



THE ECONOMIC IMPACT OF THE UNIVERSITY SYSTEM OF MARYLAND

A HUMAN CAPITAL INVESTMENT AND FISCAL ANALYSIS | FY2019

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UNIVERSITY SYSTEM
of MARYLAND



EXECUTIVE SUMMARY

The University System of Maryland (USM) retained the Jacob France Institute of the University of Baltimore to prepare this update of the prior 2012 The Economic Impact of the University System of Maryland: A Fiscal Perspective FY2011 report. This analysis uses the Human Capital Approach to assess the system's economic impact and State of Maryland's return on its investment by assessing the incremental earnings impacts associated with four cohorts of USM graduates and the current impacts of out-of-state spending attracted to Maryland by the USM. The key findings of this analysis are as follows:

The University System of Maryland is a Major Economic Driver for Maryland

In Fiscal 2021, the University System of Maryland had a total budget in of \$6 billion dollars and employed 31,868 workers. This generates an estimated \$10.4 billion in economic activity and supports 57,505 Maryland jobs.¹ As described below, the Human Capital approach used in this analysis goes beyond these simple multiplier effects calculations to estimate the impact of USM on increasing the earnings and the resulting State of Maryland revenues associated with the Maryland workers educated by the system.

Finding #1: The State of Maryland receives a high return on its investment in USM.

The state of Maryland's return on investment was estimated by comparing the additional state income and sales tax revenues generated by each cohort's incremental earnings to the state funding for USM for each cohort. **Maryland receives between two and three dollars for each dollar invested in USM.** Maryland's return on investment ranges from \$1.9 in revenues per each \$1 invested for the 1996 cohort to \$2.9 in revenues per each \$1 invested for the 2006 cohort.

Finding #2: The University System of Maryland Makes an Important Contribution to the Maryland Economy

- **A USM degree increases graduate earnings.** Over his or her lifetime, a USM bachelor's degree recipient can expect to earn between \$2.5 and \$4.2 million in incremental earnings; a master's degree recipient between \$100,000 and \$900,000; a Doctoral degree recipient between \$40,000 and \$600,000; and a professional degree recipient between \$2.5 and \$3.9 million; and
- The out-of-state revenues and spending attracted into Maryland by USM **also generate significant Maryland economic activity.** USM attracts an estimated \$1.8 billion in out-of-state student tuition, fees, living expenses, federal grants and contracts and out-of-state visitor spending. This spending supports a total of almost \$3.3 billion in economic activity in the state, supports 26,791 jobs earning nearly \$1.1 billion in fiscal year 2019.

Finding #3: USM is a vital investment in Maryland's Workforce Development System.

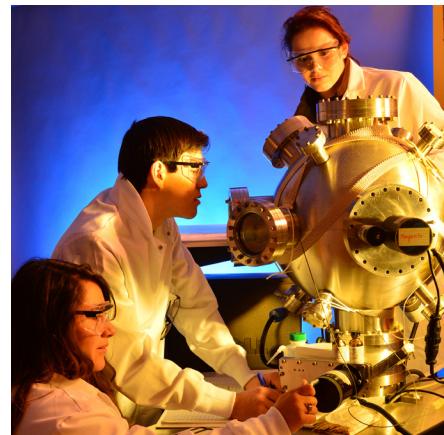
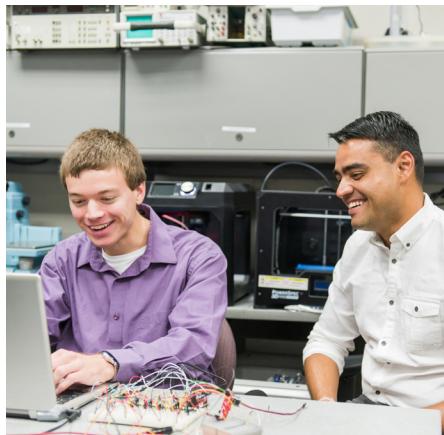
- USM accounted for 72.1% of the total enrollment of Maryland's four-year degree granting institutions, up from 69% in the 2011 study.
- USM schools accounted for: 79% of total bachelor's degrees awarded; 53% of total master's degrees; 55% of total doctoral degrees; and 83% of professional degrees awarded.

¹ Based on a JFI analysis of the USM Budget.

- USM plays a critical role in key occupational areas and generates 82% of bachelor's STEM (non-health) degrees; 79% of education degrees; and 81% of both business and health degrees; and
- Maryland faces critical shortages in workers across these occupations that would be far worse without USM.

Finding #4: USM plays a critical role in supporting Maryland's economic competitiveness.

With \$1.3 billion in research expenditures USM plays a vital role in supporting the development of new technologies and innovation driven companies and generated 331 invention disclosures, 198 new patent applications, executed 68 licenses, and 119 companies formed based on USM technologies.



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INTRODUCTION AND KEY FINDINGS

The University System of Maryland (USM) commissioned the University of Baltimore's Jacob France Institute (JFI) to update its 2012 *The Economic Impact of the University System of Maryland: A Fiscal Perspective FY2011* report. This report updates the prior analysis conducted in 2012 for the Maryland economic and fiscal impacts associated with the 1986, 1989 and 1996 cohorts of USM graduates and adds a new analysis of the economic and fiscal impacts associated with the 2006 cohort of graduates. Similar analyses were also conducted in 1994, 1998, and 2002. These four earlier studies and this study demonstrate the significant contribution made by USM to the economic health and vitality of the state of Maryland. The goal of this analysis is to quantify the system's contribution to Maryland's economy and estimate the state's return on investment in this vital component of Maryland's educational system. This report assesses the economic and fiscal impact of USM in three areas:

1. the economic and fiscal impact of the system using a "human capital" approach.
2. the workforce development role of the system; and
3. the economic development impact of the system.

It is important to note that the methodology used in this report and in the prior four reports differs from traditional studies of the economic impacts of higher education. Traditional university economic impact studies simply analyze the impacts of the revenues and spending associated with colleges, universities or entire university systems. The traditional approach treats colleges or universities as only a source of spending and jobs in an economy. In contrast, this analysis employs the "*Human Capital*" approach. This methodology analyzes the impacts of USM as a source of investment

in the education, or the **human capital**, of the Maryland and out-of-state students that attend its 12 institutions, by measuring the incremental earnings associated with a USM degree. Because the USM's mission is to **provide high quality and affordable public post-secondary educational opportunities for the people of Maryland**, the human capital approach assesses the impact of USM's fulfillment of its core mission. By assessing the Maryland incremental earnings associated with a USM education, this analysis estimates the economic and fiscal impacts of a USM education, not the simple impacts of the revenues and spending associated with USM. It is also important to note that the human capital approach used in this report is very conservative in that it does not account for the impacts of graduates whose earnings are not available to the state, most importantly federal employees, self-employed persons, and Maryland residents commuting out of state.² As a result, the impressive economic and fiscal impact numbers contained in this report are likely to significantly undercount the actual economic and fiscal impacts of USM. Some of the key findings of this analysis are as follows:

Earnings, Economic and Fiscal Impact

For the 1986 Cohort of USM graduates:

- A bachelor's degree recipient can expect to earn nearly \$2.6 million in additional income and pay \$171,961 in additional state income and sales taxes over his/her lifetime.
- A master's degree recipient can expect to earn \$115,853 in additional income and pay \$7,415 in additional state income and sales taxes over his/her lifetime.
- A doctoral degree recipient can expect to earn

² See the methodology section at the conclusion of this report for a description of the Human Capital approach and discussion of the conservative nature of the approach and data used.

\$631,096 and pay \$41,661 in additional state income and sales taxes over his/her lifetime; and

- A professional degree recipient can expect to earn almost \$2.6 million in additional income and pay \$170,971 in additional state income and sales taxes over his/her lifetime.

For the 1989 cohort of USM graduates:

- A bachelor's degree recipient can expect to earn \$2.5 million in additional income and pay \$168,318 in additional state income and sales taxes over his/her lifetime.
- A master's degree recipient can expect to earn \$264,180 in additional income and pay \$17,192 in additional state income and sales taxes over his/her lifetime.
- A doctoral degree recipient can expect to earn \$202,348 in additional income and pay \$13,081 in additional state income and sales taxes over his/her lifetime; and
- A professional degree recipient can expect to earn over \$2.5 million in additional income and pay \$165,195 in additional state income and sales taxes over his/her lifetime.

For the 1996 cohort of USM graduates:

- A bachelor's degree recipient can expect to earn \$3.2 million in additional income and pay \$214,548 in additional state income and sales taxes over his/her lifetime.
- A master's degree recipient can expect to earn \$307,832 in additional income and pay \$19,962 in additional state income and sales taxes over his/her lifetime.
- A doctoral degree recipient can expect to earn \$484,592 and pay \$31,949 in additional state income and sales taxes over his/her lifetime; and
- A professional degree recipient can expect to earn \$3.3 million in additional income and pay \$218,237 in additional state income and sales taxes over his/her lifetime.

For the 2006 cohort of USM graduates:

- A bachelor's degree recipient can expect to earn

\$4.1 million in additional income and pay \$277,280 in additional state income and sales taxes over his/her lifetime.

- A master's degree recipient can expect to earn \$872,105 in additional income and pay \$57,417 in additional state income and sales taxes over his/her lifetime.
- A doctoral degree recipient can expect to earn \$41,961 in additional income and pay \$2,686 in additional state income and sales taxes over his/her lifetime; and
- A professional degree recipient can expect to earn almost \$3.9 million in additional income and pay \$256,126 in additional state income and sales taxes over his/her lifetime.

The incremental earnings associated with USM graduates working in Maryland directly contribute to the Maryland economy and state government revenues as this income is earned, spent, and taxed in Maryland. The lifetime incremental earnings and associated tax revenues of each of the four cohorts analyzed are as follows:

- The 1986 cohort of USM graduates will earn \$11.6 billion in additional income and pay \$745.8 million in incremental State income and sales taxes over their lifetimes.
- The 1989 cohort of USM graduates will earn \$12.7 billion in additional income and pay nearly \$842.4 million in incremental State income and sales taxes over their lifetimes.
- The 1996 cohort of USM graduates will earn \$17.8 billion in additional income and pay nearly \$1.2 billion in incremental Maryland income and sales taxes over their lifetimes.
- The 2006 cohort of USM graduates will earn \$23.9 billion in additional income and pay \$1.6 billion in incremental Maryland income and sales taxes over their lifetimes.

These incremental earnings of USM graduates are a significant source of economic activity in the Maryland economy. The economic impacts of these four cohorts³ are as follows:

- The 1986 cohort of USM graduates will generate \$13.7 billion in economic activity over their estimated

³ It is important to note that these figures represent the impacts of only the four cohorts studied and of only two state revenues streams – income and sales taxes. As a result, the actual economic and fiscal impacts on the state would be the aggregate effect of all USM graduates working in Maryland and all state revenues sources, and would therefore, be much larger.

work-life, support an average of 2,009 annual jobs earning \$3.8 billion in salaries and wages, and generate \$1.0 billion in additional state income and sales taxes.

- The 1989 cohort of USM graduates will generate \$14.8 billion in economic activity over their estimated work-life, supports an average of 2,244 annual jobs earning \$4.1 billion in salaries and wages, and generate a total of \$1.1 billion in additional state income and sales taxes.
- The 1996 cohort of USM graduates will generate \$20.6 billion in economic activity over their estimated work-life, supports an average of 3,027 annual jobs earning \$5.8 billion in salaries and wages, and generate a total of \$1.6 billion in additional state income and sales taxes.
- The 2006 cohort of USM graduates will generate \$28.5 billion in economic activity over their estimated work-life supports an average of 4,171 annual jobs earning \$8.0 billion in salaries and wages, and generate a total of \$2.2 billion in additional state income and sales taxes; and
- The incremental earnings of **just these four cohorts** of USM graduates support nearly 10,000 jobs and over \$115 million in estimated State income and sales tax revenues in 2020.

In addition to the cohort economic impacts described above, the out-of-state revenues and spending attracted into Maryland by USM generates significant Maryland economic activity. USM attracts an estimated \$1.8 billion in out-of-state student tuition, fees, living expenses, federal grants and contracts and out-of-state visitor spending. This spending supports a total of almost \$3.3 billion in economic activity in the state, supports 26,791 jobs earning nearly \$1.1 billion in fiscal year 2019. These economic impacts occur in addition to the increases in economic activity associated with the incremental earnings of system graduates. These activities generate an estimated \$37.4 million in state income and sales taxes.

Maryland's investment in USM is a good one and the state of Maryland receives a high return on its investment in the USM. The state of Maryland's return on investment in USM is as follows:

- For the 1986 Cohort, the state revenue/cost ratio for

the 1986 is 2.6 to 1, signifying that the state receives \$2.60 in revenue for each \$1 invested.

- For the 1989 Cohort, the state revenue/cost ratio is 1.9 to 1.
- For the 1996 Cohort, the state revenue/cost ratio is 2.4 to 1; and
- For the 2006 Cohort, the state revenue/cost ratio is 2.9 to 1.

Workforce Development Impacts

As the largest provider of university-educated workers to Maryland's economy, the University System of Maryland is a key contributor to Maryland's nationally and internationally competitive position in workforce development. The economic and fiscal impacts of USM are both significant and important but are not the only impacts that the system has on the State of Maryland. The most important impact that USM has on Maryland's economy is through the educational and training services that it provides. Some measures of the contribution of USM to Maryland workforce development system are as follows:

USM accounted for 72.1% of the total enrollment of Maryland's four-year degree granting institutions, up from 69% in the 2011 study.

In 2019, USM schools awarded:

- 27,039 Bachelor's degrees - 79% of total bachelor's degrees awarded.
- 10,968 Master's degrees - 53% of total master's degrees awarded.
- 816 Doctoral degrees – 55% of total doctoral degrees awarded; and
- 1,216 Professional degrees – 83% of Professional degrees awarded.

USM play a critical role in STEM education and awards:

- 93% of all Bachelor's, 73% of master's and 64% of Doctoral Computer Science degrees.
- 72% of Bachelor's, 44% of Master's, and 64% of Doctoral Engineering degrees.
- 81% of Bachelor's, 39% of Master's, and 77% of Professional Health degrees; and
- Without USM, Maryland would face critical shortages in these and other STEM fields.

USM institutions play a critical role in meeting Maryland's demand for skilled and educated workers, and meets:

- 84% of the occupational demand for management and business occupations.
- 58% of the occupational demand for computer science occupations.
- 57% of the projected occupational demand for health occupations; and
- 54% of the demand for engineering occupations.

Economic Development Impacts

With most of Maryland's leading public research universities, USM plays a vital role in supporting the development of new technologies and innovation driven companies. Some metrics of USM's role are as follows:

- Since 2014, USM's research expenditures have increased by 12% to \$1.2 billion and accounts for 28% of total Maryland academic R&D expenditures, 22% of federal academic R&D expenditures, and 29% of business sponsored R&D expenditures.
- In FY 2018, the USM generated 341 invention disclosures (up from 224 in FY 2011); 211 new patent applications; executed 57 licenses and options and generated \$5.6 million in licensing royalties (up from \$1.3 million in licensing royalties in 2011) and accounted for more than a quarter of these activities in Maryland; and
- Since 2012, USM has generated 100 of the 212 new companies formed based on university-licensed technologies (47% of the total).

THE ECONOMIC AND FISCAL IMPACT OF THE UNIVERSITY SYSTEM OF MARYLAND

As described in the methodology section below, the JFI estimated the economic impacts of the USM through the following five steps:

1. The earnings of four cohorts of USM graduates are derived for each year after graduation from a database of state employment and earnings maintained by the JFI.
2. These earnings are compared to estimates of what the graduates would have earned had they not obtained a degree. The difference is the incremental earnings effect of their degree.
3. The increased economic activity and state sales and income tax revenues derived from the incremental earnings are then calculated.
4. The increased economic activity and state revenues attributable to the expenditures of out-state-students and visitors, and of grants originating out-of-state are also calculated by modeling the economic activity these expenditures generate; and
5. The total increased State revenues are then compared to the state's cost of producing the graduates, to determine the net fiscal impact of the state's investment.

The results of these analyses are described and summarized in the body of this report below.

The Incremental Earnings of USM Graduates

The incremental earnings of each of the four cohorts of USM graduates are presented in Figures 1 through 16 below.⁴

- Figures 1 through 4 are graphical representations of the average incremental earnings for the 1986 cohort of USM graduates.
- Figures 5 through 8 are graphical representations of the average incremental earnings for the 1989 cohort of USM graduates.
- Figures 9 through 12 are graphical representations of the average incremental earnings for the 1996 cohort of USM graduates; and
- Figures 13 through 16 are graphical representations of the average incremental earnings for the newly added 2006 cohort of USM graduates.

⁴ These income figures are expressed in nominal dollars and are not adjusted for inflation.

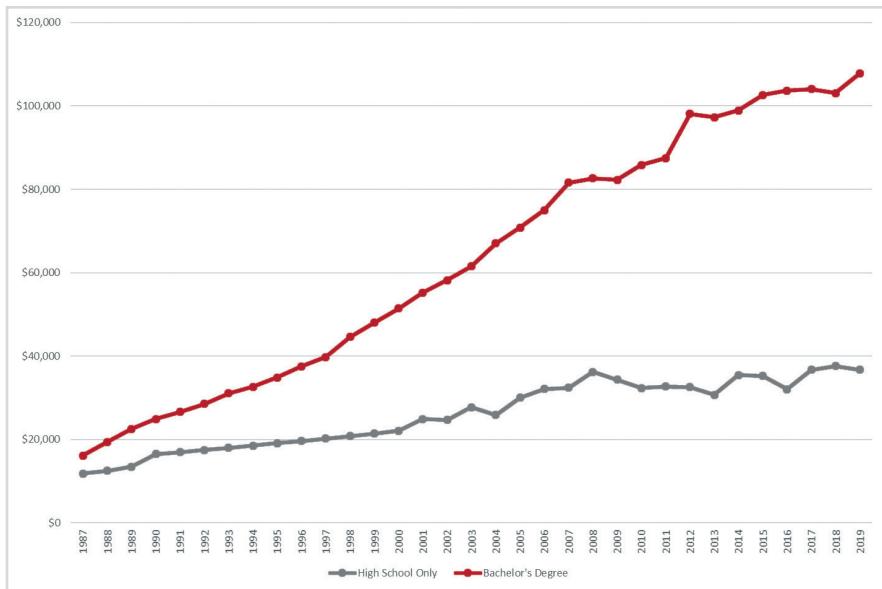


Figure 1. Individual Incremental Earnings - 1986 Cohort - Bachelor's vs. High School Graduate Earnings

FIGURE 1 The average earnings of a 1986 USM degree recipient in 2019 were \$107,798, with incremental earnings of \$71,071 more than a person whose highest level of educational attainment was a high school degree.

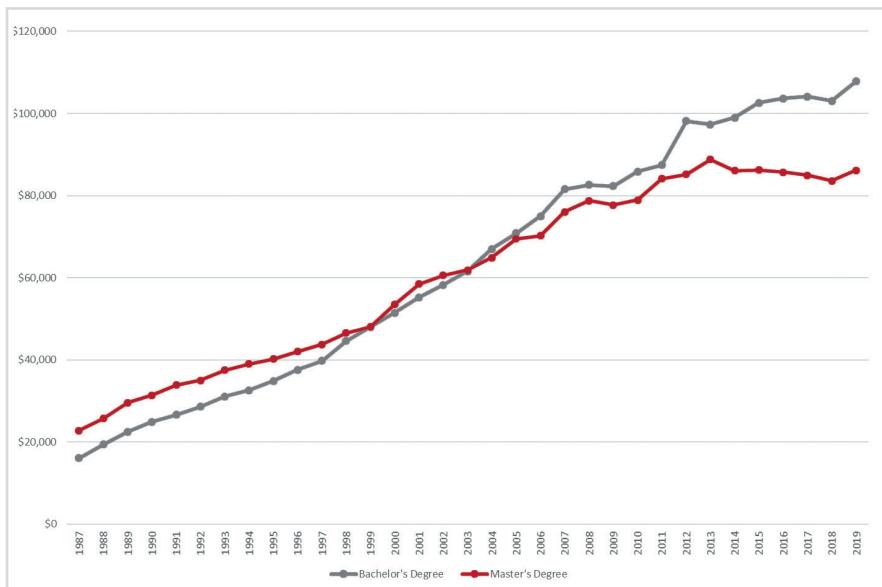


Figure 2. Individual Incremental Earnings - 1986 Cohort - Master's vs. Bachelor's Graduate Earnings

FIGURE 2 The average 2019 earnings for 1986 master's degree recipients were \$86,130, a level of earnings \$21,668 below the earnings of average USM bachelor's degree recipient.

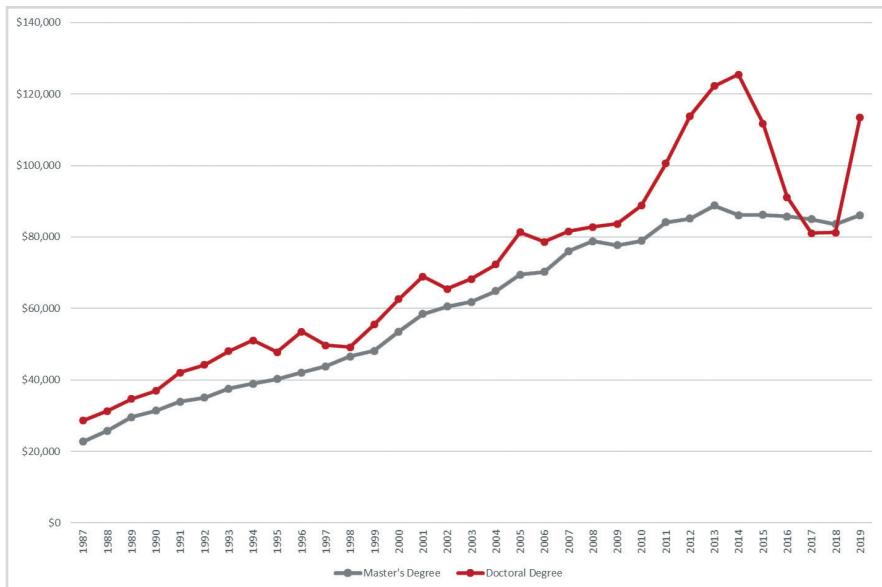


Figure 3. Individual Incremental Earnings - 1986 Cohort - Doctorate vs. Master's Graduate Earnings

FIGURE 3 The average 2019 earnings for 1986 Doctoral degree recipients were \$113,504, with incremental earnings of \$27,374 more than the average USM master's degree recipient.

