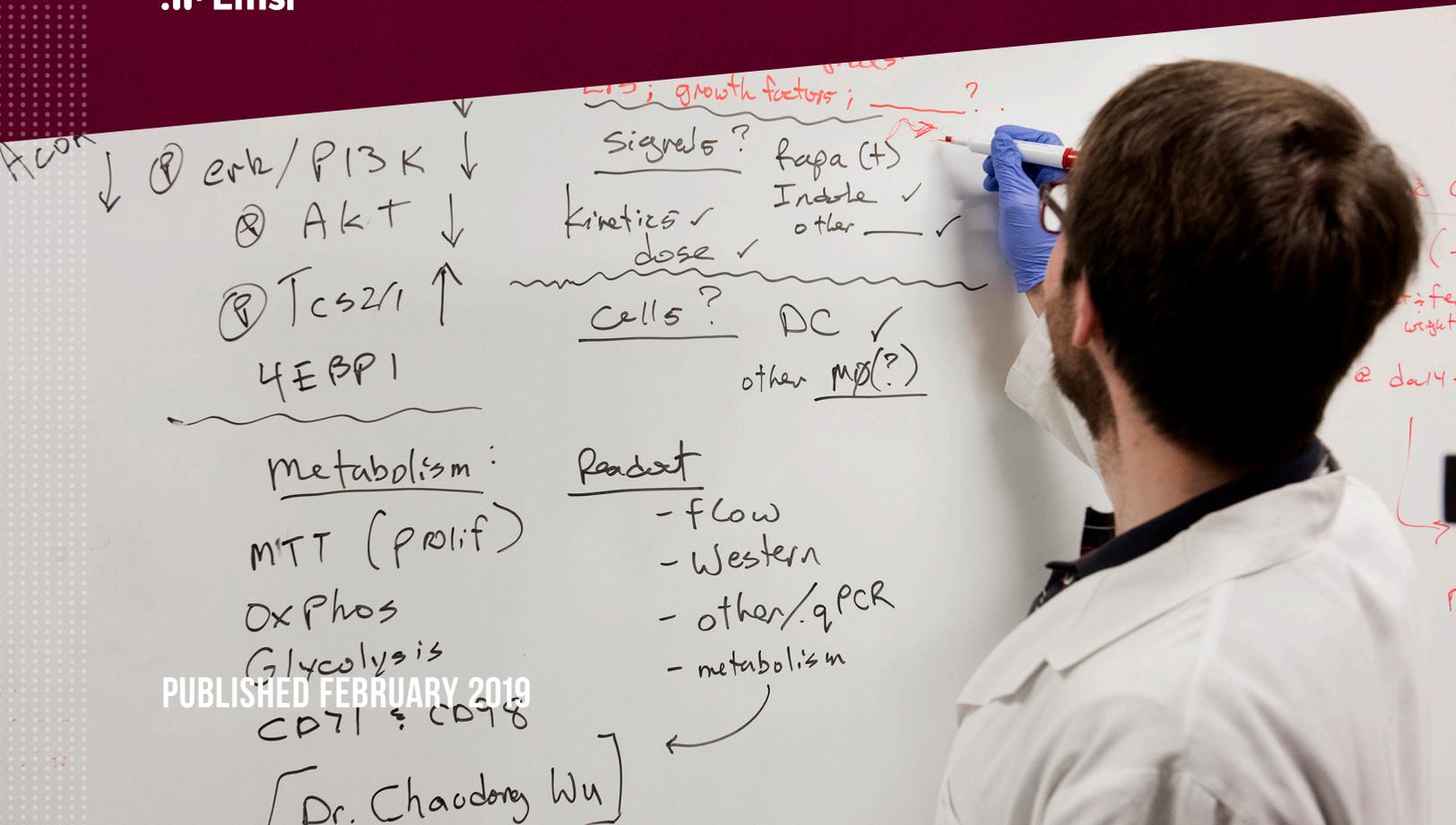


THE ECONOMIC VALUE TO TEXAS OF TEXAS A&M UNIVERSITY HEALTH SCIENCE CENTER

IN FISCAL YEAR OF ANALYSIS 2017-2018

Emsi



Acron ↓

Ⓟ erk/PI3K ↓
 Ⓟ AKT ↓
 Ⓟ Tcs2l1 ↑
 4EBP1

ERF; growth factors; ?

