefit-cost ratio	1.9	1.8	1.7	1.7	1.7	1.6	1.5
Social perspective							
Discount rate	0.8%	1.1%	1.4%	1.5%	1.7%	1.9%	2.3%
Net present value (millions)	$488	$452	$432	$420	$407	$390	$363
Benefit-cost ratio	9.0	8.4	8.1	7.9	7.7	7.4	6.9

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 5.1% to 7.6%) reduces the students' benefit-cost ratio from 4.8 to 3.8. Conversely, reducing the discount rate for students by 50% (from 5.1% to 2.5%) increases the benefit-cost ratio from 4.8 to 7.2. The sensitivity analysis results for society and taxpayers show the same inverse relationship between the discount rate and the benefit-cost ratio, with the variance in results being the greatest under the social perspective (from a 9.0 benefit-cost ratio at a -50% variation from the base case, to a 6.9 benefit-cost ratio at a 50% variation from the base case).

46 These values are based on the baseline forecasts for the 10-year Treasury rate published by the Congressional Budget Office and the real treasury interest rates recommended by the Office of Management and Budget for 30-year investments. See the Congressional Budget Office "Table 4. Projection of Borrower Interest Rates: CBO's April 2018 Baseline" and the Office of Management and Budget "Discount Rates for Cost-Effectiveness of Federal Programs."

Retained student variable

The retained student variable only affects the student spending impact calculation in Table 2.4. For this analysis, we assume a retained student variable of 10%, which means that 10% of BTC's students who originated from the BTC District would have left the district for other opportunities, whether that be education or employment, if BTC did not exist. The money these retained students spent in the district for accommodation and other personal and household expenses is attributable to BTC.

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 BTC range from a high of $9.2 million when the retained student variable is 15% to a low of $7.3 million when the retained student variable is 5%. This means as the retained student variable decreases, the student spending attributable to BTC decreases. Even under the most conservative assumptions, the student spending impact on the BTC District 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%	8%	9%	10%	11%	13%	15%
Student spending impact (thousands)	$7,336	$7,814	$8,101	$8,293	$8,484	$8,771	$9,249

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 if the college under analysis did not exist. An estimate of 10%, for example, means that 10% of students do not depend directly on the existence of the college in order to obtain their education.

Alternative use of funds A measure of how monies that are currently used to fund the college might otherwise have been used if the college 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 workforce due to out-migration, unemployment, 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.

Counterfactual scenario What would have happened if a given event had not occurred. In the case of this economic impact study, the counterfactual scenario is a scenario where the college did not exist.

Credit hour equivalent Credit hour equivalent, or CHE, is defined as 15 contact hours of education if on a semester system, and 10 contact hours if on a quarter system. In general, it requires 450 contact hours 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 enrollment). The law of the downward-sloping demand curve is related to the fact that enrollment increases only if the price (tuition and fees) is lowered, or conversely, enrollment decreases if price increases.

Discounting Expressing future revenues and costs in present value terms.

Earnings (labor income) Income that is received as a result of labor; i.e., wages.

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 (enrollment) to changes in market prices (tuition and fees). If a decrease in fees increases or decreases total enrollment by a significant amount, demand is elastic. If enrollment 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 behaviors such as improved health, lower crime, and reduced demand for income assistance. Educational institutions do not receive compensation for these benefits, but benefits still occur because education is statistically proven to lead to improved social behaviors.

Gross regional product Measure of the final value of all goods and services produced in a district 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., labor, land and capital. These include wages, salaries, proprietors' incomes, profits, rents, and other. Gross regional product is also sometimes called value added or added income.

Initial effect Income generated by the initial injection of monies into the economy through the payroll of the college and the higher earnings of 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 labor that this requires. When educational institutions pay wages and salaries and spend money for supplies in the district, 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 that, 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 effect Additional income created in the economy as the college and its students spend money in the district. It consists of the income created by the supply chain of the industries initially affected by the spending of the college 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).

NAICS The North American Industry Classification System (NAICS) classifies North American business establishment in order to better collect, analyze, and publish statistical data related to the business economy.

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.

Non-labor income Income received from investments, such as rent, interest, and dividends.

Opportunity cost Benefits foregone from alternative B once a decision is made to allocate resources to alternative A. Or, if individuals choose to attend college, they forego earnings that they would have received had they chose instead to work full-time. Foregone earnings, therefore, are the "price tag" of choosing to attend college.

Payback period Length of time required to recover an investment. The shorter the period, the more attractive the investment. The formula for computing payback period is:

Payback period = cost of investment/net return per period

Appendix 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 a college—on the economy of a specified district.

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 service region, and if so, why?

Yes. Regional economic data are drawn from Emsi's proprietary MR-SAM model, the Census Bureau, and other sources to reflect the specific earnings levels, jobs numbers, unemployment rates, population demographics, and other key characteristics of the service region served by the college. Therefore, model results for the college are specific to the given service region.

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

Emsi'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 college. Rather, it is an impact assessment of the additional income created in the district as a result of the college spending on payroll and other non-pay expenditures, net of any impacts that would have occurred anyway if the college did not exist.

How does my college's rates of return compare to that of other institutions?

In general, Emsi discourages comparisons between institutions since many factors, such as regional economic conditions, institutional differences, and student demographics are outside of the college's control. It is best to compare the rate of return to the discount rates of 5.1% (for students) and 1.5% (for society and taxpayers), 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.

Emsi 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 Emsi, 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 30 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 30 years, the dollar 30 years from now needs to be adjusted to express its worth today. 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?

Using the bank as an example, an individual needs to decide between spending all of their paycheck today and 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. This makes it so an individual can expect, for example, a 3% return in the future for money that they put into savings now.

Total economic impact: How do I communicate this in laymen’s terms?

Big numbers are great, but putting them into perspective can be a challenge. To add perspective, find an industry with roughly the same “% of GRP” as your college (Table 1.3). This percentage represents its portion of the total gross regional product in the district (similar to the nationally recognized gross domestic product but at a regional level). This allows the college to say that their single brick and mortar campus does just as much for the BTC District as the entire Utilities *industry*, for example. This powerful statement can help put the large total impact number into perspective.