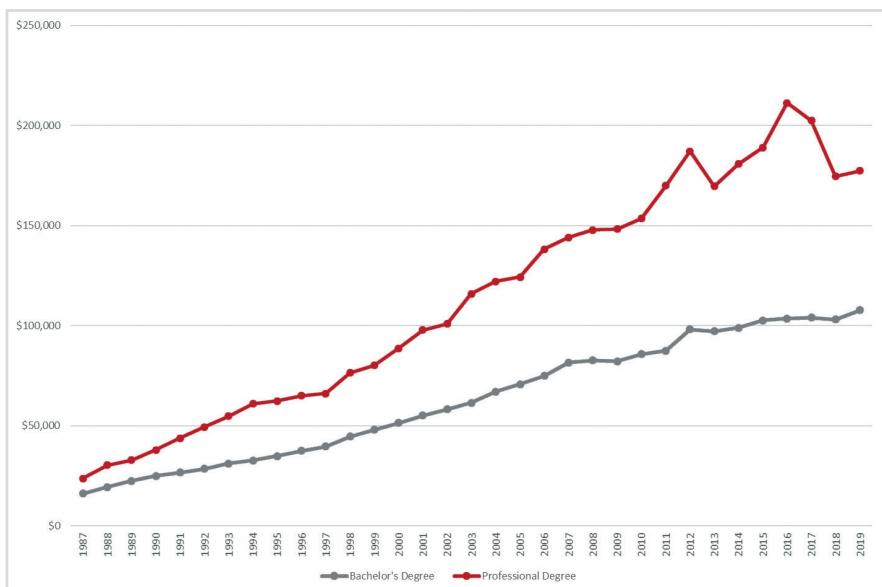


Figure 4. Individual Incremental Earnings - 1986 Cohort - Professional vs. Bachelor's Graduate Earnings

FIGURE 4 The average 2019 earnings for a 1986 professional school graduate were \$177,407 with incremental earnings of \$69,609 more than the average USM bachelor's degree recipient.

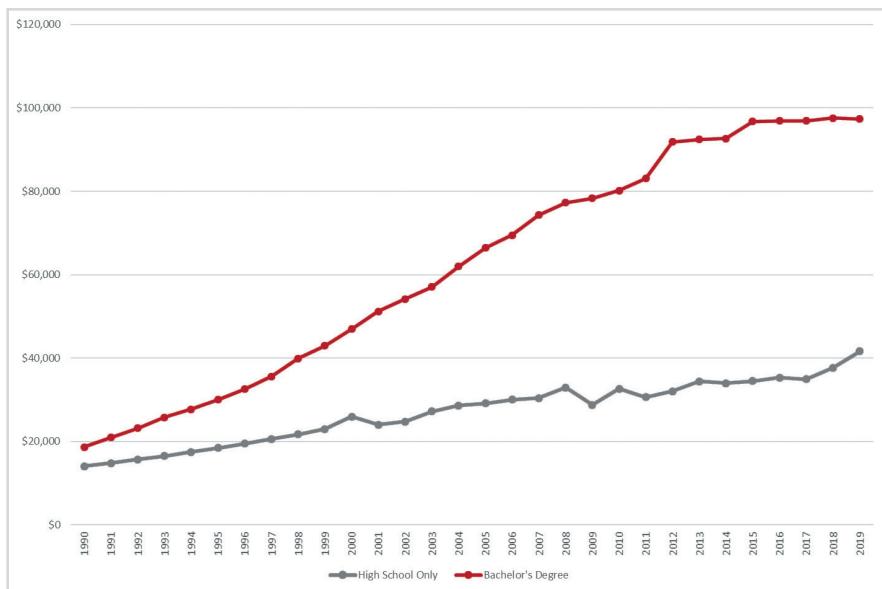


Figure 5. Individual Incremental Earnings - 1989 Cohort - Bachelor's vs. High School Graduate Earnings

FIGURE 5 The average earnings of a 1989 USM bachelor's degree recipient in 2019 were \$97,384, with incremental earnings of \$55,766 more than a person whose highest level of educational attainment was a high school degree.

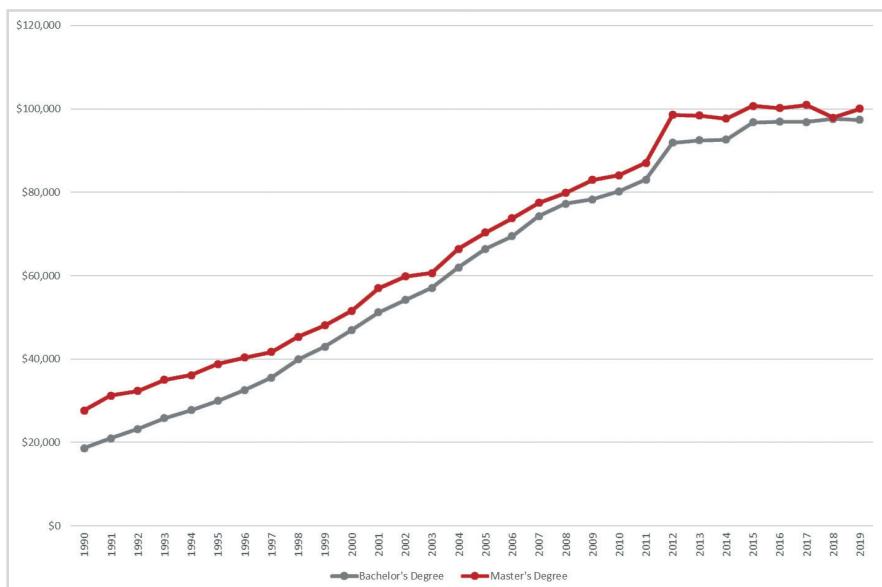


Figure 6. Individual Incremental Earnings - 1989 Cohort - Master's vs. Bachelor's Graduate Earnings

FIGURE 6 The average 2019 earnings for 1989 master's degree recipients were \$100,044, with incremental earnings of \$2,660 above the earnings of average USM bachelor's degree recipient.

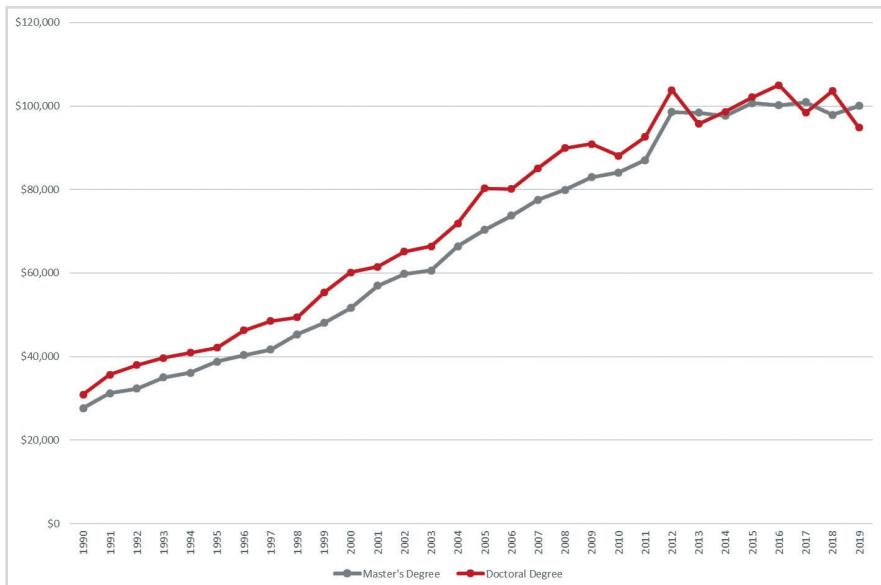


Figure 7. Individual Incremental Earnings - 1989 Cohort - Doctorate vs. Master's Graduate Earnings

FIGURE 7 The average 2019 earnings for 1989 doctoral degree recipients were \$94,848, with a level of earnings \$5,196 below than the average USM master's degree recipient.

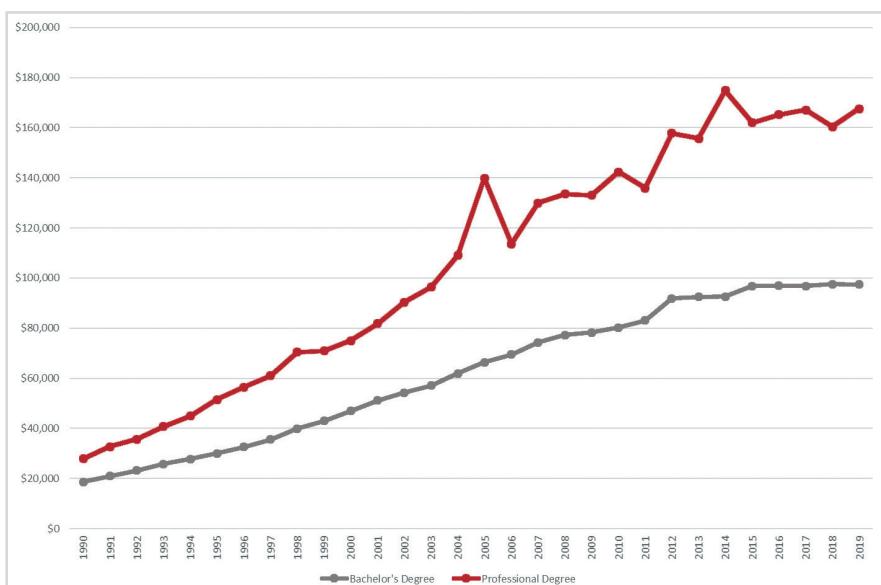


Figure 8. Individual Incremental Earnings - 1989 Cohort - Professional vs. Bachelor's Graduate Earnings

FIGURE 8 The average 2019 earnings for a 1989 professional school graduate were \$167,618 with incremental earnings of \$70,234 more than the average USM bachelor's degree recipient.

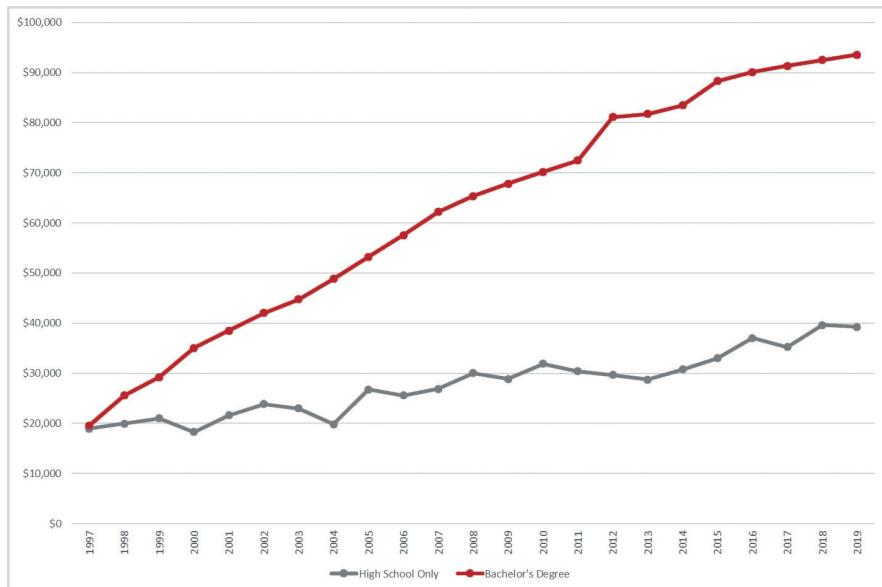


Figure 9. Individual Incremental Earnings - 1996 Cohort - Bachelor's vs. High School Graduate Earnings

FIGURE 9 The average earnings of a 1996 USM bachelor's degree recipient in 2019 were \$93,569, with incremental earnings of \$54,345 more than a person whose highest level of educational attainment was a high school degree.

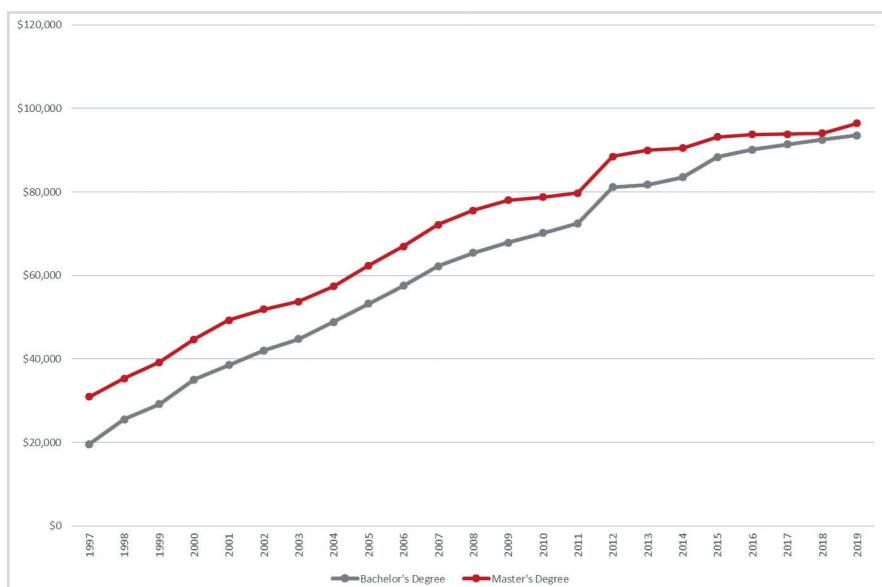


Figure 10. Individual Incremental Earnings - 1996 Cohort - Master's vs. Bachelor's Graduate Earnings

FIGURE 10 The average 2019 earnings for 1996 master's degree recipients were \$96,420, with incremental earnings of \$2,851 above the earnings of average USM bachelor's degree recipient.

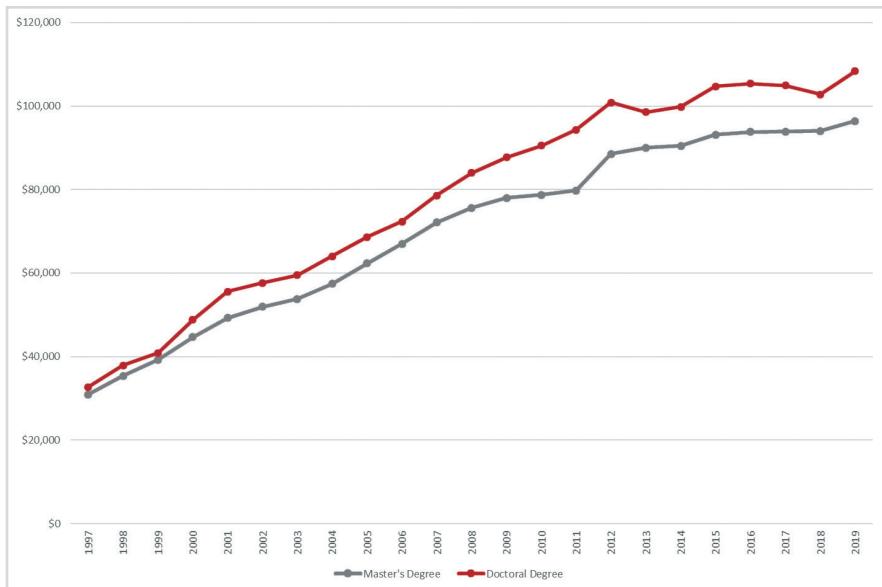


Figure 11. Individual Incremental Earnings - 1996 Cohort - Doctorate vs. Master's Graduate Earnings

FIGURE 11 The average 2019 earnings for 1996 doctoral degree recipients were \$108,383, with incremental earnings of \$11,963 more than the average USM master's degree recipient.

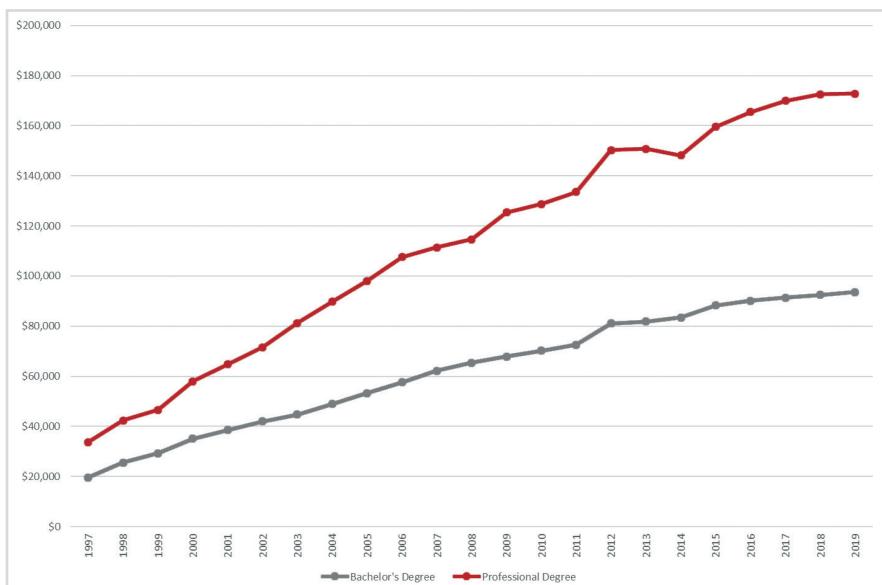


Figure 12. Individual Incremental Earnings - 1996 Cohort - Professional vs. Bachelor's Graduate Earnings

FIGURE 12 The average 2019 earnings for a 1986 professional school graduate were \$172,767, with incremental earnings of \$79,198 more than the average USM bachelor's degree recipient.

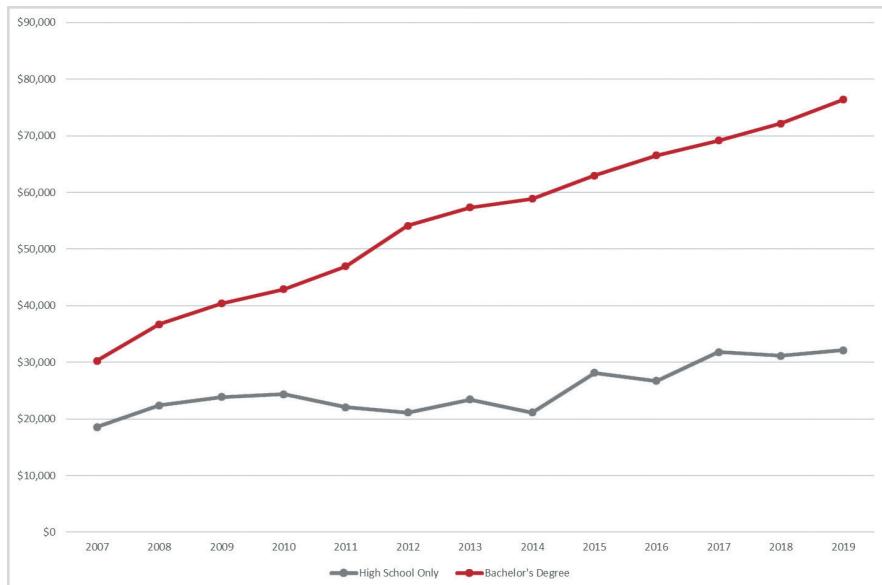


Figure 13. Individual Incremental Earnings - 2006 Cohort - Bachelor's vs. High School Graduate Earnings

FIGURE 13 The average earnings of a 2006 USM bachelor's degree recipient in 2019 were \$76,387, with incremental earnings of \$44,273 more than a person whose highest level of educational attainment was a high school degree.

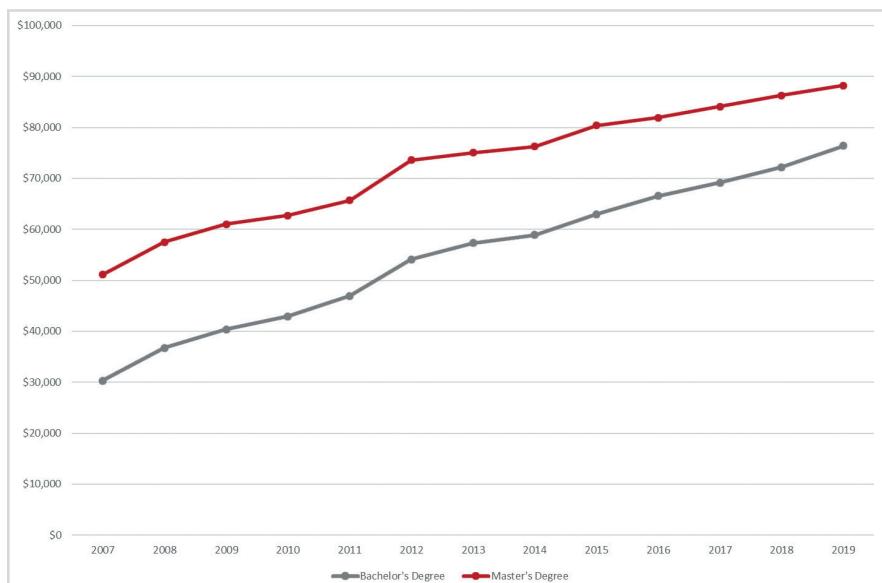


Figure 14. Individual Incremental Earnings - 2006 Cohort - Master's vs. Bachelor's Graduate Earnings

FIGURE 14 The average 2019 earnings for 2006 master's degree recipients were \$88,240, with incremental earnings \$11,853 above the earnings of average USM bachelor's degree recipient.