Signals? fapa (+)
 Indole ✓
 other ✓

Kinetics ✓
 dose ✓

Cells? DC ✓
 other MP(?)

Metabolism:

MTT (prolif)
 OxPhos
 Glycolysis
 CD71 : CD98

Readout

- flow
- Western
- other/qPCR
- metabolism

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Texas A&M University Health Science Center (Texas A&M HSC) encompasses research, administration, and clinical services for the five Texas A&M colleges with a health sciences focus: Dentistry, Medicine, Nursing, Pharmacy, and Public Health. Texas A&M HSC creates value in a variety of ways. Texas A&M HSC improves higher education delivery throughout the state and helps students increase their employability and potential.

The value of Texas A&M HSC influences both the lives of students and also the state economy. Texas A&M HSC serves a range of industries in Texas, supports state businesses, and benefits society as a whole in Texas from an expanded economy and improved quality of life. The benefits created by Texas A&M HSC extend as far as the state and local government through increased tax revenues and public sector savings.

This study investigates the economic impacts created by Texas A&M HSC in Texas on the business community and the benefits that Texas A&M HSC generates in return for the investments made by their key stakeholder groups—students, taxpayers, and society.

The following two analyses are presented:

- **Economic impact analysis**
- **Investment analysis**

All results reflect student and financial data for Fiscal Year (FY) 2017-18 (September 1, 2017 to August 31, 2018). Impacts on the state business community are reported under the economic impact analysis. Results are measured in terms of total income. The return on investment to students, taxpayers, and society are reported under the investment analysis. Both analyses are described more fully in the following sections. An electronic version of the executive summary and fact sheet are available at: economicimpact.tamu.edu.





ECONOMIC IMPACT ANALYSIS

Texas A&M HSC promotes economic growth in Texas through its direct expenditures and resulting expenditures of students, visitors, and state businesses. Texas A&M HSC serves as an employer and buyer of goods and services for its general, research, and construction operations. Numerous start-up companies have formed through programs and knowledge at Texas A&M HSC. Texas A&M HSC's reputation and activities attract students and visitors from outside Texas, whose expenditures benefit state vendors. In addition, Texas A&M HSC is a primary source of education to Texas residents and a supplier of trained workers to state industries, increasing overall productivity in the state workforce.



OPERATIONS SPENDING IMPACT

Texas A&M HSC is an important employer in Texas. In FY 2017-18, Texas A&M HSC employed 1,266 full-time and part-time faculty and staff (less research). Of these, 99% lived in Texas. Total payroll at Texas A&M HSC was \$129.3 million, much of which was spent in the state for groceries, dining out, clothing, and other household expenses. In addition, Texas A&M HSC is a large-scale buyer of goods and services. In FY 2017-18, Texas A&M HSC spent \$61.3 million to cover its expenses for facilities, professional services, and supplies (less research).

Texas A&M HSC added \$89.1 million in total income to the state during the analysis year as a result of its day-to-day operations (less research). This figure represents Texas A&M HSC's payroll, the multiplier effects generated by the spending of Texas A&M HSC and its employees, and a downward adjustment to account for funding that Texas A&M HSC received from state and local sources.

RESEARCH SPENDING IMPACT

Research activities impact the economy by employing people and requiring the purchase of equipment and other supplies and services. Over the last four years, Texas A&M HSC received 114 invention disclosures, filed 87 new US patent applications, and produced 24 licenses. Texas A&M HSC also generated license income over the same four-year time period, with \$374.1 thousand in license income in FY 2017-18.

In FY 2017-18, Texas A&M HSC spent \$38.6 million on payroll to support research activities, creating a net total of \$95.4 million in total income for the state economy.

