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# An Economic Analysis of Investment in Public Higher Education in Massachusetts:

*Recovering from the COVID-19 Crisis  
and Laying Foundations for the Future*

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# Summary

Increased state spending on public higher education in Massachusetts can generate both short-run economic stimulus in the face of the COVID-19 crisis and lay the foundation for decades of improved social and economic performance. Indeed, it would be difficult to identify investment, public or private, that offers greater short-run and long-run benefits. We examine the short-run employment impact of additional spending on public higher education and the long-run fiscal and socioeconomic impact of investment in a college-educated workforce.

The conclusions, summarized in four main points, should command the attention of public decision-makers:

- 1.** Increased spending on public higher education in Massachusetts will create an immediate increase in employment in the state. Public higher education has strong employment-generating effects relative to most other sectors. The strong employment-creation benefits are net effects, inclusive of the taxation required to fund the investment with a state balanced-budget constraint. If the funding for the stimulus comes from, for example, federal support in light of the COVID-19 crisis, then the employment effects will be all the stronger.
- 2.** The high income and wealth of the Commonwealth, the extraordinary inequality of the income and wealth distribution in the Commonwealth, and the differential pattern of expenditure and financialized activity across the income classes of Massachusetts all point to progressive taxation as an efficient and effective way to finance investment in public higher education. In the absence of substantive federal relief, progressive taxation, which requires a larger contribution from higher-income households, is superior to either across-the-board taxation or higher tuition as the funding mechanism for higher-education investment.
- 3.** The long-run effects of increased investment in public higher education are likely to maintain a robust employment profile and to support fiscal balance in the long run through the increased tax revenue that results from more and better employment generated throughout the Commonwealth.
- 4.** The long-run benefits include a reduction in public need for welfare, Medicaid and other social programs. The material and intellectual benefits of increased public funding of public higher education will create broad social and economic benefits for individual citizens and their families.

Government officials, business leaders, and citizens groups are all seeking ways to expand the Massachusetts economy and to restore its health in the face of the COVID-19 crisis. This report finds that compared to commonly considered alternatives — or to doing nothing — increased public funding for the state's institutions of higher education is efficient and viable, ensuring large, reliable short- and long-term benefits. A systematic analysis of current data indicates that while the present cost of educating someone in a public institution of higher education in Massachusetts is around \$69,000, that public college or university graduate will in return, by a conservative estimate, contribute \$146,000 to state coffers, a net return of roughly \$83,000 per graduate.

The education received by new graduates will enable them to earn more and, hence, to pay more taxes and to greatly reduce the use of public support such as welfare and Medicaid. For every additional student educated in a public college or university in the state, the Commonwealth of Massachusetts comes out approximately \$80,000 ahead. There are few investment opportunities, including public investments, that can match public higher education in terms of the public return on investment. Increased public funding for public higher education justifies itself and provides increased benefits for the entire Commonwealth as well as the individual recipients of the education.

# 1. IMMEDIATE JOB CREATION

In the short run, spending on public higher education will create relatively high-paying jobs, and workers will recirculate the earnings from those jobs. Such a stimulative effect for the state’s economy is analogous to what can often be accomplished by private investment, but the differences are significant, especially in terms of how efficiently the public investment can deliver benefits to the largest number of citizens and to the Commonwealth as a whole. In particular right now, increased spending on public higher education in Massachusetts will reinvigorate the Massachusetts economy by creating jobs in sectors that have suffered in the current downturn. One obvious area is construction work; others include service jobs (maintenance, food preparation, security) and professional work (architects, planners, etc.).

Standard economic analysis shows a definite, positive short-run impact on employment in Massachusetts. To make this short-run analysis meaningful, we compare the impact of additional public spending on higher education with the impact of equivalent public spending on other kinds of economic activity, including casinos, health care, and tax cuts. We have focused on how these different kinds of additional public spending can boost employment.

## High-Income and Low-Income Households of Massachusetts

Before proceeding to the core of the analysis, it is helpful to examine the households of Massachusetts to understand both the fiscal capacity of Massachusetts as a whole and the highly unequal distribution of income within Massachusetts. Table 1 provides a portrait of the households of Massachusetts by income group, with approximately 10% of Massachusetts households receiving more than \$200,000 in annual income and 10% of Massachusetts households earning less than \$15,000 in annual income. The group that earns more than \$200,000 receives roughly one-third of all income in the state, while the poorest four groups, representing 35% of the households in the Commonwealth, receive only 14% of the income. Capacity to contribute to public taxation for the public good is clearly concentrated in the upper-income groups.

**Table 1: Massachusetts Households by Income Group, 2018**

Income Group	Number of Households	Share of All Households	Share of Income	Total Income	Local Consumption Demand	Percentage of Income Consumed in Massachusetts	Percent of Income Leaking from Massachusetts Circular Flow	Induced MA Job Losses per \$1M Tax Increase
GT\$200k	292,989	10.8%	33.7%	\$176,829,129,139	\$75,512,011,794	42.7%	57.3%	-4.7
\$150-200k	243,941	9.0%	13.8%	\$72,601,615,374	\$38,599,808,246	53.2%	46.8%	-5.7
\$100-150k	474,080	17.5%	18.6%	\$97,547,850,755	\$61,558,984,736	63.1%	36.9%	-6.8
\$70-100k	409,001	15.1%	12.1%	\$63,333,948,661	\$43,018,209,049	67.9%	32.1%	-7.1
\$50-70k	333,140	12.3%	7.8%	\$40,751,836,114	\$27,723,040,110	68.0%	32.0%	-7.1
\$40-50k	175,745	6.5%	3.6%	\$18,674,900,344	\$13,509,709,530	72.3%	27.7%	-7.4
\$30-40k	193,060	7.1%	3.5%	\$18,137,566,910	\$13,402,260,360	73.9%	26.1%	-8.0
\$15-30k	308,162	11.4%	4.2%	\$21,938,252,371	\$16,404,200,283	74.8%	25.2%	-7.5
LT\$15k	282,964	10.4%	2.9%	\$14,988,767,569	\$11,335,421,686	75.6%	24.4%	-7.7
<b>Total households</b>	<b>2,713,081</b>	<b>100.0%</b>	<b>100.0%</b>					

**SOURCE:** IMPLAN v. 3.0 and authors’ calculations.

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The rich households of Massachusetts differ from poor and middle-income households more than simply by income. Rich households of Massachusetts use their income differently. A key determinant of the effectiveness of local investment for stimulating the state economy is whether the additional expenditure circulates fully within the state. Higher-income households are more likely to undertake financial investment with their income, which may orient their purchases to financial assets, such as stocks and bonds, in national or even international financial markets. These financial-asset purchases do not directly or systematically stimulate the local economy. Higher-income households may also purchase more goods or services from other states or from abroad, which are sources of increased leakage from circular flow. Table 1 provides strong evidence of this differential contribution to circular flow. The richest households, those with incomes greater than \$200,000 per year, spend only 42.7% of every dollar of income on goods and services produced in the Massachusetts economy; the other 57.3% leaks from the circular flow. In contrast, households earning less than \$50,000 per year spend between 70% and 75% of their income on goods and services produced in the Commonwealth.

This differential leakage, or differential contribution to circular flow, bears on the economic implications of taxation. One dollar — or one million dollars — taxed from households in the richest tranche does not reduce the demand for goods and services produced in the Commonwealth by a significant amount because most of the dollar would have been spent or stored elsewhere anyway. One dollar — or one million dollars — taxed from households earning less than \$50,000 per year will make a noticeable dent in Commonwealth economic activity because much of that household's purchasing power would have been used close to home.

The final column of Table 1 shows the impact on Massachusetts employment of raising \$1 million in public revenue by alternatively taxing each of the income groups. One million dollars in taxation from the poorest income group reduces its purchases enough to reduce Massachusetts employment by 7.7 jobs. One million dollars in taxation from the richest income group decreases the purchases these households would have made by substantially less than \$1 million and therefore reduces employment by fewer than 5 jobs.

Although these data are not sufficiently granular to examine tax increases on the very rich, e.g., with incomes in excess of \$1 million per year, such an increase would have an impact on employment even smaller than the 4.7 jobs per \$1 million revenue for taxes on households with incomes above \$200,000 per year.

Of course, the goal at this time is not to reduce employment, but to increase it. So we will now turn to the positive job impact of alternative expenditure and investment programs. But if taxation is to be one of the sources for this increased expenditure, then we need a model of how the progressiveness or regressiveness of the tax program will affect its economic impact.

More progressive taxation, i.e., taxation that requires a greater share from higher-income households, is more efficient for the Commonwealth in terms of minimizing the negative economic impact of increased collection of tax revenue. The high income and wealth of the Commonwealth, the extraordinary inequality of the income and wealth distribution in the Commonwealth, and the differential patterns of expenditure and financialized activity across the income classes of Massachusetts all point to progressive taxation as an efficient and effective way to finance investment in public higher education.

