



Investing in Success

Findings From a Cost–Benefit
Analysis of Massachusetts
Community Colleges

April 2022

The Boston
Foundation 

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Executive Summary

In June 2021, MassINC and the Boston Foundation released a report revealing strong employment and earnings gains for students who complete certificates and degrees at Massachusetts community colleges. Building on this research, we conducted a cost-benefit analysis for a full cohort of students entering community colleges within a few years of high school graduation. This analysis documents large returns to individual students who graduate with a certificate or degree. Taxpayers also see substantial benefits on a per-degree basis, but low attainment rates mean returns to the public are minimal in the aggregate. Given the potential fiscal benefits, we show how Massachusetts can invest in evidence-based initiatives to boost completion and return on investment for both students and taxpayers.

Below, we provide a more detailed summary of the findings and policy recommendations presented in the full report.

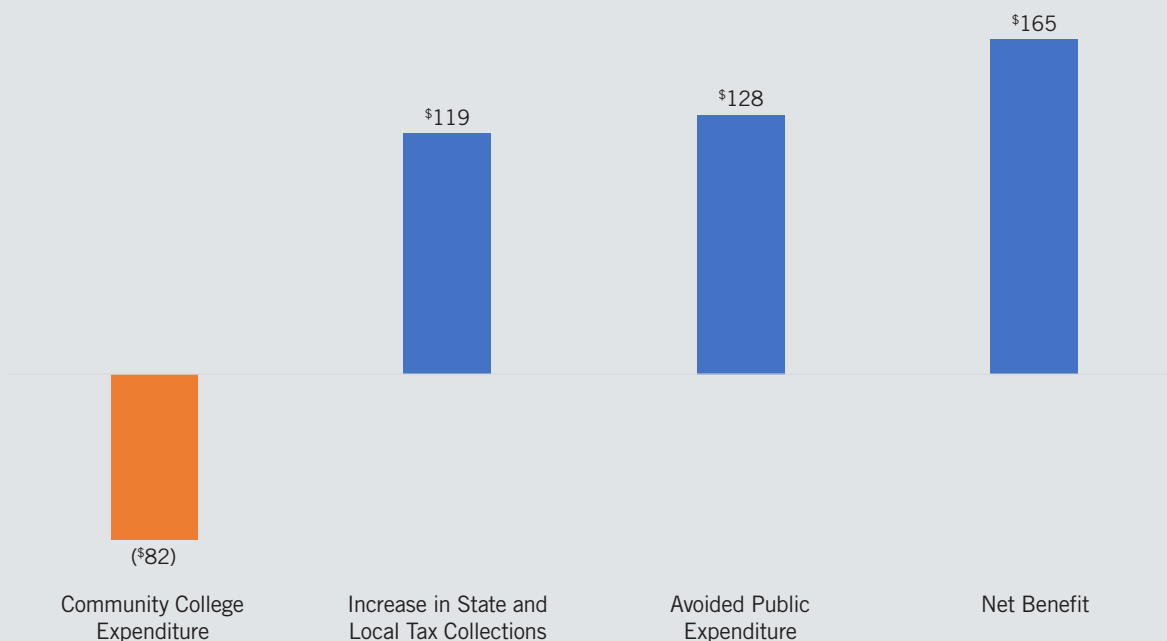
Return on Investment for Students

- Women who complete a certificate or degree at a Massachusetts community college earn approximately \$172,000 more over their lifetimes in present-value terms. Men who obtain associate's degrees earn about \$108,000 more; the earnings benefit of a certificate for men is significantly larger, at around \$151,000.
- For each dollar they spend on tuition and fees (after grant aid), women get back \$37 for an associate's degree and over \$51 for a certificate. For men, the returns are 23-to-1 for an associate's degree and 44-to-1 for a certificate.
- On average, women who attend community college but do not complete a certificate or degree gain over \$33,000 in lifetime earnings. This represents a return of 14-to-1. However, men who do not complete a certificate or degree experience no earnings gain and, consequently, receive no return on their investment.
- A more complete accounting of benefits, including a valuation for nonmonetary returns, such as improvements to health and well-being, produces dramatically higher figures. Drawing on academic research, we estimate that the present value of the combined income gains and nonmonetary benefits of an associate's degree to students is approximately \$350,000. Based on average tuition and fees, the benefits of obtaining an associate's degree exceed the costs by a ratio of 93-to-1 for women and 58-to-1 for men.

Return on Investment for Taxpayers

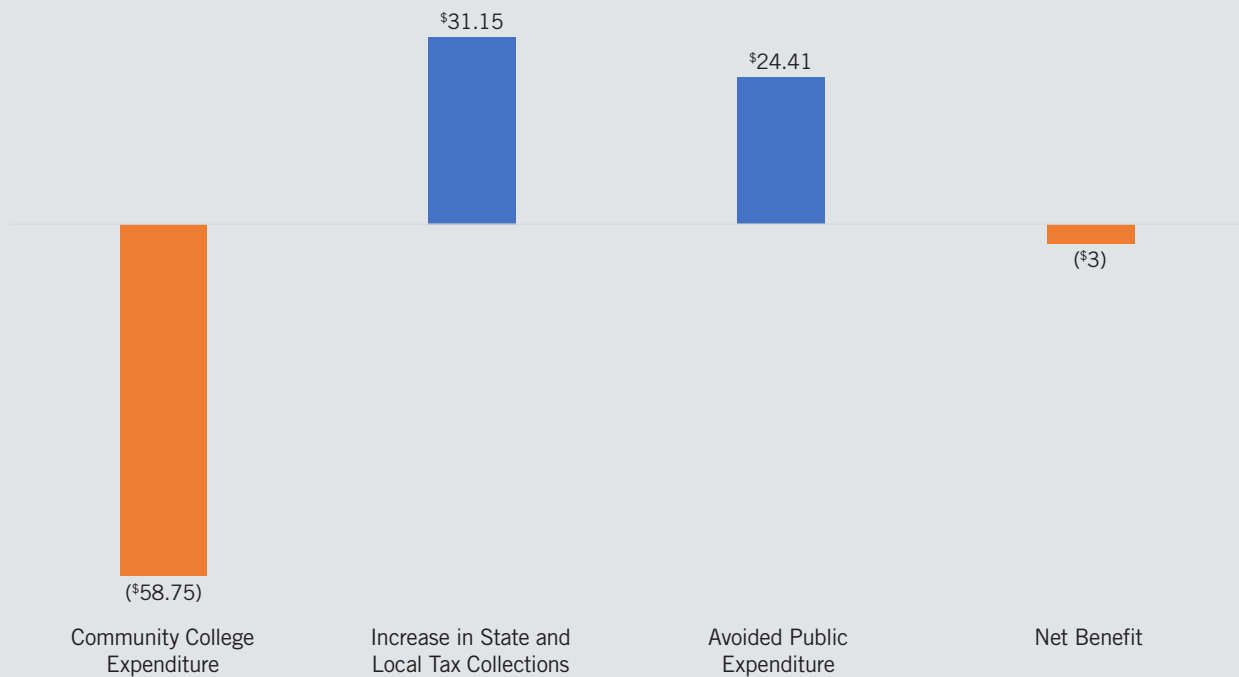
- For each associate’s degree completer, the present value of the state and local tax payments is \$10,000 for men and \$15,500 for women. Studies generally find that individuals rely less on government services when they receive postsecondary education. Drawing from this research, we estimate that the avoided costs to state government are slightly higher than the additional tax revenue (\$13,000 for men and \$17,500 for women).
- Combining the additional tax revenue and avoided public costs, the total state and local benefits of associate’s degrees are around \$23,000 for men and \$33,000 for women. Net of costs, the benefits to state and local governments are approximately \$11,000 for men and \$21,000 for women. This means that for each dollar the state spends on a student who earns an associate’s degree, Massachusetts taxpayers receive between \$1.89 and \$2.75 in benefits. For certificates, the returns to the state are more than 3-to-1.
- Estimating a more complete set of benefits to the larger community (e.g., more civic participation, greater public health) significantly increases the returns. On average, an associate’s degree provides approximately \$130,000 in net public benefits. It is difficult to apportion this broader set of benefits between levels of government, but overall, the return on each dollar in public spending on associate’s degree completers is \$3.10 for men and \$4.90 for women.
- Examining the full cohort of students who took the 10th-grade MCAS in 2008 and enrolled at a Massachusetts community college within a few years of high school graduation, we estimate the potential for \$165 million in net fiscal benefit to state and local governments (ES 1). However, the state is not realizing the largest returns possible, at current completion rates. At present, Massachusetts is roughly in the break-even range on community college investment for this cohort (ES 2).

Figure ES 1: Potential State and Local Net Fiscal Benefit Calculation for 2008 MCAS Cohort (millions of dollars)



Source: Authors’ calculations (see Section II for data and methods)

Figure ES 2: State and Local Net Fiscal Benefit Calculation for 2008 MCAS Cohort (millions of dollars)



Source: Authors' calculations (see Section II for data and methods)

Break-Even Thresholds

- Accounting for additional tax payments and avoided public costs, Massachusetts can spend almost \$16,000 more per associate's degree completion and still generate a fiscal return for taxpayers. For the federal government, up to \$25,000 in additional spending would produce a payoff. If both the state and federal governments contribute to efforts to increase completion, they could invest an additional \$41,000 per graduate and still break even.
- These figures provide conservative benchmarks for determining the cost effectiveness of interventions to increase college completion. For instance, if the state breaks even at \$16,000 per completion, then an initiative that boosts completion rates by 20 percentage points can cost up to \$3,200 per participant and still provide a net return to the state. If we consider both the state and federal benefits, an intervention that increases completion by 20 percentage points delivers a return to taxpayers if the costs fall below \$8,200 per participant.

Recommendations

Our analysis provides compelling evidence that targeted spending to position more community college students for success will generate sizeable returns for taxpayers. Building on this research, we offer five recommendations relative to cost-effective investments in college success:

- 1. Expand access to comprehensive student support.** Research on cost-effective college completion interventions consistently points to comprehensive programs that provide students with advisors who have relatively small caseloads, tutoring and career-planning services, and financial assistance to help with books, transportation costs, and living expenses.¹ Acting on this evidence, the legislature recently created a new line item (7100-4002—Community College SUCCESS Fund) to fund these supports. As we work to scale this model in Massachusetts, community colleges will need robust metrics and rigorous evaluation to demonstrate that these efforts are delivering on their promise.
- 2. Expand access to Early College High schools.** Massachusetts has been working to help students prepare for postsecondary success while in high school through the state’s Early College Initiative.² Despite significant disruption imposed by the COVID-19 pandemic, evidence from the first two cohorts of students to matriculate to postsecondary education suggests this young initiative is already yielding significant increases in college enrollment, persistence, and completion. Projections indicate the number of high school students participating in Early College could rise to as many as 8,700 next year.

According to MassINC research, an appropriate target for Early College expansion in Massachusetts is somewhere in the range of 45,000 students in grades nine through 12. Sustaining Early College at this scale will require significant public investment. In addition to continuing to carefully monitor the impact of these programs on postsecondary enrollment, persistence, and completion, it is critical to evaluate the credit efficiency of these pathways to ensure that the approach is cost effective.
- 3. Enhance the state’s longitudinal student data system.** This research demonstrates the value of longitudinal data to help Massachusetts tackle social and economic inequality. Education stakeholders need to nurture this data infrastructure and conscientiously advocate for enhancements that provide an even better understanding of how various educational pathways operate.
- 4. Utilize information on the returns to higher education by field of study to inform college and career advising.** Given the large variability in earnings, it is vital to present students with accurate information about earnings by field of study alongside costs so they can make informed choices. With Student Opportunity Act funds, many high schools are bringing on more guidance counselors. By providing these counselors with greater access to quality information, the state can leverage this advising capacity and help more students position themselves for entry into high-return college pathways.
- 5. Advocate for changes to federal financial aid programs.** This analysis shows an outsized share of the fiscal return generated by community colleges flows to the federal budget. Congress can do its part to increase completion rates (and returns for taxpayers) by making several long-overdue changes to federal financial aid programs so that they work better for community college students. These improvements include increasing the size of the Pell Grant and indexing it to inflation, factoring living expenses for part-time students into financial aid calculations, and addressing serious flaws in income-driven repayment plans for federal student loans.