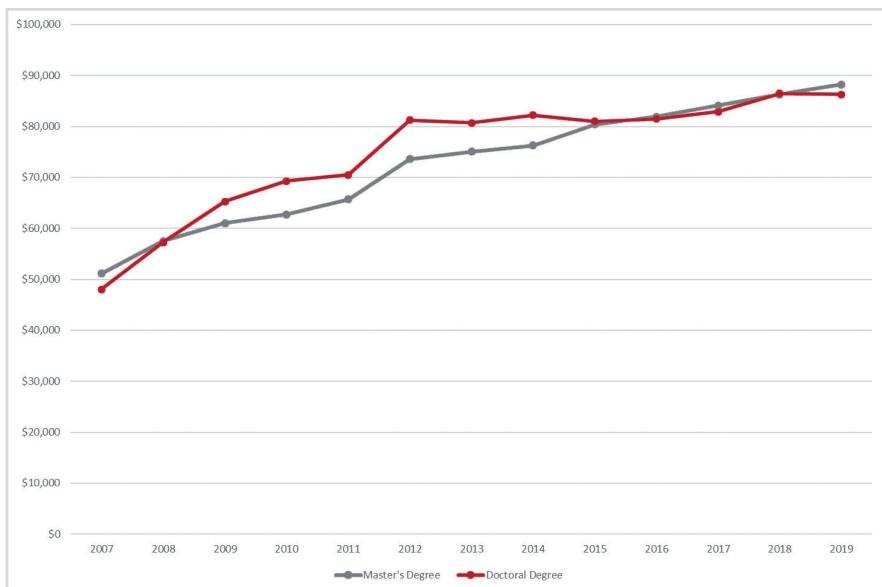


Figure 15. Individual Incremental Earnings - 2006 Cohort - Doctorate vs. Master's Graduate Earnings

FIGURE 15 The average 2019 earnings for 2006 Doctoral degree recipients were \$86,263, with a level of earnings \$1,977 below the average USM master's degree recipient.

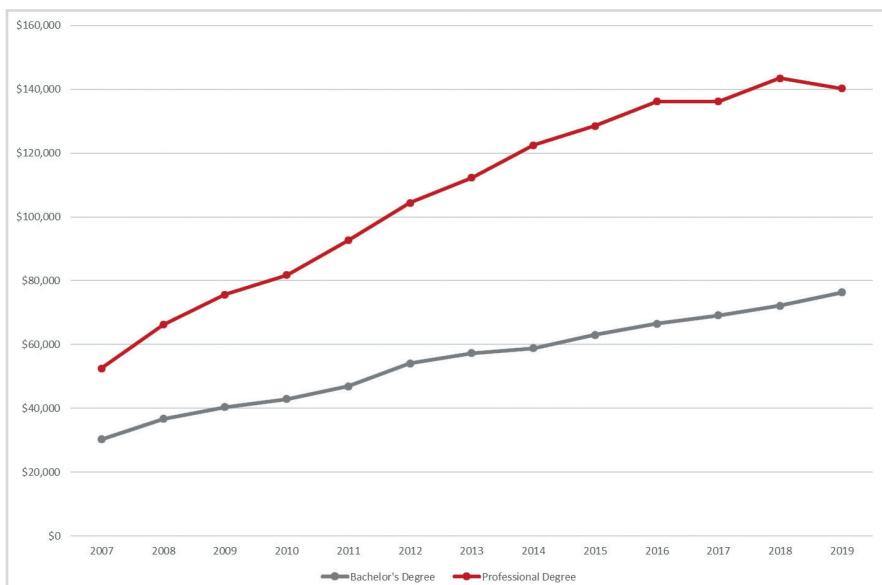


Figure 16. Individual Incremental Earnings - 2006 Cohort - Professional vs. Bachelor's Graduate Earnings

FIGURE 16 The average 2019 earnings for a 2006 professional school graduate were \$140,289, with incremental earnings of \$63,902 more than the average USM bachelor's degree recipient.

The USM education-based, incremental earnings of the 1986, 1989, 1996 and 2006 cohorts of graduates described above will continue over their entire working lives. The graduates will benefit from this additional income, and the state will also benefit from the increased economic activity, income taxes, and sales taxes supported by this income.⁵ As described in the methodology section of this report, the lifetime increased earnings and the increased state income and sales tax revenues were estimated for each of the three cohorts of graduates analyzed and are shown in Table 1.

The average individual lifetime earnings and additional state income and sales taxes paid by the 1986 cohort of graduates are as follows:

- A 1986 USM bachelor's degree recipient can expect to earn nearly \$2.6 million in additional income over his/her lifetime (\$1.5 million in discounted terms). The average bachelor's degree recipient will pay \$171,961 in additional state income and sales taxes over his/her lifetime (\$98,439 in discounted terms);
- A 1986 USM master's degree recipient can expect to earn \$115,853 in additional income over his/her lifetime (\$101,209 in discounted terms) and pay \$7,415 in additional state income and sales taxes over his/her lifetime (\$6,477 in discounted terms);
- A 1986 USM doctoral degree recipient can expect to earn \$631,096 in additional income over his/her lifetime (\$401,994 in discounted terms) and pay \$41,661 in additional state income and sales taxes over his/her lifetime (\$26,404 in discounted terms); and
- A 1986 USM professional degree recipient can expect to earn almost \$2.6 million in additional income over his/her lifetime (\$1.6 million in discounted terms) and pay \$170,971 in additional state income and sales taxes over his/her lifetime (\$107,044 in discounted terms).

The average individual lifetime earnings and additional state income and sales taxes paid by the 1989 cohort of graduates are as follows:

- A 1989 USM Bachelor's degree recipient can expect to earn \$2.5 million in additional income over his/her lifetime (\$1.5 million in discounted terms). The average bachelor's degree recipient will pay \$168,318 in additional state income and sales taxes over his/her lifetime (\$96,969 in discounted terms).
- A 1989 USM master's degree recipient can expect to earn \$264,180 in additional income over his/her lifetime (\$163,754 in discounted terms) and pay \$17,192 in additional state income and sales taxes over his/her lifetime (\$10,512 in discounted terms);
- A 1989 USM doctoral degree recipient can expect to earn \$202,348 in additional income over his/her lifetime (\$156,870 in discounted terms) and pay \$13,081 in additional state income and sales taxes over his/her lifetime (\$10,120 in discounted terms); and
- A 1989 USM professional degree recipient can expect to earn over \$2.5 million in additional income over his/her lifetime (\$1.6 million in discounted terms) and pay \$165,195 in additional state income and sales taxes over his/her lifetime (\$103,532 in discounted terms).

The average individual lifetime earnings and additional state income and sales taxes paid by the 1996 cohort of graduates are as follows:

- A 1996 USM bachelor's degree recipient can expect to earn \$3.2 million in additional income over his/her lifetime (\$1.8 million in discounted terms). The average bachelor's degree recipient will pay \$214,548 in additional state income and sales taxes over his/her lifetime (\$120,340 in discounted terms).
- A 1996 USM master's degree recipient can expect to earn \$307,832 in additional income over his/her lifetime (\$177,984 in discounted terms) and pay \$19,962 in additional state income and sales taxes over his/her lifetime (\$12,440 in discounted terms).
- A 1996 USM doctoral degree recipient can expect to earn \$484,592 in additional income over his/her lifetime (\$306,767 discounted terms) and pay \$31,949 in additional state income and sales taxes over his/her lifetime (\$20,132 in discounted terms); and

⁵ Income tax revenues are computed as incremental earnings multiplied by the state's income tax rate of for each of the historical years analyzed and at the current rate (4.75%) for future earnings. Sales tax revenues are calculated as incremental earnings multiplied by 33% and then by the state's sales tax rate for each of the historical years analyzed and at the current rate for future earnings. Past JFI research found that approximately one-third of income is spent on items subject to the Maryland sales tax. Graduates will also pay a variety of other state and local taxes – but it was outside the scope of this project to estimate all potential fiscal impacts. Thus, the tax figures can be viewed as very conservative estimates that are likely to undercount actual fiscal impacts at the state level and not include county fiscal impacts at all.

**Table 1. Individual Incremental Lifetime Earnings and Taxes Paid for the 1986, 1986, and 1996 Cohorts of USM Graduates,
By Type of Degree (Non-Discounted and Discounted Dollars)**

	Earnings		Tax Impact	
	Non-Discounted	Discounted	Non-Discounted	Discounted
1986 Cohort				
Bachelor's	\$2,593,801	\$1,491,492	\$171,961	\$98,439
Master's	\$115,853	\$101,209	\$7,415	\$6,477
Doctorate	\$631,096	\$401,994	\$41,661	\$26,404
First Professional	\$2,595,827	\$1,632,130	\$170,971	\$107,044
1989 Cohort				
Bachelor's	\$2,529,306	\$1,462,973	\$168,318	\$96,969
Master's	\$264,180	\$163,754	\$17,192	\$10,512
Doctorate	\$202,348	\$156,870	\$13,081	\$10,120
First Professional	\$2,495,702	\$1,570,843	\$165,195	\$103,532
1996 Cohort				
Bachelor's	\$3,203,703	\$1,820,257	\$214,548	\$120,340
Master's	\$307,832	\$177,984	\$19,962	\$12,440
Doctorate	\$484,592	\$306,767	\$31,949	\$20,132
First Professional	\$3,305,232	\$2,052,867	\$218,237	\$134,920
2006 Cohort				
Bachelor's	\$4,138,527	\$2,325,217	\$277,280	\$154,035
Master's	\$872,105	\$265,481	\$57,417	\$22,870
Doctorate	\$41,961	\$37,428	\$2,686	\$2,395
First Professional	\$3,876,882	\$2,412,108	\$256,126	\$158,599

Source: USM, MDOL, and the JFI

- A 1996 USM professional degree recipient can expect to earn almost \$3.3 million in additional income over his/her lifetime (\$2.1 million in discounted terms) and pay \$218,237 in additional State income and sales taxes over his/her lifetime (\$134,920 in discounted terms).

The average individual lifetime earnings and additional state income and sales taxes paid the 2006 cohort of graduates are as follows:

- A 2006 USM bachelor's degree recipient can expect to earn \$4.1 million in additional income over his/her lifetime (\$2.3 million in discounted terms). The average bachelor's degree recipient will pay \$277,280 in additional state income and sales taxes over his/her lifetime (\$154,035 in discounted terms);

- A 2006 USM master's degree recipient can expect to earn \$872,105 in additional income over his/her lifetime (\$265,481 in discounted terms) and pay \$57,417 in additional state income and sales taxes over his/her lifetime (\$22,870 in discounted terms);
- A 2006 USM doctoral degree recipient can expect to earn \$41,961 in additional income over his/her lifetime (\$37,428 discounted terms) and pay \$2,686 in additional state income and sales taxes over his/her lifetime (\$2,395 in discounted terms); and
- A 2006 USM professional degree recipient can expect to earn almost \$3.9 million in additional income over his/her lifetime (\$2.4 million in discounted terms) and pay \$256,126 in additional state income and sales taxes over his/her lifetime (\$158,599 in discounted terms).

A USM degree is an investment in increased lifetime earnings and that the benefit of an USM education has increased over time. The lifetime earnings gains have increased dramatically for the later 1996 and 2006 cohorts over the earlier 1986 and 1989 cohorts, especially for bachelor's, master's and professional degree recipients. Wages for lower-skill and education-level jobs have not grown as rapidly for higher-skilled jobs that require a college education. Moreover, the USM has been strategic in highlighting the value in providing degrees in key high-demand, high-wage fields, with a focus on in-demand STEM (Science, Technology, Engineering and Math) degrees.

Total Cohort Incremental Earnings and Estimate Maryland Income and Sales Taxes Paid by USM Graduates Working in Maryland

The incremental earnings associated with USM graduates working in Maryland directly contribute to the Maryland economy and state government revenues as this income is earned, spent, and taxed in Maryland. The lifetime incremental earnings and estimated state income and sales tax revenues associated with each of the four cohorts of USM graduates are aggregated in Table 2, with core results being as follows:

- The 1986 cohort of USM graduates will earn an estimated \$11.6 billion in additional income over their lifetimes (\$7.1 billion in discounted terms). These graduates will pay \$745.8 million in additional Maryland income and sales taxes (\$464.9 million in discounted 2019 dollars).
- The 1989 cohort of USM graduates will earn \$12.7 billion in additional income over their lifetimes (\$7.8 billion in discounted terms) and will pay \$842.4 million in additional Maryland income and sales taxes (\$513.4 million in discounted 2019 dollars).
- The 1996 cohort of USM graduates will earn \$17.8 billion in additional income over their lifetimes (\$10.8 billion in discounted terms) and will pay nearly \$1.2 billion in additional Maryland income and sales taxes (\$713.4 million in discounted 2019 dollars); and
- The 2006 cohort of USM graduates will earn \$23.9 billion in additional income over their lifetimes (\$14.6 billion in discounted terms) and will pay \$1.6 billion in

additional Maryland income and sales taxes (\$967.7 million in discounted 2019 dollars).

The Economic Impact of Four Cohorts of USM Graduates Working in Maryland

The incremental earnings of USM graduates working in Maryland are more than just a source of income and state revenues. They also support increased economic activity in the state. This activity has multiplier effects, because the incremental earnings are spent and then re-spent by other businesses and individuals in the state economy. The JFI analyzed the economic contributions of these incremental incomes using the RIMS II economic model developed by the U.S. Bureau of Economic Analysis. The RIMS II model allows the estimation of three economic impacts: economic output (a measure like gross domestic product that measures economic activity in the state), employment, and earnings.

The incremental earnings of USM graduates are a significant source of economic activity in the Maryland economy. The economic impacts of each of the four cohorts of USM graduates are presented in Tables 3 through 6 below. It is important to note that these figures represent the impacts of only the four cohorts studied. The actual economic impacts on the state would be the aggregate effect of all USM graduates working in Maryland. Therefore, that aggregate effect would be much larger. The economic contribution of each of these cohorts is as follows:

- The 1986 cohort of USM graduates will generate \$13.7 billion in economic activity over their estimated work-life (\$8.3 billion in discounted terms). The economic activity generated by these incremental earnings supports an average of 2,009 annual jobs earning \$3.8 billion in salaries and wages. In turn, these incremental earnings, salaries and wages will generate a total of almost \$1.0 billion in additional State income and sales taxes (\$601 million in discounted terms) – Table 3.
- The 1989 cohort of USM graduates will generate \$14.8 billion in economic activity over their estimated work-life (\$9.2 billion in discounted terms). The economic activity generated by these incremental

**Table 2. Total Cohort Lifetime Earnings and Taxes Paid for the 1986, 1986, and 1996 Cohorts of USM Graduates,
By Type of Degree (Non-Discounted and Discounted Dollars)**

Type of Degree	Earnings		Tax Impact	
	Non-Discounted	Discounted	Non-Discounted	Discounted
1986 Cohort	\$11,591,653,918	\$7,082,386,538	\$745,814,493	\$464,909,517
Bachelor's	\$10,636,162,234	\$6,427,603,335	\$702,175,381	\$422,290,433
Master's	\$131,594,469	\$115,656,528	\$8,422,046	\$7,402,018
Doctorate	\$49,760,077	\$35,273,349	\$2,292,928	\$2,292,928
First Professional	\$774,137,139	\$503,853,325	\$32,924,138	\$32,924,138
1989 Cohort	\$12,713,886,812	\$7,784,524,044	\$842,435,573	\$513,372,048
Bachelor's	\$11,685,538,998	\$7,089,564,818	\$774,998,203	\$468,079,511
Master's	\$305,856,490	\$220,794,374	\$19,789,643	\$14,162,601
Doctorate	\$20,799,947	\$16,648,483	\$1,340,497	\$1,071,291
First Professional	\$701,691,378	\$457,516,369	\$46,307,230	\$30,058,645
1996 Cohort	\$17,811,153,904	\$10,832,700,692	\$1,179,323,159	\$713,405,144
Bachelor's	\$16,343,750,782	\$9,770,857,732	\$1,081,062,389	\$643,047,312
Master's	\$488,968,064	\$423,691,383	\$33,943,811	\$28,610,613
Doctorate	\$48,929,763	\$32,948,152	\$3,206,061	\$2,148,861
First Professional	\$929,505,295	\$605,203,426	\$61,110,898	\$39,598,359
2006 Cohort	\$23,900,489,802	\$14,554,297,085	\$1,599,305,409	\$967,687,456
Bachelor's	\$21,824,022,746	\$12,994,010,143	\$1,445,357,226	\$856,297,818
Master's	\$913,211,804	\$796,454,632	\$77,477,196	\$61,425,654
Doctorate	\$8,491,386	\$7,555,667	\$543,449	\$483,563
First Professional	\$1,154,763,865	\$756,276,643	\$75,927,538	\$49,480,421

Source: USM, MDOL, and the JFI

earnings supports an average of 2,244 annual jobs earning \$4.1 billion in salaries and wages. In turn, these incremental earnings, salaries and wages will generate a total of \$1.1 billion in additional State income and sales taxes (\$683 million in discounted terms) – Table 4.

- The 1996 cohort of USM graduates will generate \$20.6 billion in economic activity over their estimated work-life (\$12.6 billion in discounted terms). The economic activity generated by these incremental earnings supports an average of 3,027 annual jobs earning \$5.8 billion in salaries and wages. In turn, these incremental earnings, salaries and wages will generate a total of nearly \$1.6 billion in additional State income and sales taxes (\$950 million in discounted terms) – Table 5.

- The 2006 cohort of USM graduates will generate \$28.5 billion in economic activity over their estimated work-life (\$12.6 billion in discounted terms). The economic activity generated by these incremental earnings supports an average of 4,171 annual jobs earning \$8.0 billion in salaries and wages. In turn, these incremental earnings, salaries and wages will generate a total of \$2.2 billion in additional state income and sales taxes (\$1.3 billion in discounted terms) – Table 6; and
- The incremental earnings of just these four cohorts of USM graduates support nearly 10,000 jobs and over \$115 million in estimated state income and sales tax revenues in 2020.

Table 3. Statewide Economic Impact of Incremental Income Earned by 1986 USM Cohort, By Year, Selected Years

Year	Output (Mil. 2019\$)	Earnings (Mil. 2019\$)	Employment (Mil. 2019\$)	Fiscal (Mil. 2019\$)
1987	\$112,607,420	\$30,524,163	758	\$7,855,500
1988	\$148,859,140	\$40,350,811	1,003	\$10,384,421
1989	\$170,129,864	\$46,116,604	1,147	\$11,868,268
1990	\$151,856,755	\$41,163,366	1,023	\$10,593,535
1991	\$162,160,637	\$43,956,409	1,091	\$11,312,335
1992	\$170,917,115	\$46,330,002	1,149	\$11,923,187
1993	\$187,199,474	\$50,743,613	1,260	\$13,059,045
1994	\$194,459,807	\$52,711,650	1,309	\$13,565,526
1995	\$208,493,433	\$56,515,704	1,404	\$14,544,513
1996	\$217,527,065	\$58,964,424	1,464	\$15,174,699
1997	\$225,197,546	\$61,043,639	1,515	\$15,709,793
1998	\$260,950,529	\$70,735,095	1,755	\$18,203,923
1999	\$274,534,189	\$74,417,178	1,846	\$19,151,519
2000	\$297,221,902	\$80,567,070	2,000	\$20,734,215
2001	\$300,229,955	\$81,382,454	2,019	\$20,944,057
2002	\$316,046,702	\$85,669,854	2,124	\$22,047,435
2003	\$309,376,274	\$83,861,720	2,075	\$21,582,105
2004	\$359,391,651	\$97,419,242	2,407	\$25,071,180
2005	\$343,134,000	\$93,012,328	2,294	\$23,937,046
2006	\$346,523,118	\$93,931,006	2,312	\$24,173,471
2007	\$379,381,106	\$102,837,725	2,526	\$26,465,646
2008	\$349,479,442	\$94,732,369	2,320	\$24,379,704
2009	\$351,386,299	\$95,249,255	2,330	\$24,512,727
2010	\$376,543,319	\$102,068,495	2,493	\$26,267,682
2011	\$378,656,986	\$102,641,440	2,522	\$26,415,131
2012	\$392,687,928	\$112,161,620	2,576	\$29,533,821
2013	\$378,731,607	\$108,175,342	2,484	\$28,484,174
2014	\$353,367,629	\$100,930,747	2,318	\$26,576,565
2015	\$365,576,307	\$104,417,855	2,398	\$27,494,772
2016	\$377,811,381	\$107,912,502	2,478	\$28,414,965
2017	\$341,019,272	\$97,403,743	2,237	\$25,647,853
2018	\$312,034,308	\$89,124,903	2,047	\$23,467,911
2019	\$318,388,463	\$90,939,811	2,088	\$23,945,803
2020	\$330,519,059	\$94,404,617	2,168	\$24,858,138
2025	\$392,952,358	\$112,237,148	2,577	\$29,553,708
2030	\$432,495,358	\$123,531,631	2,837	\$32,527,714
Total	\$13,658,135,809	\$3,805,137,688		\$991,296,616
		Average Annual Employment	2,009	
Discounted Total				
Total	\$8,343,496,719	\$2,313,128,827	n.m.	\$601,312,983

Source: USM, MDOL, and The Jacob France Institute

Table 4. Statewide Economic Impact of Incremental Income Earned by 1989 USM Cohort, By Year, Selected Years