## **Quantitative Methods Used in Analyzing Short-Term Effects**

Our conclusions about the strongly positive short-term job creation effect of increased public funding for higher education in Massachusetts are based on a method known in economics as input-output analysis. The first report on the economic impact of investment in public higher education in Massachusetts (Ash and Palacio, 2012) applied this method, drawing on earlier work by Garrett-Peltier and Pollin (2009), and the current report uses the same approach with updated data. This method makes it possible to compare the short-run effect on employment that results from spending on public higher education to the effects resulting from other kinds of public and private spending. The main data sources for this component of the analysis are the input-output tables developed by the U.S. Bureau of Economic Analysis (BEA) and made available by IMPLAN. These tables show data from surveys of households and firms that generate estimates specific to Massachusetts, thereby enabling policymakers to apply results from the broader literature of economics to the specific context of the Massachusetts economy.

Calculating the employment impact of an expenditure on a given activity means counting three effects of that expenditure: direct, indirect, and induced. The direct effect of the expenditure is the effect of a purchase directly on the enterprise selling the good or service. The indirect effect consists of the further economic activity, which the initial purchase stimulates among suppliers, because the enterprise providing the good or service will require goods and services from its suppliers. For example, an accounting firm, hired directly with a new expenditure, requires paper and ink from a stationer and electrical energy from a power generator. Those purchases by the accounting firm are indirect effects of the initial expenditure on accounting services. Finally, the workers and owners of both the directly affected enterprise as well as the indirectly affected suppliers receive the income from the sales, which they in turn spend on a variety of consumer goods and services. (Some of the new income may be saved rather than spent, and some of the purchases may be out of state, but much of the income circulates in state.) This additional expenditure is induced by the initial spending on the direct activity, and it too stimulates additional economic activity and employment. The employment generated by the direct, indirect, and induced pathways is the total employment effect of the stimulus.

In economics terminology, the goods and services purchased are inputs; the goods and services produced from these inputs are outputs. For a contractor, a bulldozer is an input, a building's foundation is an output. For a university, buildings and faculty are inputs; educated graduates, whose subsequent work is of value to the economy, are outputs. Input-output analysis that will identify the employment impacts of various spending choices is based on a set of tables for the U.S. economy with data produced by the BEA, as well as on interfaces provided by several private, independent economic analysis firms. In this report, the basis of the employment-impact estimates is IMPLAN, a reliable and widely used commercial product that analyzes dollar-figure expenditures in terms of the value of what those expenditures produce.

In such a short-run analysis, it is useful but incomplete to speak of the employment impact of a particular expenditure. As Siegfried et al. (2006) and Pollin and Garrett-Peltier (2009) observe, such an approach fails to consider the alternative effects that would be obtained with a different use of the same resources – people, money, etc. If public higher education funds were put to an alternative use, these funds would still generate employment (output), and the employees and owners of the alternative activity would receive compensation and profits, which they would spend on a range of consumer goods. The crucial question is, which kind of expenditure



will produce the greatest gain? The analysis in this report considers the alternatives and so determines the employment impact of expenditure on higher education relative to the effects of other kinds of spending.<sup>1</sup>

## Elements of the Stimulus

The employment effect of an economic stimulus depends on three factors: the size of the stimulus; the labor intensiveness (how many people it employs for what it accomplishes) of the activity it funds; and average compensation (wages and benefits). For an analysis in a particular geographic region, especially in a relatively small state such as Massachusetts, a fourth factor bears on the local employment impact, a factor referred to here as leakage. To the extent that the employment effects in distant locations — literally from New Hampshire to China — are not of interest to Massachusetts public decision-makers, anyone trying to determine the local employment effect of a policy in Massachusetts needs to adjust the analysis by not counting the portion of the stimulus taking place beyond the state's borders. As with leakage from household consumption decisions, the input-output method implemented by IMPLAN makes it possible to account for such leakage in the production matrix.

One feature of input-output analysis is that the source of the money to be spent does not matter in assessing its impact on employment. In terms of the immediate employment impact of additional expenditure on public higher education, it makes no difference whether the additional expenditure comes from public sources — a higher state budget appropriation for the public college and university systems — or from private sources — primarily students' or student families' tuition payments. However, we are presuming — and we are convinced that the Commonwealth in general can safely presume — that a still larger share of the cost of higher education cannot efficiently be borne by the typical student's family, let alone by poorer households. Since at least 2010, average tuition and fees at public four-year institutions in Massachusetts have been 30% above the national average; at public two-year institutions, tuition and fees are now 76% above the national average (Chronicle of Higher Education, 2010, and The College Board, 2020). Even before the recession of 2008-2010, student debt upon graduation had become high enough to compromise new graduates' options for employment or graduate study and to aggravate the debt burden for Massachusetts families. We return to the issue of high tuition and fees for higher education in the final sections of the study.

In determining the best allocation of new expenditures, three areas are particularly relevant for comparison to higher education: casino construction and operation, road construction, and other public construction. Spending could be directed toward other public priorities, but the three alternatives listed above are the most useful points of comparison because they are currently policy-relevant and because the level of expenditure in each is similar to the level of expenditure on public higher education — in the current state budget, roughly \$1 billion per year.<sup>2</sup>

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<sup>1</sup> In 2006, the Office of the President of the University of Massachusetts used input-output analysis and found the annual Massachusetts employment effect for the UMass system to be 29,000 jobs, of which 15,000 were direct employment by UMass and an additional 14,000 jobs were stimulated through the indirect effect on contractors and other suppliers (UMass Office of the President, 2006). While a valuable contribution, this analysis was incomplete since it does not compare employment effects of alternative expenditures.

<sup>2</sup> The 2001 reduction of the Massachusetts personal income tax rate by 0.65 percentage points accounts for approximately \$1 billion per year in foregone revenue. Casino gambling is forecast to produce revenue of between \$750 million and \$1.5 billion per year (Massachusetts Statewide Gaming Report, 2010).

Policymakers need to be concerned not only with the number of jobs created but also with the type and quality of these jobs. In comparing alternative expenditures, this analysis estimates the wage distribution of jobs created by each spending priority, i.e., how many new jobs will there be, how well do the jobs pay, and how unequal are earnings across jobs within sectors? In addition, the analysis of public higher education spending in Massachusetts must account for both in-state spending and out-of-state leakage.

## Spending and Investment Choices for the Commonwealth

Before comparing specific spending programs, we consider the broader goal of a spending increase. Each year, the state computes a revenue gap for public higher education – the amount by which the revenue available to Massachusetts institutions of public higher education falls short of the amount needed to maintain these institutions' focus, mission, and enrollment, based on their locations and facilities. The gap calculation establishes dollar values by using national standards, peer comparisons, and fundamental quality targets. The CHERISH Act currently under consideration in the Massachusetts Legislature calls for returning per-student expenditure to its 2001 level adjusted for inflation, prior to nearly two decades of real cuts.<sup>3</sup> The act calls for achieving the necessary \$600 million over a period of five years, \$120 million per year. Our analysis examines the impact of just the first \$120 million installment, as was proposed in January 2020.

The state can invest in public higher education in several ways. For example, it might make an extensive capital investment by constructing new buildings, or it could expand faculties and staff while continuing to use existing facilities. Different investment programs will have different impacts on employment depending on the employment profile of the component activities. This report examines a public higher education spending program in which the first two years initiate new construction while also expanding educational activity. Following the construction program, in the third year and beyond the expenditure is assigned entirely to direct provision of education. The substantial increase in the public higher education budget will be maintained at this new, higher level in subsequent years.<sup>4</sup>

In each scenario, we consider the impact of a \$120 million increase in the annual higher education budget. In the first scenario, in the initial two years half of the money is spent on new construction, and half is spent on expansion of existing educational activity; in following years, the full \$120 million increase is applied to expanded educational activity. In the second scenario, we consider simply spending the proposed \$120 million on the expansion of existing educational activity, without any investment in construction.

## What the Data Show about Short-Term Benefits

The upper panel of Table 2 displays the employment effect of \$1 million in expenditure with alternative spending and investment programs. For higher education, the table shows the underlying relationships for the scenario described above: a 70-30 mix of educational operating expenses and new construction. For casinos, which have been embraced for their job-creation potential in Massachusetts, similar scenarios can be examined: a 50-50 mix of construction and operation, or purely operation. For health care and for K-12 education, our analysis considers using the \$120 million entirely for operating expenses.

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<sup>3</sup> An act Committing to Higher Education the Resources to Insure a Strong and Healthy (CHERISH) public higher education system (Bill S.741) The 191st General Court of the Commonwealth of Massachusetts. <https://malegislature.gov/Bills/191/SD740>.

<sup>4</sup> This level will subsequently be adjusted only for inflation and population increase.