I. Introduction

Each year, tens of thousands of students enroll at Massachusetts community colleges, hoping to build the skills needed to land good jobs. Unfortunately, relatively few complete the certificates and degrees that they seek. Evidence suggests this is at least partially because community colleges are poorly resourced. A recent study examining national trends found that declines in state funding between the mid-1990s and early 2010s directly impacted the quality of education community college students received, lowering completion rates and reducing return on public investment.³

While per-student state funding has increased over the past few years, at \$7,400 per full-time equivalent student, Massachusetts remains below average for the sector among the 50 states. When all sources of revenue are included, community college students receive far less support than students at our four-year public institutions.⁴ These disparities between other states and across sectors are particularly large, considering the high-cost structure in Massachusetts and the fact that our two-year colleges disproportionately serve students with the greatest needs.

If we are inhibiting degree yield by under-resourcing community colleges, it is a costly miscalculation when Massachusetts faces such acute needs for skilled labor. A 2014 MassINC report predicted that the state would start to see a decline in its college-educated workforce for the first time in history by the middle of this decade.⁵ With more recent data from the 2020 census and various scenarios incorporating the COVID-19 pandemic's toll on retirements and college completion, it is likely that the drop will now occur sooner and more sharply than previously expected. Over the next four years, the state's college-educated labor force could contract by more than 70,000 workers (see box on p. 6).

Addressing this problem will require ensuring that students from low-income backgrounds have more secure pathways to success in postsecondary education. The most recent figures show just 22 percent of these students complete college degrees, compared to 56 percent of peers from households with greater means.⁶ The majority of low-income students who go on to postsecondary education in Massachusetts enroll in one of the state's 15 community colleges. Boosting community college completion is not just a workforce issue; ensuring that all these students have success is critical to increasing economic mobility and reducing inequality.

Comprehensive solutions that combine strong advising, tutoring, and career counseling with additional financial aid can produce impressive results. In recent years, these carefully structured interventions have been tested repeatedly using “gold standard” randomized trials, consistently yielding double-digit increases in completion rates. With COVID-19 disproportionately disrupting college enrollment and persistence among students from low-income families, resources to scale these programs are needed now, more than ever.⁷

To provide a clearer understanding of how much public funding Massachusetts can devote to these completion efforts and still generate a return on public investment, this report breaks down the costs and benefits of community college education. We rely heavily upon a recent MassINC–Boston Foundation community college labor market outcomes (LMO) study.

Led by Northeastern University economist Alicia Sasser Modestino, the study utilized administrative data following students from Massachusetts high schools through our community colleges and into the state’s workforce. The analysis provided rigorous estimates of how much additional income these students gained by pursuing higher education at a Massachusetts community college. Unlike data previously available to us, these figures control for student characteristics, which helps isolate the actual value added by community college instruction.⁸

With this crucial information in hand, we can estimate how much tax revenue these earnings gains will produce for each level of government. Extrapolating from other research, we also approximate the value of a broader array of benefits that community colleges generate for both individuals and society. Comparing the various benefits against the current cost structure, we show that conservative assumptions suggest Massachusetts has considerable room to resource community college completion efforts and still generate a healthy return on taxpayer investment.

In the next section, we provide more detail on the methodology that leads us to this conclusion. Section 3 presents returns on community college education for students and the public, along with the estimated break-even threshold for investments in community college completion programs. Collecting and analyzing the data for this analysis generated several insights. We discuss these high-level takeaways in Section 4. The paper concludes with recommendations for budget makers, community college educators, and higher education leaders.

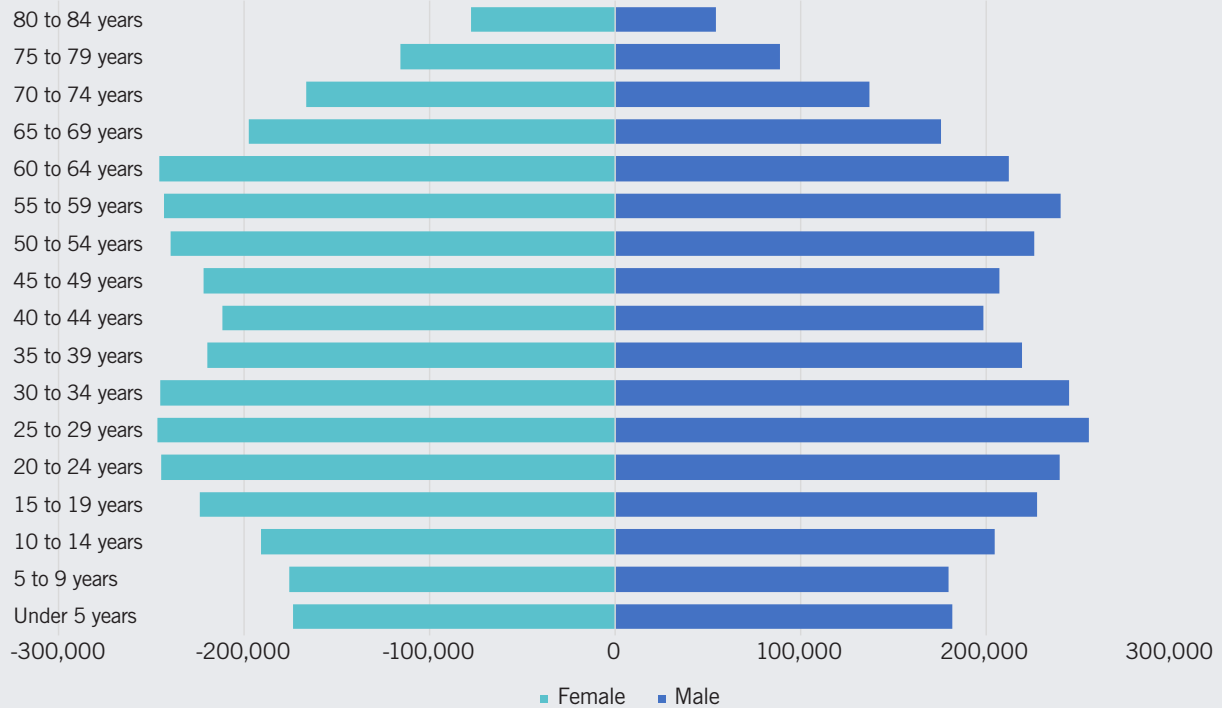
The COVID-19 Pandemic’s Toll on Massachusetts’ College-Educated Workforce

Difficulty finding employees is placing enormous strain on the pandemic recovery. There are simply not enough workers in transportation, childcare, mental health, and a variety of other areas that are needed to return to normal and heal the wounds of the pandemic. Furthermore, training and hiring all the workers required to replace aging infrastructure and respond to climate change will be a major challenge in the coming years.

Demographers have long warned that employers would have great difficulty replacing college-educated baby boomers. 2020 census data shows we are in the thick of this problem. With as many or more older residents at the top as there are younger residents at the base, the classic pyramid-shaped age distribution is no more (**Figure 1**). Generation Z is much smaller and far more diverse (nearly 40 percent non-Hispanic White versus less than 20 percent of the baby boom generation). According to the most recent estimates, these students of color are half as likely to obtain a college degree as White students and students from higher income families in Massachusetts are.⁹

Continued

Figure 1: Massachusetts Population by Age, 2020

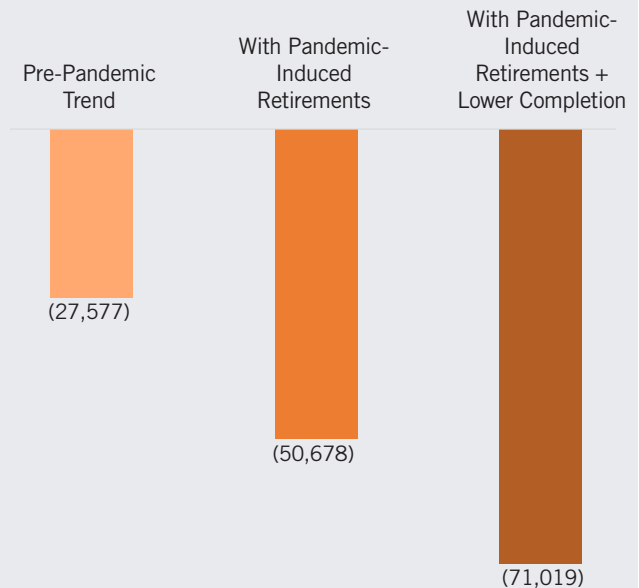


Source: 2020 census

Based on pre-pandemic employment and postsecondary completion patterns, the number of college-educated baby boomers exiting the workforce will surpass the number of young college-educated workers entering by at least 27,000 workers over the next four years. However, this projection is highly sensitive to pandemic trends. If COVID-19 pushes 10 percent more baby boomers into retirement, the gap would grow to over 50,000. If COVID-19 results in these early workforce exits **and** also reduces postsecondary completion by 10 percent, the degree deficit could increase to over 71,000 (**Figure 2**). Recent reporting on the pandemic’s impact suggests both scenarios are plausible.

As these demographic trends unfold, there is also some preliminary evidence that suggests the pandemic is accelerating job loss due to automation, with harmful consequences for low-skilled workers and people of color.¹⁰ Recent estimates by the McKinsey Global Institute indicate that as many as 76,000 Massachusetts workers could be forced to move into occupations that are two wage quintiles up from their current jobs to remain employed in the state’s economy. For most workers, making this jump will require significant postsecondary education.¹¹

Figure 2: Estimated College Degree Deficit in Massachusetts, 2020–2023



Source: Authors’ estimates using ACS PUMS, 2020 census, and Massachusetts Department of Elementary & Secondary Education data

II. The Cost–Benefit Model

Calculating the break-even threshold for state investment in community colleges begins with modeling costs and benefits. In addition to helping us determine the optimal level of state investment in the sector, cost–benefit analysis can heighten our understanding of the various benefits a community college education produces for students and the public, and how the distribution of these benefits compares to the share of the costs shouldered by students and each level of government. As we describe in this section, much of this insight comes through the practice of building the model and grappling with a variety of methodological considerations.

A. Estimating Benefits

The returns produced by higher education fall into two categories: private benefits, which accrue to individuals and their families, and public benefits that flow to the community. The benefits also come in two forms: those with direct monetary value—generally, additional income and associated tax revenue; and others that are less tangible “nonmonetary” benefits, such as increases in civic participation and improvements in public health.¹² Below we describe the various benefits in more detail and the approaches we take to factor them into our cost–benefit calculations.