Appendix 4: Example of Sales versus Income

Emsi'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, we provide context behind the income figures by also reporting the associated number of jobs. The impacts are also reported in sales and earnings terms for reference.

Appendix 5: Emsi MR-SAM

Emsi's MR-SAM represents the flow of all economic transactions in a given region. It replaces Emsi's previous input-output (IO) model, which operated with some 1,000 industries, four layers of government, a single household consumption sector, and an investment sector. The old IO model was used to simulate the ripple effects (*i.e.*, multipliers) in the regional economy as a result of industries entering or exiting the region. The MR-SAM model performs the same tasks as the old IO model, but it also does much more. Along with the same 1,000 industries, government, household and investment sectors embedded in the old IO tool, the MR-SAM exhibits much more functionality, a greater amount of data, and a higher level of detail on the demographic and occupational components of jobs (16 demographic cohorts and about 750 occupations are characterized).

This appendix presents a high-level overview of the MR-SAM. Additional documentation on the technical aspects of the model is available upon request.

Data sources for the model

The Emsi MR-SAM model relies on a number of internal and external data sources, mostly compiled by the federal government. What follows is a listing and short explanation of our sources. The use of these data will be covered in more detail later in this appendix.

Emsi Data are produced from many data sources to produce detailed industry, occupation, and demographic jobs and earnings data at the local level. This information (especially sales-to-jobs ratios derived from jobs and earnings-to-sales ratios) is used to help regionalize the national matrices as well as to disaggregate them into more detailed industries than are normally available.

BEA Make and Use Tables (MUT) are the basis for input-output models in the U.S. The *make* table is a matrix that describes the amount of each commodity made by each industry in a given year. Industries are placed in the rows and commodities in the columns. The *use* table is a matrix that describes the amount of each commodity used by each industry in a given year. In the use table, commodities are placed in the rows and industries in the columns. The BEA produces two different sets of MUTs, the benchmark and the summary. The benchmark set contains about 500 sectors and is released every five years, with a five-year lag time (e.g., 2002 benchmark MUTs were released in 2007). The summary set contains about 80 sectors and is released every year, with a two-year lag (e.g., 2010 summary MUTs were released in late 2011/early 2012).

The MUTs are used in the Emsi MR-SAM model to produce an industry-by-industry matrix describing all industry purchases from all industries.

BEA Gross Domestic Product by State (GSP) describes gross domestic product from the value added (also known as added income) perspective. Value added is equal to employee compensation, gross operating surplus, and taxes on production and imports, less subsidies. Each of these components is reported for each state and an aggregate group of industries. This dataset is updated once per year, with a one-year lag. The Emsi MR-SAM model makes use of this data as a control and pegs certain pieces of the model to values from this dataset.

BEA National Income and Product Accounts (NIPA) cover a wide variety of economic measures for the nation, including gross domestic product (GDP), sources of output, and distribution of income. This dataset is updated periodically throughout the year and can be between a month and several years old depending on the specific account. NIPA data are used in many of the Emsi MR-SAM processes as both controls and seeds.

BEA Local Area Income (LPI) encapsulates multiple tables with geographies down to the county level. The following two tables are specifically used: CA05 (Personal income and earnings by industry) and CA91 (Gross flow of earnings). CA91 is used when creating the commuting submodel and CA05 is used in several processes to help with place-of-work and place-of-residence differences, as well as to calculate personal income, transfers, dividends, interest, and rent.

Bureau of Labor Statistics Consumer Expenditure Survey (CEX) reports on the buying habits of consumers along with some information as to their income, consumer unit, and demographics. Emsi utilizes this data heavily in the creation of the national demographic by income type consumption on industries.

Census of Government's (CoG) state and local government finance dataset is used specifically to aid breaking out state and local data that is reported in the MUTs. This allows Emsi to have unique production functions for each of its state and local government sectors.

Census' OnTheMap (OTM) is a collection of three datasets for the census block level for multiple years. **Origin-Destination (OD)** offers job totals associated with both home census blocks and a work census block. **Residence Area Characteristics (RAC)** offers jobs totaled by home census block. **Workplace Area Characteristics (WAC)** offers jobs totaled by work census block. All three of these are used in the commuting submodel to gain better estimates of earnings by industry that may be counted as commuting. This dataset has holes for specific years and regions. These holes are filled with Census' Journey-to-Work described later.

Census' Current Population Survey (CPS) is used as the basis for the demographic breakout data of the MR-SAM model. This set is used to estimate the ratios of demographic cohorts and their income for the three different income categories (i.e., wages, property income, and transfers).

Census' Journey-to-Work (JtW) is part of the 2000 Census and describes the amount of commuting jobs between counties. This set is used to fill in the areas where OTM does not have data.

Census' American Community Survey (ACS) Public Use Microdata Sample (PUMS) is the replacement for Census' long form and is used by Emsi to fill the holes in the CPS data.

Oak Ridge National Lab (ORNL) County-to-County Distance Matrix (Skim Tree) contains a matrix of distances and network impedances between each county via various modes of transportation such as highway, railroad, water, and combined highway-rail. Also included in this set are minimum impedances utilizing the best combination of paths. The ORNL distance matrix is used in Emsi's gravitational flows model that estimates the amount of trade between counties in the country.

Overview of the MR-SAM model

Emsi's MR-SAM modeling system is a comparative static model in the same general class as RIMS II (Bureau of Economic Analysis) and IMPLAN (Minnesota Implan Group). The MR-SAM model is thus not an econometric model, the primary example of which is PolicyInsight by REMI. It relies on a matrix representation of industry-to-industry purchasing patterns originally based on national data which are regionalized with the use of local data and mathematical manipulation (i.e., non-survey methods). Models of this type estimate the ripple effects of changes in jobs, earnings, or sales in one or more industries upon other industries in a region.

The Emsi MR-SAM model shows final equilibrium impacts—that is, the user enters a change that perturbs the economy and the model shows the changes required to establish a new equilibrium. As such, it is not a dynamic model that shows year-by-year changes over time (as REMI's does).

