

## Investment Analysis

The benefits generated by MCC 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 Nebraska 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 section, we consider MCC 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 learn. 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.

### 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 \$18.3 million from Table 1.2. Direct outlays

also include the cost of books and supplies. On average, full-time students spent \$1,350 each on books and supplies during the reporting year.<sup>19</sup> Multiplying this figure times the number of full-time equivalents (FTEs) produced by MCC in FY 2015-16<sup>20</sup> generates a total cost of \$13.3 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 2015-16, students received a total of \$7.2 million in federal loans to attend MCC.<sup>21</sup> 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 receive no initial cost during the analysis year. Hence, to avoid double counting, the \$7.2 million in federal loans is subtracted from the costs incurred by students in FY 2015-16.

In addition to the cost of tuition, books, and supplies, students also experience an opportunity cost of attending college during the analysis year. Opportunity cost is the most difficult component of student costs to estimate. It

<sup>19</sup> Based on the data supplied by MCC.

<sup>20</sup> A single FTE is equal to 45 CHEs, so there were 9,871 FTEs produced by students in FY 2015-16, equal to 451,652 CHEs divided by 30 (excluding personal enrichment students).

<sup>21</sup> Due to data limitations, only federal loans are considered in this analysis. The interest incurred from private and other types of loans is excluded from this analysis.

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.

We derive the students' full earning potential by weighting the average annual earnings levels in Table 1.7 according to the education level breakdown of the student population when they first enrolled.<sup>22</sup> However, the earnings levels in Table 1.7 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 (27) to better reflect their wages at their current age.<sup>23</sup> This calculation yields an average full earning potential of \$23,321 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 MCC earned an average of 16.4 CHEs per student (excluding personal enrichment students), which is approximately equal to 36% of a full academic year.<sup>24</sup> We thus include no more than \$8,489 (or 36%) 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. Based on data supplied by the college, approximately 84% of students are employed. For the 16% that are not working, 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 \$8,489). The total value of their foregone earnings thus comes to \$36.8 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 58% of what they would have earned had they chosen to work full-time rather than go to college.<sup>25</sup> The remaining 42% comprises the percent of 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 42% 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.<sup>26</sup> Assuming that an hour of leisure is equal in value to an hour of work, we derive the total cost of leisure by multiplying the number of leisure hours foregone during the academic year by the average hourly pay of the students' full earning potential. For working students, therefore, their total opportunity cost comes to \$94.7 million, equal to the sum of their foregone earnings (\$82 million) and foregone leisure time (\$12.7 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

22 This is based on the number of students who reported their entry level of education to MCC. Emsi provided estimates in the event that the data was not available from the college.

23 Further discussion on this adjustment appears in Appendix 5.

24 Equal to 16.4 CHEs divided by 45, the assumed number of CHEs in a full-time academic year.

25 The 58% 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](http://www.bls.gov/oes/current/oes_nat.htm)).

26 Bureau of Labor Statistics. "Charts by Topic: Leisure and Sports Activities." *American Time Use Survey*. Last modified December 2016. Accessed January 2017. <http://www.bls.gov/TUS/CHARTS/LEISURE.HTM>.

time for the loans. The \$7.2 million in loans was awarded to 1,968 students, averaging \$3,644 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 make an assumption that since MCC is a two-year college, students will be indebted twice that amount, or \$7,287 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.<sup>27</sup>

This indebtedness calculation is used solely to estimate the loan payback period. Students will be paying back the principal amount of \$7.2 million over time. After taking into consideration the time value of money, this means that students will pay off a discounted present value of \$5.6 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 2015-16. Using the student discount rate of 4.3%<sup>28</sup> as our interest rate, we calculate that students will pay a total discounted present value of \$1.4 million in interest on student loans 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 \$24.1 million, the sum of tuition and fees (\$18.3 million) and books and supplies (\$13.3 million) less federal loans received (\$7.2 million) and \$300.9 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 \$120.1 million, excluding \$11.4 million in offsetting residual aid that is paid directly to students.<sup>29</sup> Finally, we have the present value of future student loan costs, amounting to \$7.1 million between prin-