Year	Output (Mil. 2019\$)	Earnings (Mil. 2019\$)	Employment (Mil. 2019\$)	Fiscal (Mil. 2019\$)
1990	\$128,620,308	\$34,864,730	905	\$8,972,559
1991	\$145,331,283	\$39,394,525	1,021	\$10,138,318
1992	\$153,877,898	\$41,711,231	1,080	\$10,734,530
1993	\$172,223,520	\$46,684,125	1,210	\$12,014,322
1994	\$176,054,722	\$47,722,638	1,238	\$12,281,587
1995	\$195,637,963	\$53,031,010	1,375	\$13,647,715
1996	\$202,713,808	\$54,949,038	1,424	\$14,141,326
1997	\$213,803,877	\$57,955,191	1,501	\$14,914,970
1998	\$246,043,057	\$66,694,171	1,728	\$17,163,977
1999	\$253,422,030	\$68,694,367	1,779	\$17,678,734
2000	\$252,468,695	\$68,435,949	1,900	\$17,612,229
2001	\$306,762,561	\$83,153,229	2,123	\$21,399,772
2002	\$316,047,377	\$85,670,037	2,402	\$22,047,482
2003	\$308,030,805	\$83,497,008	2,006	\$21,488,245
2004	\$334,364,211	\$90,635,127	2,167	\$23,325,265
2005	\$367,897,643	\$99,724,936	2,646	\$25,664,559
2006	\$357,524,789	\$96,913,197	2,443	\$24,940,948
2007	\$383,826,091	\$104,042,614	2,449	\$26,775,728
2008	\$373,083,093	\$101,130,541	2,467	\$26,026,296
2009	\$410,483,113	\$111,268,455	2,845	\$30,111,832
2010	\$386,134,482	\$104,668,343	2,534	\$28,325,688
2011	\$406,049,093	\$110,066,538	2,575	\$29,786,566
2012	\$416,323,061	\$118,912,413	2,656	\$32,925,899
2013	\$390,866,540	\$111,641,386	2,564	\$30,912,610
2014	\$383,336,418	\$109,490,592	2,514	\$30,317,072
2015	\$388,088,814	\$110,847,997	2,546	\$30,692,927
2016	\$374,504,397	\$106,967,943	2,456	\$29,618,571
2017	\$365,642,512	\$104,436,764	2,398	\$28,917,707
2018	\$337,592,046	\$96,424,841	2,214	\$26,699,270
2019	\$306,042,725	\$87,413,556	2,007	\$24,204,117
2020	\$320,618,396	\$91,576,736	2,103	\$25,356,868
2025	\$393,261,111	\$112,325,336	2,580	\$31,101,990
2030	\$443,863,777	\$126,778,739	2,911	\$35,104,022
2033	\$487,288,279	\$139,181,877	3,196	\$38,538,352
Total	\$14,776,253,332	\$4,131,806,636		\$1,116,133,978
		Average Annual Employment	2,244	
Discounted Total				
Total	\$9,155,049,106	\$2,546,653,925	n.m.	\$683,170,122

Source: USM, MDOL, and The Jacob France Institute

Table 5. Statewide Economic Impact of Incremental Income Earned by 1996 USM Cohort, By Year, Selected Years

Year	Output (Mil. 2019\$)	Earnings (Mil. 2019\$)	Employment (Mil. 2019\$)	Fiscal (Mil. 2019\$)
1997	\$89,665,005	\$24,305,230	630	\$6,255,035
1998	\$162,576,324	\$44,069,088	1,142	\$11,341,333
1999	\$194,935,648	\$52,840,635	1,368	\$13,598,721
2000	\$313,070,322	\$84,863,055	1,804	\$21,839,802
2001	\$303,624,652	\$82,302,645	1,810	\$21,180,872
2002	\$303,413,242	\$82,245,339	2,054	\$21,166,124
2003	\$335,224,553	\$90,868,338	1,924	\$23,385,282
2004	\$407,573,049	\$110,479,632	2,344	\$28,432,317
2005	\$359,236,381	\$97,377,153	2,245	\$25,060,349
2006	\$399,689,960	\$108,342,787	2,296	\$27,882,393
2007	\$415,849,397	\$112,723,078	2,504	\$29,009,676
2008	\$402,427,943	\$109,084,964	2,372	\$28,073,394
2009	\$426,398,664	\$115,582,637	2,593	\$29,745,593
2010	\$404,505,907	\$109,648,231	2,766	\$28,218,353
2011	\$421,974,881	\$114,383,495	2,798	\$29,436,990
2012	\$452,680,470	\$129,297,010	2,969	\$34,045,823
2013	\$453,824,336	\$129,623,727	2,977	\$34,131,853
2014	\$430,572,653	\$122,982,458	2,824	\$32,383,108
2015	\$438,677,091	\$125,297,290	2,877	\$32,992,638
2016	\$412,569,363	\$117,840,262	2,706	\$31,029,092
2017	\$420,969,504	\$120,239,555	2,761	\$31,660,861
2018	\$385,143,833	\$110,006,836	2,526	\$28,966,434
2019	\$387,453,801	\$110,666,621	2,541	\$30,642,705
2020	\$404,939,115	\$115,660,870	2,656	\$32,025,573
2025	\$494,520,434	\$141,247,564	3,244	\$39,110,324
2030	\$588,312,494	\$168,036,952	3,859	\$46,528,092
2035	\$687,189,392	\$196,278,699	4,507	\$54,348,007
2040	\$743,810,579	\$212,451,145	4,879	\$58,826,028
Total	\$20,572,777,269	\$5,804,186,136		\$1,569,356,091
		Average Annual Employment	3,027	
Discounted Total				
Total	\$12,595,579,119	\$3,537,473,848	n.m.	\$949,626,170

Source: USM, MDOL, and The Jacob France Institute

Table 6. Statewide Economic Impact of Incremental Income Earned by 2006 USM Cohort, By Year, Selected Years

Year	Output (Mil. 2019\$)	Earnings (Mil. 2019\$)	Employment (Mil. 2019\$)	Fiscal (Mil. 2019\$)
2007	\$331,784,698	\$89,935,906	2,004	\$23,145,318
2008	\$345,500,100	\$93,653,700	2,086	\$24,102,105
2009	\$356,995,250	\$96,769,657	2,156	\$24,904,007
2010	\$366,758,766	\$99,416,224	2,215	\$25,585,111
2011	\$432,247,053	\$117,167,943	2,610	\$30,153,577
2012	\$499,316,823	\$135,348,349	3,015	\$34,832,368
2013	\$483,055,491	\$130,940,437	2,917	\$33,697,976
2014	\$503,535,742	\$136,491,959	3,041	\$35,126,680
2015	\$457,318,416	\$123,963,963	2,762	\$31,902,557
2016	\$482,587,625	\$130,813,614	2,914	\$33,665,338
2017	\$439,284,027	\$119,075,434	2,653	\$30,644,477
2018	\$455,562,844	\$123,488,086	2,751	\$31,780,088
2019	\$458,124,283	\$124,182,407	2,767	\$31,958,774
2020	\$478,081,808	\$129,592,235	2,887	\$33,351,012
2025	\$534,361,235	\$152,627,106	3,505	\$40,188,984
2030	\$633,143,911	\$180,841,941	4,153	\$50,073,692
2035	\$737,411,644	\$210,623,447	4,837	\$58,319,953
2040	\$848,131,408	\$242,247,816	5,563	\$67,076,489
2045	\$966,326,310	\$276,007,275	6,338	\$76,424,214
2050	\$984,217,065	\$281,117,327	6,456	\$77,839,147
Total	\$28,504,300,424	\$8,045,635,353		\$2,178,363,049
		Average Annual Employment	4,171	
Discounted Total				
Total	\$12,595,579,119	\$3,537,473,848	n.m.	\$1,315,643,456

Source: USM, MDOL, and The Jacob France Institute

The Economic Impact of USM's Out-of-State Revenues on Maryland's Economy

The human capital analysis approach described above only assesses the economic and fiscal contributions of the incremental earnings associated with a USM degree. In addition to these large and important impacts, the USM is also an important source of economic activity in Maryland in its own right. USM attracts new spending from outside of the state in the form of:

- the nearly \$300 million in tuition and fees paid by out of state students.
- the estimated \$433 million in living expenses associated with these out-of-state students⁶.
- \$1 billion in federal contracts and grants; and
- an estimated \$86 million in out-of-state visitors coming to Maryland to attend campus events.

These four sources of net, new, and incremental spending attracted to Maryland by USM total nearly \$1.8 billion in revenues and spending and are similarly subject to multiplier effects.

USM's Out-of-State revenues generate significant impacts. These four sources of spending total \$1.8 billion in out-of-state supported economic activity associated with the USM. As shown in Table 7, this spending creates a total of \$3.3 billion in economic activity in the state, supports 26,791 jobs earning nearly \$1.1 billion in fiscal year 2019. These economic impacts occur in

addition to the increases in economic activity associated with the incremental earnings of system graduates. These activities generate an estimated \$37.4 million in state income and sales taxes.

Just combining the economic and fiscal impacts of the four cohorts described above and the impacts of out-of-state revenues and spending presented in Table 7, yields an estimated 36,600 jobs and \$148 million in state income and sales taxes, or more than 15% of USM's 2019 appropriation.

The Economic Impact of USM's Construction Expenditures on Maryland's Economy

The USM also generates economic activity through its spending on construction and capital improvements. As presented in Table 8, the USM has spent over \$500 million each year on capital projects over the past three fiscal years. These expenditures have generated over \$1 billion in Maryland economic activity and between 6,700 and 7,700 jobs over each of the last three fiscal years. State income and sales tax revenues range from \$13.0 to \$14.4 million.

The State of Maryland's Return on Investment in USM: Analysis of Four Cohorts

The state of Maryland receives a high return on its investment in USM. The economic and fiscal impacts of a USM education on graduate workers in and of the

Table 7. Economic Base Approach Economic Impact (Fiscal 2019)

Item	Direct Impacts	Economic Impact		
		Output	Earnings	Employment
Total	\$1,784,971,811	\$3,264,018,351	\$1,090,284,585	26,791
Non-Resident Students				
Tuition and Fees	\$298,800,440	\$548,000,007	\$194,399,566	4,417
Student Cost of Living	\$432,791,028	\$781,794,579	\$222,070,270	6,760
Federal Grants and Contracts	\$967,096,343	\$1,773,654,692	\$629,192,881	14,296
Out-of-State Visitors	\$86,284,000	\$160,569,073	\$44,621,868	1,318

Source: USM, JFI, and BEA

⁶ These were estimated by multiplying the number of out-of-state students enrolled at each USM institution by the projected cost of living for each student, from each institution's cost of attendance figures, to yield estimated student living expenditures. These costs of living figures are conservative and may underestimate the actual level of out-of-state student living expenses and resulting economic impact estimates.

Table 8. Economic Impact of USM Construction Spending

Item	FY2017	FY2018	FY2019
USM Construction Spending	\$574,682,921	\$537,676,334	\$518,712,966
Economic Impact			
Output	\$1,119,654,735	\$1,047,554,802	\$1,010,608,472
Employment Compensation	\$420,610,430	\$393,525,309	\$379,646,020
Employment	7,703	7,066	6,683

Source: USM, JFI and BEA

out-of-state revenues attracted into Maryland by USM described above are impressive; yet they only tell part of the story of the importance of USM. A central goal of this analysis is to assess the state's return on investment in USM. To accomplish this, the JFI compared the state income and sales tax revenues derived from the increased earnings of USM graduates to its funding support for the system. This is done through two analyses. The first analysis, which is presented in Table 9, compares the state subsidy received by the average USM graduate⁷ to the incremental tax revenues derived from each graduate and yields the following results:

- For the 1986 Cohort, the estimated incremental state income and sales tax revenues attributable to a bachelor's degree earnings is \$171,961 compared to an estimated state subsidy of \$25,504 per student for a revenue/cost ratio of 6.7 to 1. The revenue/cost ratio for a master's degree recipient was 0.5 to 1; for a doctoral degree 1.4 to 1; and for a professional degree recipient was 8.6 to 1.
- For the 1989 Cohort, the revenue/cost ratio for a bachelor's degree was 4.7 to 1; for a master's degree 0.9 to 1; for a doctoral degree 0.3 to 1; and for a professional degree 5.8 to 1.
- For the 1996 Cohort, the revenue/cost ratio for a bachelor's degree was 6.5 to 1; for a master's degree 1.2 to 1; for a doctoral degree 0.8 to 1; and for a Professional degree 8.7 to 1; and

- For the 2006 Cohort, the revenue/cost ratio for a bachelor's degree was 8.5 to 1; for a master's degree 3.4 to 1; for a doctoral degree 0.1 to 1; and for a Professional degree 10.5 to 1.

The revenue-cost figures in Table 9 above include only the income and subsidy received by graduates working in Maryland. This analysis overestimates the actual revenue benefits to the state because it does not include the subsidy costs for USM graduates who leave Maryland. Nor does that analysis include the multiplier effects of the incremental income derived from a USM degree. Three steps were undertaken to derive a more complete estimate of Maryland's return on investment in USM:

- The state subsidy for each cohort of students was increased to reflect the effects of graduates not appearing in the MDOL data⁸;
- The total number of graduates in each degree cohort was multiplied by the average subsidy received per degree type for each cohort of graduates to derive a total cohort subsidy; and
- State revenue estimates were also increased to include the economic multiplier effects.

These adjustments make it possible to compare the total cost of each cohort to the fiscal benefits derived from each cohort. This provides the most complete measure of the state's return on investment as measured by the

⁷ The state subsidy was derived dividing the state appropriation received by the USM by total enrollment for the years being analyzed in order to derive the state per student subsidy for each year of operation. This ignores differences between institutions and programs within institutions but provides a reasonable estimate of the average cost of a USM student. These figures were then summed for each year for the number of years at a USM institution for each class of the two cohorts. Bachelor's degree recipients were assumed to spend 4 years at a USM institution, master's degree recipients 2 years, doctoral degree recipients 5 years, and professional degree recipients 3 years. All values are expressed in constant 2019 dollars.

⁸ As described above, only a portion of USM graduates appeared in the MDOL data used in this analysis. Some graduates move out-of-state to find employment. Others may reside in Maryland but work in neighboring states or are self-employed or work for employers (such as the federal government) not included in the data used. The omission of these latter types of graduates undercounts the actual incremental wage and related fiscal impacts of the USM. However, there was no means to obtain information on these graduates. As a result, the estimates presented here can be viewed as very conservative.

fiscal revenue/cost ratio for the USM. The results of this analysis are presented in Table 10, with the key findings as follows:

- For the 1986 Cohort, the state revenue/cost ratio is 2.6 to 1 signifying that the state receives \$2.60 in revenue for each \$1 invested.
- For the 1989 Cohort, the state revenue/cost ratio is 1.9 to 1.
- For the 1996 Cohort, the state revenue/cost ratio is 2.4 to 1; and
- For the 2006 Cohort, the State revenue/cost ratio is 2.9 to 1.

It is clear from this analysis that USM is a good investment for the state of Maryland, which receives between two to three times more in revenues over the level of state support for the system over the work life of a graduate using conservative estimates of the state's fiscal return. Because this analysis only estimates Maryland's state income and sales tax revenues; does not include federal or Maryland residents commuting to jobs in neighboring states; and does not include the fiscal impacts of USM's out-of-state revenues described in Table 7; the actual return on investment to the state is likely to be much higher.

Table 9. Fiscal Impact of University System of Maryland Per Student Revenues and Costs

	Bachelor's	Master's	Doctorate	Professional
1986 Cohort				
Increase in Tax Revenues	\$171,961	\$7,415	\$41,661	\$170,971
State per Student Tax Subsidy	\$25,504	\$14,617	\$30,753	\$19,917
Revenue/Cost Ratio	6.7	0.5	1.4	8.6
1989 Cohort				
Increase in Tax Revenues	\$168,318	\$17,192	\$13,081	\$165,195
State per Student Tax Subsidy	\$35,998	\$19,994	\$43,141	\$28,524
Revenue/Cost Ratio	4.7	0.9	0.3	5.8
1996 Cohort				
Increase in Tax Revenues	\$214,548	\$19,962	\$31,949	\$218,237
State per Student Tax Subsidy	\$33,183	\$16,725	\$41,462	\$25,108
Revenue/Cost Ratio	6.5	1.2	0.8	8.7
2006 Cohort				
Increase in Tax Revenues	\$277,280	\$57,417	\$2,686	\$256,126
State per Student Tax Subsidy	\$32,563	\$16,715	\$41,554	\$24,504
Revenue/Cost Ratio	8.5	3.4	0.1	10.5

Source: USM, Jacob France Institute

Table 10. Fiscal Impact of University System of Maryland Cohort Costs and Benefits, Including Multiplier Effects and Attrition

Item	1986 Cohort	1989 Cohort	1996 Cohort	2006 Cohort
Increase in Tax Revenues	\$991,296,616	\$1,116,133,978	\$1,569,356,091	\$2,178,363,049
State Cohort Subsidy	\$380,771,901	\$591,574,407	\$648,131,273	\$745,842,719
Revenue/Cost Ratio	2.6	1.9	2.4	2.9

Source: USM, Jacob France Institute

THE WORKFORCE DEVELOPMENT IMPACT OF THE UNIVERSITY SYSTEM OF MARYLAND

The economic and fiscal impacts of USM are both significant and important but are not the only impacts that the system has on the state of Maryland. The most important impact that USM has on Maryland's economy is through the educational and training services that it provides. Universities are vital in providing employers with the workforce that has the education, training and skills required by the employer community. Universities have become increasingly important with the growing importance of advanced technology in today's market. According to Area Development Magazine's 35th Annual Corporate Survey on the economic development factors considered by businesses, the "availability of skilled labor ranks first — considered important 'very important' or 'important' by 91.4 percent of the Corporate Survey respondents. Despite an increase in remote working during the pandemic, basing the location decision on where the available skilled workers can be found is still paramount."⁹ Colleges and universities have their most important impact on a state's economy by meeting this need through their role in providing skilled and educated graduates to the local economy. According to data from the Maryland Department of Labor, the percentage of Maryland jobs that will require a bachelor's degree or above will increase from 33% in 2018 to 37% in 2028. Maryland's colleges and universities are doing a good job in meeting this demand for educated workers. According to the 2019 Maryland Business Climate Survey, Maryland businesses have a positive view of Maryland's educational institutions, especially of four-year colleges and universities and graduate and professional schools which are ranked as good or excellent by 84% and 83% respectively by Maryland businesses. With the ever-in-

creasing importance of technology in today's market, USM's top quality universities are becoming increasingly vital in providing the highly qualified and trained employees that Maryland employers demand.

The Importance of Higher Education

In addition to the earnings impacts described in the previous section, the USM also improves Maryland's competitiveness by providing the skilled and educated workforce required by Maryland's employer community. By preparing new entrants to the workforce, as well as providing the ability to upgrade the skill sets and training of the existing workforce; institutions of higher education are essential in ensuring the high-quality, highly skilled workforce that is of critical importance to Maryland's economic competitiveness. The presence of highly educated and skilled workers in an area creates an "industrial competitive advantage" which enables businesses to compete more effectively regionally, nationally, and globally. Maryland has the distinction of having one of the best educated resident populations in the nation. According to the Bureau of the Census' 2019 American Community Survey, 40.9% of Maryland's population that is 25 years and older has completed a bachelor's degree or higher. By comparison, this percentage across the United States is 33.1%. This places Maryland fifth in educational attainment compared to all 50 states and the District of Columbia. Maryland's skilled and educated workforce is one of its principal economic development advantages. According to the Maryland Department of Business and Economic Development:

⁹ <https://www.areadevelopment.com/Corporate-Consultants-Survey-Results/Q1-2021/35th-annual-corporate-survey.shtml>.

- Maryland has the highest concentration of employed doctoral scientists and engineers. The state ranks first in total PhD scientists and engineers per 100,000 employed workers, with a first place ranking for PhD scientists and fifth for PhD engineers. Maryland also holds rankings in the following fields for employed doctoral scientists per 100,000 employed workers:
 - first in biological sciences, mathematics and statistics, and health.
 - second in physical sciences and social sciences.
 - third in psychology.
 - sixth in computer and information sciences.
- Maryland ranks second among the states in the percentage of professional and technical workers (29.2%) in the workforce; and
- Maryland has the highest concentration of workers in STEM occupations at 9.8%, totaling 252,910 workers in 2019.

As the largest provider of university-educated workers to Maryland's economy, the USM is a key contributor to Maryland's nationally and internationally competitive position in workforce development.