NATIONAL SAM

Following standard practice, the SAM model appears as a square matrix, with each row sum exactly equaling the corresponding column sum. Reflecting its kinship with the standard Leontief input-output framework, individual SAM elements show accounting flows between row and column sectors during a chosen base year. Read across rows, SAM entries show the flow of funds into column accounts (also known as receipts or the appropriation of funds by those column accounts). Read down columns, SAM entries show the flow of funds into row accounts (also known as expenditures or the dispersal of funds to those row accounts).

The SAM may be broken into three different aggregation layers: broad accounts, sub-accounts, and detailed accounts. The broad layer is the most aggregate and will be covered first. Broad accounts cover between one and four sub-accounts, which in turn cover many detailed accounts. This appendix will not discuss detailed accounts directly because of their number. For example, in the industry broad account, there are two sub-accounts and over 1,000 detailed accounts.

MULTI-REGIONAL ASPECT OF THE MR-SAM

Multi-regional (MR) describes a non-survey model that has the ability to analyze the transactions and ripple effects (i.e., multipliers) of not just a single region, but multiple regions interacting with each other. Regions in this case are made up of a collection of counties.

Emsi's multi-regional model is built off of gravitational flows, assuming that the larger a county's economy, the more influence it will have on the surrounding counties' purchases and sales. The equation behind this model is essentially the same that Isaac Newton used to calculate the gravitational pull between planets and stars. In Newton's equation, the masses of both objects are multiplied, then divided by the distance separating them and multiplied by a constant. In Emsi's model, the masses are replaced with the supply of a sector for one county and the demand for that same sector from another county. The distance is replaced with an impedance value that takes into account the distance, type of roads, rail lines, and other modes of transportation. Once this is calculated for every county-to-county pair, a set of mathematical operations is performed to make sure all counties absorb the correct amount of supply from every county and the correct amount of demand from every county. These operations produce more than 200 million data points.

Components of the Emsi MR-SAM model

The Emsi MR-SAM is built from a number of different components that are gathered together to display information whenever a user selects a region. What follows is a description of each of these components and how each is created. Emsi's internally created data are used to a great extent throughout the processes described below, but its creation is not described in this appendix.

COUNTY EARNINGS DISTRIBUTION MATRIX

The county earnings distribution matrices describe the earnings spent by every industry on every occupation for a year—i.e., earnings by occupation.

The matrices are built utilizing Emsi's industry earnings, occupational average earnings, and staffing patterns.

Each matrix starts with a region's staffing pattern matrix which is multiplied by the industry jobs vector. This produces the number of occupational jobs in each industry for the region. Next, the occupational average hourly earnings per job are multiplied by 2,080 hours, which converts the average hourly earnings into a yearly estimate. Then the matrix of occupational jobs is multiplied by the occupational annual earnings per job, converting it into earnings values. Last, all earnings are adjusted to match the known industry totals. This is a fairly simple process, but one that is very important. These matrices describe the place-of-work earnings used by the MR-SAM.

COMMUTING MODEL

The commuting sub-model is an integral part of Emsi's MR-SAM model. It allows the regional and multi-regional models to know what amount of the earnings can be attributed to place-of-residence vs. place-of-work. The commuting data describe the flow of earnings from any county to any other county (including within the counties themselves). For this situation, the commuted earnings are not just a single value describing total earnings flows over a complete year, but are broken out by occupation and demographic. Breaking out the earnings allows for analysis of place-of-residence and place-of-work earnings. These data are created using Bureau of Labor Statistics' OnTheMap dataset, Census' Journey-to-Work, BEA's LPI CA91 and CA05 tables, and some of Emsi's data. The process incorporates the cleanup and disaggregation of the OnTheMap data, the estimation of a closed system of county inflows and outflows of earnings, and the creation of finalized commuting data.

NATIONAL SAM

The national SAM as described above is made up of several different components. Many of the elements discussed are filled in with values from the national Z matrix—or industry-to-industry transaction matrix. This matrix is built from BEA data that describe which industries make and use what commodities at the national level. These data are manipulated with some industry standard equations to produce the national Z matrix. The data in the Z matrix act as the basis for the majority of the data in the national SAM. The rest of the values are filled in with data from the county earnings distribution matrices, the commuting data, and the BEA's National Income and Product Accounts.

One of the major issues that affect any SAM project is the combination of data from multiple sources that may not be consistent with one another. Matrix balancing is the broad name for the techniques used to correct this problem.

Emsi uses a modification of the "diagonal similarity scaling" algorithm to balance the national SAM.

GRAVITATIONAL FLOWS MODEL

The most important piece of the Emsi MR-SAM model is the gravitational flows model that produces county-by-county regional purchasing coefficients (RPCs). RPCs estimate how much an industry purchases from other industries inside and outside of the defined region. This information is critical for calculating all IO models.

Gravity modeling starts with the creation of an impedance matrix that values the difficulty of moving a product from county to county. For each sector, an impedance matrix is created based on a set of distance impedance methods for that sector. A distance impedance method is one of the measurements reported in the Oak Ridge National Laboratory's County-to-County Distance Matrix. In this matrix, every county-to-county relationship is accounted for in six measures: great-circle distance, highway impedance, rail miles, rail impedance, water impedance, and highway-rail-highway impedance. Next, using the impedance information, the trade flows for each industry in every county are solved for. The result is an estimate of multi-regional flows from every county to every county. These flows are divided by each respective county's demand to produce multi-regional RPCs.

Appendix 6: Value per Credit Hour Equivalent and the Mincer Function

Two key components in the analysis 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 CHE

Typically, the educational achievements of students are marked by the credentials they earn. However, not all students who attended BTC in the 2018-19 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 credit hour equivalents, or CHEs. This approach allows us to see the benefits to all students who attended the college, not just those who earned a credential.

To calculate the value per CHE, we first determine how many CHEs are required to complete each education level. For example, assuming that there are 30 CHEs in an academic year, a student generally completes 120 CHEs in order to move from a high school diploma to a bachelor's degree, another 60 CHEs to move from a bachelor's degree to a master's degree, and so on. This progression of CHEs 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 CHEs in the education ladder based on the wage differentials presented in Table 1.4.[47] For example, the difference in district earnings between a high school diploma and an associate degree is $9,900. We spread this $9,900 wage differential across the 60 CHEs that occur between a high school diploma and an associate degree, applying a ceremonial "boost" to the last CHE in the stage to mark the achievement of the degree.[48] We repeat this process for each education level in the ladder.