**TABLE 3.1:** Present value of student costs, FY 2015-16 (thousands)

<b>DIRECT OUTLAYS</b>	
Tuition and fees	\$18,269
Less federal loans received	-\$7,171
Books and supplies	\$13,326
Less direct outlays of personal enrichment students	-\$301
<b>Total direct outlays</b>	<b>\$24,124</b>
<b>OPPORTUNITY COSTS IN FY 2015-16</b>	
Earnings foregone by non-working students	\$36,834
Earnings foregone by working students	\$81,992
Value of leisure time foregone by working students	\$12,712
Less residual aid	-\$11,413
<b>Total opportunity costs</b>	<b>\$120,125</b>
<b>FUTURE STUDENT LOAN COSTS (PRESENT VALUE)</b>	
Student loan principal	\$5,649
Student loan interest	\$1,412
<b>Total present value student loan costs</b>	<b>\$7,060</b>
<b>Total present value student costs</b>	<b>\$151,309</b>

Source: Based on data supplied by MCC and outputs of the Emsi impact model.

cipal and interest. Summing direct outlays, opportunity costs, and future student loan costs together yields a total of \$151.3 million in present value student costs.

## 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 1.7, 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

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

28 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 - March 2012 Baseline, Congressional Budget Office Publications, last modified March 13, 2012, accessed July 2013, [http://www.cbo.gov/sites/default/files/cbofiles/attachments/43054\\_StudentLoanPellGrantPrograms.pdf](http://www.cbo.gov/sites/default/files/cbofiles/attachments/43054_StudentLoanPellGrantPrograms.pdf).

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

they make in education. We calculate the future benefits stream to the college's FY 2015-16 students first by determining their average annual increase in earnings, equal to \$46.1 million. This value represents the higher wages that accrues 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 Nebraska earnings, the marginal wage increase per CHE is \$156. For a full description of the methodology used to derive the \$46.1 million, see Appendix 5.

The second step is to project the \$46.1 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.<sup>30</sup> 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 \$46.1 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, on the next page.

As shown in Table 3.2, the \$46.1 million in gross higher earnings occurs around Year 22, 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 accrues to students

30 Appendix 5 provides more information on the Mincer function and how it is used to predict future earnings growth.

in the years leading up to the midpoint is less than \$46.1 million and the gross higher earnings in the years after the midpoint is greater than \$46.1 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 2015-16 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 Section 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 Section 2.<sup>31</sup> 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 to students

Having estimated the students' costs and their future benefits stream, the next step is to discount the results to the present to reflect the time value of money. For the student

31 See the discussion of the alumni impact in Section 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.



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

YEAR	GROSS HIGHER EARNINGS TO STUDENTS (MILLIONS)	% ACTIVE IN WORKFORCE*	NET HIGHER EARNINGS TO STUDENTS (MILLIONS)	STUDENT COSTS (MILLIONS)	NET CASH FLOW (MILLIONS)
0	\$16.8	5%	\$0.9	\$144.2	-\$143.4
1	\$17.9	10%	\$1.8	\$0.9	\$0.9
2	\$19.2	18%	\$3.4	\$0.9	\$2.5
3	\$20.4	34%	\$6.9	\$0.9	\$6.0
4	\$21.7	59%	\$12.7	\$0.9	\$11.8
5	\$23.0	96%	\$22.1	\$0.9	\$21.2
6	\$24.4	96%	\$23.4	\$0.9	\$22.5
7	\$25.8	96%	\$24.7	\$0.9	\$23.8
8	\$27.2	96%	\$26.0	\$0.9	\$25.2
9	\$28.6	96%	\$27.4	\$0.9	\$26.5
10	\$30.1	96%	\$28.7	\$0.9	\$27.9
11	\$31.5	95%	\$30.1	\$0.0	\$30.1
12	\$33.0	95%	\$31.4	\$0.0	\$31.4
13	\$34.4	95%	\$32.8	\$0.0	\$32.8
14	\$35.8	95%	\$34.1	\$0.0	\$34.1
15	\$37.2	95%	\$35.4	\$0.0	\$35.4
16	\$38.6	95%	\$36.6	\$0.0	\$36.6
17	\$40.0	95%	\$37.8	\$0.0	\$37.8
18	\$41.3	94%	\$39.0	\$0.0	\$39.0
19	\$42.6	94%	\$40.1	\$0.0	\$40.1
20	\$43.9	94%	\$41.1	\$0.0	\$41.1
21	\$45.0	93%	\$42.1	\$0.0	\$42.1
22	\$46.1	93%	\$42.9	\$0.0	\$42.9
23	\$47.2	93%	\$43.7	\$0.0	\$43.7
24	\$48.2	92%	\$44.4	\$0.0	\$44.4
25	\$49.1	92%	\$45.1	\$0.0	\$45.1
26	\$49.9	91%	\$45.6	\$0.0	\$45.6
27	\$50.6	91%	\$46.0	\$0.0	\$46.0
28	\$51.2	90%	\$46.3	\$0.0	\$46.3
29	\$51.8	90%	\$46.4	\$0.0	\$46.4
30	\$52.2	89%	\$46.5	\$0.0	\$46.5
31	\$52.5	88%	\$46.4	\$0.0	\$46.4
32	\$52.7	88%	\$46.2	\$0.0	\$46.2
33	\$52.9	87%	\$45.9	\$0.0	\$45.9
34	\$52.9	86%	\$45.5	\$0.0	\$45.5
35	\$52.8	85%	\$45.0	\$0.0	\$45.0
36	\$52.6	84%	\$44.3	\$0.0	\$44.3
37	\$52.3	83%	\$43.5	\$0.0	\$43.5
38	\$51.9	82%	\$42.6	\$0.0	\$42.6
39	\$51.4	81%	\$41.5	\$0.0	\$41.5
<b>Present value</b>			<b>\$566.6</b>	<b>\$151.3</b>	<b>\$415.3</b>
Internal rate of return					13.7%
Benefit-cost ratio					3.7
Payback period (no. of years)					10.1