USM's Role in Maryland Higher Education

Increasing the number of well-educated residents in Maryland is the key goal of the USM. In 2019, the USM

accounted for 72.1% of the total enrollment of Maryland's four-year degree granting institutions, including 72.6% of the State's full-time undergraduate enrollment; 92.6% of part-time undergraduate enrollment; and 56.6% and 56.8% respectively of both the full-time and part time graduate/professional enrollment (see Table 11). USM's role has increased from the last report in 2011, when USM accounted for 69% of total enrollment

Undergraduate Education – Degrees Awarded

As presented in Table 12, USM schools awarded 27,039 bachelor's degrees (79% of total bachelor's degrees awarded) in 2019. USM play its most important role in STEM fields, with 4,424 degrees awarded in computer science – 93% of all computer science Bachelor's degrees granted in Maryland; 1,360 engineering degrees – 72% of the total; 1,560 Biological and Biomedical Sciences degrees – 69% of the total; 365 Mathematics and Statistics degrees – 73% of the total; and 299 Physical Sciences degrees – 70% of the total. USM also accounts for 81% of the Health Professions and Related Program degrees, critical to Maryland's health care system, 79% of Maryland Education degrees, critical to Maryland's K-12 education system; and 81% of business degrees. **Without USM, Maryland would face workforce shortages in these high demand fields.**

Table 11. University System of Maryland's Share of Total Maryland Enrollment at Four-Year Degree Granting Institutions, 2019

	All Maryland Institutions	University System of Maryland	% of Total	Morgan and St. Mary's	% of Total	State-Aided Independent	% of Total	Other Private	% of Total
Full-time Undergraduate	119,402	86,685	72.6%	7,351	6.2%	23,052	19.3%	2,314	1.9%
Part-time Undergraduate	52,333	48,441	92.6%	638	1.2%	1,986	3.8%	1,268	2.4%
Full-time Graduate/Professional	31,211	17,653	56.6%	1,021	3.3%	11,099	35.6%	1,438	4.6%
Part-time Graduate/Professional	41,625	23,644	56.8%	302	0.7%	17,096	41.1%	583	1.4%
Total	244,571	176,423	72.1%	9,312	38%	53,233	21.8%	5,603	2.3%

Source: MHEC

Graduate Education – Degrees Awarded

USM plays a critical role in providing master's level graduates across the spectrum of fields of study. As presented in Table 13, the University System of Maryland accounts for more than half of all master's degrees granted, again with a strong focus in STEM and high demand fields, including:

- 73% of master's degrees awarded in Computer and Information Sciences and Support Services.
- 44% of master's degrees awarded in Engineering.
- 47% of master's degrees awarded in Mathematics and Statistics; and
- 70% of master's degrees awarded in Business, Management, Marketing, and Related Support Services degrees.

Doctoral Education – Degrees Awarded

USM plays a similarly critical role in providing doctoral level graduates across the spectrum of fields of study, including both scholarship and professional doctorates.

As presented in Table 14, the University System of Maryland accounts for more than half of all doctoral degrees granted, again with a strong focus on STEM and high demand fields, including:

- 64% of Doctoral degrees awarded in Computer and Information Sciences and Support Services.
- 64% of Doctoral degrees awarded in Engineering.
- 77% of Doctoral degrees awarded in Mathematics and Statistics.
- 56% of Doctoral degrees awarded in Physical Sciences; and
- 59% of Doctoral degrees awarded in Business, Management, Marketing, and Related Support Services degrees.

Doctoral degree students are not only important to Maryland's current employer community. They also play a critical role in supporting Maryland's strong national and internationally competitive position in research and development (described in the next section of this report).

Table 12. Bachelor's Degrees Awarded by USM and Independent Colleges and Universities in Maryland in 2019

	All Maryland Institutions	University System of Maryland	% of Total	Morgan and St. Mary's	% of Total	State-Aided Independent	% of Total	Other Private	% of Total
Total Degrees	58,052	40,039	69%	1,831	3%	15,618	27%	564	1%
Total Bachelor's Degrees	34,272	27,039	79%	1,483	4%	5,624	16%	126	0%
Agriculture, Agriculture Operations, and Related Sciences	212	212	100%	-	-	-	-	-	-
Natural Resources and Conservation	374	318	85%	25	7%	31	8%	-	-
Architecture and Related Services	114	78	68%	27	24%	9	8%	-	-
Area, Ethnic, Cultural, Gender, and Group Studies	174	154	89%	1	1%	19	11%	-	-
Communication, Journalism, and Related Programs	1,570	1,284	82%	72	5%	214	14%	-	-
Communications Technologies/Technicians and Support Services	237	213	90%	10	4%	14	6%	-	-
Computer and Information Sciences and Support Services	4,753	4,424	93%	80	2%	249	5%	-	-
Education	1,010	800	79%	75	7%	135	13%	-	-
Engineering	1,893	1,360	72%	175	9%	358	19%	-	-
Engineering Technologies and Engineering-Related Fields	42	35	83%	--	--	7	17%	-	-
Foreign Languages, Literatures, and Linguistics	208	163	78%	10	5%	35	17%	-	-
Family and Consumer Sciences/Human Sciences	323	247	76%	44	14%	32	10%	-	-
Legal Professions and Studies	129	98	76%	0	0%	31	24%	-	-
English Language and Literature/Letters	712	481	68%	47	7%	184	26%	-	-
Liberal Arts and Sciences, General Studies and Humanities	430	185	43%	86	20%	159	37%	-	-
Biological and Biomedical Sciences	2,274	1,560	69%	113	5%	601	26%	-	-
Mathematics and Statistics	498	365	73%	20	4%	113	23%	-	-
Multi/Interdisciplinary Studies	419	217	52%	5	1%	197	47%	-	-
Parks, Recreation, Leisure, and Fitness Studies	874	813	93%	0	0%	61	7%	-	-
Philosophy and Religious Studies	192	84	44%	15	8%	39	20%	54	28%
Theology and Religious Vocations	82	0	0%	0	0%	10	12%	72	88%
Physical Sciences	427	299	70%	27	6%	101	24%	-	-
Psychology	2,176	1,760	81%	110	5%	306	14%	-	-
Homeland Security, Law Enforcement, Firefighting and Related Protective Service	831	750	90%	-	-	81	10%	-	-
Public Administration and Social Service Professions	678	577	85%	72	11%	29	4%	-	-
Social Sciences	3,042	2,401	79%	128	4%	513	17%	-	-
Transportation and Materials Moving	11	11	100%	-	-	-	-	-	-
Visual and Performing Arts	1,361	709	52%	61	4%	591	43%	-	-
Health Professions and Related Programs	3,210	2,599	81%	20	1%	591	18%	-	-
Business, Management, Marketing, and Related Support Services	5,544	4,500	81%	224	4%	820	15%	-	-
History	472	342	72%	36	8%	94	20%	--	--

Source: MHEC

Table 13. Master's Degrees Awarded by USM and Independent Colleges and Universities in Maryland in 2019

	All Maryland Institutions	University System of Maryland	% of Total	Morgan and St. Mary's	% of Total	State-Aided Independent	% of Total	Other Private	% of Total
Total Degrees	58,052	40,039	69%	1,831	3%	15,618	27%	519	1%
Total Master's Degrees	20,839	10,968	53%	277	1%	9,203	44%	391	2%
Agriculture, Agriculture Operations, and Related Sciences	18	18	100%	-	-	-	-	-	-
Natural Resources and Conservation	30	29	97%	-	-	1	3%	-	-
Architecture and Related Services	51	25	49%	26	51%	-	-	-	-
Area, Ethnic, Cultural, Gender, and Group Studies	17	12	71%	3	18%	2	12%	-	-
Communication, Journalism, and Related Programs	199	40	20%	5	3%	154	77%	-	-
Communications Technologies/Technicians and Support Services	9	-	-	-	-	9	100%	-	-
Computer and Information Sciences and Support Services	2,596	1,887	73%	-	-	684	26%	25	1%
Education	2,773	952	34%	49	2%	1,772	64%	-	-
Engineering	1,382	610	44%	19	1%	753	54%	-	-
Engineering Technologies and Engineering-Related Fields	87	32	37%	-	-	55	63%	-	-
Foreign Languages, Literatures, and Linguistics	16	14	88%	-	-	2	13%	-	-
Family and Consumer Sciences/Human Sciences	22	13	59%	-	-	9	41%	-	-
Legal Professions and Studies	143	108	76%	-	-	35	24%	-	-
English Language and Literature/Letters	174	75	43%	1	1%	98	56%	-	-
Liberal Arts and Sciences, General Studies and Humanities	92	9	10%	-	-	83	90%	-	-
Library Science	59	59	100%	-	-	0	0%	-	-
Biological and Biomedical Sciences	831	211	25%	1	0%	619	74%	-	-
Mathematics and Statistics	243	114	47%	2	1%	127	52%	-	-
Multi/Interdisciplinary Studies	612	487	80%	1	0%	124	20%	-	-
Parks, Recreation, Leisure, and Fitness Studies	26	11	42%	-	-	15	58%	-	-
Philosophy and Religious Studies	8	2	25%	-	-	6	75%	-	-
Theology and Religious Vocations	136	0	0%	-	-	71	52%	65	48%
Physical Sciences	182	42	23%	-	-	140	77%	-	-
Psychology	200	103	52%	-	-	97	49%	-	-
Homeland Security, Law Enforcement, Firefighting and Related Protective Service	258	203	79%	-	-	55	21%	-	-
Public Administration and Social Service Professions	1,028	881	86%	69	7%	78	8%	-	-
Social Sciences	1,165	160	14%	19	2%	986	85%	-	-
Visual and Performing Arts	389	75	19%	6	2%	308	79%	-	-
Health Professions and Related Programs	2,742	1,066	39%	19	1%	1,356	49%	301	11%
Business, Management, Marketing, and Related Support Services	5,313	3,704	70%	56	1%	1,553	29%	-	-
History	38	26	68%	1	3%	11	29%	-	-

Source: MHEC

Table 14. Doctorate - Research Scholarship Degrees Awarded by USM and Independent Colleges and Universities in Maryland in 2019

	All Maryland Institutions	University System of Maryland	% of Total	Morgan & St. Mary's	% of Total	State-Aided Independent	% of Total	Other Private	% of Total
Total Degrees	58,052	40,039	69%	1,831	3%	15,618	27%	519	1%
Total Doctoral Degrees	1,477	816	55%	71	5%	588	40%	2	0.1%
Agriculture, Agriculture Operations, and Related Sciences	26	26	100%	-	-	-	-	-	-
Natural Resources and Conservation	3	3	100%	-	-	-	-	-	-
Architecture and Related Services	2	2	100%	-	-	-	-	-	-
Area, Ethnic, Cultural, Gender, and Group Studies	11	11	100%	-	-	-	-	-	-
Communication, Journalism, and Related Programs	13	13	100%	-	-	-	-	-	-
Computer and Information Sciences and Support Services	106	68	64%	-	-	38	36%	-	-
Education	159	60	38%	38	24%	61	38%	-	-
Engineering	277	178	64%	9	3%	90	32%	-	-
Foreign Languages, Literatures, and Linguistics	20	13	65%	-	-	7	35%	-	-
Family and Consumer Sciences/Human Sciences	5	5	100%	-	-	-	-	-	-
English Language and Literature/Letters	10	7	70%	-	-	3	30%	-	-
Liberal Arts and Sciences, General Studies and Humanities	9	5	56%	-	-	4	44%	-	-
Biological and Biomedical Sciences	249	90	36%	1	0%	158	63%	-	-
Mathematics and Statistics	35	27	77%	-	-	8	23%	-	-
Multi/Interdisciplinary Studies	27	24	89%	-	-	3	11%	-	-
Parks, Recreation, Leisure, and Fitness Studies	4	4	100%	-	-	-	-	-	-
Philosophy and Religious Studies	4	2	50%	-	-	2	50%	-	-
Theology and Religious Vocations	2	-	-	-	-	-	-	2	100%
Physical Sciences	120	67	56%	-	-	53	44%	-	-
Psychology	39	33	85%	1	3%	5	13%	-	-
Public Administration and Social Service Professions	29	21	72%	8	28%	-	-	-	-
Social Sciences	88	63	72%	-	-	25	28%	-	-
Transportation and Materials Moving	2	-	-	2	100%	-	-	-	-
Visual and Performing Arts	46	32	70%	-	-	14	30%	-	-
Health Professions and Related Programs	145	42	29%	6	4%	97	67%	-	-
Business, Management, Marketing, and Related Support Services	27	16	59%	2	7%	9	33%	-	-
History	19	4	21%	4	21%	11	58%	-	-

Source: MHEC

Professional Education – Degrees Awarded

As presented in Table 15, USM schools accounted for 83% of all Professional degrees awarded by four-year public and private colleges and universities in Maryland. The University of Maryland, Baltimore and the University of Baltimore are the only two schools in Maryland that offer a professional law degree. The University of Maryland, Baltimore is one of two four-year colleges and universities in Maryland that offers a professional degree in medicine and is the only school to offer a professional degree in dentistry. USM Institutions accounted all professional business degrees awarded and 77% of all health-related professional degrees awarded, including all dentistry, physical therapy, and veterinary medicine degrees, 58% of medical degrees, 83% of nurse practitioner degrees, 82% of pharmacy degrees awarded. These professional degrees that are awarded by USM have a significant impact on the state's economy by providing advanced candidates for numerous high-wage occupations for which there is great demand by Maryland businesses, non-profits, and government. Maryland's health care system depends on USM for a large share of its professional workforce needs and without

USM, existing critical shortages of health care workers would only be larger.

Occupational Demand for USM Graduates

The USM plays a vital role in providing the workers needed by the public and private sector in Maryland. EMSI (Economic Modeling Specialists Intl.) prepares projections of the demand for workers by occupation for a ten-year period. Data on the educational requirements of these occupations is also available from EMSI. Based on these occupational demand projections and recent USM graduation data, Table 16 compares USM graduates to estimated occupational openings for key degree areas.

As presented in Table 16, the USM is a vital component of Maryland workforce development system and meets or exceeds the total level of projected annual occupational demand in a number of key areas. USM institutions alone met:

- 84% of the occupational demand for management and business occupations.

Table 15. Doctorate - Professional Practice Degrees Awarded by USM and Independent Colleges and Universities in Maryland in 2019

	All Maryland Institutions	University System of Maryland	% of Total	State-Aided	% of Total	Other Private	% of Total
Total Degrees	58,052	40,039	69%	15,618	27%	519	1%
Total Professional Degrees	1,464	1,216	83%	203	14%	45	3%
Legal Professions and Studies	390	390	100%	-	-	-	-
Theology and Religious Vocations	8	-	-	-	-	8	100%
Psychology	11	-	--	11	100%	-	-
Health Professions and Related Programs	1,009	780	77%	192	19%	37	4%
Dentistry	130	130	100%	-	-	-	-
Doctor of Veterinary Medicine (DVM)	28	28	100%	-	-	-	-
Medicine	281	163	58%	118	42%	--	-
Nursing Practice	164	136	83%	28	17%	--	-
Pharmacy	262	216	82%	46	18%	--	-
Physical Therapy	90	90	100%	-	-	-	-
All Other Health	54	17	31%	0	0%	37	69%
Business, Management, Marketing, and Related Support Services	46	46	100%	-	-	-	-

Source: MHEC

Table 16. Occupational Demand of University System of Maryland Graduates in Selected Occupations

Occupational Category	Maryland Occupational Demand	USM Graduates 2019	Graduates as a % of Demand
Management and Business	9,836	8,250	84%
Education	10,901	1,752	16%
Social Sciences/Government/Planning	25,669	4,019	16%
Health	7,885	4,487	57%
Physical/Biological Sciences	3,448	1,943	56%
Computer Sciences	10,967	6,311	58%
Engineering	3,620	1,970	54%
Law	878	596	68%
Agricultural Science	122	230	188%

Source: EMSI and USM

- 58% of the occupational demand for computer science occupations.
- 57% of the projected occupational demand for health occupations; and
- 54% of the demand for engineering occupations.

Maryland already faces critical workforce shortages in many of these occupations. Even though USM accounts for most of Maryland's higher education enrollment and degrees granted in many of these fields, its graduates alone do not meet state and regional demands for workers. As a result, Maryland needs to import workers nationally and internationally. **Without USM, Maryland would face even worse workforce shortages in occupations critical to the state's economic future.**

In-State Employment of the 2015 and 2019 Cohorts of USM Graduates

In addition to analyzing the current employment of the 1986, 1989, 1996 and 2006 cohorts of USM graduates described above, the JFI analyzed the in-state employment of two more recent (2015 and 2018) cohorts of USM graduates. This analysis was conducted to demonstrate that USM's graduates play a critical role in providing the skilled and educated workforce required by Maryland's employer community. The JFI measured the in-state employment level by degree type and area. This analysis includes only the workers covered by unemployment insurance, so as described above it does not include federal or self-employed workers. As a result, it

undercounts the actual in-State employment of these two additional cohorts. Key findings of this analysis are as follows:

- Fifty-seven percent of 2015 USM Bachelor's degree graduates, 47% of master's degree graduates, 35% of Doctoral degree graduates and 67% of Professional degree graduates were working in Maryland one-year after graduation. For the 2018 cohort: 57% of bachelor's degree; 45% of master's degree, 35% of doctoral degree; and 59% of professional degree graduates were working in Maryland one-year after graduation.
- USM play a critical role in **STEM Fields** with
 - 45% of 2015 and 43% of 2018 Computer Science Bachelor's degree recipients were working in Maryland one-year after graduation;
 - 48% of 2015 and 54% of 2018 Engineering Bachelor's degree recipients were working in Maryland one-year after graduation; and
 - 61% of 2015 and 64% of 2018 Biosciences Bachelor's degree recipients were working in Maryland one-year after graduation.
- USM is a critical supplier of talent to Maryland's **educational and healthcare systems**, with
 - 74% of 2015 and 75% of 2018 Education Bachelor's degree recipients were working in Maryland one-year after graduation. At the master's degree level, 79% of the 2015 and 80% of the 2018 cohorts were working in Maryland; and
 - 73% of 2015 and 71% of 2018 Health-related degree bachelor's degree recipients were working in

Maryland one-year after graduation. At the Professional degree level, 64% of the 2015 and 54% of the 2018 cohorts were working in Maryland.

- **It is clear from these numbers that USM plays a vital role in providing workers in critical, high demand occupations.**

Selected Additional Workforce Development Programs

While the primary workforce development impacts of USM institutions comes from their core educational programs, all USM member institutions offer a variety of additional workforce development, training, educational, and outreach efforts that improve the functioning of Maryland's overall workforce development system. A

selection of these programs offered identified by each USM member institution in the campus survey conducted are presented below.

As Maryland's first historically black public university, Bowie State University empowers a diverse population of students to reach their potential by providing innovative academic programs and transformational experiences as they prepare for careers, lifelong learning, and civic responsibility. Bowie State University supports Maryland's workforce and economy by engaging in strategic partnerships, research, and public service to benefit our local, state, national, and global communities.

- The University has been designated a **National Center of Academic Excellence in Cyber Defense** (NCAE-CD),

Table 17. In-State Employment of 2015 Cohort of Graduates, By Degree

Occupational Category	% Employed in 2016				% Employed in 2019			
	Bachelors	Masters	Doctorate	Professional	Bachelors	Masters	Doctorate	Professional
Total	57%	47%	35%	67%	49%	41%	29%	58%
Agriculture	53%	37%	29%	—	41%	33%	26%	—
Architecture	49%	39%	*	—	49%	33%	*	—
Area Studies	39%	42%	*	—	37%	*	*	—
Arts	66%	65%	77%	—	59%	50%	62%	—
Bio Sciences	61%	47%	37%	—	46%	38%	38%	—
Business	49%	36%	*	28%	42%	32%	*	24%
Communications	55%	39%	*	—	45%	24%	*	—
Computer Science	45%	30%	36%	—	41%	26%	25%	—
Education	74%	79%	63%	—	66%	71%	58%	—
Engineering	48%	29%	29%	—	44%	22%	24%	—
English	60%	62%	*	—	54%	50%	*	—
Foreign Languages	57%	63%	*	—	46%	44%	*	—
Health	73%	71%	30%	64%	65%	64%	25%	59%
Interdisciplinary Studies	67%	56%	44%	—	56%	45%	26%	—
Law	37%	66%	*	72%	34%	60%	*	61%
Library Science	0%	51%	*	—	0%	45%	*	—
Mathematics	54%	41%	17%	—	50%	35%	10%	—
Physical Sciences	64%	54%	20%	—	51%	39%	17%	—
Psychology	58%	68%	41%	—	51%	53%	27%	—
Public Affairs	71%	66%	*	—	62%	60%	*	—
Social Sciences	54%	35%	32%	—	46%	29%	22%	—

(*) Sample size too small to report

Source: USM, MDOL, and The Jacob France Institute

part of the National Centers of Academic Excellence in Cybersecurity program. As a CAE designated institution, the university offers training and professional development opportunities for high schools, community colleges, and other institutions of higher education.

- The university provides **experiential learning** opportunities through internships for students by leveraging faculty research in our undergraduate research institute and partnerships with industry to support all majors to increase employment opportunities for students.
- The university's **continuing education and degree programs** offer flexible programs including weekend college, accelerated programs, dual degree programs, and certification programs to support a variety of students from high school to working professionals

interested in making a career change.

Coppin State University supports workforce development through the College of Business Center for Strategic Entrepreneurship. Several grants and corporate proposals have incorporated support for local business partners, maker communities, undergraduate research experiences for students and transdisciplinary faculty's research in the area of advanced manufacturing.

- The university's new Certificate in Entrepreneurship and Innovations is a credit-bearing certificate offered in conjunction with services at the College of Business (COB) Center for Strategic Entrepreneurship (CSE). The credential directly aligns with the Coppin State University (CSU) mission and commitment to building

Table 18. In-State Employment of 2018 Cohort of Graduates, By Degree

Occupational Category	% Employed in 2019			
	Bachelors	Masters	Doctorate	Professional
Total	57%	45%	35%	59%
Agriculture	51%	47%	21%	-
Architecture	71%	46%	*	-
Area Studies	47%	71%	*	-
Arts	68%	54%	38%	-
Bio Sciences	64%	50%	35%	-
Business	51%	36%	*	34%
Communications	57%	51%	31%	-
Computer Science	43%	27%	20%	-
Education	75%	80%	62%	-
Engineering	54%	24%	26%	-
English	61%	52%	33%	-
Foreign Languages	59%	*	42%	-
Health	71%	67%	39%	54%
Interdisciplinary Studies	67%	43%	71%	-
Law	41%	59%	*	73%
Library Science	0%	45%	*	-
Mathematics	53%	35%	19%	-
Physical Sciences	53%	39%	34%	-
Psychology	59%	53%	35%	-
Public Affairs	70%	60%	50%	-
Social Sciences	52%	29%	24%	-

(*) Sample size too small to report

Source: USM, MDOL, and The Jacob France Institute

"on a rich legacy of empowering students, promoting community revitalization, and strengthening relationships with local, national, and global partners." The program is designed to provide participants with the legal, marketing, financial, and technology-related knowledge and skills required to successfully establish and position business startups for sustainable growth. Flexible scheduling is provided to facilitate completion and help learners manage the multiple demands of emerging entrepreneurs. Opportunities for practical exposure to the entrepreneurial ecosystem is emphasized.