Next we map the CHE production of the FY 2018-19 student population to the education ladder. Table 1.2 provides information on the CHE production

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

48 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 effect or signaling effect. The ceremonial boosts applied to the achievement of degrees in the Emsi impact model are derived from Jaeger and Page (1996).

of students attending BTC, broken out by educational achievement. In total, students completed 61,539 CHEs during the analysis year, excluding personal enrichment students. We map each of these CHEs to the education ladder depending on the students' education level and the average number of CHEs they completed during the year. For example, bachelor's degree graduates are allocated to the stage between the associate degree and the bachelor's degree, and the average number of CHEs they completed informs the shape of the distribution curve used to spread out their total CHE production within that stage of the progression.

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

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

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 CHEs completed at step i.

Table A6.1 displays the result for the students' aggregate annual increase in income (*ΔE*), a total of $10.1 million. By dividing this value by the students' total production of 61,539 CHEs during the analysis year, we derive an overall value of $163 per CHE.

TABLE A6.1: AGGREGATE ANNUAL INCREASE IN INCOME OF STUDENTS AND VALUE PER CHE

Aggregate annual increase in income	$10,054,311
Total credit hour equivalents (CHEs) in FY 2018-19*	61,539
Value per CHE	**$163**

* Excludes the CHE production of personal enrichment students.
Source: Emsi impact model.

Mincer function

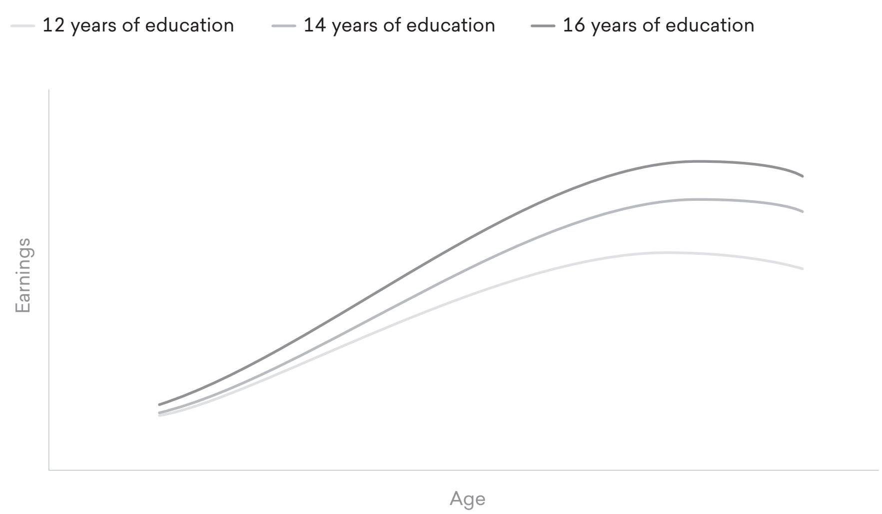
The $163 value per CHE in Table A6.1 only tells part of the story, however. Human capital theory holds that earnings levels do not remain constant; rather, they start relatively low and gradually increase as the worker gains more experience. Research also shows that the earnings increment between educated 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 as a proxy for experience.[49] 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 labor economics. Those critical of the Mincer function point to several unobserved

49 See Mincer (1958 and 1974).

factors such as ability, socioeconomic status, and family background that also help explain higher earnings. Failure to account for these factors results in what is known as an "ability bias." Research by Card (1999 and 2001) 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%. We use state-specific and education level-specific Mincer coefficients.

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 $163 value per CHE to the students' age and work experience. To the students just starting their career during the analysis year, we apply a lower value per CHE; to the students in the latter half or approaching the end of their careers we apply a higher value per CHE. The original $163 value per CHE applies only to the CHE production of students precisely at the midpoint of their careers during the analysis year.

In Chapter 3 we again apply the Mincer function, this time to project the benefits stream of the FY 2018-19 student population into the future. Here too the value per CHE 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.

Appendix 7: Alternative Education Variable

In a scenario where the college did 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 college. The alternative education variable accounts for these students and is used to discount the benefits we attribute to the college.

Recall this analysis considers only relevant economic information regarding the college. Considering the existence of various other academic institutions surrounding the college, we have to assume that a portion of the students could find alternative education and either remain in or return to the 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 region upon completing their studies. For these students—who would have found an alternative education and produced benefits in the region regardless of the presence of the college—we discount the benefits attributed to the college. An important distinction must be made here: the benefits from students who would find alternative education outside the region and not return to the region are *not* discounted. Because these benefits would not occur in the region without the presence of the college, they must be included.

In the absence of the college, we assume 15% of the college's students would find alternative education opportunities and remain in or return to the region. We account for this by discounting the alumni impact, the benefits to taxpayers, and the benefits to society in the region in Chapters 2 and 3 by 15%. In other words, we assume 15% of the benefits created by the college's students would have occurred anyway in the counterfactual scenario where the college did not exist. A sensitivity analysis of this adjustment is presented in Appendix 1.

Appendix 8: Overview of Investment Analysis Measures

The 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.[50]

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**

Internal rate of return	Benefit-cost ratio	Payback period (no. of years)
18.0%	1.7	4.2

Assumptions are as follows:

- Benefits and costs are projected out 10 years into the future (Column 1).
- The student attends the college for one year, and the cost of tuition is $1,500 (Column 2).
- Earnings foregone while attending the college for one year (opportunity cost) come to $20,000 (Column 3).

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

- Together, tuition and earnings foregone 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 otherwise would have 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, 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 college or to forego post-secondary education and maintain his present employment. If he decides to enroll, certain economic implications unfold. Tuition and fees must be paid, and earnings will cease for one year. In exchange, the student calculates that with post-secondary education, his 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 enroll? 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 foregone) 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.[51]

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 10, 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 10 years. An "economically rational" person would, therefore, be equally satisfied receiving $3,377 today or $5,000

51 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.