Earnings Benefits and Associated Tax Revenues

The earnings benefit is the differential between a student’s earnings after community college education and what they would have earned had they not pursued additional education after graduating from high school. Including increases in earnings generated by an increase in the probability of employment, this annual increment ranges from about \$1,600 for women who attend community college but do not complete a certificate or degree, to more than \$13,000 for women who graduate with an associate’s degree in health.¹³

These estimates come from the LMO study, which employed strong statistical controls for selection bias. This means they more accurately reflect the value added by community college education, which is important for a cost–benefit analysis, since both the individual and the public only receive a financial return, as far as income and taxes are concerned, when the education provided leads to actual labor market gains.¹⁴

Because additional income generated through community college education is realized over time, and a dollar received in the future has less value than a dollar in hand today, we must “discount” the flow of future earnings. Consistent with other research examining returns to education, we use a real discount rate of 3.5 percent in our basic model. (There is considerable debate about the appropriate discount rate, and this choice has significant influence on the estimated returns. Accordingly, we will present a sensitivity analysis with a range of discount rates in the appendix.)¹⁵

We take the present value of the earnings gains before taxes for a period of 36 years, which is the worklife expectancy for associate’s degree holders who enter the labor market by age 25.¹⁶ Our basic model assumes that the income differential between associate’s degree holders and high school graduates remains constant over time. Due to current data limitations, the LMO study only captured earnings gains in the first few years of post-college employment. It is possible that community college graduates realize even larger gains as they advance in their careers. Alternatively, the benefits of a certificate or degree could wane if the economy changes and the skills built through postsecondary education are no longer in demand. To gauge the impact of this uncertainty on our estimates, we will also provide a sensitivity analysis examining different assumptions about the earnings trajectory in the appendix.

For all these scenarios, we calculate the additional tax proceeds from earnings increases using state and local tax incidence estimates for Massachusetts produced by the Institute on Taxation and Economic Policy (ITEP) and federal tax rates from the Tax Policy Center.¹⁷

Avoided Public Costs

In addition to capturing additional tax collections, most cost–benefit estimates of higher education attempt to tally reductions in government expenditure associated with increases in educational attainment. We estimate savings across many categories of public expenditure, including Medicaid, incarceration, Temporary Assistance for Needy Families, unemployment, housing support, energy assistance, and Supplemental Security Income. As other studies have done, we rely heavily on Philip Trostel’s research on the fiscal benefits of higher education. To contextualize Trostel’s national figures, we adjust up or down according to cost variation between Massachusetts and the US average in each of these areas.¹⁸

Including increases in earnings generated by an increase in the probability of employment, [the annual earning benefit] ranges from about \$1,600 for women who attend community college but do not complete a certificate or degree, to more than \$13,000 for women who graduate with an associate’s degree in health.

Trostel’s estimates do not control for selection and are not intended to be causal. It is possible that higher education is not the driving force behind individuals with more education utilizing fewer government services. While studies that employ more advanced methods and unique datasets that allow them to isolate the direct impact of education on receipt of public services do find strong causal effects, bias in Trostel’s estimates could potentially overstate the savings to the public that we report.¹⁹

Alternative Estimate of Benefits

Drawing entirely from studies with robust controls, Walter McMahon developed estimates that can help us overcome this selection issue and also capture a wider array of benefits. Beyond income gained, additional taxes collected, and public expenditures avoided, there are returns to higher education that are more challenging to categorize and quantify. Roughly speaking, they include indirect economic activity, private nonmonetary benefits to individuals and their families, and public nonmonetary benefits to society.²⁰

- **Indirect economic activity.** In addition to quantifying the increases in earnings that those who complete higher education garner for themselves, it is also important to consider the earnings increases other workers gain through indirect economic benefits. A rise in the share of college graduates can make an entire regional economy more productive, increasing wages for all workers.²¹ In regions of Massachusetts that lack advanced industries, it is likely that community colleges generate particularly large indirect benefits relative to four-year institutions because the workers that they educate are less likely to migrate to Boston and other knowledge-intensive regions.²²
- **Private nonmonetary benefits.** Studies probing the returns to higher education increasingly attempt to value private nonmonetary benefits. This category is considered especially large because postsecondary education also makes us more productive at domestic work, and most individuals spend more than twice as many waking hours at home as on the job. From managing personal finances to selecting health care providers, many of these tasks have become more complex over time, increasing the private nonmonetary return to higher education.²³

In regions of Massachusetts that lack advanced industries, it is likely that community colleges generate particularly large indirect benefits relative to four-year institutions because the workers that they educate are less likely to migrate to Boston and other knowledge-intensive regions.

Among these nonmonetary benefits, the impact on children has received the most attention, and these generational effects most certainly result in significant benefits to the public that we have not captured in our basic model. Researchers consistently find that the children of parents with associate's degrees have higher levels of cognitive development and greater educational attainment, even after controlling for the additional income parents gain through postsecondary training.²⁴

In many instances, it is not necessary to heavily discount these second-order benefits because they appear quite soon. For instance, the health effects include large reductions in low-birth weight infants, which likely leads to substantial medical cost savings within a few years of making the educational investment in the parent. Educational benefits can also spread through families quickly in other ways. An emerging body of research demonstrates that low-income students are more likely to earn a college degree once their cousins have completed college.²⁵

- **Public nonmonetary benefits.** Many of the private benefits described above spill over and benefit the public, but increasing postsecondary attainment leads to other, more generalized, improvements for society, including higher vaccination rates and other public health benefits, lower rates of crime and victimization, greater social cohesion, stronger civic institutions, and higher levels of democratic engagement.

McMahon’s research quantifying the value of these public nonmonetary gains suggests that they are about equal to the associate’s degree earnings increment, while the private nonmonetary benefits are 1.5 times the earning increase. Combined, the nonmonetary benefits are 2.5 times the earning increment. We use this benchmark to provide an alternative estimate of the total return to community college degrees.

B. Estimating Costs

Calculating the cost of delivering higher education through community colleges is a much more straightforward undertaking. We produce cost estimates per credit hour, averaging figures for FY 2012 through FY 2015. This smooths out annual fluctuations and roughly covers the period students attended these institutions in the earnings study. We produce and report all estimates using constant 2020 dollars.

Student Costs

The Integrated Postsecondary Education Data System (IPEDS) provides the total charge per credit hour along with the total amount of federal, state, local, institutional, and other sources of grant aid awarded to undergraduate students. We assume the average cost to students is total charges minus these grant awards, which works out to approximately \$54 per credit hour.

Many researchers also include the opportunity cost of reduced earnings while students are enrolled in postsecondary education. However, data from the LMO study shows community college students in Massachusetts do not see a reduction in earnings. If anything, attending a community college boosts the probability of employment and earnings during each quarter that a student enrolls. Still, we must recognize that pursuing community college while working many hours to cover education and living expenses places students under enormous stress. In addition to reducing the likelihood of completion, this undoubtedly has consequences for health and long-term well-being that researchers could incorporate in the future to provide more complete models of student costs.

Many researchers also include the opportunity cost of reduced earnings while students are enrolled in postsecondary education. However, data from the LMO study shows community college students in Massachusetts do not see a reduction in earnings. If anything, attending a community college boosts the probability of employment and earnings during each quarter that a student enrolls.

State Costs

We divide the sum of the state operating appropriation, state financial aid to community college students, and annual capital spending on community college facilities by total credit hours of instruction.²⁶ This works out to approximately \$141 per credit hour. (Many cost–benefit analyses do not include capital costs. See appendix for revised estimates excluding recent spending on community college facilities).

Federal Costs

We divide total expenses from IPEDS by the total number of credit hours of instruction and subtract the student and state costs. To net out federal spending, we also deduct revenue from private grants, investment income, and other sources. This leaves us with federal costs at approximately \$233 per credit hour.

Credits Completed and Credits Attempted

A 2011 study found Massachusetts community college students who complete an associate's degree earn 77 credits on average, while those who complete a certificate earn 56 credits.²⁷ However, community college students attempt significantly more classes, which increases instructional costs. We assume an average course passing rate of 90 percent for completers, which leads us to an average of 85 and 62 credits attempted for associate's degree and certificate completers, respectively.²⁸ Studies also find students who do not complete a certificate or degree generally accumulate significant credits before they drop out. We estimate they get halfway to an associate's degree, representing 43 credits of completed coursework.²⁹

We lack data to account for the cost of providing developmental coursework. However, this limitation is likely offset by the fact that we are not able to include the delivery of other noncredit courses provided by community colleges (i.e., workforce training and lifelong learning), which slightly inflates our per-credit hour cost estimates.³⁰

Due to data limitations, we assume the same cost structure for all fields of study. This is a significant weakness when we examine returns by major. Instruction is often more expensive to deliver in fields that generate the largest labor market gains. For future research, it would be valuable to collect more detailed data to develop precise estimates of how much of this additional expense students pay for through higher tuition and fees and how much is covered by other sources.



III. Cost–Benefit Analysis

We utilize our cost–benefit model to estimate the return to students and the return on public investment. Comparing benefits to costs, we also calculate break-even thresholds for additional public investment aimed at increasing community college completion rates.

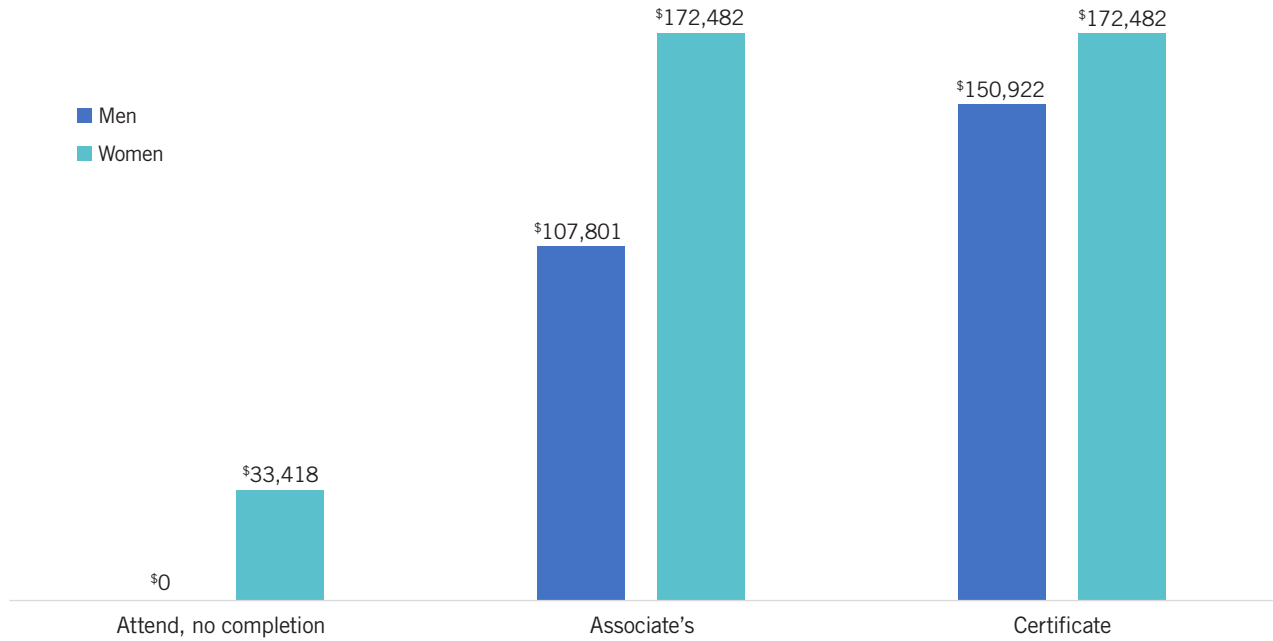
A. Returns to Students

Calculating the returns to students begins with discounting the lifetime earnings gains to estimate the present value of this cash flow (**Figure 3**). With a real discount rate of 3.5 percent, men who obtain associate’s degrees earn \$107,801 more over their lifetimes; for women, the earnings benefit is \$172,482. For men, the benefits of a certificate are greater than an associate’s degree; for women, they are about the same as an associate’s degree. This finding should be interpreted with some caution, as relatively few certificates are awarded.