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**Table 2: Massachusetts Jobs Created Per \$1 Million**

Sector Receiving \$1 Million Investment	Direct Jobs	Indirect Jobs	Sum of Direct + Indirect Jobs	Induced Jobs	Total Jobs
<b>Higher Education Sectors</b>					
Higher education (481, two-year colleges, colleges, universities and professional schools)	8.5	1.4	9.9	3.3	13.2
Other educational services (482)	18.7	2.6	21.3	4.0	25.3
State educational employment (539)	12.3	0.0	12.3	4.6	16.9
Construction of new educational buildings (53)	6.7	1.0	7.7	3.3	11.0
Maintenance and repair of educational buildings (60)	4.6	1.8	6.4	2.7	9.1
Higher ed investment program (90% higher ed, 10% new higher ed construction)	12.5	1.3	13.8	3.9	17.7
Higher ed investment program (100% higher ed expansion in existing facilities)	13.2	1.3	14.5	4.0	18.5
<b>Other Sectors</b>					
K-12 education (480)	16.3	0.9	17.2	5.4	22.6
Construction of new highways and streets (54)	4.7	1.2	5.9	2.6	8.5
Maintenance and repair of highways and streets (62)	9.8	2.2	12.0	5.0	17.0
Casino (Construction)	6.8	1.1	7.9	3.3	11.2
Casino (Operation)	7.3	1.8	9.1	2.7	11.8
<b>Massachusetts Job Effect Per \$1 Million in Taxation</b>					
\$1M increase in total tax revenue from: Massachusetts households with income > \$150K	0.0	0.0	0.0	-5.2	-5.2
\$1M increase in total tax revenue from: Massachusetts households with income > \$50K	0.0	0.0	0.0	-6.3	-6.3
All Massachusetts households	0.0	0.0	0.0	-6.9	-6.9

**NOTES:** Sectoral structure of 2018 using IMPLAN v. 3.0; expenditure adjusted for inflation to 2020 investment analysis. IMPLAN sectoral codes in parentheses. Direct jobs are those created directly in the sector receiving the investment. Indirect jobs are those created in sectors with input demand from the sector receiving the investment. Induced jobs are those created by the consumption expenditure of households receiving earnings or profit income from the direct and indirect sectors.

**SOURCE:** IMPLAN v. 3.0 and authors' calculations.

It is noteworthy that investment and spending on public higher education is highly employment intensive. Additional spending on public higher education creates somewhere between 13 and 25 new jobs per \$1 million expenditure. The bulk of the jobs are in public higher education itself, although there are also jobs indirectly created and additional jobs created by the increase in consumption spending by the worker and owner households that receive the additional income. The substantial range in estimates (13 to 25 jobs per \$1 million expenditure) depends on differences about the potential expenditure programs. We settle on a more conservative figure of 17.7 jobs in order to summarize the results, and we acknowledge substantial potential variation in the results.

The lower panel of Table 2 considers alternative taxation programs to finance \$1 million in new expenditure and investment with figures drawn from Table 1. A tax applied to households with incomes in excess of \$150,000 per year, the group that benefited most from the reduction in 2001 of the tax rate on dividends and capital gains from 12 percent to 5.3 percent, will reduce jobs by 5.2 jobs per \$1 million in tax revenue. The second and third tax scenarios consider less progressive programs. The final scenario would distribute the tax cuts on an equal per-household basis, even to households with no existing income-tax liability, which would come at a cost of 6.9 jobs per \$1 million in tax revenue.

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Tables 2a and 2b give more information on how the direct and indirect employment effects of sectoral expenditure will play out in the economy. Table 2a describes the top five sectors that will experience indirect effects, the effect of input demand from the sector directly targeted with the initial \$1 million expenditure.

For example, if the higher education expenditure increases by \$1 million, we know from Table 2 that we expect a total of 9.9 new direct and indirect jobs. (This does not count the additional jobs induced by the household spending from the income from this activity.) Of the 9.9 new jobs, 8.5 are in higher education itself. Table 2a shows that the 1.4 jobs created by demand from the higher education sector are heavily concentrated in five sectors: hospitals (0.3 jobs), restaurants or food services (0.4 jobs), individual and family services (0.2 jobs), and real estate (0.1 jobs), with the remaining 0.4 jobs spread by the demand for inputs from a broad mix of sectors, including office supplies, electricity generation, and others.

**Table 2a: Top 5 Sectors of Indirect Employment Generation**

<b>Higher Education (481) – two-year colleges, colleges, universities and professional schools</b>		
<b>Sector</b>	<b>Description</b>	<b>Employment</b>
447	Other real estate	0.6
509	Full-service restaurants	0.2
490	Hospitals	0.2
476	Services to buildings	0.1
493	Individual and family services	0.1
<b>Other Educational Services (482)</b>		
<b>Sector</b>	<b>Description</b>	<b>Employment</b>
447	Other real estate	0.7
509	Full-service restaurants	0.3
490	Hospitals	0.3
472	Employment services	0.2
476	Services to buildings	0.2
<b>State Educational Employment (539)</b>		
<b>Sector</b>	<b>Description</b>	<b>Employment</b>
490	Hospitals	0.3
509	Full-service restaurants	0.2
493	Individual and family services	0.2
510	Limited-service restaurants	0.2
447	Other real estate	0.1
<b>Construction of New Educational Buildings</b>		
<b>Sector</b>	<b>Description</b>	<b>Employment</b>
490	Hospitals	0.2
447	Other real estate	0.2
509	Full-service restaurants	0.2
493	Individual and family services	0.1
510	Limited-service restaurants	0.1

continued

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<b>Maintenance and Repair of Educational Buildings</b>		
<b>Sector</b>	<b>Description</b>	<b>Employment</b>
405	Retail – Building material and garden equipment and supplies stores	0.5
447	Other real estate	0.2
490	Hospitals	0.2
509	Full-service restaurants	0.2
493	Individual and family services	0.1
<b>K-12 Education</b>		
<b>Sector</b>	<b>Description</b>	<b>Employment</b>
447	Other real estate	0.4
490	Hospitals	0.3
509	Full-service restaurants	0.3
511	All other food and drinking places	0.2
493	Individual and family services	0.2
<b>Construction of New Highways and Streets (54)</b>		
<b>Sector</b>	<b>Description</b>	<b>Employment</b>
490	Hospitals	0.2
447	Other real estate	0.1
509	Full-service restaurants	0.1
396	Wholesale – Other durable goods merchant wholesalers	0.1
493	Individual and family services	0.1
<b>Maintenance and Repair of Highways and Streets (62)</b>		
<b>Sector</b>	<b>Description</b>	<b>Employment</b>
405	Retail – Building material and garden equipment and supplies stores	0.9
490	Hospitals	0.3
509	Full-service restaurants	0.3
447	Other real estate	0.2
457	Architectural, engineering, and related services	0.2
<b>Casino (Construction)</b>		
<b>Sector</b>	<b>Description</b>	<b>Employment</b>
490	Hospitals	0.2
447	Other real estate	0.2
509	Full-service restaurants	0.2
493	Individual and family services	0.1
510	Limited-service restaurants	0.1
<b>Casino (Operation)</b>		
<b>Sector</b>	<b>Description</b>	<b>Employment</b>
511	All other food and drinking places	0.5
447	Other real estate	0.2
490	Hospitals	0.2
476	Services to buildings	0.2
509	Full-service restaurants	0.2

**SOURCE:** IMPLAN v. 3.0 and authors' calculations.

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Table 2b shows the median wage and a range of wages in typical occupations for each direct expenditure area and for some of the most common indirect sectors that provide inputs to the direct sectors. These figures give a sense of the quality and pay of the jobs created. A higher average wage and a low spread from low to high indicate that expenditure in these sectors will create better jobs and a more equal distribution than would an alternative choice. The smaller spread between the highest- and lowest-paying jobs indicates that any given job in this area is more likely to be a desirable one, since even the lowest-paying jobs in this sector pay relatively well. At the same time, other things being equal, a higher median wage indicates that fewer jobs may be created per dollar of expenditure. This relationship, however, is not automatic and invariable, because some sectors may be more labor intensive, employing more workers and less expensive plant equipment. Table 2b also shows the unemployment rate in each direct-expenditure sector under analysis.

**Table 2b: Quality of Employment Indicators, Direct-Effect and Leading Indirect-Effect Sectors**

	National median wage	Median Occupational Wages (Massachusetts)				Unemployment rate
		Lower paid		Higher paid		
Public Higher Education	\$56,160	office clerks	\$37,830	faculty	\$62,380	1.8
K-12 Education	\$48,310	teaching assistants	\$32,770	teachers	\$79,950	1.8
Construction	\$58,440	laborers	\$50,850	managers	\$104,820	5.0
Casinos	\$26,910	dealers	\$24,970	supervisors	\$37,440	5.0
Hospitals	\$58,210	nursing assistants	\$33,810	RN's	\$87,540	2.4
Road Construction	\$50,370	laborers	\$50,850	supervisors	\$84,590	5.0
Real Estate	\$40,590	office clerks	\$37,830	managers	\$79,430	2.3

**NOTES:** Unemployment is national unemployment rate for the sector, December 2019, prior to the COVID-19 Crisis.

**SOURCE:** Bureau of Labor Statistics: Occupational Employment Statistics, 2019, and Current Population Survey, April 2020.

The national median annual earnings in higher education is \$56,160 per year. In construction, which is part of one of the higher education programs and other expenditure programs considered here, average annual earnings are \$58,440. In casinos, median annual earnings are \$26,910 per year; in hospitals, the median is \$58,210 per year. Road construction has a median annual earnings of \$53,070, and real estate has median annual earnings of \$40,590. Other relevant features of desirable jobs include health insurance coverage, pension coverage, and other non-wage benefits; the size of these benefits varies substantially across sectors. For example, access to medical coverage is available to 70 percent of workers in construction, 83 percent of workers in installation, maintenance and repair, 90 percent of workers in public education, and only 44 percent of workers in services (Bureau of Labor Statistics).