10 years from today given the going rate of interest of 4%. The process of discounting—finding the present value of future higher earnings—allows the model to express values on an equal basis in future or present value terms.

The goal is to express all future higher earnings in present value terms so that they can be compared to investments incurred today (in this example, tuition plus earnings foregone). 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—18.0% in fact, as indicated in Table A8.1. Or, if a discount rate of 18.0% 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 18.0% 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 18.0%, higher earnings of $5,000 per year for the next nine years will earn back all investments of $21,500 made plus pay 18.0% 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, 18.0% is far higher than 4%. It may be concluded, therefore, that the investment in this case is solid. Alternatively, comparing the 18.0% 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).

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 18.0% 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 18.0% 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.

Payback period

This is the length of time from the beginning of the investment (consisting of tuition and earnings foregone) 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 foregone while attending the college. 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

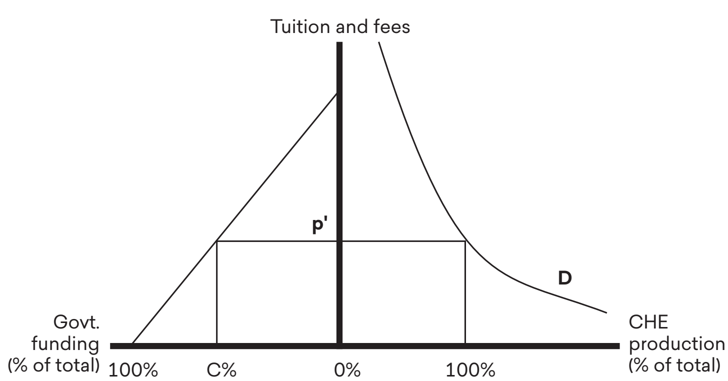
The investment analysis in Chapter 3 weighs the benefits generated by the college against the state and local taxpayer funding that the college receives to support its operations. An important part of this analysis is factoring out the benefits that the college would have been able to generate anyway, even without state and local taxpayer support. This adjustment is used to establish a direct link between what taxpayers pay and what they receive in return. If the college is able to generate benefits without taxpayer support, then it would not be a true investment.[52]

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

State and local government support versus student demand for education

Figure A9.1 presents a simple model of student demand and state and local government support. The right side of the graph is a standard demand curve (*D*) showing student enrollment as a function of student tuition and fees. Enrollment

FIGURE A9.1: STUDENT DEMAND AND GOVERNMENT FUNDING BY TUITION AND FEES

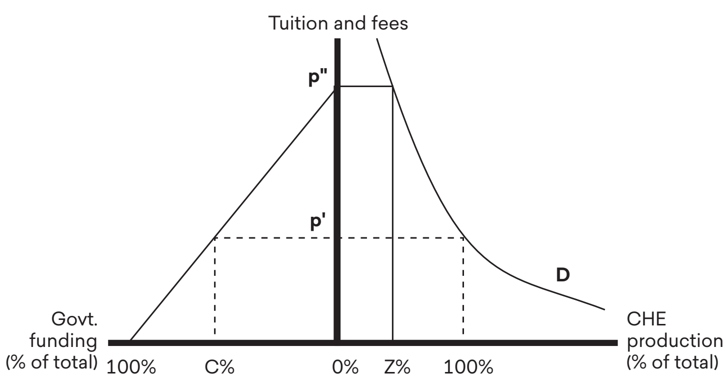


52 Of course, as a public training provider, the college would not be permitted to continue without public funding, so the situation in which it would lose all state support is entirely hypothetical. The purpose of the adjustment factor is to examine the college in standard investment analysis terms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

is measured in terms of total credit hour equivalents (CHEs) and expressed as a percentage of the college's current CHE production. Current student tuition and fees are represented by *p'*, and state and local government support covers *C%* of all costs. At this point in the analysis, it is assumed that the college has only two sources of revenues: 1) student tuition and fees and 2) state and local government support.

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

FIGURE A9.2: CHE PRODUCTION AND GOVERNMENT FUNDING BY TUITION AND FEES



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

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

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

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

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

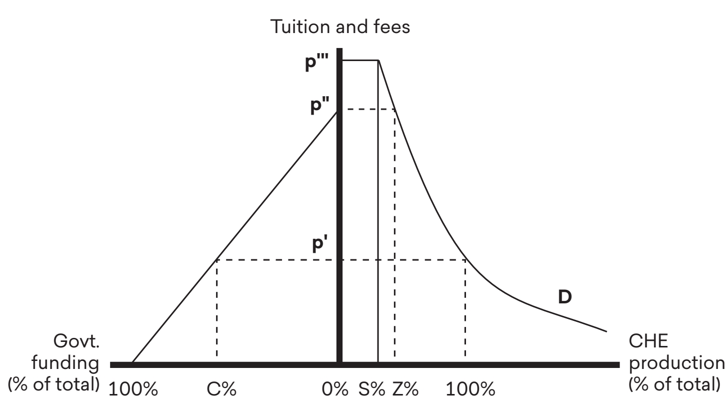
Inasmuch as the benefits in equation 2 occur with or without state and local government support, the benefits appropriately attributed to state and local government support are given by equation 3 as follows:

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

Calculating benefits at the shutdown point

Colleges and universities 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.[53] The shutdown point is introduced graphically in Figure A9.3 as S%. The location of point S% indicates that the college can operate at an even lower enrollment level than Z% (the point at which the college receives zero state and local government funding). State and local government support at point S% is still zero, and student tuition and fees have been raised to p'''. State and local government 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 college would no longer be able to attract enough students to keep the doors open, and it would shut down.