As illustrated in **Figure 4**, men get back more than \$23 in lifetime earnings for each dollar spent on tuition and fees (after grant aid) for an associate’s degree, and \$45 for a certificate. For women, the returns are even greater, 37-to-1 for an associate’s degree and 51-to-1 for a certificate. These returns are extremely large because many students receive Pell Grants and other forms of financial aid. However, even if a student were to pay full tuition and fees, and borrow the entire amount, they would still receive multiples on their investment just in the form of higher earnings.

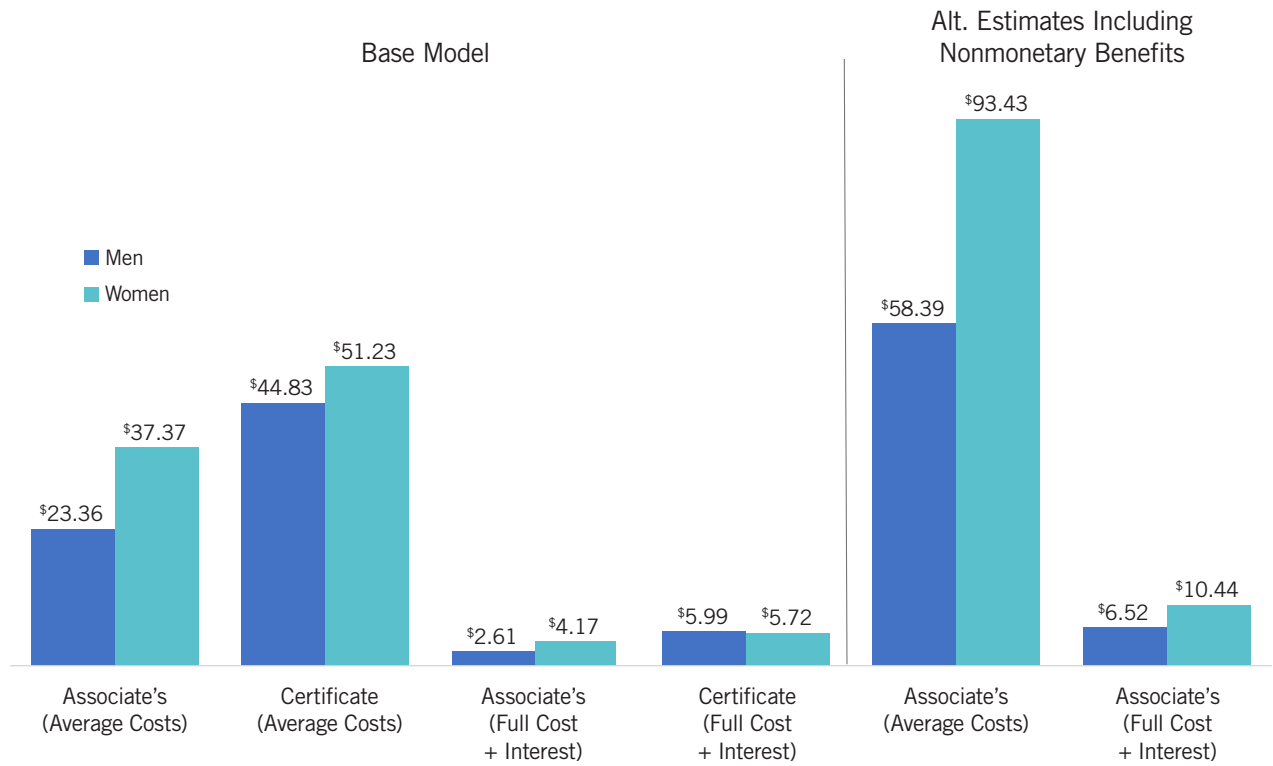
It is notable that students can garner especially large returns with certificates, yet far fewer pursue them. In FY 2020, community colleges granted 9,413 associate’s degrees compared to just 2,311 certificates.³¹ It could be that these specialized programs only have limited capacity, making it difficult for students to pursue this option. Alternatively, it is plausible that many students prefer associate’s degree programs because they put them on a firmer path toward a four-year degree, which typically delivers much larger increases in income.

Figure 3: Present Value of Estimated Lifetime Earnings Benefit With 3.5% Discount Rate



Source: Authors' calculations (see Section II for data and methods)

Figure 4: Estimated Cost-Benefit Ratios for Students



Source: Authors' calculations (see Section II for data and methods)

Most students who enroll will not complete a certificate or degree, and in this situation, the return on investment looks very different for women and men. On average, women who do not complete a certificate or degree gain over \$33,000 in lifetime earnings. If they take an average of 43 credits, paying the average cost before dropping out, they still realize a 14-to-1 return. Even those who pay full tuition and fees and borrow the entire amount will see a significant gain. In contrast, the absence of an earnings gain for men who do not complete a certificate or degree means they realize no return on their spending. The fairly low probability of completing and the absence of a return for non-completers may contribute significantly to lower rates of enrollment for men.

Returns are especially large for students in certain majors. For women with associate's degrees in health, benefits exceed costs by a ratio of 60-to-1. While health students generally pay higher tuition and fees per credit and in many cases must take significantly more credits to earn a certificate or degree, even if the costs exceed standard tuition and fees by 30 percent, they will still realize above-average returns. Students who pay full tuition and fees and borrow to cover these costs receive sizeable returns for all fields, except for men who major in liberal arts.

A more complete accounting of the benefits to students, including a valuation for nonmonetary returns (as estimated by McMahan and described in the preceding section), produces dramatically higher figures. Combining the income gains and the nonmonetary benefits, the present value of an associate's degree rises to approximately \$350,000. Paying average tuition and fees, the benefits of obtaining an associate's degree exceed the costs by a ratio of 58-to-1 for men and 93-to-1 for women.

B. Return on Public Investment

For each associate's degree completer, the present value of the state and local tax payments ranges between \$10,000 for men and \$15,500 for women. The avoided costs to state government are slightly higher (\$13,000 for men and \$17,500 for women). Combining the tax payments and avoided public costs, the total benefits are around \$23,000 for men and \$33,000 for women. Net of costs, the benefits to the state are approximately \$11,000 for men and \$21,000 for women. This means that for each dollar the state spends on a student who earns an associate's degree, Massachusetts taxpayers receive between \$1.89 and \$2.75 in benefits. The returns are even higher on certificates (**Figure 5**).

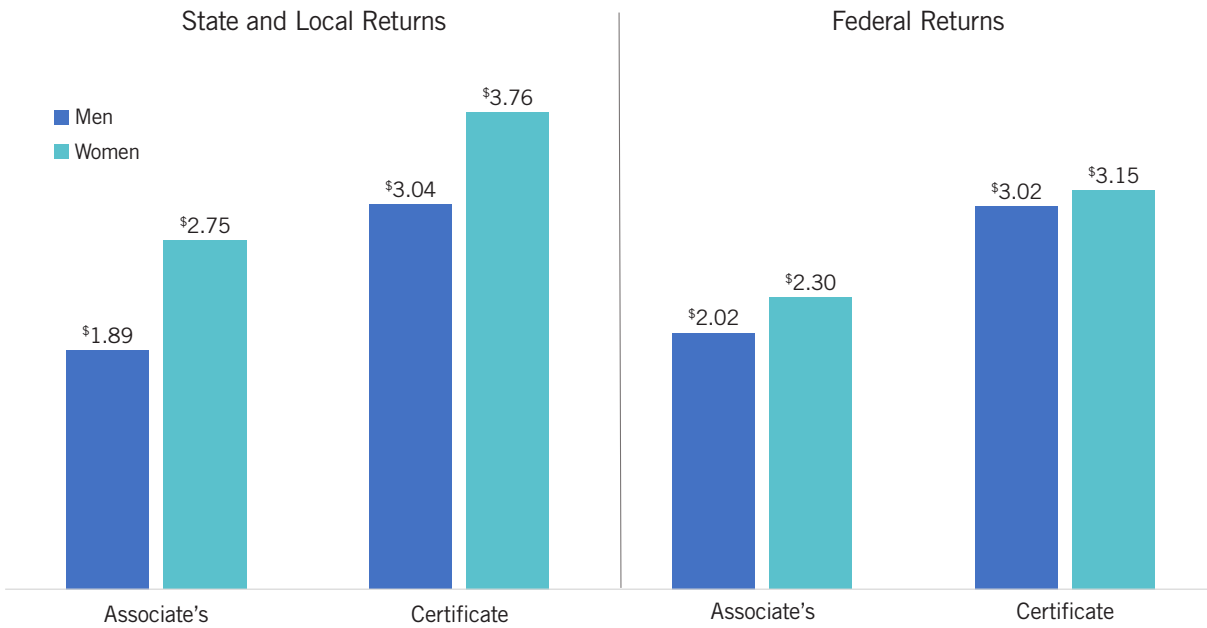
While the federal government shoulders approximately 60 percent of public educational expenses, the returns are similar to what the state receives because the federal government captures roughly 60 percent of the avoided public costs. For associate's degrees, the federal return is \$2.02 for men and \$2.30 for women. For certificates, the returns rise to \$3.02 for men and \$3.15 for women.

Assuming the same average costs for each major, the state generates a return ranging from \$1.16 for men with liberal arts degrees to \$3.45 for women with health degrees. Many majors generate a return for the state based just on the strength of the earnings gains (i.e., before we even consider the avoided costs to the public). For instance, women who earn an associate's degree in health pay \$2 in additional taxes for each dollar of state expenditure on community colleges (**Figure 6**).

A more complete accounting, using McMahan's calculations for benefits to the larger community (e.g., lower crime, more civic participation) significantly increases the estimated returns. On average, an associate's degree provides approximately \$130,000 in net public benefits. It is difficult to apportion this broader set of benefits between levels of government, but overall, the return on each dollar of state and federal spending on associate's degree completers is \$3.10 for men and \$4.90 for women (**Figure 7**).