TABLE 1: Research developments created by Texas A&M HSC

	Inventions	Patents	Licenses
2014-15	30	5	8
2015-16	38	28	6
2016-17	30	29	1
2017-18	16	25	9
Total	114	87	24

CONSTRUCTION SPENDING IMPACT

Texas A&M HSC commissioned contractors to build or renovate a number of facilities during the analysis year. The quick infusion of income and jobs that occurred in the state economy as a result of this construction spending is only considered short-term due to the one-time nature of construction projects. Nonetheless, the construction spending had a substantial impact on the state economy in FY 2017-18, equal to \$5.7 million in added income for Texas.

START-UP COMPANY IMPACT

Texas A&M HSC creates an exceptional environment that fosters innovation and entrepreneurship, evidenced by the number of Texas A&M HSC start-up companies created in the state. Start-up companies, created specifically to license and commercialize Texas A&M HSC technology or knowledge, have a strong and clearly defined link to Texas A&M HSC. The number of companies reported by Texas A&M HSC includes faculty whose primary residence is in the Bryan-College Station area and who have joint appointments at Texas A&M HSC and at Texas A&M System agencies. However, the number of companies may be significantly undercounted due to limited data availability.

In FY 2017-18, Texas A&M HSC start-up companies added \$25.6 million in total income to the Texas economy.

STUDENT SPENDING IMPACT

Around 13% of credit-bearing students attending Texas A&M HSC originated from outside the state in FY 2017-18. Some of these students relocated to Texas. These students would not have come to the state if Texas A&M HSC did not exist. In addition, a number of in-state students would have left the state for other education opportunities if not for the existence of Texas A&M HSC. While attending Texas A&M HSC, these relocator and retained students spent \$17.2 million to purchase groceries, rent accommodation, pay for transportation, and so on. A significant portion of these

expenditures occurred in the state, generating \$21.5 million in total income in the state economy during the analysis year.

VISITOR SPENDING IMPACT

Thousands of visitors from outside the state were attracted to Texas A&M HSC during the analysis year to attend commencement, sports events, conferences, meetings, and other activities sponsored by Texas A&M HSC. These visitors stayed an average of three nights. While in the state, visitors spent money for lodging, food, transportation, and other personal expenses. The off-campus expenditures of Texas A&M HSC's out-of-state visitors generated a net impact of \$2.2 million in total income for the state economy in FY 2017-18.

TOTAL TEXAS A&M HSC IMPACT ON THE TEXAS ECONOMY

The total Texas A&M HSC impact on the Texas economy amounted to \$239.5 million in added income. This stems from Texas A&M HSC's spending on operations research, and construction, its start-up companies, and the spending of its students and visitors. This \$635.7 million in added income is equivalent to supporting 2,617 jobs.

FORMER STUDENT IMPACT

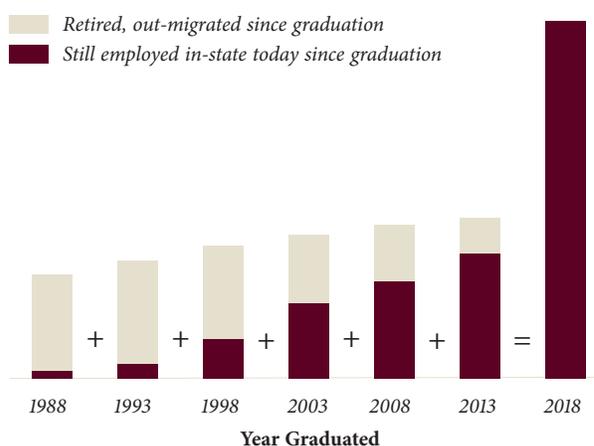
Since Texas A&M HSC was established, students have studied at Texas A&M HSC and entered the workforce with new skills. Today, thousands of former students are employed in Texas (Figure 1).

During the analysis year, past and present students of Texas A&M HSC generated \$396.2 million in total income for the state. This figure represents the higher wages that students earned during the year, the increased output of the businesses that employed the students, and the multiplier effects that occurred as students and their employers spent money at other businesses.