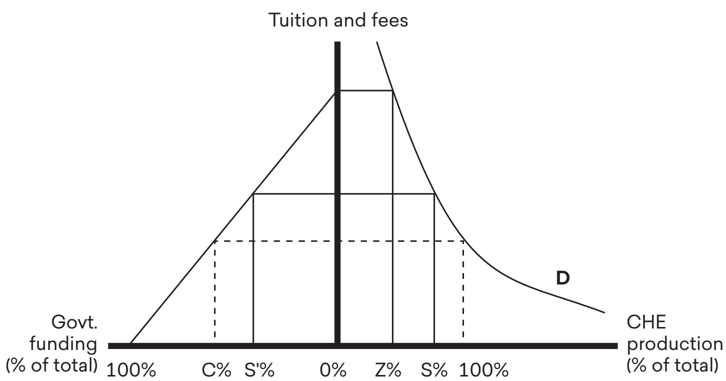
FIGURE A9.3: SHUTDOWN POINT AFTER ZERO GOVERNMENT FUNDING



53 In the traditional sense, the shutdown point applies to firms seeking to maximize profits and minimize losses. Although profit maximization is not the primary aim of colleges and universities, the principle remains the same, *i.e.*, that there is a minimum scale of operation required in order for colleges and universities to stay open.

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

FIGURE A9.4: SHUTDOWN POINT BEFORE ZERO GOVERNMENT FUNDING



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 communities and citizens throughout the region, including taxpayers. In this appendix we discuss the following three main benefit categories: 1) improved health, 2) reductions in crime, and 3) reduced demand for government-funded 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

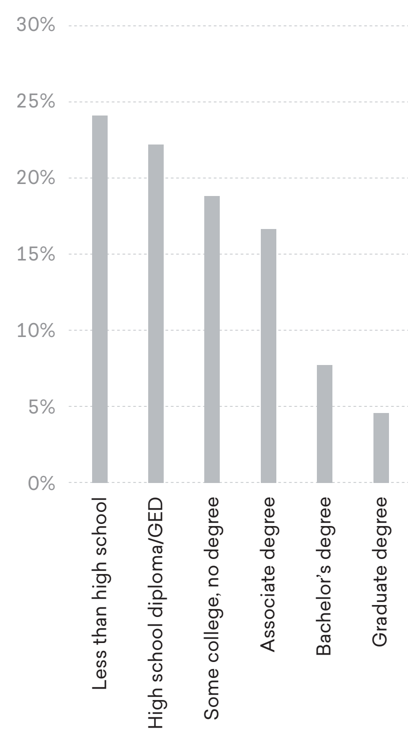
Statistics show a correlation between increased education and improved health. The manifestations of this are found in five health-related variables: smoking, alcohol dependence, obesity, depression, and drug abuse. There are other health-related areas that link to educational attainment, but these are 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

Despite a marked decline over the last several decades in the percentage of U.S. residents who smoke, a sizeable percentage of the U.S. population still smokes. The negative health effects of smoking are well documented in the literature, which identifies smoking as one of the most serious health issues in the U.S.

Figure A10.1 shows the prevalence of cigarette smoking among adults, 25 years and over, based on data provided by the National Health Interview Survey.[54] The data include adults who reported smoking more than 100 cigarettes during their lifetime and who, at the time of interview, reported smoking every day or some days. As indicated, the percent of who smoke begins to decline beyond the level of high school education.

FIGURE A10.1: PREVALENCE OF SMOKING AMONG U.S. ADULTS BY EDUCATION LEVEL



Source: Centers for Disease Control and Prevention.

54 Centers for Disease Control and Prevention. "Table. Characteristics of current adult cigarette smokers," National Health Interview Survey, United States, 2016.

The Centers for Disease Control and Prevention (CDC) reports the percentage of adults who are current smokers by state.[55] We use this information to create an index value by which we adjust the national prevalence data on smoking to each state. For example, 16.4% of Wisconsin adults were smokers in 2018, relative to 15.9% for the nation. We thus apply a scalar of 1.03 to the national probabilities of smoking in order to adjust them to the state of Wisconsin.

ALCOHOL DEPENDENCE

Although alcohol dependence has large public and private costs, it 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 health care expenditures for treatment, prevention, and support; workplace losses due to reduced worker productivity; and other effects.

Figure A10.2 compares the percentage of adults, 18 and older, that abuse or depend on alcohol by education level, based on data from the Substance Abuse and Mental Health Services Administration (SAMHSA).[56] These statistics give an indication of the correlation between education and the reduced probability of alcohol dependence. Adults with an associate degree or some college have higher rates of alcohol dependence than adults with a high school diploma or lower. Prevalence rates are lower for adults with a bachelor's degree or higher than those with an associate degree or some college. Although the data do not maintain a pattern of decreased alcohol dependence at every level of increased education, we include these rates in our model to ensure we provide a comprehensive view of the social benefits and costs correlated with education.

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 average cost of obesity-related medical conditions is calculated using information from the *Journal of Occupational and Environmental Medicine*, which reports incremental medical expenditures and productivity losses due to excess weight.[57]

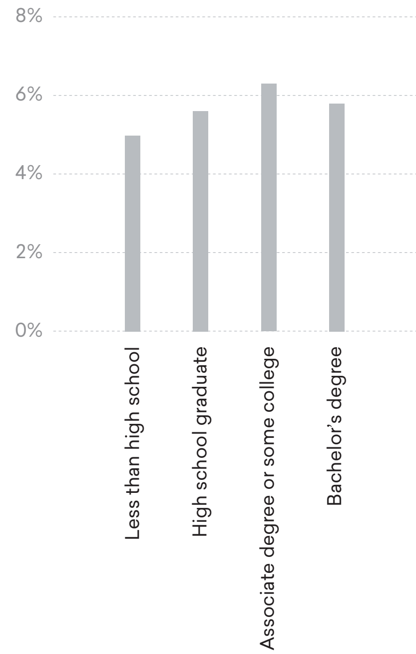
Data for Figure A10.3 is derived from the National Center for Health Statistics which shows the prevalence of obesity among adults aged 20 years and over

55 Centers for Disease Control and Prevention. "Current Cigarette Use Among Adults (Behavior Risk Factor Surveillance System) 2018." *Behavioral Risk Factor Surveillance System Prevalence and Trends Data,* 2018.

56 Substance Abuse and Mental Health Services Administration. "Table 5.4B - Alcohol Use Disorder in Past Year among Persons Aged 12 or Older, by Age Group and Demographic Characteristics: Percentages, 2017 and 2018." SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2017 and 2018.