Frostburg State University (FSU) offers a variety of programs to support local workforce development. The university places particular emphasis on efforts to create synergies between workforce development initiatives, experiential learning opportunities for students, and attraction/creation/expansion of new business to the region at FSU Innovation Park. FSU is focused on the development of two Centers of Excellence: the Renewable and Resilient Energy Center of Excellence; and the Waste-to-Value Center of Excellence; and offer a variety of programs to meet the education and training needs of each.

Salisbury University's, **BEACON** research center has been working with the Maryland Department of Labor to design and evaluate the EARN Maryland Grant Program and to make Program and Process Improvement recommendations. The Employment Advancement Right Now (EARN) Maryland Program is an industry-led initiative that helps businesses cultivate the skilled workforce they need to compete while helping prepare Marylanders for meaningful careers. The program challenges traditional workforce development models by placing employer and industry partners at the forefront of program implementation. The EARN program has helped more than 2,500 Marylanders obtain employment and provided training to over 7,500 incumbent workers to help them move up the career ladder. Thanks partially to the ongoing guidance provided and the best-practice recommendations made by BEACON, the EARN Maryland Program has a very high return on investment whereby, for every dollar invested by the State, around \$18 of economic activity for Maryland is generated. The

EARN Maryland Program was named one of the Top 25 programs in the 2018 Innovations in American Government Award competition by The Ash Center for Democratic Governance and Innovation, a leading research center at the John F. Kennedy School of Government at Harvard University.

Towson University offers a variety of programs to support and enhance workforce development in Maryland. Selected examples include:

- **Continuing and Professional Studies** – Towson University (TU) is committed to providing educational opportunities to working professionals to enhance expertise and advance careers. In-class and online certification prep courses help adult learners meet their career goals. The university's industry-recognized courses align with the academic mission of Towson University and focus on business and management, information technology, and the health professions. Key program offerings include Project Management Professional, Professional in Human Resources, CompTIA A+, Network+ & Security+, and Certified Medical Coding: Physician's Practice Courses.
- **Cisco Networking Academy** – Towson University is the home of the only support and training center in Maryland. Cisco Networking Academies prepare students for advanced study in IT and for industry certifications. Towson University serves more than 100 Cisco Academies in Maryland, Virginia, Washington DC, and Pennsylvania. The Cisco Networking Academy provides curriculum programs that range from exploratory IT courses to career networking and programming courses that align with international industry badges and certifications, including CompTIA A+, Cisco CCNA, CCNA CyberOps Associate and Cisco CCNP (ENCOR).
- **Dr. Nancy Grasmick Leadership Institute** – Launching in summer 2021, the Dr. Nancy Grasmick Leadership Institute leverages innovative research and practice to prepare leaders to take on the world's challenges and make transformative impact with ethics, resilience, self-awareness, execution and dedication. It's the place where professionals from diverse industries and backgrounds convene to establish, expand and hone expertise as highly effective leaders, team builders and culture creators. The Institute builds on TU's

ongoing commitment to community and workforce engagement while serving as a key regional asset—uniquely supporting leadership recruitment, development and retention to allow our state and region to thrive.

University of Baltimore is a career-focused university offering a variety of training and educational experiences. Some examples of programs to facilitate City, regional and state workforce development include:

- Since 2016, The University of Baltimore's **Second Chance College Program** has been working with men in the Jessup Correctional Institution (JCI), to foster their education toward a Bachelor of Arts in Human Services Administration degree. While taking courses at JCI, students receive academic support from UBalt faculty and staff, community volunteers, and their incarcerated peers.
- **Early College Initiatives** at the University of Baltimore help local high school students get a head start on college through College Readiness and Dual Enrollment programs. By earning college credit before you graduate from high school, students participate in college-level:
 - critical thinking and analysis.
 - self-determination.
 - independent thinking; and
 - collaborative work habits.
- The University of Baltimore's **Bob Parsons Scholarship Fund** provides financial support to military/veteran students toward allowing them to access to in-demand and career-focused academic programs.

University of Maryland, Baltimore (UMB) has a variety of programs to support workforce development in Maryland, with selected examples including:

- **Workforce Wednesday** resources are available through UMB's Community Engagement Center virtually five days a week. Job seekers can receive one-on-one guidance about job resources in the area, résumé writing, and applications. Consultations are available with the CEC's workforce development team, which includes a Southwest Works representative and volunteers from UMB's Human Resources office.

- The **University of Maryland Partnership with West Baltimore** brings together UMB and the University of Maryland Medical Center, the two largest anchor institutions on the Westside of Baltimore, to work in partnership with neighboring residents to build and support a healthy, empowered, socially cohesive, and revitalized community. Economic and Community Development initiatives provide access to employment opportunities, with a goal of building a pipeline of qualified applicants by leveraging strategic partnerships, removing barriers, and providing advancement opportunities. Westside resident's quality for the Southwest Partnership Anchor Institution Community Referral program, which positions qualified candidates who apply for jobs at UMB, UMMC, and the University Physicians, Inc., to get an interview.

- The **UMB CURE Scholars Program** is a groundbreaking program that prepares sixth-to 12th-grade students in Baltimore for competitive, lucrative, and rewarding research and health care careers at UMB and other health institutions in the region. The National Cancer Institute's (NCI) Continuing Umbrella of Research Experiences (CURE) program was established by the NCI's Center to Reduce Cancer Health Disparities (CRCHD) in 1999 to help support under-represented students in biomedical research and career development. CURE utilizes a pipeline approach and provides career navigation, workforce training, and mentorship to diverse scholars at all stages of academic and career development. The CURE program is driven by a mission to build a diverse biomedical workforce, which is critical to addressing the health needs of all Americans and eliminating cancer health disparities in the nation.

University of Maryland, Baltimore County (UMBC) workforce development related training programs include:

- A prominent NSF Federal CyberCorps/SFS contributor and partner since 2012, Cyber Security is a strategic priority for UMBC. Through UMBC's **Center for Cyber Security** (UCYBR), UMBC is one of the few universities in the nation designated both a Center of Excellence in Cyber Defense (CAE-CD) and a Cyber Research (CAE-R) by the National Security Agency.
- The **UMBC Career Center** serves all UMBC students

and alumni and hosts innovative programs to connect employers of all sizes with UMBC's diverse, talented community. UMBC students actively pursue applied learning opportunities, and these internships and research experiences have a huge impact. Fully half of UMBC undergraduates entering the workforce reported having interned or worked for their employer as a student. Thousands of students and alumni connect with the Career Center each year. In the most recent survey of new UMBC grads, 90% percent reported that they were employed and/or are pursuing graduate studies upon graduation and 75% of employed UMBC graduates are working in Maryland. In addition, 85% of undergraduates and more than 90% of graduate degree recipients are employed in positions directly related to their career goals.

- **UMBC Training Centers** delivers high quality applied education and training services to individuals, government agencies, non-profit organizations, and businesses. Training Centers extends the academic excellence of UMBC to working professionals and organizations through the delivery of technical, scientific, and professional non-degree training programs. Specifically, the Centers deliver programs to improve the performance of organizations through the delivery of professional development training for their workforce and address critical talent gaps in the region through accelerated programs for career starters and career changers in cybersecurity, software development, project management, and leadership. The Training Centers delivers training to over 10,000 students annually and is a major provider of professional development training to the intelligence community, the Department of Defense, as well as federal civilian agencies and businesses.
 - **Cyber training for military and veterans:** The U.S. Army recently selected UMBC Training Centers as the sole recipient of an award to develop a novel cybersecurity curriculum for soldiers. The 70-week-long program will train soldiers for a new military role, as cyberspace capabilities developer technicians.
- **The Maryland Technology Internship Program (MTIP)** helps Maryland employers retain top talent by increasing the number of paid technical internships offered in the state. MTIP officially launched in August 2018 and offers financial assistance to technology-based businesses, as well as state and local agencies, to hire more interns. MTIP industries represented include IT and Software Solutions; Biohealth and Life Sciences; Cyber Security; Digital Marketing; Engineering; Finance; and Manufacturing and Logistics. MTIP has funded a total of 540 internships in Maryland and has already resulted in nearly a 2-1 return on the states investment through industry contributions.

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At the University of Maryland, College Park, the [University Career Center](#) provides resources specializing in recruitment through large-scale and niche career fairs; preparation through online career courses; career exposure through programs such as Intern for a Day; experience through the Transform Maryland Summer Internship Program; and support through scholarships such as the Bright Futures and Eisen Family Scholarship. Additional workforce development opportunities are available across campus. Examples include: the [Maryland Transportation Institute](#), which provides Workforce Development programs including the [Road Scholar Program](#) and the [Freight Academy](#). The Smith School aids workforce development through the [Dingman Center for Entrepreneurship](#), [Office of Executive Education](#) and [Executive MBA program](#).

The University of Maryland Eastern Shore's Aviation Science program has been developing workforce leaders in the aviation and aerospace industries for more than 30 years. The program educates professionals who lead in all areas of aviation management, including safety, maintenance, operations, air traffic control, and government oversight. The program also trains professional pilots who complete flight training and earn commercial pilot and flight instructor certifications while completing the Bachelor of Science degree program on the Eastern Shore campus.

University of Maryland Center for Environmental Science's Institute of Marine and Environmental Technology has hosted a **summer internship program** focused on creating a more diverse science workforce. Through hands-on research projects and group activities focused on science communication and professional skill development, interns are well prepared for graduate

studies and STEM careers. This program has over 200 alumni from backgrounds that are underrepresented in the sciences, many of whom have gone on to earn an M.S. or Ph.D. and gone on pursue careers in science and become leaders in academia, government, and industry.

University of Maryland Global Campus's Corporate **Learning Solutions** program assists employer training

efforts by providing workforce development curriculum and career-focused education, to improve employee productivity, retain crucial employees, and increase organizational value and reputation. The program offers access to more than 90 UMGC degrees, specializations, and certificates as well as custom education and training.

THE RESEARCH AND DEVELOPMENT, TECHNOLOGY COMMERCIALIZATION, BUSINESS AND ECONOMIC DEVELOPMENT IMPACT OF THE UNIVERSITY SYSTEM OF MARYLAND

The state of Maryland recognizes the important role of new technology development and commercialization to the performance of the State's economy. The Maryland Economic Development Commission identifies the need to foster advancing innovation and entrepreneurship as one of the six core goals and strategies for economic prosperity. Home to major academic, business and federal research activities, Maryland is a national leader in research and development and new technology generation and commercialization. Maryland's competitive position in technology generation and commercialization is evident in the following rankings:

- Maryland ranks fourth in the Milken Institute's biennial State Technology and Science Index for 2020. According to study results, Maryland received top ten rankings in all of the five index components, including first in the technology and science workforce category, second in human capital investment and research and development inputs, and tenth in technology concentration and dynamism:¹⁰
- Maryland ranks fourth in the 2020 State New Economy Index, a measure of a state's economy as knowledge-based, globalized, entrepreneurial, information technology-driven and innovation-based;⁹ and
- According to the National Science Foundation, Maryland is ranked 7th in total research and development

(R&D) performance, 5th in academic R&D performance; 1st in federal R&D obligations.¹¹

The USM plays a critical role in supporting Maryland's strongly competitive position in R&D performance and new technology development and commercialization. The importance of research and commercialization is acknowledged in USM's mission statement and strategic plan, with **Research to Jobs - Expanding Maryland's Leadership in Research, Innovation, and Economic Competitiveness** as one of the six core themes of USM's strategic plan. In 2016, USM created its Office of Economic Development 2016 to promote technology commercialization, workforce development, entrepreneurship and partnerships among USM institutions and private and public sector organizations toward the goal of economic development.

In addition to its core role in providing a skilled and educated workforce with a strong focus on critical STEM fields of study, USM pays a critical role in supporting economic development through its research and development and technology commercialization activities. In addition, nearly all USM's twelve member institutions are engaged in programmatic activities to work with and support local businesses and many operate business incubators, research parks or innovation districts.

¹⁰ Business in Maryland | Rankings & Statistics | Maryland Department of Commerce.

¹¹ <https://www.nsf.gov/statistics/states/interactive/show.cfm?stateID=53&year=0>.

USM's Role in Maryland Research and Development

With more than \$1.2 billion in academic R&D expenditures in FY2019, USM plays a central part supporting Maryland's position as a leading academic research center. Since 2014, USM's research expenditures have increased by 22% with University of Maryland being the largest performer of academic R&D, accounting for 86% of the USM total in 2019 (Table 19). USM accounts for 27% of the total of \$4.6 billion of academic R&D performed in Maryland (Figure 17). USM accounts for 28%

of total Maryland academic R&D expenditures, 22% of federal academic R&D expenditures and 24% of business sponsored R&D expenditures (Table 20).

USM's Role in Technology Transfer and Commercialization

The Association of University Technology Managers (AUTM) tracks the research and technology transfer activities at major research universities. Data were available for the USM and for Johns Hopkins (both the university and the Applied Physics Lab) and USM provided

Table 19. Total Research and Development Expenditures by University System of Maryland Institutions, 2014-2019, (Millions of Dollars)

Campus	2014	2015	2016	2017	2018	2019
USM Total	\$1,041.6	\$1,051.8	\$1,085.3	\$1,128.1	\$1,171.6	\$1,267.8
UM College Park	\$485.1	\$505.7	\$539.4	\$548.9	\$540.7	\$1,096.6
UM, Baltimore	\$411.3	\$397.7	\$393.9	\$426.9	\$475.1	
UM Baltimore County	\$67.8	\$68.7	\$70.2	\$70.4	\$71.5	\$80.6
UM Center for Environmental Science	\$50.8	\$52.2	\$55.0	\$55.1	\$54.1	\$56.0
University of Baltimore	\$5.0	\$5.0	\$5.8	\$6.9	\$10.6	\$12.5
Salisbury University	\$7.9	\$8.0	\$8.5	\$7.7	\$9.1	\$9.4
UM Eastern Shore	\$9.0	\$9.7	\$8.3	\$7.4	\$4.9	\$7.1
Towson University	\$3.0	\$3.2	\$2.3	\$2.8	\$3.2	\$3.4
Bowie State University	\$1.8	\$1.5	\$1.9	\$1.8	\$1.8	\$1.9
Frostburg State University	(*)	(*)	(*)	(*)	\$0.3	(*)
Coppin State University	(*)	\$0.2	\$0.2	\$0.2	\$0.2	\$0.2

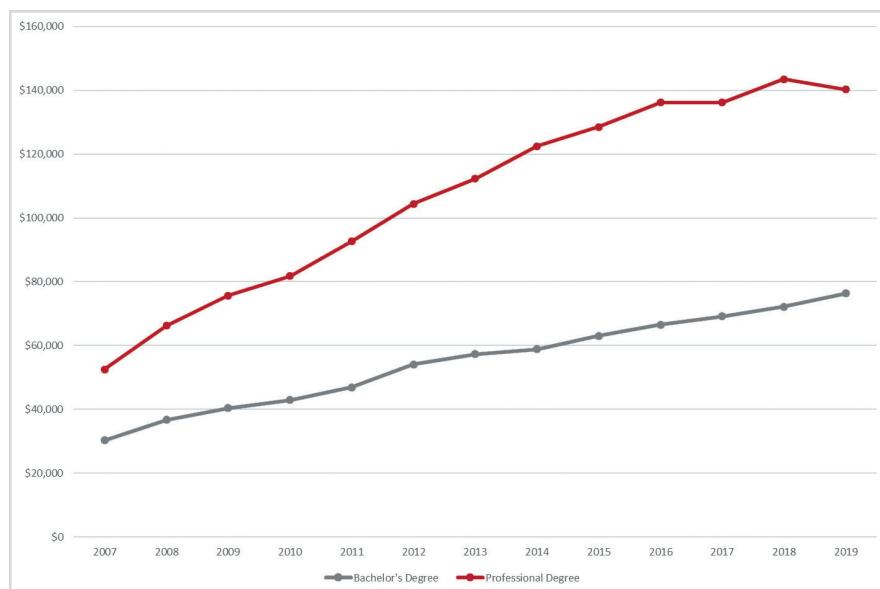


FIGURE 17 USM's and Total Maryland Academic R&D Expenditures, 2010-19

Table 20. Research Expenditures in 2019, by Type of Institution and Key Source, (Millions of Dollars)

Campus	Total Research Expenditures	% of Total	Federal Research Expenditures	% of Total	Business Research Expenditures	% of Total
Total Higher Education Research	\$4,631.4	100%	\$3,599.8	100%	\$139.1	100%
University System of Maryland	\$1,267.8	27%	\$794.0	22%	\$33.0	24%
Other Maryland Public Institutions ¹	\$13.6	0.3%	\$12.2	0.3%	\$0.3	0.2%
Johns Hopkins University	\$2,917.4	63%	\$2,482.1	69%	\$105.8	76%
Other Private Universities	\$1.6	0%	\$0.7	0%	--	--
Federal Institutions ²	\$430.9	9%	\$310.8	9%	--	--

1. Morgan State and St. Mary's

2. U.S. Naval Academy and Uniformed Services University of the Health Sciences

Source: NSF-HERD

detailed data for the three principal USM research institutions: the University of Maryland, Baltimore; the University of Maryland, Baltimore County; and the University of Maryland, College Park. As presented in Table 21, the USM is an important generator of technology that can be commercialized. After a technology is developed through research at a university, the first phase of the commercialization process is the filing of an invention disclosure. If a technology is then considered to have commercial potential, the university may seek to protect its intellectual property rights over the technology by filing for a patent. For a patent to be awarded, the technology must be judged to be novel, non-obvious, and useful. The number of invention disclosures, patent applications filed, and patents awarded can all serve as indicators of the number of commercialization-ready technologies being developed by universities in Maryland. In FY2019, the USM generated 331 invention disclosures (up from 224 in FY2011) and 198 new patent applications. When these metrics are normalized per \$10 million in R&D expenditures, USM generates more

commercialization activities than Johns Hopkins (Table 21) per \$10 million in research.

A principal economic development contribution of a research university is the commercialization of university technologies and discoveries. Once a new technology is developed in a university, it is often licensed to a private sector firm to then be developed into a product. Universities can offer companies either exclusive or non-exclusive rights to then develop those technologies. The Association of University Technology Managers collects information annually on the licensing activities of major research universities. The number of licenses and options executed, and the royalty payments received, can all serve as indicators of the levels of actual technology commercialization occurring at a university. As seen in Table 22, the universities within the USM executed 68 licenses and options and generated \$3.7 million in licensing royalties (up from \$1.3 million in licensing royalties in 2011). Since 2012, a total of 250 companies have been formed based on university licensed technologies.

Table 21. Selected Technology Commercialization Metrics - Invention Disclosures and Patent Applications, 2019

Institution	Invention Disclosures	% of Total	New Patent Applications Filed	% of Total	Per \$10 Mil. In Research	
					Invention Disclosures	New Patent Applications Filed
All Maryland Respondents	1,193	100%	562	100%		
University System of Maryland	331	28%	198	35%	2.72	1.63
Johns Hopkins University	443	37%	282	50%	2.35	1.50
Johns Hopkins University APL	419	35%	82	15%	2.47	0.48

Source: AUTM

Table 22. Selected Technology Commercialization Metrics - Licenses Executed and License Income, 2019

Institution	Licenses & Options Executed	% of Total	License Income	% of Total	Per \$10 Mil. In Research	
					Licenses & Options Executed	License Income
All Maryland Respondents	199	100%	\$77,700,803	100%		
University System of Maryland	68	34%	\$3,717,530	5%	0.56	\$30,571
Johns Hopkins University	94	47%	\$73,494,269	95%	0.50	\$389,680
Johns Hopkins University APL	37	19%	\$489,004	1%	0.22	\$2,887

Source: AUTM

Of these, 119 companies, 48% of the total were started out of USM institutions (Table 23).

Assistance and Support for Businesses

The USM Office of Economic Development promotes technology commercialization, workforce development, entrepreneurship and partnerships among USM institutions and private and public sector organizations toward the goal of economic development. In 2016, USM created the **\$10M USM Maryland Momentum Fund (MMF)**, which is managed via partnership among the USM Office of Economic Development and USM institutions, to invest in USM-affiliated startup companies. The Fund supports entrepreneurship, catalyzes outside investment in early-stage startups, and fosters economic development and technology commercialization. A pre-seed to late-seed stage investment fund, the Maryland Momentum Fund helps promising early-stage companies bridge from grant funding and angel investment to a Series A round of investment. Through fiscal year 2021, MMF invested \$9.6M in 26 companies, leveraging about \$6.87 from co-investors for every \$1 invested by USM. Through 2021, 165 jobs have been created by MMF portfolio companies.

In addition to USM's vital overall system-level role in supporting Maryland's leading national position in

academic research and technology commercialization described above, every USM campus is engaged in supporting state or local economic development through specific formal programs as well as faculty, staff and student engagement with local businesses. Each of the USM's 12 member institutions are engaged in supporting business and economic development through efforts such as: business incubators and accelerators; university research parks; business technical assistance programs; entrepreneurship programs; and faculty/student work with local businesses.

Some highlights of USM programs that provide business, consulting, commercialization, and other technical assistance to support economic development are as follows. Additionally, the USM and its institutions are proudly part of the state-wide Maryland Entrepreneur Hub (<https://marylandentrepreneurhub.com/>), which enables innovators, startup founders, and small business owners to find and connect with the right resources for their business, including investors, universities, mentoring programs, networking groups, training programs, and more.