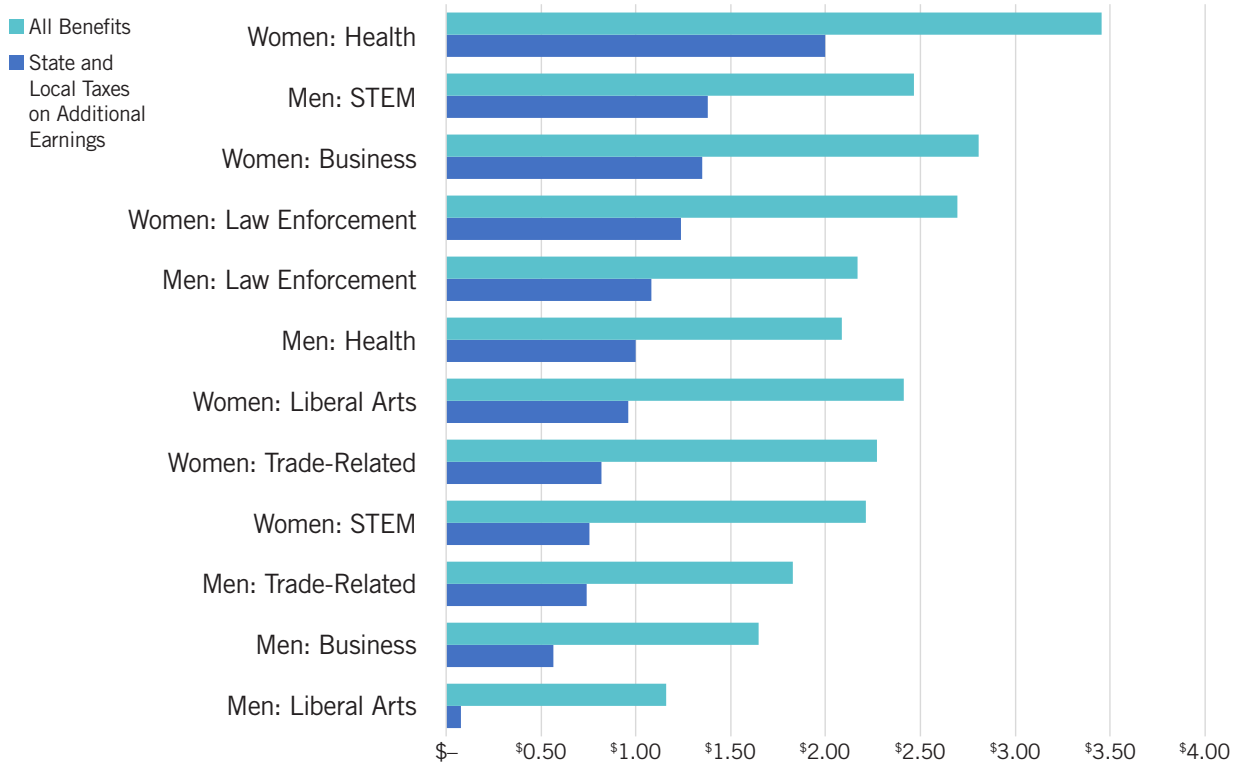
In general, higher education return on investment studies only provide cost-benefit ratios for those who complete degrees. At the community college level, however, most students do not complete their education. By following an entire cohort of students, the LMO study provides information to gauge return on investment in the aggregate.

Figure 5: Estimated Fiscal Cost-Benefit Ratios



Source: Authors' calculations (see Section II for data and methods)

Figure 6: State and Local Cost-Benefit Ratios by Major

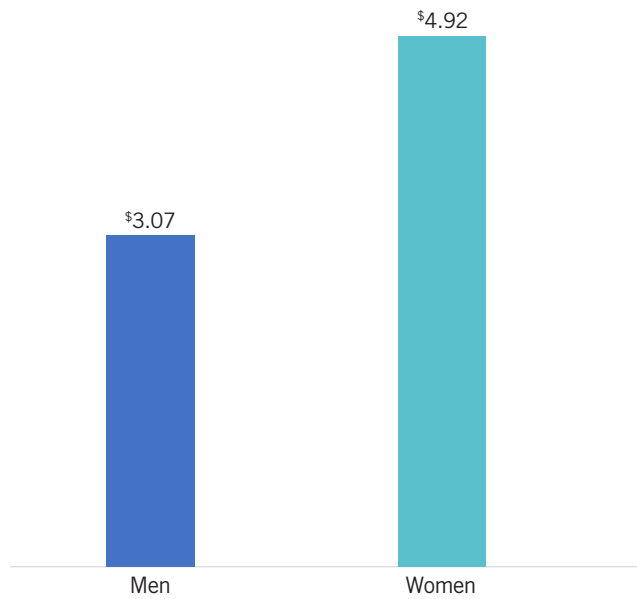


Source: Authors' calculations (see Section II for data and methods)

As we have seen, the public receives positive returns from all students who complete a certificate or degree, regardless of their field of study. However, the costs exceed the benefits, such that the public loses about 50 cents for each dollar expended when women do not complete. Every dollar spent on men who do not complete is a dollar lost, since there is no quantifiable earnings gain, and we conservatively assume that there is no public cost avoidance without completion.

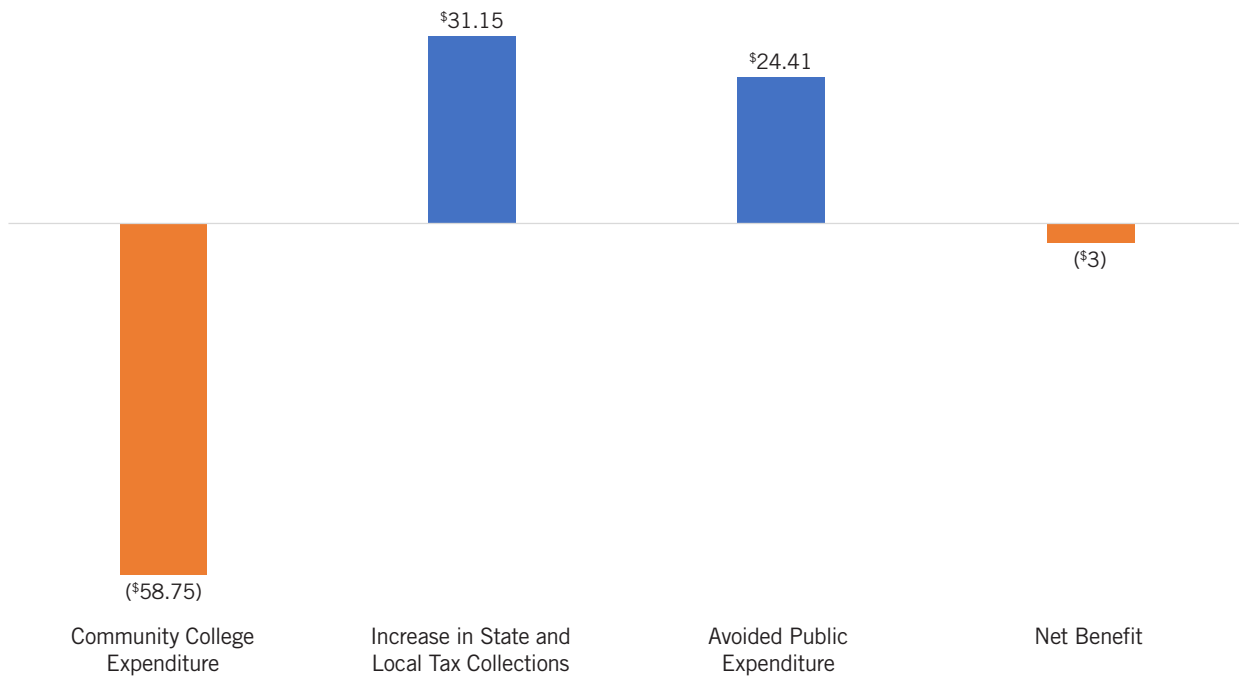
When combining all the students who took the 10th-grade MCAS in 2008 and studied at a community college without further enrollment at a four-year institution, the costs for students who do not complete their programs negate the benefits, but only ever so slightly for the state (Figure 8). For each dollar expended, there are 95 cents in state and local benefits. And this estimate understates the benefits in at least three important ways.

Figure 7: Alternative Estimate of Social Benefits to Public Costs Ratio for Associate’s Degrees



Source: Authors’ calculations (see Section II for data and methods)

Figure 8: State and Local Net Fiscal Benefit Calculation for 2008 MCAS Cohort (millions of dollars)



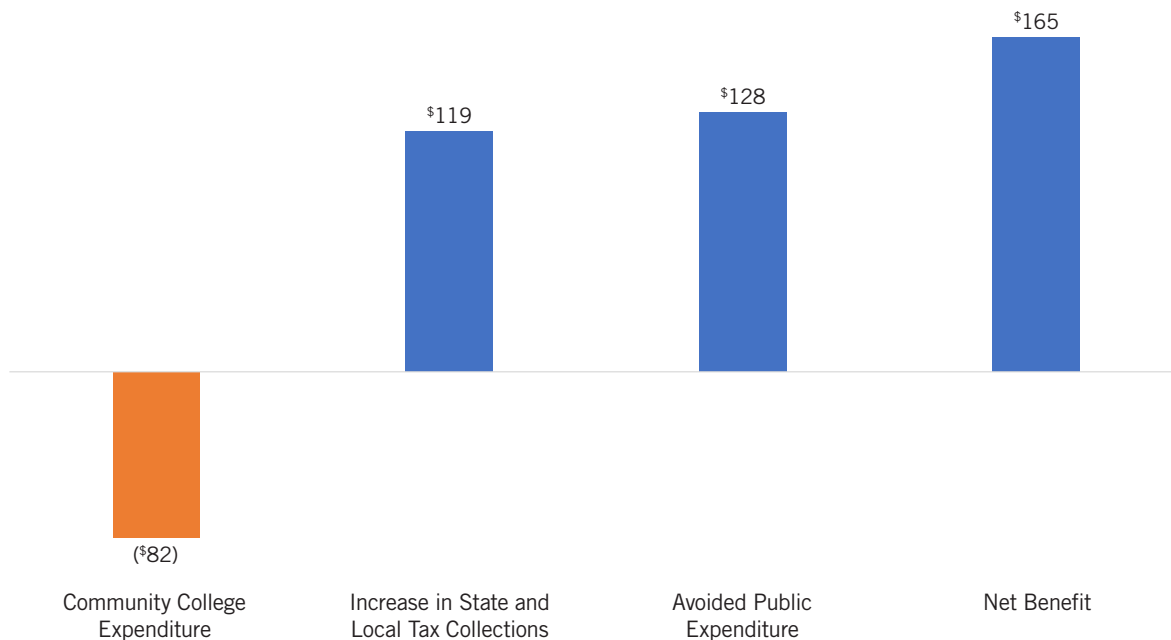
Source: Authors’ calculations (see Section II for data and methods)

First, it conservatively assumes no cost avoidance for non-completers. Second, this accounting also relies on the narrow definition of public benefits. While we cannot isolate state and local benefits from McMahon’s alternative nonmonetary benefit estimate model, if we were able to, the larger valuations it produces would certainly show that the state is more than breaking even on the totality of spending on this cohort. And third, this cohort analysis systematically undervalues the economic contribution of community colleges by excluding the large number of students in each class of entrants who transfer to four-year colleges. We do not include the costs of these students, but we also do not capture the benefits. Many of these students will earn four-year degrees, which will generate an even larger return on investment; community colleges provided the postsecondary pathway that made this achievement possible.

Even with these significant limitations, the cohort analysis is revealing. Despite relatively low completion rates, community colleges are likely breaking even for the state. However, if per-student costs rise due to declining enrollment, and completion rates do not increase, this may no longer be the case. Alternatively, if additional investment increases completion, taxpayers could realize significantly larger returns on investment in community colleges.

This is evident in **Figure 9**, which provides the potential net fiscal benefit for the 2008 MCAS cohort of community college students. With 100 percent of these entrants graduating, the net fiscal benefit would be \$165 million. While this idealized scenario is clearly infeasible, the heuristic powerfully illustrates the meaningful implications that efforts to increase community college success could have for the state budget even if they only brought completion rates up to half of students in each cohort.