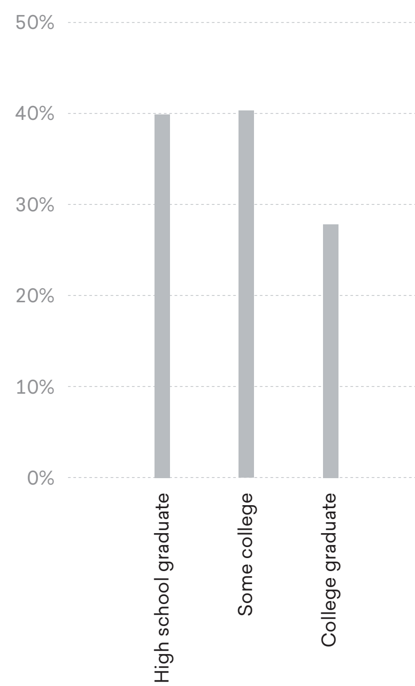
57 Eric A. Finkelstein, Marco da Costa DiBonaventura, Somali M. Burgess, and Brent C. Hale, "The Costs of Obesity in the Workplace," *Journal of Occupational and Environmental Medicine* 52, no. 10 (October 2010): 971-976.

FIGURE A10.2: PREVALENCE OF ALCOHOL DEPENDENCE OR ABUSE BY EDUCATION LEVEL



Source: Centers for Disease Control and Prevention.

FIGURE A10.3: PREVALENCE OF OBESITY BY EDUCATION LEVEL



Source: Derived from data provided by the National Center for Health Statistics.

by education, gender, and ethnicity.[58] As indicated, college graduates are less likely to be obese than individuals with a high school diploma. However, the prevalence of obesity among adults with some college is actually greater than those with just a high school diploma. In general, though, obesity tends to decline with increasing levels of education.

DEPRESSION

Capturing the full economic cost of mental illness is difficult because not all mental disorders have a correlation with education. For this reason, we only examine the economic costs associated with major depressive disorder (MDD), which are comprised of medical and pharmaceutical costs, workplace costs such as absenteeism, and suicide-related costs.[59]

Figure A10.4 summarizes the prevalence of MDD among adults by education level, based on data provided by the CDC.[60] As shown, people with some college are most likely to have MDD compared to those with other levels of educational attainment. People with a high school diploma or less, along with college graduates, are all fairly similar in the prevalence rates.

DRUG ABUSE

The burden and cost of illicit drug abuse is enormous in the U.S., but little is known about the magnitude of costs and effects at a national level. What is known is that the rate of people abusing drugs is inversely proportional to their education level. The higher the education level, the less likely a person is to abuse or depend on illicit drugs. The probability that a person with less than a high school diploma will abuse drugs is 3.9%, twice as large as the probability of drug abuse for college graduates (1.7%). This relationship is presented in Figure A10.5 based on data supplied by SAMHSA.[61] Similar to alcohol abuse, prevalence does not strictly decline at every education level. Health costs associated with illegal drug use are also available from SAMSHA, with costs to state and local government representing 40% of the total cost related to illegal drug use.[62]

58 Ogden Cynthia L., Tala H. Fakhouri, Margaret D. Carroll, Craig M. Hales, Cheryl D. Fryar, Xianfen Li, David S. Freedman. "Prevalence of Obesity Among Adults, by Household Income and Education — United States, 2011–2014" National Center for Health Statistics, Morbidity and Mortality Weekly Report, 66:1369–1373 (2017).

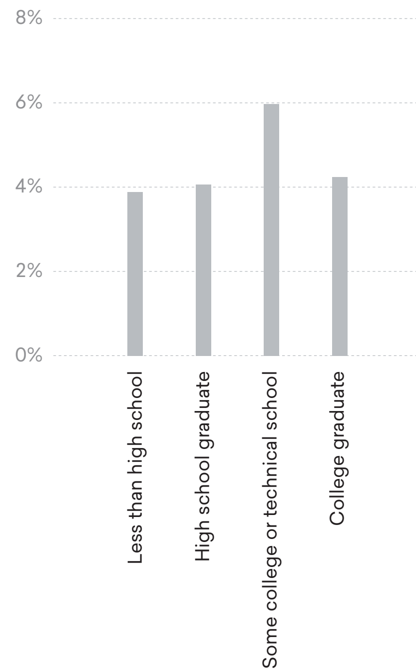
59 Greenberg, Paul, Andree-Anne Fournier, Tammy Sisitsky, Crystal Pike, and Ronald Kesslaer. "The Economic Burden of Adults with Major Depressive Disorder in the United States (2005 and 2010)" Journal of Clinical Psychiatry 76:2, 2015.

60 National Survey on Drug Use and Health. "Table 8.40B: Major Depressive Episode (MDE) or MDE with Severe Impairment in Past Year among Persons Aged 18 or Older, and Receipt of Treatment for Depression in Past Year among Persons Aged 18 or Older with MDE or MDE with Severe Impairment in Past Year, by Geographic, Socioeconomic, and Health Characteristics: Numbers in Thousands, 2017 and 2018."

61 Substance Abuse and Mental Health Services Administration. "Table 5.3B - Illicit Drug Use Disorder in Past Year among Persons Aged 12 or Older, by Age Group and Demographic Characteristics: Percentages, 2017 and 2018." SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 2017 and 2018.

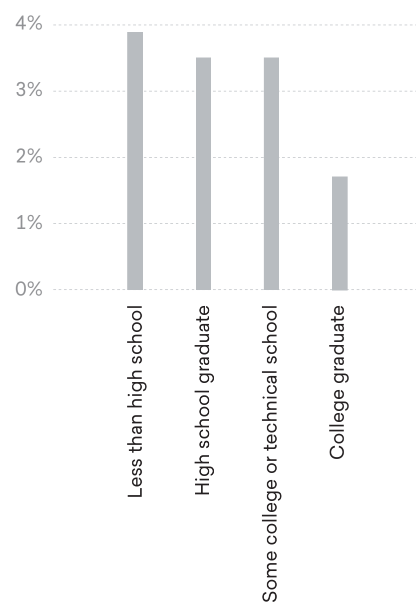
62 Substance Abuse and Mental Health Services Administration. "Table A.2. Spending by Payer: Levels and Percent Distribution for Mental Health and Substance Abuse (MHSA), Mental Health (MH), Substance Abuse (SA), Alcohol Abuse (AA), Drug Abuse (DA), and All-Health, 2014." *Behavioral Health Spending & Use Accounts, 1986 – 2014. HHS Publication No. SMA-16-4975*, 2016.