In higher education, the lowest-paid category of employees is office clerks, with median annual earnings in Massachusetts of \$37,830. At the high end, faculty earn on average \$62,380 per year across a range of disciplines and levels of institutions. In road construction, the range of earnings is significantly wider, from laborers who earn \$50,850 per year to managers with average annual earnings of over \$100,000. The range in the casino industry and in health care is wide, from median earnings around \$25,000 to 30,000 in the lowest-paid job categories to earnings for the highest-paid workers in excess of \$75,000.

This analysis of the quantity and quality of employment in jobs created by investment in higher education answers the charge of Siegfried et al. (2006) to consider alternative expenditures. The comparison to casino expenditure

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and to road construction indicates that higher education is a cost-effective way to create additional jobs, with more jobs created per dollar of expenditure than in these other sectors. Furthermore, the jobs created are of generally high quality, with average annual earnings of \$56,160, a relatively narrow salary range and low unemployment (4 percent nationally for all persons employed in higher education in 2010); in other words, these are stable middle-class jobs.

Tables 2, 2a, and 2b describe the quantity, type, and quality of jobs created under alternative programs of spending and taxation. Assuming the new funds for higher education come as a result of a tax increase, we must examine and factor in to what extent a tax increase will reduce household expenditure, in turn reducing demand for some kinds of goods and services. In this case, the employment gain from new investment in higher education (or roads, other public construction, casinos, or health care) must be adjusted to include the reduced employment resulting from lower household expenditures caused by a tax increase.

## Analyzing a Higher Education Investment Program

Table 3 collates results from Tables 1 and 2 to provide predicted results from a particular expenditure program, an increase in public higher education of \$120 million.

**Table 3: Balanced Budget Higher Education Investment Program**  
**Massachusetts Employment Effect of Increasing Higher Education Investment by \$120 Million**  
*Jobs created in Massachusetts*

	Employment Effect (Change in Jobs)		
	Year 1	Year 2	Year 3 and beyond
Direct Employment (Higher Education)	1,502	1,502	1,580
Indirect Employment (Higher Ed Suppliers)	156	156	160
Induced Employment (Earnings)	1,658	1,658	1,740
<b>Total Employment Effect</b>	<b>3,317</b>	<b>3,317</b>	<b>3,480</b>
Balanced budget; taxation limited to households earning more than \$150K	-624	-624	-624
<b>Net Employment Effect</b>	<b>2,693</b>	<b>2,693</b>	<b>2,856</b>
Balanced budget; years 1-2 50% funded by Federal Relief Grant	-312	-312	-624
<b>Net Employment Effect</b>	<b>3,005</b>	<b>3,005</b>	<b>2,856</b>

**NOTES:** Higher Education Investment Program

Years 1-2 higher education investment split between the expansion of educational activity at existing facilities and new construction.

Year 3 and beyond assumes the full higher education investment in expansion of activity at existing and newly completed facilities.

Sectoral structure of 2018 using IMPLAN v. 3.0; expenditure adjusted for inflation to 2020 investment analysis.

**SOURCE:** IMPLAN v. 3.0 and authors' calculations

For the spending scenarios, the employment effect is divided into three components: the direct effect of the spending on the sector in which the spending occurs, the indirect effect as the target sector then purchases inputs from Massachusetts businesses, and the induced effect as the recipients of the new wage and profit income spend some of this income on household consumption.

In each of years one and two, the expenditure on higher education and construction generates 1,502 jobs through the direct employment effect, an additional 156 jobs at in-state suppliers, and a further 1,658 jobs as households spend their new earnings. The total number of jobs created is 3,317. In subsequent years, the

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direct employment effect increases to 1,580 jobs, largely because higher education is more labor intensive than construction. The indirect, or supplier, effect contributes an additional 160 jobs, and higher household expenditure adds another 1,740. The total number of jobs created is 3,300 in the first two years, increasing to almost 3,500 in the third year. If the additional spending continues, i.e., if the \$120 million additional spending becomes a permanent part of the budget, then this increased employment will continue.

In the analysis in Table 3, the \$120 million increase in spending on higher education can be funded by a tax increase that would affect only households earning more than \$50,000 per year. The employment effect of the tax program possibly needed to finance the higher education expenditure is substantially lower in magnitude – roughly 625 jobs with some variation depending on how the tax is structured. Because of the spending and, more particularly, the saving patterns of higher-income households, the tax cuts directed to higher-income households produce less employment than those directed to lower-income households. This variation among the effects of alternative tax cuts, however, is overwhelmed by their substantially less stimulative effect on Massachusetts employment, regardless of the taxation approach taken. The basic reasons for the low impact of taxation are, first, that households spend only part of a tax cut, while saving the rest or making household purchases that do not stimulate employment in the state.

As shown in Table 3, these higher taxes correspond to a decrease in employment of 625 jobs – roughly one-fifth the number of new jobs simultaneously created. The net employment effect from increased public spending on public higher education is therefore overwhelmingly positive. As indicated in the last row, Net Employment Effect, the higher education investment program creates almost 2,700 net new jobs in Massachusetts, increasing to 2,850 in year 3 and beyond. Furthermore, in the first two years of the program, a significant share of the employment will be in construction, an area that is especially vulnerable to recession and creates substantial middle-class employment opportunities for workers with less formal education. These high-quality jobs are fully paid for, and they put people in the Commonwealth to work using existing resources.

As of March 2020, the unemployment rate in Massachusetts was beginning to rise sharply in response to the COVID-19 crisis (at the date of publication of this report, the state unemployment rate for April was not available). The national unemployment rate as of April 2020 was 15%, which is widely considered an undercount of the extent of unemployment, and rising, and the Massachusetts unemployment rate will almost certainly rise sharply, too. This is important because it makes clear that the increases in employment predicted in Table 3 will be true net increases in employment or averted unemployment, rather than merely shifts of workers from one industry to another, which is a more reasonable concern when the economy is operating close to full employment. In technical terms, the net increase in employment is much larger than the opportunity cost – i.e., the impact on new and needed employment is substantially larger than it would be were the economy not in crisis. The opportunity to expand higher education with public funds is an excellent one for the situation currently facing the Commonwealth.

### **Additional Remarks on Financing the Investment**

A final consideration of financing the expenditure is in order to fully understand the potential for stimulating the Massachusetts economy. The scenarios analyzed in Table 3 operate cautiously from the perspective that all investment in public higher education must be fully funded by within-state taxation under the Commonwealth's



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constitutional balanced-budget provisions. There are other possibilities. The federal government is considering — and the U.S. House of Representatives has passed — legislation that would provide fiscal relief to states in the face of the COVID-19 crisis. If the federal government funds some or all of the investment in public higher education, then the increase in taxes, and concomitant partial offset in jobs, would be unnecessary, further increasing the stimulative impact of the investment. If the expansion is fully federally funded, then only the Total Employment Effect in Table 3 has no offset from collecting tax revenue and is the best estimate of the complete employment effect. Another scenario in which the expansion is partly federally funded for its first two years is outlined in the last row of Table 3.

There are other possibilities for expansion without taxation. New investment in public higher education could be funded through higher individual tuition, which has been the predominant public response for financing higher education for the past four decades. There are several important problems with this approach. Higher education, as the next section explores in detail, has many public benefits that cause the social return on education to exceed the private return. The excess of social return over private return means that private expenditure alone is very unlikely to achieve the fully efficient net benefit of the investment, which makes a strong case for public investment. Economists of every stripe, including Milton Friedman, have recognized the importance of public interventions to realize these social gains. Higher individual tuition translates into higher debt for graduates, which research has demonstrated is a significant drag on the economy, inhibiting home ownership, entrepreneurship, and eleemosynary activity (Wilson, 2020). Furthermore, higher individual tuition denies higher education to students who may make excellent use of the education but cannot afford the time or tuition now. For all of these reasons, higher individual tuition is an inefficient, inequalitarian, and burdensome approach to higher education investment.

Some other, innovative approaches are possible. The Federal Reserve, the central bank of the United States, could provide essentially full, zero-cost support for state and local expansions of education via bond issue (Epstein, 2020). Another option that has emerged in response to the depth of the crisis and paralysis of the federal government is that Massachusetts could undertake deficit spending. Both the Federal Reserve option and deficit spending by the state are innovative, unprecedented measures; on the other hand, the current challenge is equally unprecedented.

One potential basis for undertaking these investments with the assistance of the Federal Reserve or a relaxation of state rules concerning budget balance in the operating budget is that the investment in public higher education is a short-run stimulus program that can assist economic recovery immediately, but it is more than a short-run stimulus program. Like the object of many investments financed with financial instruments, investment in public higher education is a long-run investment in the economic and social well-being of the Commonwealth. In the final analysis and in the absence of outstanding federal or national policies to support the investment, progressive taxation is a fair and efficient approach to financing expanded investment in public higher education. In the next section, we examine the long-run impact of this public investment, an essential component of analyzing any investment.

## **2. LONG-TERM IMPACT ON TAX REVENUE & FISCAL BALANCE**

As the previous section shows, higher education investment is an excellent job creator. Moreover, the employment generated by the higher education investment program is far more than any dig-a-hole-and-fill-it-up employment stimulus. Higher education investment builds both human capital — the health, know-how, and other productive capacity of the population — and social capital, i.e., the networks and relationships among people that magnify their productivity exponentially. Both kinds of capital will pay long-run economic, fiscal, and social dividends. In plainer terms, both mean more jobs, better jobs, increased tax revenues, a higher quality of life, and a healthier economy. People with more education receive higher incomes, accumulate greater wealth, and therefore generate higher tax revenues.