Figure 9: Potential State and Local Net Fiscal Benefit Calculation for 2008 MCAS Cohort (millions of dollars)



Source: Authors’ calculations (see Section II for data and methods)

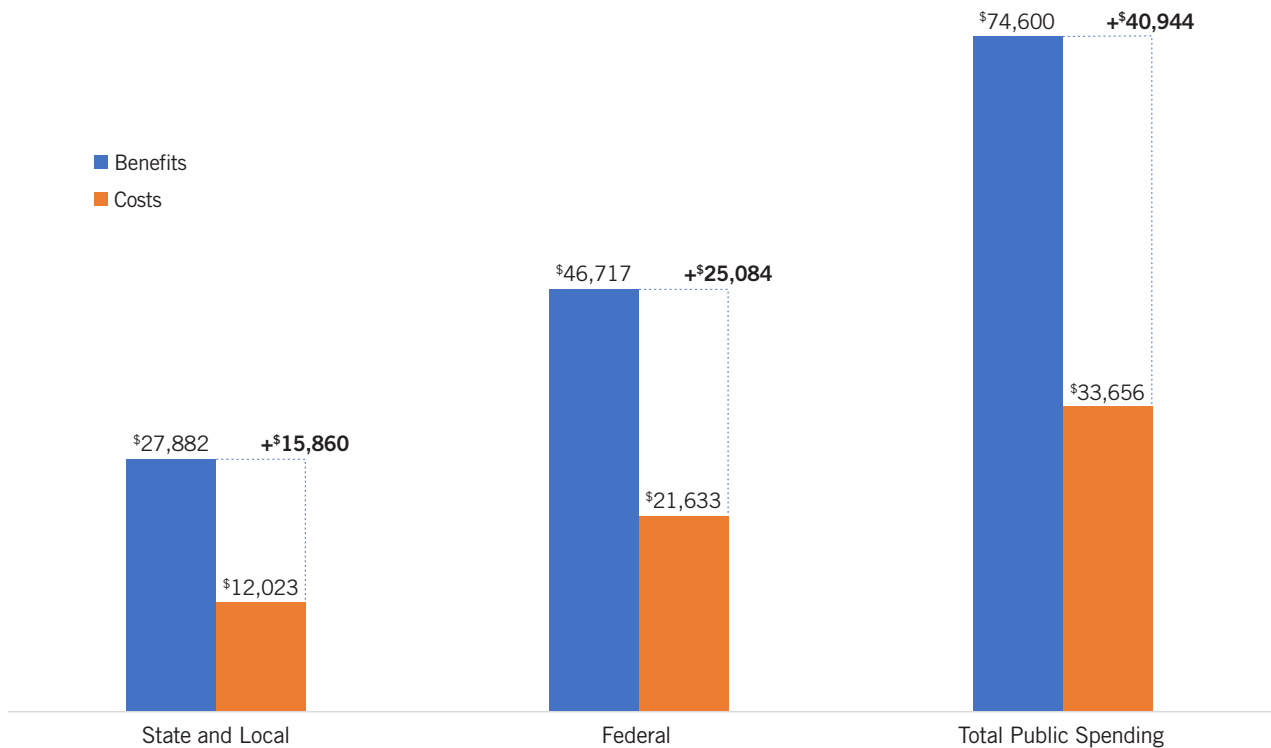
C. Break-Even Analysis

With these cost–benefit figures, we can now calculate how much more the state can spend per completion and still generate a return. For simplification, we average benefits for men and women to produce this estimate. The present value of public benefits for each student who completes an associate’s degree in Massachusetts is \$75,000. This includes approximately \$28,000 in state and local benefits and \$47,000 in federal benefits. At current spending levels, students completing associate’s degrees cost the state around \$12,000 and the federal government about \$22,000.

Subtracting these costs from total benefits provides the break-even investment threshold. The state can spend almost \$16,000 more per student and still generate a fiscal return for taxpayers. For the federal government, up to \$25,000 in additional spending would produce a payoff (Figure 10).

These figures provide conservative benchmarks for determining the cost effectiveness of interventions to increase college completion. For instance, if the state breaks even at an additional \$16,000 per completion, then a program where 50 percent of students (who would not otherwise complete) earn degrees is cost-effective for the state as long as the expenses remain below \$8,000 per participant. Put another way, the state could spend \$160 per participant for each percentage point increase in the probability of completion an intervention yields. So, an initiative that boosts completion rates by 20 percentage points breaks even at \$3,200 per participant. If we consider both the state and federal benefits, an intervention that increases completion by 20 percentage points provides a return to taxpayers if the costs fall below \$8,200 per participant.

Figure 10: Break-Even Investment Thresholds per Additional Associate’s Degree



Source: Authors’ calculations (see Section II for data and methods)



IV. Three Observations From Cost–Benefit Analysis

In addition to providing a fuller understanding of the costs and benefits of community college education, this analysis brings to light three fundamental issues that policymakers must consider as they work to ensure that more students find pathways to upward economic mobility at Massachusetts community colleges.

1. Expenditures that increase enrollment without increasing completion will not provide a large return on investment.

Our cost–benefit analysis shows the state is roughly in the break-even range when an entire cohort of students is examined. This suggests policies are unlikely to generate positive returns for taxpayers when they lead to enrollment increases without increasing the share of students completing.

This takeaway is pertinent given recent focus on making community college free for all students. The impact of tuition-free policies varies considerably according to their design, but evidence suggests that rather than increasing completion rates, the most common impact is a sizeable boost in enrollment among students who would not otherwise have attended. Notably, this effect is largely a feature of marketing and simplification, as students induced to enroll through the promise of free tuition would generally pay very little under current aid programs.³²

Many experts believe tuition-free policies are not the most cost-effective approach to improving community college outcomes.³³ Our analysis reinforces these concerns, with one important caveat: Most tuition-free programs studied to date provided last dollar funding. Under some proposals, including the model put forward by the Biden administration, tuition and fees would be waived, and low-income students would still receive their full Pell Grant. With no tuition or fees to pay, they could use these funds to defray transportation costs, living expenses, and other indirect costs. This would mean low-income students could work less and/or take on larger course loads, which should have a significant impact on completion rates.

Still, a free community college model that provides students with greater financial support for indirect costs is unlikely to generate gains on the order of magnitude possible when programs provide additional financial aid in combination with structured student supports.³⁴ This is important to keep in mind, now that Congress has shown a reluctance to move forward with free community college, and calls may grow louder for state and local governments to fund free community college models on their own.

2. Increasing completion lowers cost per degree granted, but significantly increases total costs. If we budget equitably, declining enrollment should make it easier for campuses to gradually absorb this expense.

Increasing student persistence increases costs, especially as instructional expenses tend to rise as students progress to more advanced courses. This is evident in a recent MDRC evaluation of the Accelerated Study in Associate Programs (ASAP) model in Ohio. The intervention doubled graduation rates, at a cost of \$5,521 per participant. However, when the additional course enrollments for students who now persist are included, ASAP's costs rise to \$8,303 per participant, which is 50 percent more than the price tag on the intervention alone. Still, when the ASAP treatment group is compared to the control group, the cost per degree completed is 22 percent lower, factoring both the expense of the intervention and the additional coursework students complete when they make it all the way to graduation.³⁵

If budgets do not grow as institutions successfully increase persistence, colleges will be forced to cut elsewhere, which may reduce success rates among future cohorts.³⁶ Using performance-based funding formulas that reward institutions for increasing completion is one approach to ensure that resources grow proportional to enrollment. Many states have experimented with this model. However, evidence suggests these formulas have had adverse impacts, including restricting admissions and relaxing academic standards. In some instances, underserved students disproportionately suffered these unintended consequences.³⁷

If budgets do not grow as institutions successfully increase persistence, colleges will be forced to cut elsewhere, which may reduce success rates among future cohorts. Using performance-based funding formulas that reward institutions for increasing completion is one approach to ensure that resources grow proportional to enrollment.

Massachusetts has also struggled with this approach. In the recovery from the Great Recession, the state built a formula incorporating national best practices. The approach had the support of all the state's community colleges, and the legislature adopted it 2012, but it was abandoned after just a few short years because many believed it was furthering inequities.³⁸

While the first generation of performance-based funding formulas has not proven effective, we can learn from the past to develop clear and transparent budgeting practices so that changes in enrollment (and the composition of enrollment across majors with different cost structures) do not accumulate and create large inequities between campuses.³⁹ This is especially critical with the dwindling college-age population. Enrollment declines should be sufficient to offset additional costs that accompany increases in persistence; however, we must be careful to structure budgets in a manner that provides each community college with the financial stability necessary to ensure that low-income students have both access and success.

This will require striking the right balance and avoiding perverse incentives that arise when funding is tied too tightly to performance. On its own, declining enrollment gives community colleges a strong impetus to increase persistence to keep revenue from falling. Campuses in regions with sharp enrollment drops that cannot be overcome with increases in persistence may have fixed costs that will require more per student operating support. At the same time, campuses that increase persistence will have larger variable costs that merit additional operating funds, particularly if the enrollment gains are disproportionately in high-return majors with greater instructional expenses.

3. Increasing completion in high-return majors and credentials will generate a large payoff for taxpayers, but it will take work to get there.

We have shown how many majors generate sizeable returns for taxpayers on the strength of revenue from additional earnings alone. While some understandably object to the idea of treating higher education as an investment proposition, increasing their economic position is the primary goal of many community college students. Policymakers would benefit from a greater understanding of the processes that influence choice of major. Institutions may simply have limited slots or admissions criteria that preclude students from selecting high-return majors. However, there is also evidence that various other factors keep students from pursuing these fields.

Research from four-year colleges suggests cost is very likely one of these factors. At least two recent studies with rigorous controls show that providing additional financial aid significantly shifts students to high-return STEM majors. Low-income students in Texas who received Pell Grants were 16 percent more likely to earn a STEM degree within six years of enrollment.⁴⁰ In Florida, students who received need-based aid provided by the state were 50 to 60 percent more likely to complete a STEM degree within seven years of high school graduation.⁴¹

To the extent that students avoid high-return majors, evidence suggests that concern about their ability to complete is another major factor. A study of community college students in California found a 10 percent increase in earnings increased a student's probability of selecting a major by 7 percent, whereas a 10 percent increase in a student's expected GPA in a major increased the likelihood of selecting the major by 18 percent.⁴²

For students from underrepresented racial and ethnic groups, the demographic composition of students in majors on their campuses may also have a significant influence on the decision.⁴³ Similarly, students make individual choices about majors based on the demographics of the workforce in the related field in their regions.⁴⁴

Early College programs, which introduce structured college pathways as soon as middle school, are particularly well-suited to addressing the multiple factors preventing students from entering high-return majors. By beginning years before the transition to college, these programs help ensure that all students have both academic preparation and knowledge of the job opportunities available to them within different industries. Students may also complete up to two years of college for free, significantly reducing the cost barrier associated with high-return majors.



V. Conclusions and Policy Recommendations

With the results of this cost–benefit analysis in hand, we can reiterate with even greater conviction the conclusion of the MassINC–Boston Foundation labor market outcomes study: *There is much more that we can do to position community colleges to provide an even larger contribution to equitable economic growth.* Toward this end, we offer five suggestions.

1. Expand access to comprehensive student support. Study after study show that we can dramatically increase completion rates by assigning students to advisors with relatively small caseloads, as well as providing tutoring and career planning services, and offering financial assistance to help with books, transportation costs, and living expenses.⁴⁵ Acting on this compelling evidence base, the legislature created a \$7.1 million Community College SUCCESS Fund (7100-4002) in the FY 2021 budget. The FY 2022 budget added another \$10.5 million to the fund.

To put this resource into context, the successful Ohio ASAP program noted above served students at a cost of \$1,800 per student per year.⁴⁶ If Massachusetts community colleges deploy a similar set of interventions with an equivalent cost structure, \$10.5 million would allow them to serve 5,700 students. This is less than one-tenth of current enrollment.

Leaders at the Department of Higher Education are partnering with the community colleges to structure these programs and evaluate their performance. This work is absolutely critical because interventions tested with randomized controls often struggle to deliver results when they are brought to scale or replicated in other jurisdictions. As we work to scale this model in Massachusetts, community colleges will need robust metrics and rigorous evaluation protocols to demonstrate that their initiatives are delivering on the promise.