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

Source: Emsi impact model.



perspective we assume a discount rate of 4.3% (see below). Because students tend to rely upon debt to pay for their educations – i.e. they are negative savers – their discount rate is based upon student loan interest rates.<sup>32</sup> In Section 4, 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, 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 \$566.6 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 2015-16 student body is rewarded for its investment in MCC with a capital asset valued at \$566.6 million.

### 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 4.5% discount rate from the student perspective and a 1.4% discount rate from the perspective of taxpayers and society.

32 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, "Table 4. Projection of Borrower Interest Rates: CBO's January 2017 Baseline," *Congressional Budget Office Publications, CBO's January 2017 Baseline Projections for the Student Loan Program*, last modified January 25, 2017, accessed February 2017, <https://www.cbo.gov/sites/default/files/recurringdata/51310-2017-01-studentloan.pdf>.

The students' cost of attending the college is shown in Column 5 of Table 3.2, equal to a present value of \$151.3 million. Note that costs occur only in the single analysis year and are thus already in current year dollars. Comparing the cost with the present value of benefits yields a student benefit-cost ratio of 3.7 (equal to \$566.6 million in benefits divided by \$151.3 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.<sup>33</sup> Table 3.2 shows students of MCC earning average returns of 13.7% 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).

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 13.7% student rate of return is a real rate. With an inflation rate of 2.3% (the average rate reported over the past 20 years as per the U.S. Department of Commerce, Consumer Price Index), the corresponding nominal rate of return is 16.0%, higher than what is reported in Table 3.2.

The payback period is defined as the length of time it takes

33 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.



to entirely recoup the initial investment.<sup>34</sup> Beyond that point, returns are what economists would call pure costless rent. As indicated in Table 3.2, students at MCC see, on average, a payback period of 10.1 years on their foregone earnings and out-of-pocket costs.

## TAXPAYER PERSPECTIVE

From the taxpayer perspective, the pivotal step here is to hone in on 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.

### Growth in state tax revenues

As a result of their time at MCC, 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 MCC on increased tax revenues begins with the present value of the students' future earnings stream, which is displayed in Column 4 of Table 3.2. To this we apply a multiplier derived from Emsi's MR-SAM model to estimate the added labor income created in the state as students and businesses spend their higher earnings.<sup>35</sup> 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 Nebraska gross state product to total labor income in the state. We also include the spending impacts discussed in Section 2 that were created in FY 2015-16 from the operations and construction spending of the college and student spending. 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.

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 Section 2 and is designed to account for the counterfactual scenario where MCC 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 6.

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 MCC did not exist and MCC 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.

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

35 For a full description of the Emsi MR-SAM model, see Appendix 4.

For MCC, 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 8.