The following data analysis shows in specific terms how such an investment improves the overall economic outlook for the Commonwealth. All the estimates are based on current, cross-sectional differences between college-educated and high school-educated workers. Their usefulness as a guide to policy therefore depends on these differences remaining constant; if the differences tend to fluctuate over time, policy analysts will need to make appropriate adjustments. For instance, if the unemployment rate among college-educated workers were to increase relative to that of less-educated workers, then the earnings premium and the public-expenditure advantage would understandably be diminished. On the other hand, if the relative labor market performance of college-educated workers increases — i.e., if they become more and more likely to be well employed — then the net benefits of higher education will prove larger than presented.

Economist Philip Trostel (2007) converts data on the earnings differences among workers with different levels of education into resulting differences in tax payments, which are the public's most visible return on its investment in public higher education. Trostel also examines differences in subsequent public expenditure as a function of the level of education of the recipient of the expenditure. He finds that college graduates are substantially less likely to draw on a variety of public and social insurance programs than are people without college degrees. Welfare, Medicaid and other public health care, unemployment compensation, or workers' compensation — a college graduate is statistically much less likely to require funds from these sources than is someone with only a high school diploma. College graduates are also less likely to be unemployed or incarcerated.

Key results for Massachusetts using Trostel's methodology are shown in Tables 4-6, updated with the most current data from the U.S. Current Population Survey. Table 4 shows the higher average earnings for college-educated workers relative to those for workers with only high school diplomas. The first row shows the level of annual wage and salary earnings by the level of education. The second row shows the earnings differential for people with some college, those with associate degrees, and those with bachelor's degrees, relative to those who are only high school educated. As the numbers indicate, this degree premium expands sharply with the completion of the bachelor's degree. People with bachelor's degrees earn, on average, some \$40,000 per year above what people with only a high school diploma earn; more simply, the average four-year college graduate earns twice as much as the average high school graduate.

**Table 4. Impact of Higher Education Investment on Annual Earnings  
and Tax Revenue for Massachusetts**

*Poverty rate, average annual labor earnings and state and local tax revenues, 2016-2018*

	High School	Some College	Associate Degree	Bachelor's Degree
Poverty rate (Federal Poverty Line)	11.1%	8.4%	5.4%	3.5%
Near-poverty rate (150% FPL)	20.5%	15.3%	10.3%	5.0%
Full-year, full-time	56.0%	61.0%	63.0%	68.0%
Wage and Salary Earnings (Full-year, full-time)	\$51,051	\$57,997	\$61,173	\$91,270
Degree Premium		\$6,946	\$10,122	\$40,219
Wage and Salary Earnings	\$33,223	\$39,827	\$44,130	\$70,621
Degree Premium		\$6,604	\$10,907	\$37,398
State Income Tax	\$1,337	\$2,031	\$2,477	\$3,432
State Income Tax Premium		\$694	\$1,140	\$2,095
Home ownership rate	56.3%	60.7%	62.7%	68.2%
State Income Tax and Property Tax	\$3,849	\$5,454	\$5,978	\$7,414
State Income Tax and Property Tax Premium		\$1,605	\$2,129	\$3,565
State Income Tax and Property Tax	\$5,344	\$7,246	\$7,567	\$9,956
State Income Tax and Property Tax Premium		\$1,902	\$2,223	\$4,612

**NOTES:** All dollar values adjusted to 2019 dollars with CPI-U; property tax estimates available only 2016-2017. Sales tax estimate is based on a propensity to consume declining from 75% to 60% across the income categories and a state sales tax rate of 6%.

**SOURCE:** Annual Social and Economic Supplement of Current Population Survey 2017-2019.

Table 4 then shows the annual tax revenue differential between high school-educated workers and those with some higher education or a post-secondary degree. With higher incomes, college graduates will pay higher state income tax, own more expensive houses (or rent more expensive apartments) with higher property tax payments, and purchase more commodities with higher sales tax. The sales tax estimate used in Tables 4 and 5 is based on Trostel (2007) and applies the sales tax to an estimated propensity to consumption from income for each educational group. As the table indicates, state income tax, local property taxes, and sales taxes paid each year by workers with bachelor's degrees are \$4,612 greater than the taxes paid by workers with only high school diplomas.

Table 5 shows the total average tax payment and the tax revenue differential for the college-educated over the taxpayer's entire working life after graduation. Numbers in the table distinguish between the Sum, which simply adds the amounts paid in taxes over the course of the worker's career, and the Present Value, a standard financial adjustment that puts more weight on costs incurred and benefits realized today and less weight on costs and benefits realized in the future.

**Table 5. Estimated Lifetime State and Local Taxes Across Education Categories in Massachusetts, 2016-2018**

	High School	Associate Degree	Bachelor's Degree
<b>State Income Tax</b>			
Lifetime Payment (Simple Sum)	\$53,480	\$99,080	\$137,280
Lifetime Payment (Present Value)	\$36,574	\$67,760	\$93,884
Lifetime Degree Premium (Simple Sum)		\$45,600	\$83,800
Lifetime Degree Premium (Present Value)		\$31,185	\$57,310
<b>S.I.T. and Property Tax</b>			
Lifetime Payment (Simple Sum)	\$153,960	\$239,120	\$296,560
Lifetime Payment (Present Value)	\$105,291	\$163,531	\$202,814
Lifetime Degree Premium (Simple Sum)		\$85,160	\$142,600
Lifetime Degree Premium (Present Value)		\$58,240	\$97,522
<b>S.I.T., Property Tax and Sales Tax</b>			
Lifetime Payment (Simple Sum)	\$213,761	\$296,471	\$360,107
Lifetime Payment (Present Value)	\$146,189	\$212,558	\$257,137
Lifetime Degree Premium (Simple Sum)		<b>\$82,709</b>	<b>\$146,346</b>
Lifetime Degree Premium (Present Value)		<b>\$66,369</b>	<b>\$110,949</b>

**NOTES:** Present Values are calculated with a 2% discount rate.

**SOURCE:** Annual Social and Economic Supplement of Current Population Survey 2017-2019 and Trostel (2007).

The logic of Present Value is that people are to some extent impatient and discount the future relative to the present. The Present Value computation allows for this sentiment by means of a standard formula familiar to accountants.<sup>5</sup> However, a long-lived public entity such as our Commonwealth, which has a responsibility to future generations as well as to our own, might well focus on the simple sum, over time of benefits, minus costs. Both approaches are legitimate for comparing the benefits and costs of college attendance, and so both are presented here.

For an illustration of advantages of investing public funds in higher education, in Row 1 of Table 5 we find that a worker with a high school diploma pays Massachusetts \$53,480 in state income tax over the course of a career, while a worker with a bachelor's degree, and therefore on average a much higher income, pays \$137,280 in state income tax – an additional \$83,800, or almost three times as much – over the course of a career. However, because workers with bachelor's degrees usually do their highest earning late in their careers, and because their earnings begin only after four years of college, the Present Value of a college graduate's additional tax payments is \$57,310.

The additional rows of the table show the degree premium for tax revenues paid in combined income and property taxes (because college-educated workers own higher-valued homes) and in these taxes plus sales taxes (because college-educated workers purchase more goods on which sales tax is charged in Massachusetts). When income, property, and sales taxes are added, the college-educated Massachusetts resident pays on

<sup>5</sup> Each year's term in the Sum is divided by  $1.02^t$  where .02 is an assumed discount rate for public-sector applications, and  $t$  is the number of years in the future that the cost or benefit arrives. The lower the discount rate, the more closely the present value will approach the simple sum.

average \$146,346 more in Sum, or \$110,949 more in Present Value, in state and local taxes than does someone with only a high school education. The additional tax revenue alone covers the cost per public degree, without any consideration of the effect on public expenditure or the non-monetary social value of a college-educated workforce. When these two factors are included in the calculation, the net gain for the Commonwealth is significant.

### **3. SAVINGS IN STATE SPENDING PROGRAMS**

Beyond the fact that some of the benefit created by public investment returns directly to the public coffers in the form of higher tax revenues from those with associate, bachelor's and advanced degrees, more highly educated people also require less in the way of public expenditures. They receive lower transfer payments (welfare, Medicaid, unemployment compensation, workers' compensation, etc.), because they experience less unemployment and less poverty; and they are less likely to be incarcerated. In quantifying such public-sector fiscal impacts of higher education, this report draws heavily on the work of Trostel (2007), who has confirmed that college-educated people pay much more in taxes and use less in public benefits than people who lack such education.

Table 6 displays cross-sectional use rates and the lifetime state and local expenditures on various public programs for those with a high school education, those with some college, and those with bachelor's degrees. In every category, the college-educated require smaller average public outlays than do the high school-educated.