2. Expand access to Early College High schools. Massachusetts has been working to help students prepare for postsecondary success while in high school, through the state’s Early College Initiative.⁴⁷ Despite significant disruption imposed by the COVID-19 pandemic, evidence from the first two cohorts of students to matriculate to postsecondary education suggests this young initiative is already leading to significant increases in postsecondary enrollment and persistence.⁴⁸

In the FY 2022 budget, the legislature doubled funding for Early College. This appropriation included significant funding for technical assistance grants to launch and expand programs across the state. The state is also using federal recovery resources to provide challenge grants to communities with ambitious plans to build large Early College initiatives. Dozens of communities have responded by applying for the grants and pursuing state designations. Projections suggest the number of high school students participating in Early College could rise from approximately 4,500 this year to as many as 8,700 next year.

While the growth and performance of Early College programs is impressive, considerable focus and attention will be required to scale Early College to a level that contributes to meaningful reductions in postsecondary completion gaps by race, ethnicity, and income. According to MassINC's estimates, an impactful annual target for Massachusetts is somewhere in the range of 45,000 students (grades nine through 12) participating in Early College.⁴⁹

Sustaining Early College at this scale will require significant public investment. In addition to continuing to carefully monitor the impact of these programs on postsecondary enrollment, persistence, and completion, it will be important to evaluate the efficiency of these pathways. Our estimates point to elevated costs due to students taking more courses than needed. Early College could provide a solution here, boosting return on higher education spending by increasing course-passing rates and reducing the number of excess credits students receive. Similarly, Early College should position more students to transfer to four-year colleges, transfer sooner than they would otherwise, and transfer more credits into their major. As noted above, Early College also holds real promise as a strategy to position more students for success in high-return majors.

While the growth and performance of Early College programs is impressive, considerable focus and attention will be required to scale Early College to a level that contributes to meaningful reductions in postsecondary completion gaps by race, ethnicity, and income.

On other hand, if the credits students receive in high school do not transfer, and fulfill major requirements for those taking courses that go beyond the general education foundation, return on Early College investment will be considerably lower. Moving forward, programs must begin to track and transparently report these efficiency measures.

3. Enhance the state's longitudinal student data system. It would not be possible to explore the policy questions presented in this analysis without the state's longitudinal student data system (SLDS). Massachusetts must remain committed to maintaining and improving upon this vital tool. The state should place particular emphasis on refinements that allow researchers and institutions to develop more precise estimates of resource use.

Providing a firm understanding of educational costs puts decision-makers in a strong position to gauge whether the potential benefits of a policy or program will exceed costs. Without this information, policymakers operate in the dark when planning and evaluating strategic efforts to increase completion and close large equity gaps.

In addition to educational expenses, Massachusetts can follow the example of Florida and several other states that have utilized a variety of administrative databases to analyze student data in order to improve understanding of how education directly influences receipt of public services. This information is critical because cost avoidance represents over half of the estimated fiscal benefit to the state.

Finally, enhancing the SLDS will be critical to increasing our understanding of the process behind major selections. As noted above, policymakers need to know more about how space constraints, admissions criteria, and course costs impact the ability of students to pursue the major of their choice.

4. Utilize information on the returns to higher education by field of study to inform college and career advising. Given the large variability in earnings, it is vital to present high school students with accurate information about earnings by field of study alongside costs so they can make informed decisions. It is particularly important to give them access to information on success rates for each major. As noted above, evidence suggests students are already evaluating their major choices based on the likelihood of completing the required coursework, without reliable information to make this assessment. To avoid further stratification, completion rates by field of study should be provided by trained counselors who can refer students to resources and supports that will set them up for success in the major of their choice while there is still ample time to prepare.

Massachusetts high schools have increasing capacity to have these conversations with students. With state funds provided by the Student Opportunity Act, schools are hiring more guidance counselors. High schools also have a number of sophisticated community partners providing students with college and career support. We must match this growing staff capacity with access to quality information.

State education agencies have spent over a decade and tens of millions of dollars in federal grants to link records and build the data infrastructure backbone required to process this information. To get it into the hands of people who need it, the state now has capital investment plans to upgrade public-facing information systems at both the Department of Elementary and Secondary Education and the Department of Higher Education. Leaders at these agencies should be transparent about the scope of these IT projects and anticipated delivery dates. If the resources required to complete these projects are not in place, this would be an excellent use for one-time federal recovery funds.

State education agencies have spent over a decade and tens of millions of dollars in federal grants to link records and build the data infrastructure backbone required to process this information. To get it into the hands of people who need it, the state now has capital investment plans to upgrade public-facing information systems at both the Department of Elementary and Secondary Education and the Department of Higher Education.

5. Advocate for changes to federal financial aid programs. This analysis shows an outsized share of the fiscal return flows to the federal budget. Congress can do its part to increase completion rates (and returns for taxpayers) by making a number of long-overdue changes to financial aid programs. Advancing bipartisan legislation to double the size of the maximum Pell Grant and index it to inflation would make an enormous difference to community college students, especially if adjustments are made to include living expenses for part-time students in financial aid calculations.

There is also an urgent need to reform federal loan programs. Many low-income students are understandably averse to debt.⁵⁰ However, as our findings indicate, even if they borrow at relatively high levels, community college students will likely see large returns, so long as they complete a certificate or degree. Given this math, many experts believe students should borrow more, if doing so will allow them to attend full-time.⁵¹

Before community college students assume more debt to accelerate their education, Congress must address severe flaws in the design and administration of income-driven repayment (IDR) plans. A recent report from The Education Trust that looked at the experience of federal student loans for Black borrowers is the latest to show that IDRs are extremely problematic as currently constructed. Black borrowers described them as a “trap” or “scam” and reported that the loans felt like “shackles on their ankles” because they had no hope of paying them off. Over periods as long as 25 years, loan balances grow when affordable payment levels are less than the interest expense. As a result, borrowing costs pile up to far more than the original loan principal.⁵² Congress must tackle this problem, so community college students can utilize debt for educational advancement more successfully in the future.⁵³

Appendix: Sensitivity Analysis

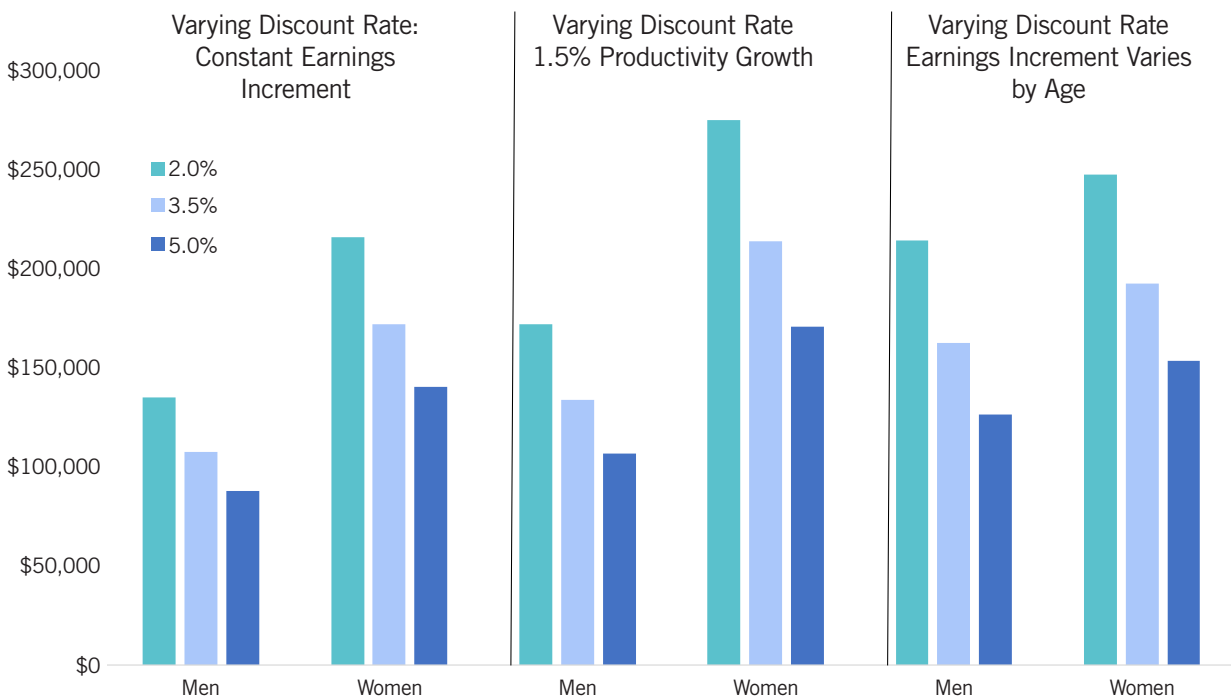
The results reported above are sensitive to the choice of discount rate as well as our assumption that the earnings differential between high school graduates and workers with community college education will remain stable over time. To address this uncertainty, we can model alternative scenarios and provide lower and upper bounds on our estimates (**Figure A1**).

Discount Rates

Economists hold differing perspectives about how to discount future cash flows when considering government investments. The discount rate reflects underlying assumptions about risk. Some believe government investments are highly diversified, so it is not necessary to provide private market returns for risk, especially when the government can generally borrow at very low rates if necessary. State investment in community college is certainly much less risky than in, say, a small municipality with limited ability to borrow or generate additional revenue bonding for a wastewater treatment plant. Following this logic, many would suggest a real discount rate of 2 percent, which increases the present value of the lifetime earnings gain by 26 percent relative to our standard 3.5 percent discount rate. Returns to state and local government for associate’s degrees rise from \$1.89 to \$2.38 for men and \$2.75 to \$3.45 for women. On average, for men and women, the break-even threshold for the state increases to over \$19,000 per additional completion.

However, others argue that a public investment that carries risk should be discounted more heavily because taxpayers will suffer consequences, either higher taxes or reduced services, if the investment underperforms. It is certainly possible that community college spending will underperform. For instance, the labor market returns

Figure A1: Present Value of Additional Earnings With Variation in Discount Rate and Earnings Trajectory



Source: Authors’ calculations (see Section II for data and methods)

on community college education could decline, or additional public investment could fail to increase completion. Setting aside risk, there is also a legitimate argument that if taxpayers forgo a benefit that an alternative use of public funds could provide today, they should be compensated with more resources in the future. Economists in this camp would suggest a real discount rate of at least 5 percent, which reduces the present value of the earnings gain by 18 percent. Returns to state and local government for associate's degrees fall to \$1.54 for men and \$2.24 for women; the state's break-even threshold drops to \$13,500 per additional completion.

Capital Costs

Finally, many would argue for excluding capital costs, particularly given the significant investments in community college facilities that occurred during this period. If we exclude capital costs, the per-credit hour expense to the state falls from \$141 to \$122. Returns to state and local government for associate's degrees rise to \$2.20 for men and \$3.19 for women. On average, for men and women, the break-even threshold for the state increases to over \$17,500 per additional completion.

Changes in the Earnings Differential Over Time

The assumption that the earnings differential between high school graduates and students with a community college education will remain constant over time presents another significant source of uncertainty.

One issue here is productivity growth. Studies analyzing the returns to higher education often assume that workers will see income growth over time due to productivity increases.⁵⁴ Over the past three decades, most of the income generated by productivity growth has gone to those with at least a bachelor's degree. If this pattern continues, higher productivity is unlikely to lead to a much larger differential between the earnings of high school graduates and associate's degree holders. Because we do not know how much productivity will increase and how these returns will be distributed, our basic model does not incorporate productivity effects. However, it is plausible that productivity growth will increase the earnings differential between community college completers and high school graduates in the future. If associate's degree holders see their wages increase above high school graduates by 1.5 percent annually, the present value of the earnings increment would grow by 25 percent at the standard 3.5 percent discount rate. At the lower 2 percent discount rate, the present value for earnings grows to \$275,659 for women and \$172,287 for men.