FIGURE A10.4: PREVALENCE OF MAJOR DEPRESSIVE EPISODE BY EDUCATION LEVEL



Source: National Survey on Drug Use and Health.

FIGURE A10.5: PREVALENCE OF ILLICIT DRUG DEPENDENCE OR ABUSE BY EDUCATION LEVEL



Source: Substance Abuse and Mental Health Services Administration.

Crime

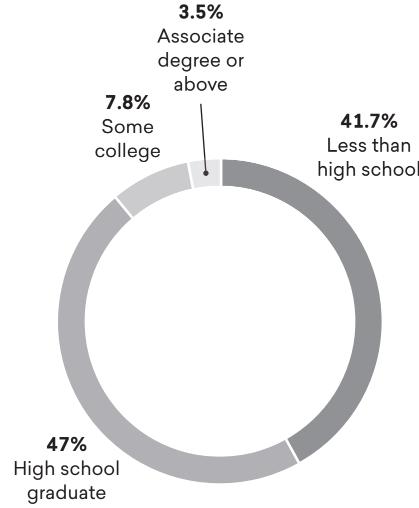
As people achieve higher education levels, they are statistically less likely to commit crimes. The analysis identifies the following three types of crime-related expenses: 1) criminal justice expenditures, including police protection, judicial and legal, and corrections, 2) victim costs, and 3) productivity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

Figure A10.6 displays the educational attainment of the incarcerated population in the U.S. Data are derived from the breakdown of the inmate population by education level in federal, state, and local prisons as provided by the U.S. Census Bureau.[63]

Victim costs comprise material, medical, physical, and emotional losses suffered by crime victims. 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.[64]

Yet another measurable cost is the economic productivity of people who are incarcerated and are thus not employed. The measurable productivity cost is simply the number of additional incarcerated people, who could have been in the labor force, multiplied by the average income of their corresponding education levels.

FIGURE A10.6: EDUCATIONAL ATTAINMENT OF THE INCARCERATED POPULATION



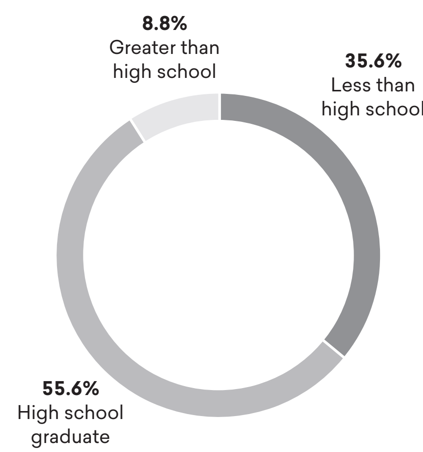
Source: Derived from data provided by the U.S. Census Bureau.

Income Assistance

Statistics show that as education levels increase, the number of applicants for government-funded income assistance such as welfare and unemployment benefits declines. Welfare and unemployment claimants can receive assistance from a variety of different sources, including Temporary Assistance for Needy Families (TANF), Supplemental Nutrition Assistance Program (SNAP), Medicaid, Supplemental Security Income (SSI), and unemployment insurance.[65]

Figure A10.7 relates the breakdown of TANF recipients by education level, derived from data provided by the U.S. Department of Health and Human Services.[66] As shown, the demographic characteristics of TANF recipients are weighted heavily towards the less than high school and high school categories,

FIGURE A10.7: BREAKDOWN OF TANF RECIPIENTS BY EDUCATION LEVEL



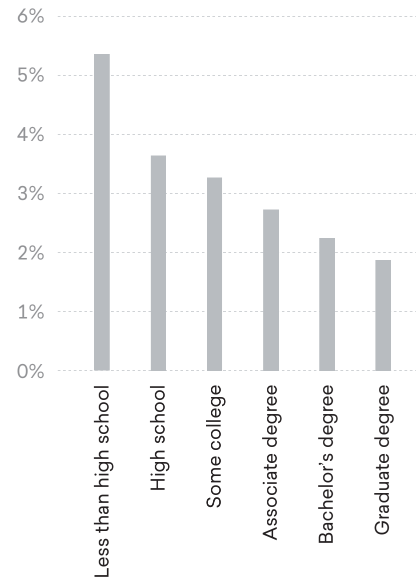
Source: US. Department of Health and Human Services, Office of Family Assistance.

63 U.S. Census Bureau. "Educational Characteristics of Prisoners: Data from the ACS." 2011.
64 McCollister, Kathryn E., Michael T. French, and Hai Fang. "The Cost of Crime to Society: New Crime-Specific Estimates for Policy and Program Evaluation." Drug and Alcohol Dependence 108, no. 1-2 (April 2010): 98-109.
65 Medicaid is not considered in this analysis because it overlaps with the medical expenses in the analyses for smoking, alcohol dependence, obesity, depression, and drug abuse. We also exclude any welfare benefits associated with disability and age.
66 U.S. Department of Health and Human Services, Office of Family Assistance. "Characteristics and Financial Circumstances of TANF Recipients, Fiscal Year 2018."

with a much smaller representation of individuals with greater than a high school education.

Unemployment rates also decline with increasing levels of education, as illustrated in Figure A10.8. These data are provided by the Bureau of Labor Statistics.[67] As shown, unemployment rates range from 5.4% for those with less than a high school diploma to 1.9% for those at the graduate degree level or higher.

FIGURE A10.8: UNEMPLOYMENT BY EDUCATION LEVEL



Source: Bureau of Labor Statistics.

67 Bureau of Labor Statistics. "Table 7. Employment status of the civilian noninstitutional population 25 years and over by educational attainment, sex, race, and Hispanic or Latino ethnicity." Current Population Survey, Labor Force Statistics, Household Data Annual Averages, 2019.