TABLE 2: Impacts created by Texas A&M HSC and its former students on the state in FY 2017-18

Total Income	Jobs
OPERATIONS SPENDING IMPACT	
\$89.1 MILLION	947
RESEARCH SPENDING IMPACT	
\$95.4 MILLION	1,080
CONSTRUCTION SPENDING IMPACT	
\$5.7 MILLION	77
START-UP COMPANY IMPACT	
\$25.6 MILLION	82
STUDENT SPENDING IMPACT	
\$21.5 MILLION	387
VISITOR SPENDING IMPACT	
\$2.2 MILLION	44
TOTAL TEXAS A&M HSC IMPACT	
\$239.5 MILLION	2,617
FORMER STUDENT IMPACT	
\$396.2 MILLION	6,316
GRAND TOTAL IMPACT	
\$635.7 MILLION	8,933

FIGURE 1: Texas A&M HSC former students working in-state today



GRAND TOTAL IMPACT ON THE TEXAS ECONOMY

The overall impact of Texas A&M HSC on the state business community during the analysis year amounted to \$635.7 million in total income, equal to the sum of the Texas A&M HSC impact (includes the operations spending impact, the research spending impact, the construction spending impact, the impact from start-up companies, the student spending impact, the visitor spending impact, and the former student impact.

The total impact is also expressed in terms of the jobs supported by the total income; they are calculated by jobs-to-sales ratios specific to each industry. Overall, the \$635.7 million impact supports 8,933 jobs.

A portion of the total \$635.7 million is broken out into an industry-by-industry impact ordered by total income. Table 3 outlines the top industries impacted by Texas A&M HSC. Because industries have different jobs-to-sales ratios, the associated jobs supported by the Texas A&M HSC impact differ by industry. Nonetheless, these are impacts that would not have been generated without Texas A&M HSC's presence.

TABLE 3: Top industries in the state impacted by Texas A&M HSC

Industry	Total income (millions)	Jobs
Health Care & Social Assistance	\$264.9	4,428
Professional & Technical Services	\$73	829
Government, Non-Education	\$52.1	505
Real Estate & Rental & Leasing	\$42.2	636
Administrative & Waste Services	\$20.2	358
All other industries	\$183.2	2,176
Total impact	\$635.7 MILLION	8,933

*Numbers may not add due to rounding.



INVESTMENT ANALYSIS

Investment analysis is the process of evaluating total costs and measuring these against total benefits to determine whether or not a proposed venture will be profitable. If benefits outweigh costs, then the investment is worthwhile and considered profitable.

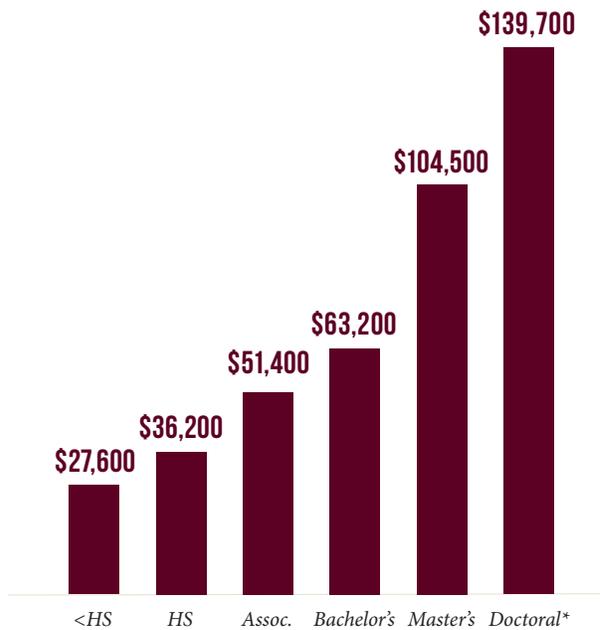
Texas A&M HSC received a total of \$403.1 million in FY 2017-18. Tuition and fees comprised 9% of total revenue, student aid from government sources comprised another 52%, and all other revenue comprised the remaining 38%. This study considers Texas A&M HSC as an investment from the perspectives of those whom provided these revenues - students, taxpayers, and society. The backdrop for the analysis is the entire Texas economy.