**Table 6. Lifetime State and Local Expenditures Across Education Categories in Massachusetts**

	High School	Associate Degree	Bachelor's Degree
<b>Welfare</b>			
Rate	1.7%	1.6%	0.2%
Lifetime Sum	\$739	\$3,033	\$292
Lifetime Present Value	\$506	\$2,074	\$199
Lifetime Degree Premium (Sum)		\$2,294	-\$448
Lifetime Degree Premium (PV)		\$1,569	-\$306
<b>Medicaid</b>			
Percent in Excellent/Good Health	55.3%	65.8%	76.1%
Medicaid Use Rate	44.9%	28.8%	18.8%
Lifetime Sum	\$72,230	\$46,286	\$30,273
Lifetime Present Value	\$49,397	\$31,655	\$20,703
Lifetime Degree Premium (Sum)		-\$25,944	-\$41,957
Lifetime Degree Premium (PV)		-\$17,742	-\$28,694
<b>Unemployment Compensation</b>			
Lifetime Sum	\$7,640	\$5,560	\$6,400
Lifetime Present Value	\$5,225	\$3,802	\$4,377
Lifetime Degree Premium (Sum)		-\$2,080	-\$1,240
Lifetime Degree Premium (PV)		-\$1,422	-\$848

continued

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	High School	Associate Degree	Bachelor's Degree
<b>Workers' Compensation</b>			
Lifetime Sum	\$5,120	\$988	\$980
Lifetime Present Value	\$3,502	\$676	\$670
Lifetime Degree Premium (Sum)		-\$4,132	-\$4,140
Lifetime Degree Premium (PV)		-\$2,826	-\$2,831
<b>Corrections</b>			
Lifetime Sum	\$41,345	\$11,412	\$4,769
Lifetime Present Value	\$19,437	\$5,757	\$2,833
Lifetime Degree Premium (Sum)		-\$29,933	-\$36,576
Lifetime Degree Premium (PV)		-\$13,680	-\$16,604
<b>Total State and Local Expenditure</b>			
Lifetime Sum	\$127,074	\$67,280	\$42,714
Lifetime Present Value	\$78,066	\$43,964	\$28,783
Lifetime Degree Premium (Sum)		-\$59,795	-\$84,361
Lifetime Degree Premium (PV)		-\$34,102	-\$49,283

**NOTES:** Present Values are calculated with a 2% discount rate.

Estimates for Corrections are from Trostel (2007), based on national averages, and updated with the CPI-U.

**SOURCE:** Annual Social and Economic Supplement of Current Population Survey 2017-2019 and Trostel (2007).

Moreover, econometric studies that adjust for the prior advantage held by the more affluent people who historically have gone to college confirm that these outcomes are the actual effect of the education, not a mere reflection of the type of people who tend to get a college education. When the reductions in public expenditures across all of these categories are added, the college-educated incur lower social costs: \$84,361 less in Sum and \$49,283 less in Present Value than do the high school-educated.

Table 7 then adds these relative savings to the value already established for the increase in taxes to show the net fiscal impact of four-year-equivalent degrees. A college degree holder pays \$146,346 more in taxes and costs \$84,361 less in public expenditure than does a high-school graduate, for a net post-college fiscal benefit to Massachusetts of \$230,707 (\$160,232 in present value). These terms need to be adjusted for migration, which we discuss in more detail below. Migration-adjusted values are presented and do not substantively change the analysis; the net fiscal benefit per four-year degree remains a net of \$214,557 (\$149,015 in present value).

The benefits in higher tax revenue and lower public expenditure need to be compared to the public cost to the Commonwealth of producing a college graduate. Updated for inflation, the estimated cost in Massachusetts is \$68,948 (\$65,634 in present value) per four-year-equivalent degree, i.e., appropriately including the cost of two-year degrees as well.

Updating Trostel's research, Table 7 shows the full lifetime fiscal impact per four-year-equivalent degree. The migration-adjusted summed benefits of \$214,557 easily cover the \$68,948 cost of a public degree, a lifetime state surplus of \$145,609. Because the costs are front-loaded while the benefits are realized over a career, we may prefer to analyze the Present Value of all benefits and costs. The present value of the lifetime benefits is \$149,015 and the cost of a four-year-equivalent degree is \$65,634, giving a net present value of \$83,382, the net gain to the Commonwealth of creating a new college graduate. Viewed as an investment, the Commonwealth's expenditure on higher education yields a better return than do many financial assets.



**Table 7. Estimated Lifetime Fiscal Effects per Four-Year-Equivalent Degree in Massachusetts**

Post-College Effects	Sum	Present Value
	<b>Revenue</b>	
State Income Tax	\$83,800	\$57,310
<b>State and Local Taxes</b>	<b>\$146,346</b>	<b>\$110,949</b>
	<b>Cost</b>	
Welfare	-\$448	-\$306
Medicaid	-\$41,957	-\$28,694
Unemployment Compensation	-\$1,240	-\$848
Workers' Compensation	-\$4,140	-\$2,831
Corrections	-\$36,576	-\$16,604
<b>Total</b>	<b>-\$84,361</b>	<b>-\$49,283</b>
<b>Net Post-College Effect</b>	<b>\$230,707</b>	<b>\$160,232</b>
<b>With migration adjustment</b>	<b>\$214,557</b>	<b>\$149,015</b>
<b>Public Cost Per Public Degree</b>	<b>\$68,948</b>	<b>\$65,634</b>
<b>Net Fiscal Effect</b>	<b>\$145,609</b>	<b>\$83,382</b>

**NOTES:** Present Values are calculated with a 2% discount rate.

**SOURCE:** Trostel (2007), Annual Social and Economic Supplement of CPS 2017-2019, Digest of Education Statistics (2018)

## Higher Education in the Current Economy

This report comes as the United States and the Commonwealth are confronting a deep economic crisis caused by COVID-19. During the Great Recession, the economic crisis that began in 2007, some commentators have questioned whether a college degree is still worth it. This question, raised in the context of the debate over austerity, is legitimate in that the likelihood of unemployment may have increased or the pay premium (and hence tax premium) may have decreased for college graduates sufficiently to eliminate the fiscal advantages of college education.

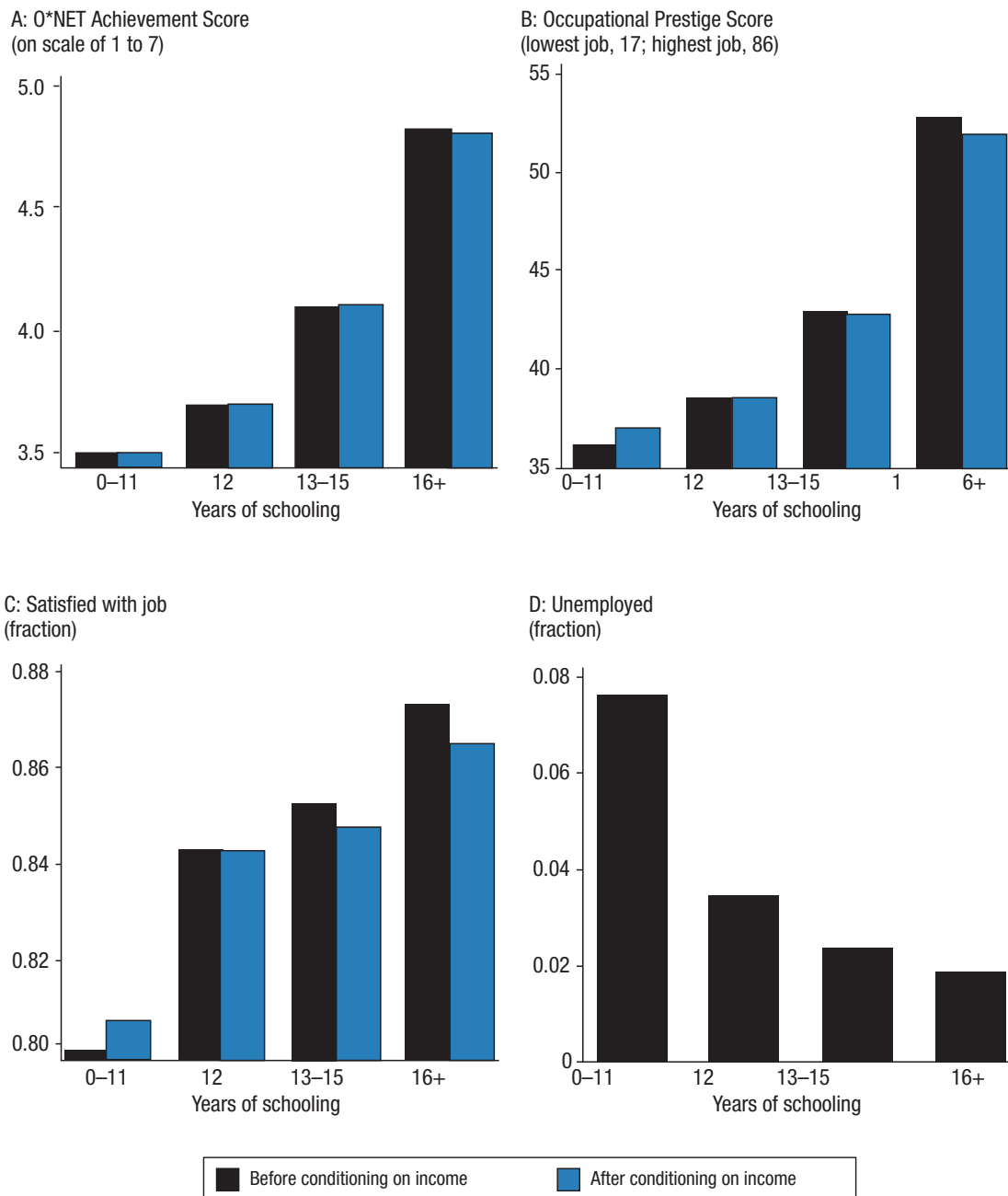
In fact, the advantage for college graduates still exists. Recent data on unemployment by level of education from the U.S. Bureau of Labor Statistics show that while the unemployment rate increased for all levels of education, the increase was least severe for the college-educated. From the business cycle peak in 2007 to the worst of the Great Recession, the unemployment rate for those with a bachelor's degree or more education increased by 3 percentage points, from 2% to slightly under 5%. For those with only a high school diploma, however, the increase was more than 6 percentage points, from slightly over 4% to nearly 11%. When we examine the ratio of the unemployment rates, we find that people with college diplomas are usually less than half as likely to be unemployed as those with high school diplomas, and this relative advantage increased during the Great Recession. While we cannot predict what will happen in the current COVID-19 crisis, there is no reason to expect substantial deviation from these persistent features of the economy. Furthermore, the advantages for college graduates in lower public expenditure, such as on welfare or Medicaid, that Trostel documents (2007) have in general increased through 2020.