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 \$282.1 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 0.7%. This is the real treasury interest rate recommended by the Office of Management and Budget (OMB) for 30-year investments, and in Section 4, we conduct a sensitivity analysis of this discount rate.<sup>36</sup>

### 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 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 MCC. Government savings appear in Table 3.3 and break down into three main categories: 1) health savings, 2) crime savings, and 3) welfare and unemployment 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). Welfare and unemployment benefits comprise avoided costs due to the reduced number of social assistance and unemployment insurance claims.

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

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

<b>Added tax revenue</b>	<b>\$282,085</b>
<b>GOVERNMENT SAVINGS</b>	
Health-related savings	\$7,823
Crime-related savings	\$5,343
Welfare/unemployment-related savings	\$136
<b>Total government savings</b>	<b>\$13,303</b>
<b>Total taxpayer benefits</b>	<b>\$295,388</b>

Source: Emsi impact model.

unemployment benefits. Deriving the probabilities involves assembling data from a variety of studies and surveys analyzing the correlation between education and health, crime, welfare, and unemployment 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 claim welfare and unemployment benefits. We dampen these results by the ability bias adjustment discussed earlier in the student perspective section and in Appendix 5 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, welfare, and unemployment.<sup>37</sup> Finally, we apply the same adjustments for attrition and alternative education to derive the net savings to the government.

Table 3.3 displays all benefits to taxpayers. The first row shows the added tax revenues created in the state, equal to \$282.1 million, from students' higher earnings, increases in non-labor income, and spending impacts. A breakdown in government savings by health, crime, and welfare/unemployment-related savings appears next. These total to \$13.3 million. The sum of the social savings and the added income in the state is \$295.4 million, as shown in the bottom row of Table 3.3. These savings continue to accrue in the future as long as the FY 2015-16 student population of MCC remains

36 Office of Management and Budget. "Circular A-94 Appendix C." *Real Interest Rates on Treasury Notes and Bonds of Specified Maturities (in Percent)*. Last modified November 2016. Accessed January 2017. [https://obamawhitehouse.archives.gov/omb/circulars\\_a094/a94\\_appx-c](https://obamawhitehouse.archives.gov/omb/circulars_a094/a94_appx-c).

37 For a full list of the data sources used to calculate the social externalities, see the Resources and References section. See also Appendix 4 for a more in-depth description of the methodology.



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

YEAR	BENEFITS TO TAXPAYERS (MILLIONS)	STATE AND LOCAL GOV'T COSTS (MILLIONS)	NET CASH FLOW (MILLIONS)
0	\$22.3	\$83.7	-\$61.4
1	\$0.4	\$0.0	\$0.4
2	\$0.8	\$0.0	\$0.8
3	\$1.5	\$0.0	\$1.5
4	\$2.8	\$0.0	\$2.8
5	\$4.9	\$0.0	\$4.9
6	\$5.2	\$0.0	\$5.2
7	\$5.5	\$0.0	\$5.5
8	\$5.8	\$0.0	\$5.8
9	\$6.1	\$0.0	\$6.1
10	\$6.4	\$0.0	\$6.4
11	\$6.8	\$0.0	\$6.8
12	\$7.1	\$0.0	\$7.1
13	\$7.4	\$0.0	\$7.4
14	\$7.7	\$0.0	\$7.7
15	\$8.1	\$0.0	\$8.1
16	\$8.4	\$0.0	\$8.4
17	\$8.7	\$0.0	\$8.7
18	\$9.0	\$0.0	\$9.0
19	\$9.2	\$0.0	\$9.2
20	\$9.5	\$0.0	\$9.5
21	\$9.8	\$0.0	\$9.8
22	\$10.0	\$0.0	\$10.0
23	\$10.2	\$0.0	\$10.2
24	\$10.4	\$0.0	\$10.4
25	\$10.6	\$0.0	\$10.6
26	\$10.7	\$0.0	\$10.7
27	\$10.8	\$0.0	\$10.8
28	\$10.9	\$0.0	\$10.9
29	\$10.9	\$0.0	\$10.9
30	\$11.0	\$0.0	\$11.0
31	\$11.0	\$0.0	\$11.0
32	\$10.9	\$0.0	\$10.9
33	\$10.9	\$0.0	\$10.9
34	\$10.8	\$0.0	\$10.8
35	\$10.6	\$0.0	\$10.6
36	\$10.5	\$0.0	\$10.5
37	\$10.3	\$0.0	\$10.3
38	\$10.0	\$0.0	\$10.0
39	\$9.8	\$0.0	\$9.8
<b>Present value</b>	<b>\$295.4</b>	<b>\$83.7</b>	<b>\$211.7</b>
Internal rate of return			8.9%
Benefit-cost ratio			3.5
Payback period (no. of years)			14.1

Source: Emsi impact model.



in the workforce.