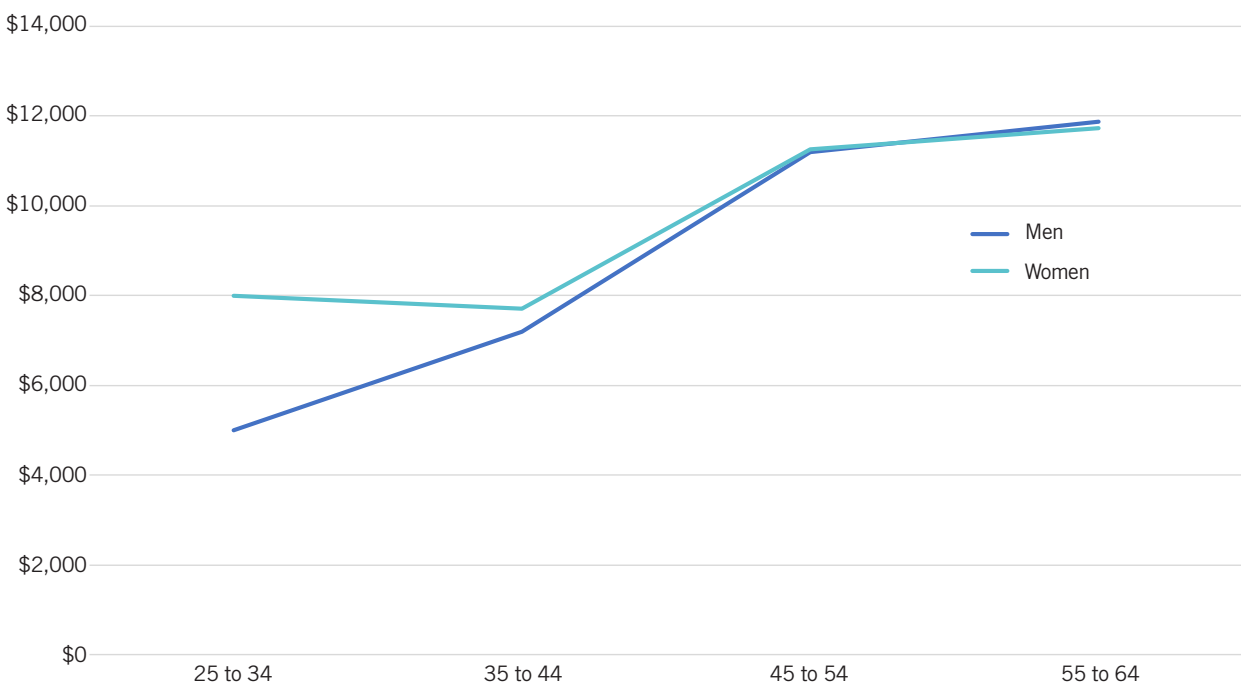
The varying value of a postsecondary education as workers progress in their careers is more challenging to model. Studies suggest college-educated workers with broader skill sets will likely see their earnings increment grow with experience over that of high school graduates, while those with narrower training may see their income decline as specialized skills become outdated.⁵⁵ American Community Survey (ACS) data for Massachusetts shows significant changes in the earnings differentials between high school graduates and associate's degree holders by age (**Figure A2**). If we adjust the earnings increment proportional to this variation, the present value of earnings increases by 150 percent for men but just 12 percent for women. This is because men see the earnings increment jump sharply in their thirties, while for women the increment declines before rising. With discounting, the early increases for men are far more valuable than the later gains for women.

Employing ACS data is a relatively crude technique because compositional issues across the age cohorts, including occupational mix, industry mix, exposure to recessions, and a variety of other factors, may explain these earnings differences. Nevertheless, these pronounced increases in the increment over time indicate it is important to improve our understanding of earnings trajectories as more longitudinal data become available. It is particularly notable that the earnings increments appear much larger for older workers, and our study generalizes from a cohort of students who enter community college within a few years of high school graduation.

Community colleges serve large numbers of mid-career entrants. While these students would have fewer years remaining in their careers to collect earnings gains, and the cost-avoidance profile is likely much different, a larger earnings increment could still yield large returns on public investment.

Assumptions about the long-term earnings trajectory are also important as we consider policies leading to a significant increase in community college completion rates. The laws of supply and demand suggest a large increase in workers with associate’s degrees could place downward pressure on their relative earnings. The average earnings of those with associate’s degrees could also fall, if achieving a significant increase in degree completion means schools begin to graduate students with nonacademic skills that are more marginal in the labor market; in this case, it is plausible that these graduates will not be able to utilize their education as productively as those who came prior. However, in the past, growth in demand and the productivity advantages of a more educated workforce have kept the college wage premium from declining even as we have seen the number of college-educated workers increase dramatically. Given the state’s aging workforce, it is unlikely that additional supply generated by increases in completion will impact the college wage premium any time soon.

Figure A2: Estimated Change in Earnings Increment by Age



Source: Authors’ calculations (see Section II for data and methods)

Endnotes

- ¹ Rachel Fulcher Dawson and others. “Comprehensive Approaches to Increasing Student Completion in Higher Education: A Survey of the Landscape.” *Working Paper #28046* (Cambridge, MA: National Bureau of Economic Research, 2020).
- ² Drew Atchison and others. “The Costs and Benefits of Early College High Schools.” *Education Finance and Policy* (2019).
- ³ Rajashri Chakrabarti and others. “State Investment in Higher Education: Effects on Human Capital Formation, Student Debt, and Long-Term Financial Outcomes of Students.” *Working Paper #27885* (Cambridge, MA: National Bureau of Economic Research, 2020).
- ⁴ “State Higher Education Finance: FY 2020.” (Boulder, CO: State Higher Education Executive Officer Association, 2021); Victoria Yuen. “The \$78 Billion Community College Funding Shortfall.” (Washington, DC: Center for American Progress, 2020).
- ⁵ Mark Melnik and others. “At the Apex: The 2030 Educational Attainment Forecast and Implications for Bay State Policymakers.” (Boston, MA: MassINC, 2014).
- ⁶ Authors’ analysis of data from the Massachusetts Department of Elementary and Secondary Education. Postsecondary completion rates are the share earning a degree within six years of anticipated high school graduation. The figures are for the most recent cohort, the high school graduating class of 2012.
- ⁷ For a concise summary of this core argument, see: “Raising College Attainment: A National Proposal to Scale Student Success Strategies.” (Washington, DC: The Institute for College Access and Success, 2021).
- ⁸ Alicia Sasser Modestino and others. “Pathways to Economic Mobility: Identifying the Labor Market Value of Community College in Massachusetts.” (Boston, MA: MassINC and The Boston Foundation, 2021).
- ⁹ The Massachusetts Department of Elementary and Secondary Education data following students in the high school class of 2012 cohort found that just 22 percent of low-income students had completed a postsecondary degree within six years of their anticipated high school graduation. This compares to 42 percent of all students. Nearly half of White students (49 percent) completed a postsecondary degree within this time frame compared to 17 percent of Hispanic students and 24 percent of Black students.
- ¹⁰ Lei Ding and Julieth Saenz Molina. “‘Forced Automation’ by COVID-19? Early Trends From Current Population Survey Data.” *No. 88713* (Federal Reserve Bank of Philadelphia, 2020); Sylvain Leduc and Zheng Liu. “Can Pandemic-Induced Job Uncertainty Stimulate Automation?” (Federal Reserve Bank of San Francisco, 2020).
- ¹¹ “Preparing for the Future of Work in the Commonwealth of Massachusetts.” (Boston, MA: Commonwealth of Massachusetts, 2021).
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- ¹³ Modestino and others (2021) provided estimates using two models: one with fixed effects for students entering community college one to five years after high school completion, and a second for students entering immediately after high school, employing ordinary least squares. The earning increments in this cost–benefit analysis are an average of the results from the two models.
- ¹⁴ The increments we derive from the LMO study for Massachusetts fall well within the range of other rigorous estimates of the return to community college education in the US. For a synthesis of the extant research, see: Clive Belfield and Thomas Bailey. “The Labor Market Returns to Sub-Baccalaureate College: A Review. A CAPSEE Working Paper.” (New York, NY: Center for Analysis of Postsecondary Education and Employment, 2017).
- ¹⁵ Mark Moore and others. “‘Just Give Me a Number!’ Practical Values for the Social Discount Rate.” *Journal of Policy Analysis and Management* 23.4 (2004); Anthony Boardman and others. *Cost Benefit Analysis: Concepts and Practice*. (Upper Saddle River, NJ: Prentice Hall, 2011).
- ¹⁶ Kurt Krueger and Frank Slesnick. “Total Worklife Expectancy.” *Journal of Forensic Economics* 25.1 (2014).
- ¹⁷ The state and local tax incidence rates are for those with family income in the second quintile (between \$23,100 and \$43,300 in 2015). Generated in 2018, these estimates reflect changes from the federal 2017 tax bill with the exception of the elimination of the SALT deduction. See: <https://itep.org/whopays/massachusetts/>. The federal rates are for all households in the second quintile. See: <https://www.taxpolicycenter.org/statistics/historical-average-federal-tax-rates-all-households>.
- ¹⁸ The exception is TANF and SSI. For these programs, we are able to estimate uptake in Massachusetts by educational attainment using the American Community Survey public use microsample.

- ¹⁹ Trostel suggests that causal studies often find that simple correlations underestimate the impact of education on receipt of government services, which would make his estimates conservative. However, it is not clear whether this conclusion holds, given more recent research findings. For example, see: Titus Galama and others. “The Effect of Education on Health and Mortality: A Review of Experimental and Quasi-Experimental Evidence.” *Working Paper #24225* (Cambridge, MA: National Bureau of Economic Research, 2018).
- ²⁰ Glenn Blomquist and others. “Estimating the Social Value of Higher Education: Willingness to Pay for Community and Technical Colleges.” *Discussion Paper #4086* (Bonn, Germany: IZA Institute of Labor Economics, 2009); Walter McMahon. “The Total Return to Higher Education: Is There Underinvestment for Economic Growth and Development?” *The Quarterly Review of Economics and Finance* 70 (2018).
- ²¹ Enrico Moretti. “Estimating the Social Return to Higher Education: Evidence From Longitudinal and Repeated Cross-Sectional Data.” *Journal of Econometrics* 121 (2004).
- ²² Phillippe Aghion and others. “Exploiting States’ Mistakes to Identify the Causal Impact of Education on Growth.” (Cambridge, MA: Harvard University, 2005).
- ²³ Gary Becker and Kevin Murphy. “Education and Consumption: The Effects of Education in the Household Compared to the Marketplace.” *Journal of Human Capital* 1.1 (2007).
- ²⁴ McMahon (2018).
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ACKNOWLEDGMENTS

MassINC would like to recognize the Boston Foundation and the Richard and Susan Smith Family Foundation for providing generous financial support to make this nonpartisan research possible. The authors would like to express their gratitude to Antoniya Marinova, Elizabeth Pauley, and Marjorie Ringrose, who provided thoughtful guidance and considerable encouragement throughout the course of this study. We must also recognize Alicia Sasser-Modestino, Walter McMahon, and Philip Trostel for the groundbreaking research that we relied heavily upon to derive our estimates. While the assistance that these individuals provided was invaluable, the authors bear all responsibility for the analysis and recommendations contained in this report.

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