The fiscal benefits of education, including higher state and local tax contributions and less use of transfer programs, depend on regular, high-quality employment. The evidence is strong that especially during the current downturn, a college education has retained both private and social economic value.

## 4. BROADER SOCIAL AND ECONOMIC BENEFITS

These computations, encouraging as they are, become even more so when they include the additional non-pecuniary benefits of higher education. To quantify these benefits, economists Philip Oreopoulos and Kjell Salvanes (2011) examine the ways in which important non-monetary life outcomes vary by level of education.

**Figure 1. Labor Market Outcomes by Years of Completed Schooling Before and After Conditioning on Income**

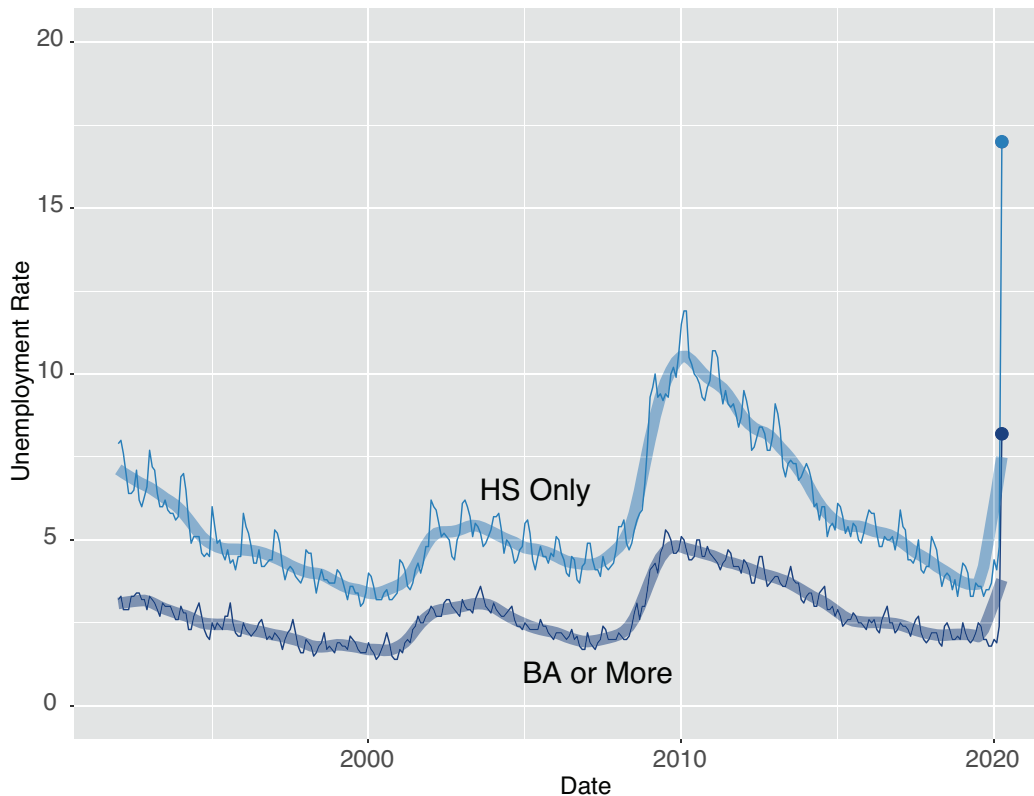


SOURCE: Oreopoulos and Salvanes (2011).

Their study examines happiness and life satisfaction, health, social capital, measures of job quality other than pay, and risky behaviors. Some of the findings are summarized below and are illustrated in Figure 1.

(a) These non-pecuniary outcomes overwhelmingly improve with education. The percentage of people who report being “happy about life” is five points higher for college graduates than for those with only a high school diploma. Compared to high school graduates, college graduates have higher job satisfaction, find employment in higher prestige and higher achievement occupations, and are only about one-fourth as likely to be unemployed (Figure 2). Almost 50 percent of college graduates report very good health compared to only 30 percent of high school graduates.

**Figure 2. Unemployment, by Education**



**SOURCE:** U.S. Bureau of Labor Statistics, seasonally adjusted by the authors.

The rate of smoking for college graduates is almost 20 percentage points lower. Divorce rates among the college-educated are less than half the rates for the high-school educated. Trust, an important component of social capital (Putnam), increases substantially with a college education; in Oreopoulos and Salvanes’ survey, almost 60% of college graduates answer “trust” to the question, “Generally speaking, would you say that most people can be trusted or that you can’t be too careful in dealing with people?” compared to only 40 percent of high school graduates.

College graduates are about one-quarter less likely to have ever been arrested, and a separate study (Lochner and Moretti, 2004) shows substantially less criminality among the college-educated. Dee (2004) finds important civic returns for education. Educational attainment increases voter participation and the frequency of newspaper readership. These non-pecuniary benefits of investment in human capital are extremely difficult to value in dollar terms, but they need to be considered in public decisions about education.

(b) These non-pecuniary benefits are not merely the result of higher incomes that accompany higher levels of education. If they were – and it might seem reasonable to assume as much – these benefits would already have been accounted for, simply by recording the higher incomes.

That is, they would represent “purchases” of a sort enabled by higher income. However, Oreopoulos and Salvanes’ comparison of college graduates and high school graduates with similar incomes shows that approximately three-quarters of the additional happiness for college graduates, relative to that for high-school graduates, persists over and above the happiness apparently due simply to income. In fact, for most of the non-pecuniary outcomes under examination, very little of the extra benefit for the college-educated is attributable to higher salaries. These effects must therefore be accounted over and above the increase in income associated with additional education.

(c) The bulk of the improvements come with the completion of a bachelor’s degree. However, college education without a degree is also associated with improvements. As most of the figures indicate, those improvements are especially pronounced at 16+ years of education, whether or not those 16 years include a college degree.

(d) Many of the effects are causal. That is, they do not merely reflect the environment and family background of people who are currently likely to receive more schooling. Rather, additional education will improve these outcomes for the average person.

It is worth repeating that while this accounting of non-pecuniary benefits demonstrates substantial private benefits, i.e., benefits to the individuals, their families and employers, many of these benefits have an important public component. For example, lower smoking rates and better overall health are factors that reduce health care costs; less criminality increases public safety and decreases the cost of the penal system; greater social capital facilitates civic and neighborhood upkeep as well as commerce. These are all important payoffs. Some of these public benefits can be quantified and accounted for in higher taxes and lower public expenditures; others are difficult to measure numerically but are no less real.

Another important recent finding is that higher education increases the wages of workers who have not received this higher education themselves. Moretti (2004) finds that increasing the number of college-educated workers makes the work of less-educated workers relatively more valuable. For example, more people living in new houses in suburban developments means a need for more plumbers and electricians. Workers with less education will experience an increase in earnings of between 1.5% and 2% for each additional percentage point of the population being college-educated. Put simply, college-educated people are themselves job creators.

Another spillover effect is that the public higher education of nurses, teachers, doctors, and other care workers in turn increases the human capital stock of the larger population. Public higher education in Massachusetts trains new educators, including teachers in the preK-12 system and higher-education faculty, and new health care workers. The value of this training is not fully captured either by the high private earnings of workers in these fields or by the conventional estimates of the non-pecuniary benefits of higher education. Rather, the additional value that educators and health care workers bring to the Commonwealth is the social value of the caring labor that these workers perform. Among other things, the people who receive this care are all the more likely to work productively and to go on to pursue higher education themselves. Increasingly, economists are recognizing this social value as integral to the well-being of the economy as a whole.

## **Advantages of Greater Access to Higher Education for All**

Another significant economic return on investment in public higher education is educational accessibility for economically challenged households. The provision of educational opportunities for first-in-family college attendees may overcome significant multi-generational barriers to economic and social mobility. Sociologists Jennie Brand and Yu Xie (2010) found that higher education is negatively selected in the United States. That is, people who are most likely to receive higher education are those who have the least potential economic benefit from the education, and that higher education has the greatest potential benefit for people who are not currently included in the higher education system. This result is surprising, because many economists expect the opposite, namely, that people will efficiently choose to acquire more education if the benefit is large.