## Return on investment to taxpayers

Taxpayer costs are reported in Table 3.4, on the next page, and come to \$83.7 million, equal to the contribution of state and local government to MCC. In return for their public support, taxpayers are rewarded with an investment benefit-cost ratio of 3.5 (= \$295.4 million ÷ \$83.7 million), indicating a profitable investment.

At 8.9%, 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 0.7%, the real treasury interest rate recommended by the Office of Management and Budget for 30-year investments.<sup>38</sup> 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 0.7% would mean that the college just pays its own way. In principle, governments could borrow monies used to support MCC and repay the loans out of the resulting added taxes and reduced government expenditures. A rate of return of 8.9%, on the other hand, means that MCC 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.

## SOCIAL PERSPECTIVE

Nebraska benefits from the education that MCC 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 MCC did not exist. Society's investment in MCC stretches across a number of investor groups, from students to employers to taxpayers. We weigh the benefits generated by MCC to these investor groups against the total social costs of

38 Office of Management and Budget. "Circular A-94 Appendix C." *Real Interest Rates on Treasury Notes and Bonds of Specified Maturities (in Percent)*. Last modified November 2016. Accessed January 2017. [https://obamawhitehouse.archives.gov/omb/circulars\\_a094/a94\\_appx-c](https://obamawhitehouse.archives.gov/omb/circulars_a094/a94_appx-c).

## 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 positive externalities such as beekeeping.

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

generating those benefits. The total social costs include all MCC expenditures, all student expenditures (including interest on student loans) less tuition and fees, and all student opportunity costs, totaling a present value of \$284.7 million.

On the benefits side, any benefits that accrue to Nebraska as a whole – including students, employers, taxpayers, and anyone else who stands to benefit from the activities of MCC – 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.

## Growth in state economic base

In the process of absorbing the newly-acquired skills of

students that attend MCC, not only does the productivity of Nebraska’s workforce increase, but so does the productivity of its physical capital and assorted infrastructure. Students earn more because of the skills they learned while attending the 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 MCC on the state’s economic base follows the same process used when calculating increased tax revenues in the taxpayer perspective. However, instead of looking at just the tax revenue portion, we include all of the added earnings and business output. We again factor in student attrition and alternative education opportunities. The shutdown point does not apply to the growth of the economic base because the social perspective captures not only the state and local taxpayer support to the college, but also the support from the students and other non-governmental sources.

After adjusting for attrition and alternative education opportunities, we calculate the present value of the future added income that occurs in the state, equal to \$3.4 billion. 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 0.7%.

### 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 MCC. Social benefits appear in Table 3.5 and break down into three main categories: 1) health savings, 2) crime savings, and 3) welfare and unemployment 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, alcoholism, obesity, mental

illness, 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. Welfare and unemployment benefits comprise avoided costs due to the reduced number of social assistance 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 \$3.4 billion, 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 savings amount to a present value of \$42.1 million, including savings due to a reduced demand for medical treatment and

**TABLE 3.5:** Present value of the future increased economic base and social savings in the state (thousands)

<b>Increased economic base</b>	<b>\$3,351,149</b>
<b>SOCIAL SAVINGS</b>	
<b>Health</b>	
Smoking	\$22,829
Alcoholism	\$2,108
Obesity	\$14,081
Mental illness	\$1,775
Drug abuse	\$1,314
<b>Total health savings</b>	<b>\$42,107</b>
<b>Crime</b>	
Criminal Justice System savings	\$5,215
Crime victim savings	\$286
Added productivity	\$915
<b>Total crime savings</b>	<b>\$6,416</b>
<b>Welfare/unemployment</b>	
Welfare savings	\$85
Unemployment savings	\$52
<b>Total welfare/unemployment savings</b>	<b>\$136</b>
<b>Total social savings</b>	<b>\$48,660</b>
<b>Total, increased economic base + social savings</b>	<b>\$3,399,809</b>

Source: Emsi impact model.



social services, improved worker productivity and reduced absenteeism, and a reduced number of vehicle crashes and fires induced by alcohol or smoking-related incidents. Crime savings amount to \$6.4 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 welfare and unemployment amount to \$136.4 thousand, stemming from a reduced number of persons in need of earnings assistance. All told, social savings amounted to \$48.7 million in benefits to communities and citizens in Nebraska.