The Bowie Business Innovation Center (Bowie BIC), located at Bowie State University, provides training, support, and networking opportunities for entrepreneurs. In

Table 23. Start-up Companies Formed by Core USM and Johns Hopkins, 2012-19

Campus	2012	2013	2014	2015	2016	2017	2018	2019
All Maryland Respondents	16	26	27	28	52	37	26	38
University System of Maryland	7	14	8	12	26	16	17	19
Johns Hopkins University	8	8	13	16	22	18	8	18
Johns Hopkins University APL	1	4	6	0	4	3	1	1

Source: AUTM

recognition of its 8(a) Accelerator Program, Bowie BIC won the 2020 Innovative Entrepreneurship Center of the Year Award from the International Business Innovation Association (InBIA). This award recognizes Bowie BIC's fast track program that helps women, minority and veteran-owned businesses secure government contracts. A cornerstone of the program is mentoring from other successful CEOs, and in its first year, the program assisted 32 8(a) companies and generated \$12 million in new government contract revenues. Bowie State University (BSU) is in the process of developing a commercialization roadmap, with an emphasis on intellectual property generated from BSU's research and entrepreneurship initiatives and academic courses, including student capstone projects, while determining opportunities for commercialization.

Coppin State University offers a variety of programs to assist with local economic development, including the following:

- The university's **Center for Strategic Entrepreneurship** (CSE), is designed to positively impact business and the entrepreneurial startup ecosystem in West Baltimore. The Center for Strategic Entrepreneurship focuses on entrepreneurship programming that leverages its location and community-centric approach, its focus on the intersection of entrepreneurship and advanced manufacturing, its attention to the relational dynamics of socio-economic inclusion, and its transdisciplinary approaches to scientific inquiry. The **Economic Inclusion Conference @ Coppin** is the CSE's signature event held digitally in April 2021, convenes of public, private, academic, and community stakeholders.
- The University (CSU) also has been awarded two MIPS grants this past year. The first MIPS was with Juxtaporia and Dr. Joan Tilghman, chairperson of the Doctor of Nursing Practice (DNP) department in the College of Health Professions. In the College of Arts and Sciences and Education, Natural Sciences department, a MIPS was awarded with DiPole Materials, Inc. and Dr. Jamal Uddin, Founding Director of the Center for Nanotechnology at CSU. These are the first two MIPS awarded to Coppin State University.

Frostburg State University offers a variety of programs to assist with local economic development, including the following:

- The **FSU Center for Regional Engagement and Economic Development** (CREED) provides consulting, outreach and technical assistance to business, nonprofit and government organizations to support economic development in Western Maryland.
- Frostburg State University led an effort to bring together economic development, tourism and business leaders to work in close cooperation, collaboration and partnership to improve the economic future of the region it serves. Consisting of professionals in each of these three areas of focus (economic development, tourism and business), the **I-68 Alliance** was created with the premise that, even across municipal, county and state boundaries, much more can be accomplished working together than separately.
- The **Western Region of the Maryland Small Business Development Center** (SBDC) is hosted at Frostburg State University and is part of the statewide SBDC Network headquartered at the University of Maryland, College Park. The SBDC helps establish and expand small businesses across western Maryland with professional training and no-cost confidential business consulting services. Offices of the western Maryland SBDC are co-located with partner organizations in Garrett, Allegany and Washington Counties. Over the past five years (FY 16 – 20), the regional centers assisted an average of 358 clients per year and delivered training to an average of 2,161 attendees, assisted clients in developing an average of \$8.3 Million in investment and loans, helped start an average of 21 businesses, and supported an average 1,584 jobs in the region. In addition, the SBDC has employed FSU students and helped students achieve paid internships for employers in the region.
- The **Western Maryland Advanced Technology Center** at FSU Innovation Park is an effort to educate and train workforce in several advanced technology industries – renewable energy, information technology, laboratory sciences and a new waste-to-value industry – while attracting and creating new companies in these sectors to locate at the center's facilities. Located adjacent to the main campus in a federal Opportunity

Zone, Innovation Park is a 60-acre tract owned by the university that is being developed specifically to expand economic opportunity in the region.

Salisbury University offers a variety of programs to assist with local economic development, including the following:

- **Salisbury University Perdue School of Business Innovation, Entrepreneurship, and Economic Development Hub** (The Hub), provides business startup assistance to SU's Student Entrepreneurship Competitions and the Ratcliffe Foundation Shore Hatchery, which award \$300,000 in cash, prizes, and services annually. In the 2020 Shore Hatchery Annual Report, 48 businesses reported creating 406 jobs, \$55,001,400 in estimated 2020 revenues, and 60% identified as female, minority, or veteran owned. Opening 2021, the Dave and Patsy Rommel Center for Entrepreneurship (Rommel Center) is a 6,000 square feet facility, located in downtown Salisbury, focusing on community entrepreneurs and provides support, resources, and mentoring to resident and community entrepreneurs, while assisting in the revitalization of downtown Salisbury.
- **Business Economic and Community Outreach Network (BEACON)** – For over 30 years, the Business, Economic, and Community Outreach Network (BEACON) at SU's Franklin P. Perdue School of Business has offered applied business and economic research services to private, public, and nonprofit sector organizations. Since 2017, BEACON teams have undertaken over 100 economic and enterprise development projects, including over 25 economic impact estimation and feasibility studies, and hosted meetings and conferences for over 4,000 participants. BEACON studies have helped create or retain over 3,000 jobs, benefiting over 100 employers on the Eastern Shore of Maryland, while providing Perdue School students a wide variety of experiential learning opportunities.
- The **Eastern Region of the Maryland Small Business Development Center** (SBDC), part of the statewide SBDC Network headquartered at University of Maryland, College Park, helps establish and expand small businesses across the Eastern Shore with professional training and no-cost confidential business consulting services. Over the past five years (FY 16 – 20), the

region assisted an average of 265 clients per year and delivered training to an average of 669 attendees. Each year the center assisted clients in developing an average of \$11.9 Million in investment and loans, start an average of 22 businesses, and supported an average 1,763 jobs in the region. The center also annually leads an average of 9 student consulting projects for local firms, giving an average of 45 Salisbury University students per year experiential learning opportunities.

Towson University is a community hub for entrepreneurship, where innovative ideas, people and businesses are sparked, developed and nurtured. In addition to entrepreneurship specific academic offerings, TU is home to multiple programs that promote business and economic development, including:

- The **StarTUp at the Armory**—TU's new state-of-the-art, entrepreneurship space in downtown Towson—serves as TU's front door for start-ups, small businesses, and our region's largest corporations. When it opens in summer 2021, this public-facing space will catalyze entrepreneurs and executives and connect them to each other and to TU's programs and people.
- The **StarTUp Accelerator** is an intensive eight-week, cohort-based fellowship where start-up founders take residency and work in a collaborative space to accelerate their ventures. Selected fellows receive a \$10,000 equity-free stipend as well as mentorship, founder-centric programming and exposure to successful ventures.
- **ATHENAPowerLink® Baltimore** is a year-long mentorship program headquartered at Towson University designed to assist women entrepreneurs with their business. Participants receive guidance, support, and advice from a personalized panel of business experts who offer direction and perspective.
- The **Student Launch Pad** is a dedicated space in Cook Library where student entrepreneurs can develop entrepreneurial ideas with help from fellow students and mentors and be connected to resources and advice.
- Founded in 2007, **TU Incubator** supported over 110 companies and produced more than \$150 million in economic impact. Towson University sunset TU Incubator in 2021.

For 15 years, University of Baltimore's **Center for Entrepreneurship and Innovation** has been encouraging and supporting entrepreneurial learning among UBalt students, faculty and alumni. Their ongoing goal is to help students and others launch and grow business ventures while providing opportunities to educate, engage, and collaborate with the Baltimore business community. They offer workshops and seminars and several business pitch competitions throughout the year, and all are available to all UBalt students and alumni, as well as community members and faculty and students from other universities. They manage a vast **Entrepreneur-in-Residence** program, and notable alumni and individuals from partner organizations donate their time to provide mentorship and advice. The University of Baltimore also supports student entrepreneurs via the Entrepreneurship Fellows Program. It provides scholarships, intensive instruction, apprenticeships, and practical experience gained by working side-by-side with expert entrepreneurs and faculty to develop their business, which students are expected to launch before or on graduation. More than three dozen students have completed fellowships, supported by the **Philip E. and Carole R. Ratcliffe Foundation**, since the program began in 2015.

University of Maryland Baltimore, County (UMBC) is a major research enterprise, with FY2020 research expenditures of \$90.5 million and the following FY2020 commercialization activities: 38 invention disclosures; 15 patent applications; 10 patents issued; 4 research licenses and options executed; \$1.3 million in license revenue; and 4 start-up companies formed. UMBC is engaged in multiple aspects of supporting economic development through research, technology commercialization, as well as running an incubator and research park. Key examples of how UMBC supports economic development based on its discoveries and programmatic, faculty and staff assets are as follows:

- The **UMBC Office of Technology Development (OTD)** assists the UMBC community in all phases of intellectual property protection and commercialization, including evaluating disclosed inventions for patentability and market potential; filing patent applications, copyright, and trademark registrations; reviewing and

negotiating material transfer agreements and non-disclosure agreements related to UMBC technologies; negotiating technology licenses; and assisting entrepreneurial faculty in new company formation. OTD works very closely with other UMBC groups supporting entrepreneurial activity, such as bwtech@UMBC.

- The **UMBC Technology Catalyst Fund (TCF)** is an internal funding initiative that provides grants of up to \$25,000 to advance innovations originating from UMBC research to more commercially viable technologies. Since December 2014, UMBC has made 53 awards through this fund, investing a total of \$866K. Recipients have started 3 companies and secured over \$3.2M in external funding as a result of the TCF program.
- The CENTRE funding is an initiative of the **Alex. Brown Center for Entrepreneurship at UMBC** and provides funds for research that leads to potential commercialization of a product or service. Any UMBC faculty conducting research in either technical fields (technical entrepreneurship) or social/humanities fields (social entrepreneurship) is encouraged to apply for funding. Interdisciplinary collaborations (for example, from humanities and technology) with faculty from different UMBC departments are strongly encouraged. Faculty who receive funds through this initiative are encouraged to file for a patent, expected to publish their research results, and be involved in commercializing the research outcomes.
- **bwtech @UMBC Research and Technology Park** (UMBC's Business Park and Incubator) The mission of bwtech@UMBC is to support the economic development efforts of the University of Maryland, Baltimore County and the greater Baltimore County community by building upon the university's research and leveraging its relationships in the region. bwtech supports early-stage company formation, the development of growth stage companies and provides resources and services to companies thereby fostering relationships and roots to keep companies at bwtech or in the region. In 2018, bwtech@UMBC supported more than 3,100 jobs, over \$200 million in labor income, and nearly \$470 million in local economic activity. Those figures are up 78%, 98%, and 116%, respectively, since our initial economic assessment of bwtech@UMBC in 2006. Employment on the two bwtech@UMBC

campuses included approximately 172 UMBC interns at the end of FY 2020.

The **University of Maryland Eastern Shore's Center For Agribusiness and Economic Development** conducts economic development research; facilitates communication and the exchange of ideas across business, academic, and governmental communities domestically and internationally; and educates stakeholders concerning agribusiness and economic development issues through community engagement and outreach.

The University of Maryland Center for Environmental Science supports business through the Institute of Marine and Environmental Technology (IMET):

- **Harbor Launch at IMET** is a University System of Maryland Business Incubator and home to numerous life science and environmental science companies in Baltimore's Inner Harbor. The business incubator is co-located with the Institute of Marine and Environmental Technology (IMET), a joint research institute of the University of Maryland, governed by UMB, UMBC, and UMCES. IMET scientists are engaged in cutting-edge research in microbiology, molecular biology and biotechnology, using marine organisms to develop new drug therapies, alternative energy and innovations to improve public health. Harbor Launch at IMET companies enjoy access to wet lab space and Core analytical facilities at the Institute. Since it opened in 2016, Harbor Launch at IMET has been home to more than 25 early-stage companies. Through **Entrepreneur Office Hours**, a monthly event featuring one-on-one conversations between expert mentors and students, professors, entrepreneurs, and aspiring business owners. From 2016 to 2020, when the program was sunset, it served over 400 entrepreneurs.
- IMET's **Ratcliffe Environmental Entrepreneur Fellow** (REEF) Program enables environmental science graduate students to apply their research to real-world problems. Through workshops with local entrepreneurs, lessons on important topics such as intellectual property and customer discovery, and a final pitch competition, students cultivate leadership and business skills to transition technologies from the lab or field into commercial markets. So far, the REEF

program has trained 40 students and post docs in entrepreneurship and innovation development, with a number of them starting their own ventures.

UMGC supports Maryland economic development efforts through a variety of programs including: serving as a corporate sponsor for the Capital Region Minority Supplier Diversity Council (CRMSDC) and serving as the educational partner of Maryland Cybersecurity Council, providing financial and staff support for meetings and events since its inception in 2015.

UM Ventures joins the research and commercialization efforts of Maryland's two largest flagship research universities – the University of Maryland, Baltimore (UMB) and the University of Maryland, College Park (UMCP). In FY20, UMB and UMCP's combined research awards totaled more than \$1.2 billion. The joint research enterprise was ranked eighth among public institutions in the National Science Foundation's FY19 Higher Education Research and Development survey.

The two institutions are driving economic impact by engaging industry partners and advancing technology ventures. In FY20, UM Ventures received 333 invention disclosures, executed 48 license agreements, assisted with the start-up of 13 new companies, and generated \$4.25 million in revenue. Additionally, several competition and funding opportunities have been created around specific topics, such as artificial intelligence, medical devices, and COVID 19 technologies, to support collaborative research with commercialization potential. UM Ventures operates a number of programs including:

- The **Center for Maryland Advanced Ventures (CMAV)** combines the entrepreneurial resources and offices at UMB and UMCP to commercialize university inventions and launch successful university startups.
- The **Baltimore Fund** is an economic development initiative that supports Maryland Public Higher Education Institution (PHEI) -created or -sponsored technology companies and entities locating and creating jobs in Baltimore City. The Baltimore Fund provides 50% rent subsidies for new startups affiliated with a city innovation center and/or a one-time conditional grant, loan, or investment for startups and established

employers opening a new facility or expanding an existing facility in Baltimore City.

- The **Robert E. Fischell Institute for Biomedical Devices** supports the BioEngineering (BioE) capstone program at UMB. Approximately 60 UMCP BioE undergrads are doing their capstone projects at UMB. Teams of three or four students are working with UMB clinicians to develop new medical devices. It also supports an Engineering MS program for students who are starting their own company or working for a UMB/UMCP medical device start-up. Additionally, a medical device prototyping lab was established at the University of Maryland School of Medicine in conjunction with the UM Ventures team at UMB.
- **Business Fundamentals for Scientists** workshop series brings together experts, advisors, mentors and service providers to share insights on various topics related to starting and growing a business. Done primarily as webinars, these workshops are open to anyone.
- UM Ventures also supports the management of the **USM Maryland Momentum Fund** and sometimes co-invests alongside USM.

University of Maryland, Baltimore (UMB) is dedicated to commercializing life science technologies and supporting innovation in Baltimore City. A strategic portfolio of initiatives advances this mission. Select highlights are:

- The **University of Maryland (UM) BioPark**, a 14-acre research park Oadjaent to the UMB campus, will boast nearly 2 million square feet of lab and office space over 12 buildings, plus garage parking and landscaped parks, at full build-out. The BioPark is currently home to more than three dozen tenants employing over 1,000 workers. To accommodate growing demand, the BioPark is planning significant expansion over the next several years.
- UMB's robust technology transfer and commercialization program, known as UM Ventures (detailed above), is driving innovation. The **UM Ventures program at UMB** invests in the most promising technologies developed by the University's researchers. Over the last six years, 15 investments have been made in 10 UMB startup companies. Four of those companies have been acquired by leading life science firms. Three others have had successful follow-on rounds, two have

received FDA approval for their medical devices, and another received a \$2 million SBIR Direct to Phase II award earlier this year. Investment returns have been used to further support UMB startups, establishing dedicated startup lab space in the BioPark and launching an on-campus medical device prototyping space in conjunction with the University of Maryland School of Medicine and the Robert E. Fischell Institute for Biomedical Devices.

- The UM Ventures program at UMB established the **Life Science Intellectual Property (LSIP) Fund** in 2018. The LSIP Fund, which is managed by the New Ventures Initiatives team, has provided project management and direct financial support to 21 promising UMB technologies. These projects have led to 10 commercial licenses and/or options, six new grants, six financings, three startups, and two clinical trials. Each LSIP Fund dollar invested has generated 14x in catalyst funding through subsequent third-party grants and investments.
- **The Grid**, an innovation space located in UMB's Health Sciences and Human Services Library (HS/HSL), provides education and programming, helping students, entrepreneurs, faculty, and staff connect to bring innovative health and social impact ideas to life.

The University of Maryland, College Park hosts over 60 programs across their ecosystem to service student, faculty, and alumni innovators and community businesses. A guide to these resources can be easily accessed through their [Innovation Gateway](#) at www.innovate.umd.edu. Specific notable programs and resources include:

- The **Discovery District**, Maryland's largest research park, encompassing two million square feet, over 150 acres, and employs an estimated 6,500 people.
- The **Quantum Startup Foundry (QSF)** provides resources and support for quantum startups including SBIR/STTR support as well as connecting companies with customers, partners and investors.
- The **Terp Entrepreneur Network** brings together UMD alumni entrepreneurs, or enTERPreneurs, to help them connect and grow their businesses through regional events, social media promotion of #TerpBusiness and an annual conference. Since 2018, they have reached over 1,000 people and helped support 250

alumni-owned businesses.

- Since its founding 35 years ago, the **Dingman Center for Entrepreneurship** has touched thousands of aspiring entrepreneurs through its programs and courses. In just the last five years, the Center has helped launch more than 500 student startups; engaged 400 mentors; and distributed more than \$700,000 in non-dilutive seed funding to student entrepreneurs. Furthermore, the Center launched one of the first-ever university-sponsored angel investment groups in 2010 with a mission to provide seed capital to regional startups. Since launching, the Dingman Center Angels has invested more than \$17 million in over 115 transactions.
- The University of Maryland, College Park's **Maryland Technology Enterprise Institute (Mtech)** is an initiative of the A. James Clark School of Engineering. Mtech is a national leader in entrepreneurship and innovation education and venture creation and is a pioneer in building successful university-company partnerships. Mtech offers a variety of other programs to support entrepreneurship and technology commercialization, including: the UMD I-Corps, a National Science Foundation program designed to foster, grow and nurture innovation ecosystems regionally and nationally; a Minor in Technology Entrepreneurship; The Rapid Prototyping Center which provides access to machines, electronics prototyping equipment, several high-powered desktop workstations for CAD, and high-accuracy measurement equipment; and several other educational and seed funding programs. Mtech also operates the following:
 - The **Maryland Industrial Partnerships (MIPS)** program provides funding, matched by participating companies, for university-based research projects that help the companies develop new products. The program is administered at the flagship campus at

the University of Maryland, College Park, and works throughout the 12-member institutions of the USM, plus Morgan State University and St. Mary's College. In the 32 years since the program started, 444 faculty researchers have worked with more than 600 Maryland companies to help develop new products. MIPS-supported products have enabled Maryland companies to directly create more than 7,150 new, high-paying, long-term, high-tech jobs throughout the state;

- **Mtech Ventures** is a University of Maryland incubator for technology-based innovations commercialized at the university. The Mtech Ventures facility offers 10,873 of affordable space, 10 laboratory facilities, and hands-on mentoring for early stage companies. The Incubator has 19 tenants with more than 76 employees; and

The **Maryland Small Business Development Center (SBDC)** is a public-private partnership between the U.S. Small Business Administration, the state of Maryland and the University of Maryland, College Park. As part of the entrepreneurial ecosystem, the SBDC links private enterprise, government, higher education and local economic development organizations to provide high-quality training, confidential consulting and market and industry research to Maryland's small businesses. The Maryland network hosts entrepreneurial assistance programs at several USM institutions. Additionally, the network also manages the Maryland Procurement Technical Assistance Program (PTAP) which aids entities seeking to participate in local, state, and federal procurement programs. In FY2020, the SBDC network supported over 53,000 Maryland jobs, provided direct assistance to more than 9,000 businesses, helped entrepreneurs start 270 business ventures statewide, and helped small businesses secure \$148 million in investments and loans.

PUBLIC SERVICE, EDUCATIONAL, CULTURAL, AND COMMUNITY CONTRIBUTIONS

Beyond the primary role that the USM plays in creating a skilled and educated workforce, the USM's member colleges and universities are active in improving the quality of life for residents, community groups, and a variety of others within the State. Each year USM students, staff, and faculty contribute millions of hours of service to the community through cultural programs, legal and medical clinics, partnerships with public schools and the business community, and other initiatives. Furthermore, each of the USM's member institutions operate a number of programs, centers, and organizations that are focused on assisting local government; assisting primary and secondary education; hosting and providing cultural, educational, sporting, and public and community health events and programs; and providing community and volunteer service. This community outreach is consistent with the USM's mission **to improve the quality of life for the people of Maryland by providing a comprehensive range of high quality, accessible, and affordable educational opportunities; engaging in research and scholarship that expand the boundaries of current knowledge; and providing knowledge-based programs and services that are responsive to the needs of the citizens of the state and the nation.** A selection of selected community programs offered by the USM member institutions that were identified by each in the campus survey conducted are presented below.

Bowie State University's Peer Recovery Workforce Training Project has added 250 nationally certified substance abuse counselors in communities throughout Maryland, Washington, DC and northern Virginia where the opioid crisis has significantly impacted African American males and other vulnerable populations. Using the Jordon Peer Recovery curriculum, BSU has trained over 200 peer

recovery professionals and over 50 peer recovery supervisors who are able to provide evidenced based practices and recovery supports in their communities. The peer recovery model, considered a best practice by the Substance Abuse and Mental Health Services Administration (SAMHSA), encourages counselors to use their personal or indirect experience with the recovery process to help others in similar situations.