This paradoxical result may be because talented people from low-income households face what in the formal terms of research is called constrained liquidity; in other words, these people don't have the money now to fund what would eventually be a valuable education for themselves and a benefit to society. Conversely, some people from households with high socioeconomic status might have good economic alternatives even in the absence of a higher education – for example, taking over a family business.

To increase access to higher education where it is needed most, public colleges and universities are indispensable. Economists have repeatedly shown that the productivity increases from higher education are associated specifically with the education available at public institutions (see, for example, Card). Their quantitative findings reflect the widespread understanding that more education means more productivity, and that it is appropriate for the public to provide such support. Two main reasons for this understanding are (1) that poor and working families cannot themselves afford the deferred wages and up-front costs of college attendance, even if the private and public rewards are likely to be large in the medium run; and (2) that, at the same time, the general public benefits substantially from a more educated citizenry.

Many poor households cannot pay tuition and other costs of a college education now, regardless of future benefits of such a worthwhile investment. This lack of liquidity is complemented by lending constraints. Poor households can find it difficult to get loans, even for high-return investments in education, because they have no way to collateralize the loan or to pledge binding loan repayment from future income streams. Risk aversion may also contribute to the unwillingness of poor households to take out loans to pursue higher education; even though the average effect on earnings may be high, the possibility that a given student's higher education will not yield high returns may be daunting to low-income families.

## **Public Spending Is Key to Enrolling Students**

The causal relationship between higher education and social and economic benefits provides strong evidence in favor of policies that encourage additional college attendance. A substantial investment in public higher education can lower the effective price for current and possible future students and result in higher rates of attendance and completion. A key question is how much of these benefits from public higher education can be realized specifically through public spending.

To answer that question we need to review what higher education really costs. Trostel's estimates are given in terms of the public cost of a public four-year-equivalent degree, a computation that makes it possible to evaluate all the various benefits of higher education by combining figures for community college education, partially

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completed degrees, and completed four-year degrees. Given an estimated annual cost for public higher education of \$17,237, an annual expenditure of \$120 million would cover the cost of educating approximately 7,000 additional students per year. In Massachusetts, approximately 155,000 full-time-equivalent students are enrolled in public higher education now (National Center for Education Statistics, 2018), so \$120 million represents a roughly 4% increase. The exact number of additional students and graduates will depend on the particular structure of the policy and the responsiveness of the population to the opportunities this policy is intended to create.

Common sense dictates, and econometric studies (e.g., Kane, Dynarski) confirm, that when the price is lower, more people attend institutions of higher education and more people complete degrees at these institutions. Households are responsive to the price of college, both for initial enrollment and for continuing toward a degree. This relationship is especially clear among poorer households, where recent studies find that the price elasticity of demand for this education is negative with respect to both enrollment and retention of students. In other words, the likelihood of someone enrolling in college in the first place and then of staying long enough to graduate is strongly related to that college's tuition, fees and other related expenses. A full exploration of the price response is beyond the scope of this report, but we provide some indicators to predict possible responses.

Net tuition and fees paid by students at public institutions in Massachusetts are roughly \$1.5 billion (National Center for Education Statistics), and the state currently spends approximately \$1.4 billion to cover the balance of the cost of educating these students. Except for UMass Amherst, the tuition and fee payments are collected almost entirely from in-state households. If the entire proposed \$120 million program were applied to making tuition and fees free for current students, then the expansion in public expenditure would replace around 8% of all the private spending — i.e., the state would pay more for current students, and those students themselves would pay less. In such a case, there would be little expansion of revenue, hence of employment or human capital.

On the other hand, if the expansion could be perfectly targeted to make college possible for exactly those people who would not otherwise have attended, and if public and private contributions (i.e., state funding and individual students' share of college costs) continue to be split roughly 50-50, then a \$120 million public expansion matched by an increase of approximately \$120 million in private outlay in the form of tuition and fees could both increase enrollment by 8% and cut fees by 8%. In this case, both the short-run employment impact and the human capital impact of the stimulus would be doubled.

The most politically and economically feasible arrangement is probably somewhere between these two options. Using half of the proposed \$120 million for a substantial tuition reduction — 4% — for current enrollees and the remaining half to expand new enrollment would provide a substantial employment stimulus in the short run. Some of the reduced cost for families would turn into new expenditure in other parts of the Commonwealth's economy with modest stimulative effects. The stimulus would be the size of the forecast explained on pp. 14-16 above, both because the capital expenditure would support entirely new employment and because the public investment would be partly matched by new tuition revenue from the new enrollees themselves. The program would also increase overall enrollment by approximately 4%. The details of the impact of the investment program on enrollment, tuition, and expenditure are shown in Table 8.



**Table 8. Estimated Enrollment, Expenditure and Tuition Impact of \$120 Million  
 Public Higher Education Investment Program (PHEIP)**

	Current	PHEIP	Change
State appropriation	\$1,421,967,000	\$1,541,967,000	8%
Tuition and fees	\$1,483,177,000	\$1,483,177,000	0%
Core expenditure (sum)	\$2,905,144,000	\$3,025,144,000	4%
Cost per student	\$18,651	\$18,651	0%
Tuition per student	\$9,522	\$9,144	-4%
FTE public enrollment	155,761	162,195	4%
Annual increase in graduates		1,608	
Long-run state income tax benefit (simple sum)		\$134,789,585	
Long-run state income tax benefit (present value)		\$92,180,842	
Long-run fiscal benefit (simple sum)		\$234,207,530	
Long-run fiscal benefit (present value)		\$160,171,480	

**SOURCE:** National Center for Education Statistics and authors' calculations.

## Higher Education & Long-Term Investment in the Commonwealth

A final important issue for states considering greater investment in higher education is the potential out-of-state migration of graduates, i.e., brain drain to other states. This is a classic economic problem, namely, that an investor's inability to capture the full benefit of an investment leads to underinvestment. The problem that out-of-state migration poses for capturing the public's return on its investment in public higher education has usually been addressed empirically. One approach has been to use alumni records to count the number of state college and university alumni who remain in the state. The findings from this study were somewhat reassuring: 85% of public higher education students remained in Massachusetts several decades after graduating (Public Higher Ed Task Force, 2005).

However, the question can be posed differently: To what extent will investment in public higher education raise or lower the number of college-educated workers in the state? The college-educated workers ultimately employed within the state do not actually have to be those who were educated in the state. For example, college-educated people may be attracted to locations with high concentrations of other college-educated people (or they could be repelled, if for example, competition for specific jobs is higher). In other words, if Massachusetts colleges and universities are educating a greater portion of the state's population, a larger number of more college-educated people from elsewhere may be attracted to jobs and communities here.

Trostel (2010) examined the net impact on the college-educated population of producing an additional college graduate. In much of the country, Trostel finds a nearly one-to-one correspondence: 100 additional college graduates in one state increase the college-educated population in that state by 93 people. Even in New England, where the relatively small sizes of the states facilitate interstate migration, 100 additional public college graduates raise the college-educated population by that national average of 93. (The net implied leakage for private college graduates is substantially higher.) This means that the state captures roughly 93 percent of its investment in public higher education, a figure higher than the value of 85 percent commonly used to measure

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retention. Again, the 93 percent estimate does not necessarily mean that 93 percent of state college graduates remain in the state but that, when migration into Massachusetts by college-educated new residents is considered along with the out-of-state migration of some who have received their higher education within Massachusetts, the investment in public higher education effectively raises the college education rate among the population. The analysis in Table 7 has been adjusted to account for the 93 percent capture rate. Given that most of the Massachusetts residents being educated in the state's university system stay here, and most of those who move out of the state are compensated for by others who move in, then the Commonwealth will realize a large benefit by spending more on higher education.

Homegrown graduates may thus be important both for their direct contribution to the state and for creating a climate that attracts and retains larger numbers of college graduates both from Massachusetts and from elsewhere. Massachusetts has long benefited from its reputation as an intellectually and professionally stimulating environment in which to work. Further investment in public higher education here will continue to enhance that reputation.

# Conclusions

All of these considerations make it clear that higher education is the foundation for reliable economic growth in Massachusetts, and that increased funding for it makes sense. Although such a focus may at first glance appear to be out of concert with the current environment of recession and austerity, in fact public spending on higher education can provide both a short-run stimulus to ease the burden of unemployment and a long-run investment in an educated populace that will pay for itself in terms of higher wages, higher tax revenue, and lower public expenditures. The immediate benefits will reach many areas of the state's workforce, and the long-term benefits will continue to renew themselves.

The proposed new revenue and investment structure would provide the entire employment stimulus described in Section 1 of this report. It would also increase enrollment by 4%, leading to roughly 1,600 additional graduates per year. Based on the fiscal balance estimates explained above, the implied steady-state additional income tax revenue alone is a roughly \$134 million (\$92 million in present value) increase for the Commonwealth. This amount by itself would cover the state investment. When the cost of the education, the increase in other state and local tax revenue, and the decreased demands on public expenditure are included in the calculation, the overall fiscal benefit would be on the order of \$234 million — that is, 1,600 new graduates with a public fiscal benefit of \$145,609 each.

In other words, a dramatic increase in the state's investment in public higher education is an exceptionally good deal for the entire Commonwealth and should be vigorously pursued by policymakers.

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