The sum of the social savings and the increased state economic base is \$3.4 billion, as shown in the bottom row of Table 3.5. These savings accrue in the future as long as the FY 2015-16 student population of MCC remains in the workforce.

### Return on investment to society

Table 3.6, on the next page, presents the stream of benefits accruing to the Nebraska 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 11.9. This means that for every dollar invested in an education from MCC, whether it is the money spent on day-to-day operations of the college or money spent by students on tuition and fees, an average of \$11.90 in benefits will accrue to society in Nebraska.<sup>39</sup>

### With and without social savings

Earlier in this chapter, social benefits attributable to education (reduced crime, lower welfare, lower unemployment, and improved health) were defined as externalities that are incidental to the operations of MCC. Some would question the legitimacy of including these benefits in the calculation

**TABLE 3.7:** Taxpayer and social perspectives with and without social savings

	INCLUDING SOCIAL SAVINGS	EXCLUDING SOCIAL SAVINGS
<b>TAXPAYER PERSPECTIVE</b>		
<b>Net present value (thousands)</b>	<b>\$211,705</b>	<b>\$198,402</b>
Benefit-cost ratio	3.5	3.4
Internal rate of return	8.9%	8.4%
Payback period (no. of years)	14.1	14.7
<b>SOCIAL PERSPECTIVE</b>		
<b>Net present value (thousands)</b>	<b>\$3,115,128</b>	<b>\$3,066,468</b>
Benefit-cost ratio	11.9	11.8

Source: Emsi impact model.

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 MCC. 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 0.7%), confirming that taxpayers receive value from investing in MCC.

## CONCLUSION

This section has shown that the education provided by MCC 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 Nebraska.

<sup>39</sup> The rate of return is not reported for the social perspective because the beneficiaries of the investment are not necessarily the same as the original investors.



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

YEAR	BENEFITS TO SOCIETY (MILLIONS)	SOCIAL COSTS (MILLIONS)	NET CASH FLOW (MILLIONS)
0	\$289.8	\$276.2	\$13.6
1	\$4.7	\$0.9	\$3.8
2	\$9.0	\$0.9	\$8.2
3	\$18.4	\$0.9	\$17.5
4	\$34.0	\$0.9	\$33.1
5	\$59.0	\$0.9	\$58.1
6	\$62.4	\$0.9	\$61.5
7	\$65.8	\$0.9	\$64.9
8	\$69.2	\$0.9	\$68.3
9	\$72.7	\$0.9	\$71.8
10	\$76.2	\$0.9	\$75.3
11	\$79.7	\$0.0	\$79.7
12	\$83.2	\$0.0	\$83.2
13	\$86.6	\$0.0	\$86.6
14	\$90.0	\$0.0	\$90.0
15	\$93.4	\$0.0	\$93.4
16	\$96.6	\$0.0	\$96.6
17	\$99.7	\$0.0	\$99.7
18	\$102.7	\$0.0	\$102.7
19	\$105.6	\$0.0	\$105.6
20	\$108.3	\$0.0	\$108.3
21	\$110.7	\$0.0	\$110.7
22	\$113.0	\$0.0	\$113.0
23	\$115.1	\$0.0	\$115.1
24	\$116.9	\$0.0	\$116.9
25	\$118.5	\$0.0	\$118.5
26	\$119.8	\$0.0	\$119.8
27	\$120.8	\$0.0	\$120.8
28	\$121.6	\$0.0	\$121.6
29	\$122.0	\$0.0	\$122.0
30	\$122.2	\$0.0	\$122.2
31	\$122.0	\$0.0	\$122.0
32	\$121.5	\$0.0	\$121.5
33	\$120.7	\$0.0	\$120.7
34	\$119.6	\$0.0	\$119.6
35	\$118.1	\$0.0	\$118.1
36	\$116.3	\$0.0	\$116.3
37	\$114.3	\$0.0	\$114.3
38	\$111.9	\$0.0	\$111.9
39	\$109.2	\$0.0	\$109.2
<b>Present value</b>	<b>\$3,399.8</b>	<b>\$284.7</b>	<b>\$3,115.1</b>
Benefit-cost ratio			11.9

Source: Emsi impact model.