Coppin State University's Voluntary Income Tax Assistance (VITA) continues to offer free tax help to people who generally make \$54,000 or less, persons with disabilities, the elderly and limited English-speaking taxpayers who need assistance in preparing their own tax returns. IRS-certified volunteers provide free basic income tax return preparation with electronic filing to qualified individuals. A signature program within the College of Business's Consumer Education Programs, VITA Center, has been in operation for 10 years and will expand its community reach by adding consumer finance literacy and wealth building foci designed to help community members develop their financial IQ and develop long term budget, income, and investment strategies. In 2018, the VITA Center assisted with \$774,963.00 in federal refunds and \$268,808 in state refunds for an estimated economic impact of \$12,228,271.

Frostburg State University is a critical and indispensable part of the community it serves in Western Maryland and the surrounding region, including parts of West Virginia and Pennsylvania. While there are many ways the university engages with and convenes its neighbors to make a positive difference to our shared community - from providing access to the arts, entertainment, and sporting events, to enriching the life, education

and experiences of children and adults alike through reading, literature, and science programs. Two new ways FSU is fulfilling its mission in this space are the announced plans to create a regional science center on Main Street in Frostburg. The science center, which will house a **Challenger Center** and other components, will be geared to provide STEM learning and enrichment to K-12 students in the tri-state region and beyond using hands-on and simulation-based learning.

Salisbury University organizes many of its formal community service efforts through its Institute for **Public Affairs and Civic Engagement** (PACE), a resource center where the SU community, local government, non-profit and public groups can access knowledge and information. PACE also hosts standalone programs enhancing the reciprocal relationship between the University and our communities. SU has received the Carnegie Foundation for the Advancement of Teaching's prestigious Community Engagement Classification, recognizing the University's commitment to community-engaged learning. Salisbury is one of only 359 campuses nationwide to hold this distinction. One program example includes ShoreCorps, an AmeriCorps State Program, working under the oversight of the Governor's Office on Service and Volunteerism (GOSV) in Maryland. This program has leveraged national service positions to provide an estimated \$2,197,580 in economic benefit to more than a dozen partner sites across the 9 counties of Maryland's Eastern Shore.

Towson University has a variety of formalized programs to support faculty, staff, and student community engagement initiatives. Through **BTU - Partnerships at Work for Greater Baltimore**, Towson University invests funds, resources, and overall support to sustain, scale, align, and institutionalize leading community engagement partnerships and projects. These "BTU Investments" have been selected based on their current establishment and relationship with partners, opportunity for growth, identification of milestones and assessment plan, and overall impact. As of May, 2020, Towson University's BTU program has tracked 410 engagements with 603 partners, which organized as follows (please note, many engagements address multiple impact areas):

- High-Quality & Equitable Education – 208
- Strong Neighborhoods & Sustainable Communities – 182
- Lifelong Health & Well-Being – 86
- Vibrant Arts & Cultural Community - 59
- Thriving & Competitive Economy - 114

University of Baltimore offers a variety of programs to support university, faculty and student engagement with the Baltimore community it serves. Two examples of projects include:

- The **Community Development Fellowship Program**—housed in the Schaefer Center for Public Policy—gives dynamic, motivated students who have a strong interest in effecting positive change in urban areas the opportunity to strengthen their leadership skills and gain hands-on development experience. By matching students with organizations that directly support Baltimore neighborhoods, this grant-funded fellowship program aims to improve the city while cultivating the next generation of community development leaders.
- The **Baltimore Neighborhood Indicators Alliance** began in 2000 after a two-year planning process where several citywide nonprofit organizations, city government agencies, neighborhoods, and foundations were gathered together by the Association of Baltimore Area Grantmakers and the Annie E. Casey Foundation. BNIA-JFI provides neighborhood level data and analytics to support community development and engagement in Baltimore City.
- **UB School of Law Clinics** provides law students with real-life practical experience serving approximately 200 low-income clients every year, including adults, children, neighborhood associations and other non-profit organizations.

As Maryland's flagship public legal and health sciences university, University of Maryland, Baltimore (UMB) provides a variety of community health and legal services programs. Selected community engagement programs include:

- Offered as a public service, **Mini-Medical School** ("Mini-Med School") is a tuition-free lecture series provided by University of Maryland School of Medicine

faculty, during which the lay public learns about diseases and their prevention.

- **Promise Heights** is a collaborative of five public schools, 20 organizations, numerous city and state agencies, and our School of Social Work, which partners with families in Upton/Druide Heights to prepare children to be ready for kindergarten, to read at grade level, and to graduate from high school ready for college and career. Promise Heights also supports families to overcome barriers in housing, health care, and employment so that families have foundational needs addressed and can focus on fully supporting their children's education. Recently, the **B'More for Healthy Babies** program has received great press touting their dramatic and noteworthy reduction in infant mortality rates. After 10 years, the Upton/Druide Heights infant mortality rate has dropped by 75% to 3.8 deaths per 1,000 live births which is well below the city, state, and US rate.
- The **Clinical Law Program** provides legal services to individuals, families, and communities throughout Maryland.
- **Wellmobiles** provide primary health care to uninsured and underserved residents across Central Maryland while serving as interprofessional clinical education sites.
- The **International Brain Bee** is a neuroscience competition for high school students. Its purpose is to motivate young men and women to learn about the human brain and to inspire them to enter careers in the basic and clinical brain sciences.
- **A Bridge to Academic Excellence** is a university-wide student organization that requests student volunteers to tutor middle and high school students, typically on Saturday mornings
- The **PATIENTS** Program leverages innovative partnerships to ensure that patients, health care providers, and other partners are actively engaged in research.
- The **Live Near Your Work (LNYW)** Program is an initiative between UMB and key community partners that focuses on community revitalization and stabilization in targeted Southwest Baltimore neighborhoods. LNYW benefits UMB employees by offering homeownership down payment and closing cost assistance on newly purchased homes while also demonstrating commitment to the community.

- The **Chacon Center for Immigrant Justice** was recently established after the UM Francis King Carey School of law received a gift from biotech entrepreneurs Marco and Debbie Chacon. The center will establish a permanent immigration law center at the UMB Law school, ensuring that Maryland's immigrant community will always have a place to turn for high-quality legal representation. The Center will continue critical pro bono clinic representation in deportation cases while simultaneously broadening its reach by creating a new Federal Appellate Clinic, launching a citizenship initiative, and expanding legislative efforts to promote critical law reform advocacy.
- **BioPark Community Funds** have supported a wide variety of outreach efforts in the immediate Southwest Partnership Community over the last 15 years. At the request of the community, funds have been directed towards the community's youth and schools, at-risk families, creating a safer environment for our immediate neighbors, providing job training, and sponsoring community building projects and events.

University of Maryland, Baltimore County has become a national leader in outreach and impact on our local and regional community through its applied learning, community and civic engagement, and community-based programs. These efforts specifically focus on partnering with communities in under-resourced areas in the Baltimore region to address issues of racial and social inequities. Selected Programs that support community engagement include:

- The **Shattuck Family Internship Program for Entrepreneurship Innovation and Social Change** prepares UMBC students for the rigors and rewards of entrepreneurship and social innovation. This program places highly motivated students from diverse backgrounds in mentored internships to better prepare them to launch start-up or nonprofit ventures. Students get training and experience to empower them to become the next generation of entrepreneurs or nonprofit leaders. This program was launched by an endowment fund started from a generous individual gift.
- The **Choice Program** at UMBC is a community based, family-centered program that partners with youth and families to bring their educational goals to fruition. It

offers mentoring, intensive advocacy, education programming and workforce development.

- **Feeding Individuals to Support Health (FISH) –** The United Way of Central MD funds the Institute of Marine & Environmental Technology/Department of Marine Biotechnology FISH project, which provides 3,500 pounds of fresh, healthy fish as a protein source to Maryland Food Bank, Franciscan Center in Baltimore, and other populations in under-resourced communities. Feeding Individuals to Support Health (FISH) project – public-private partnership with McCormick and Co, the United Way, UMBC, IMET, UMCES and seafood wholesaler JJ McDonnell to provide healthy fish to underserved communities in Baltimore.
- UMBC established the **Center for Democracy and Civic Life** in 2018 to help people develop the knowledge, skills, and dispositions to create healthy communities and tackle challenges together. The Center's work builds from the premise that civic life encompasses everyday settings and relationships through which people can build the power to shape their world. Learning experiences created by the Center, including courses, experiential programs, and workshops, reach hundreds of students every year and position them to make significant, lasting contributions to their communities.
- **The Shriver Center**, UMBC's hub for community engagement, addresses critical social challenges by bridging campus and community through engaged scholarship and applied learning. It sponsors initiatives including Service-Learning & Community Engagement (SLCE), the Shriver Peaceworker Fellows Program, Public Service Scholars programs, and the Choice Program at UMBC. The Center closely collaborates with a variety of on- and off-campus partners through shared programs and projects, working groups, service-learning and community engagement student placements, and integration of community engagement in research and curricula.
- The Center's undergraduate- and graduate-level community engagement initiatives (SLCE, Shriver Peaceworker Fellows, and Public Service Scholars) have partnered with nonprofit, community-based organizations, schools, and government agencies in the Baltimore region for more than 30 years. In FY 2019, through SLCE, UMBC students contributed 27,270 hours to 64 nonprofit, community-based

organizations, and PreK-12 schools (with an average of 30 hours/semester/student). This resulted in nearly \$800,000 (\$28.65/hour in Maryland) of non-compensated work contributed to community partners. More than 50 Public Service Scholars committed more than 2,100 hours to Maryland state government agencies and to nonprofit organizations across the state, with a contribution to these partners valued at more than \$580,000 annually. Also in FY 2019, thirteen Peace-workers contributed more than 13,500 hours at a value of nearly \$300,000 to our regional community.

- UMBC was integral to the planning for and establishment of the first state-recognized Arts & Entertainment (A&E) District in Baltimore County. A&E Districts like this one in Catonsville help develop and promote community involvement, tourism, and revitalization through tax-related incentives that attract artists, arts organizations, and other creative enterprises to towns and cities across the state. Maryland became one of the first states to create an A&E Districts program in 2001. The Catonsville Arts & Entertainment District, established in 2020, encompasses the historic area along Frederick Road and extending down Mellor Avenue toward UMBC, and is the state's newest district. The project is being managed by the Baltimore County Arts Guild under contract from Baltimore County. Thomas Moore, director of arts and culture at UMBC, heads the district's advisory board.

University of Maryland, College Park offers a variety of community engagement programs. The university created its Office of Community Engagement in 2012 to foster connections between the University of Maryland and its surrounding neighbors. The office has contributed to the University of Maryland's public service mission by creating mutually beneficial education, business, government, and community partnerships. Selected UMCP community program examples include:

- **Arte Vivo!** – Through performance, inquiry and stepping on stage, The Clarice Smith Performing Arts Center creates performing arts-based activities for people of all ages to demystify the creative process and encourage curiosity. Arte Vivo!, a program developed in partnership with the Langley Park Community Center and the Latin American Youth Center (LAYC), engages

new immigrant families from Latin American countries in art programs that reach over 400 people of all ages each year. Activities include Family Art Days, field trips to performances, and both out-of-school and summer workshops taught by bilingual UMD students.

- **The University of Maryland Hearing and Speech Clinic at College Park** has provided affordable speech, language and hearing services to the community for almost 70 years. The clinic is operated by the Department of Hearing and Speech Sciences as both a training and research facility for Audiology and Speech-Language Pathology.
- **The University of Maryland Prevention Research Center** (UMD-PRC) partners with community organizations to develop projects focused on reducing substance use and sexual risks. UMD-PRC provides scientific expertise to transform community needs into research and service projects. UMD-PRC has received two recognitions from the Centers for Disease Control and Prevention's National Community Committee for being a national role model for community-based engagement and research. UMD-PRC continues to address health disparities and strive toward better health for Maryland residents and beyond.
- **Terps for Change** is a semester-long immersive community service-learning program pairing students with local nonprofits. Students gain real-life experience and professional development while connecting with fellow Terps.
- **The Terrapin Teachers (TT) Initiative** is an innovative program at the University of Maryland, based on the national UTeach model, designed to address the local and national shortage of highly skilled STEM K-12 teachers. TT was implemented in fall 2014 as a collaborative initiative of the Provost's Office, the College of Computer, Mathematical, and Natural Sciences, and the College of Education. TT offers science and math majors a career option they may not have considered and provides them with various pathways to teaching certification, including the opportunity to complete a double major in a STEM field and secondary education within four years. Since 2014, TT undergraduates have implemented more than 544 math and science lessons at local elementary, middle, and high schools. Over the past three years, TT has provided professional development for 150 math and science high school

teachers representing four local school districts.

The University of Maryland Eastern Shore is an integral component in the activity of the Town of Princess Anne. The Hawks Corner Center for Community Engagement is an office space in downtown Princess Anne that provides a space for community organizations to meet. It allows the university to increase the engagement with leaders from the town, county and other community partners. This location also serves as a hub for university led engagement activities like "StreetSweep" an event previously held in which students, faculty and staff are engaged in a day of cleanup projects that enhance and beautify various locations throughout the town.

- The university also holds leadership roles in two vital community partners. The Princess Anne Chamber of Commerce and Mainstreet Princess Anne. In both organizations UMES facilitates knowledge sharing and knowledge transfer by providing staff to engage both organizations in creating solutions to present day problems.
- The university has recently entered into a collaborative venture with Davis Strategic Development to occupy a renovated multiuse facility that will house the Hawks Corner as well as multiple apartments above that will be geared toward faculty, staff and graduate student housing. This partnership will be the first of many projects in development for both organizations.

University of Maryland Center for Environmental Science offers a variety of opportunities for the general public to explore the world of science and UMCES' role in it. The four campuses across the state open their doors to the public for free seminars hosted by visiting scholars and our UMCES experts, and a Visitors Center in Solomons welcomes guests to learn about the health of the Chesapeake Bay current research projects and more through videos and exhibits. And the oyster hatchery in Cambridge reveals how oysters are grown for Bay restoration and aquaculture. UMCES also produces the Chesapeake Bay Report Card, which has served since 2006 as the definitive source for ecosystem health status in the Bay and tidal tributaries. UMCES engages Marylanders in citizen science through the Dolphin Watch program. Since launching in June 2017, it has more than 7,000 users.

registered and reported over 3,500 dolphin sightings.

University of Maryland Global Campus – is supporting efforts to improve access to higher education in Prince George's County. Through the county's specialized **3D Scholars Program**, Prince George's County public high

school students can earn a bachelor's degree at University of Maryland Global Campus for a total cost of less than \$10,000.

METHODOLOGY

The USM impacts the state of Maryland in numerous ways. The system is a source of economic activity; it enhances the skills and education of its students; it is a source of educated and skilled workers for Maryland employers; it provides valuable services to new and expanding businesses; it generates new technologies through research and development; and it contributes to the quality of life in Maryland through its community service activities.

This report takes an in-depth look at the economic impact of the USM in three key areas:

1. The economic and fiscal impact of the system using a “human capital” approach.
2. The workforce development role of the system; and
3. The economic development impact of the system.

This report is an update of the 2012 The Economic Impact of the University System of Maryland: A Fiscal Perspective FY2011 report, which analyzed the economic and fiscal impacts of the University System of Maryland on the State’s economy. This analysis provides a conservative estimate of the contribution made by USM to the Maryland economy. The report examines economic and fiscal impacts that can be traced directly to the System through its education, research, and economic/workforce development mission. In updating the prior 2012 study, this analysis tracks the earnings of the same three cohorts of USM graduates, from the 1986, 1989 and 1996 graduating classes in the prior study, and adds a fourth cohort of 2006 graduates. In order to demonstrate how USM is directly contributing to meeting Maryland’s employment needs, this report also provides an analysis of

the in-state employment of two additional more recent cohorts of graduates, from the 2015 and 2018 graduating classes, analyzing the number of each of these cohorts of graduates that are employed in Maryland.

The “human capital” methodology used to measure the fiscal impact (#1 above) deserves explanation. This approach was first used by economist Barry Bluestone to analyze the economic impact of the University of Massachusetts, Boston on the state of Massachusetts and was adapted by the Jacob France Institute of the University of Baltimore in its USM studies starting in 1994 of the economic impact of the USM on the state of Maryland.

The human capital model differs from the traditional American Council on Education-Caffrey and Isaacs model, which treats a university as a source of revenues and spending in an economy and only measures the impact of university spending. In contrast, the human capital model treats a university as a source of investment and calculates the impact of the public’s investment by examining the most important outcome of higher education – better educated, more skilled workers. Specifically, this model compares the state’s expenditures on higher education to the tax revenues derived from the increased earnings power of its graduates.

Measuring the USM’s economic and fiscal impact on the state using the human capital approach involves the following steps:

1. The earnings of a cohort of USM graduates are derived for each year after graduation from a database of State employment and earnings maintained by the JFI¹²;

¹² The JFI maintains a database of employment and earnings of workers covered by unemployment insurance. Data on employment and on actual reported earnings are available for an almost 40-year time period. Data are available through the end of calendar 2019, with future earnings estimated based on the assumptions presented below. Employment and earnings data are for workers covered by unemployment insurance and excludes the earnings of USM graduates who are self-employed workers, independent contractors, federal civilian and military workers, or out-of-State commuters.

2. These earnings are compared to estimates of what the graduates would have earned had they not obtained a degree. This difference is the incremental earnings effect of their degree.
3. The increased economic activity and State revenues derived from the incremental earnings are then calculated.
4. The increased economic activity and State revenues attributable to the expenditures of out-state-students and visitors, and of grants originating out-of-state are also calculated by modeling the economic activity these expenditures generate; and
5. The total increased State revenues are then compared to the state's cost of producing the graduates, to determine the net fiscal impact of the State's investment.

These steps were conducted for four representative classes of the USM, the 1986, 1989, 1996 and 2006 cohorts. Incremental earnings of these graduates were determined by making the following comparisons for each of the three graduating classes:

1. The earnings of bachelor's degree recipients are compared to the estimated earnings of a person with only a high school diploma.
2. The earnings of master's degree recipients are compared to the earnings of USM graduates with only a bachelor's degree.
3. The earnings of Doctoral degree recipients are compared to the earnings of USM graduates with a master's degree; and
4. The earnings of Professional degree recipients are compared to the earnings of USM graduates with only a bachelor's degree.

In analyzing the incremental increase in earnings, three data sources were used:

1. The USM provided information on all graduates in the 1986, 1989, 1996 and 2006 academic years.
2. The Maryland Department of Labor (MDOL) provided longitudinal data on earnings in Maryland by these graduates, excluding the self-employed, independent

- contractors, and federal workers; and
3. Income for individuals with a high school degree were estimated using two Census-related sources:
 - a. For pre-2000 earnings, the Maryland 1990 U.S. Bureau of the Census data Five-percent Public Use Micro Sample Data, which identified over 17,000 Maryland residents for whom a high school diploma represented the highest level of educational attainment were analyzed.¹³
 - b. For post-2000 earnings, data on earnings for persons with only a high school diploma by age were available from the U.S. Bureau of the Census American Community Survey. For each cohort, the comparison group was the average of the earnings for employed persons of the age of each cohort of bachelor's degree recipients in each year analyzed.

These three data sources made it possible to identify average earnings for each step of educational attainment for the three cohorts. Individual incremental incomes for all the graduates of a cohort holding a particular degree were then calculated and aggregated. Thus, the actual earnings for the three cohorts of USM graduates can be compared to their estimated incomes had they not attended a USM institution.

The Maryland earnings data used in this analysis are only available through 2019; as a result: 32 years of actual earnings were used for the 1986 cohort; 29 years of actual earnings were used for the 1989 cohort; 22 years of actual earnings were used for the 1996 cohort; and 12 years of actual earnings were used for the 1996 cohort. In order to estimate the lifetime incremental earnings associated with a USM degree, future earnings were estimated using the following assumptions:

- All graduates were assumed to work until the age of 66. Bachelor's degree recipients work for 44 years, Master's degree recipients for 41 years, doctorate degree recipients for 39 years, and professional school graduates for 40 years.
- All historical cohort earnings were converted into year 2019 dollars.

¹³ See Daniel Gerlowski and David Stevens 1998 for a more complete description of the methodology used to estimate the earnings of high school graduates.

- For the future years in which actual earnings data were unavailable, the earnings of each level of higher educational attainment were assumed to increase by 4% annually in constant dollar terms, while earnings for high school graduates was projected to remain flat in constant dollar terms; and
- In cases where the earnings for a cohort of graduates were lower than that of the preceding comparison (next lower) level of educational attainment, the gains from achieving that level of educational attainment were assumed to be \$0 – in other words, there are no negative returns (losses) to education.

The approach used in this report is very conservative in that it does not account for the impacts of graduates whose earnings are not available to the state, most importantly federal employees, self-employed persons, and Maryland residents commuting out of State. The

Maryland Wage record data used for this analysis only includes data for Maryland workers covered by unemployment insurance, and does not include federal, self-employed or Maryland residents commuting to out-of-state jobs. According to the U.S. Bureau of the Census American Community Survey 10 percent of Maryland residents worked for the Federal Government and 17 percent commute to jobs in surrounding states. Thus, it is clear that this report is likely to provide a very conservative estimate of USM economic and fiscal impacts. While this under-estimate of impacts will be somewhat mitigated by including USM graduates residing out-of-state but commuting to jobs in Maryland¹⁴. However, according to 2018 data from the Census LEHD-On-the Map website – Maryland had a net outflow of almost 209,000 workers in 2018. **As a result of these exclusions, the economic impacts presented in this report can be viewed as very conservative.**

¹⁴ The JFI's Wage Record data are by place of work, it is not known where the worker resides.