STUDENT PERSPECTIVE

In FY 2017-18, Texas A&M HSC served 3,013 credit students and 4,103 non-credit students. In order to attend Texas A&M HSC, students were charged for tuition, fees, books, and supplies. They also took out loans and will incur interest on those loans. Additionally, students gave up money that they would have otherwise earned had they been working instead of attending Texas A&M HSC. The total investment made by Texas A&M HSC's students for FY 2017-18 amounted to a present value of \$146.1 million, equal to \$41.8 million in out-of-pocket expenses (including future principal and interest on paid student loans) plus \$104.3 million in forgone time and money.

In return for their investment, Texas A&M HSC's students will receive a stream of higher future wages that will continue to grow through their working lives. As shown in Figure 2, earnings levels increase as people achieve higher levels of education. For example, the average bachelor's degree completer from Texas A&M HSC will see an increase in earnings of \$27,000 each year compared to someone with a high

FIGURE 2: Higher earnings at career midpoint by education level for FY 2017-18 Texas A&M HSC students

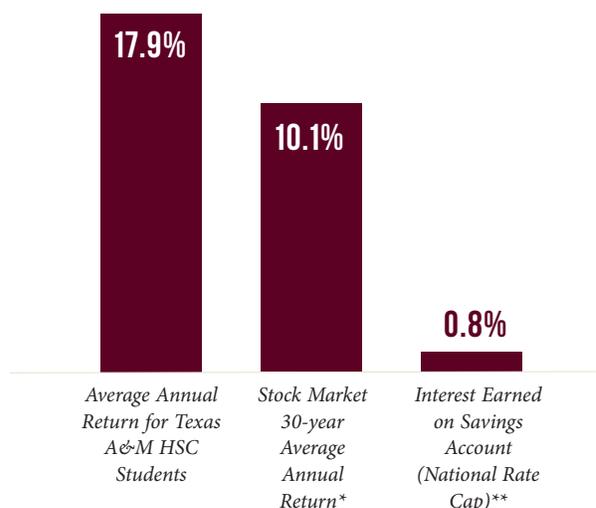


* Includes professional degrees such as MD, DDS, and PharmD.

school diploma or equivalent working in Texas. Over a working lifetime, this increase in earnings amounts to an undiscounted value of approximately \$1.1 million in higher earnings.

The present value of the higher future wages that Texas A&M HSC's students will receive over their working careers is \$644.4 million. Dividing this value by the \$146.1 million in present value student costs yields a benefit-cost ratio of 4.4. In other words, for every \$1 students invest in Texas A&M HSC in the form of out-of-pocket expenses and forgone time and money, they receive a cumulative amount of \$4.40 in higher future wages. The average annual rate of return for students is 17.9%. This is an impressive return, especially when compared to the 30-year average 10.1% return to the U.S. stock market (Figure 3).

FIGURE 3: Student rate of return



*Forbes' S&P 500, 1987-2016.

**FDIC.gov, 7-2017.

TAXPAYER PERSPECTIVE

Texas A&M HSC generates more in tax revenue than it takes. These benefits to taxpayers consist primarily of taxes that the state and local government will collect from the added revenue created in the state. As Texas A&M HSC students earn more, they will spend more resulting in higher tax revenues. Employers will also make higher tax payments as they increase their output and purchase more supplies and services. By the end of the FY 2017-18 students' working careers, the state and local government will have collected a present value of \$154.4 million in added taxes.

Benefits to taxpayers consist of the savings generated by the improved lifestyles of students and the proportionally reduced government expenditures. Education is statistically correlated with a variety of lifestyle changes that generate taxpayer savings across three main categories: 1) health, 2) crime, and 3) unemployment. Improved health habits lower the students' demand for national health care services. Students are also less likely to commit crimes, so the demand for law enforcement and criminal justice services is reduced. Students are also more employable, so the demand for welfare and unemployment benefits, such as earnings assistance and welfare benefits, is reduced. For a list of study references to these statistical

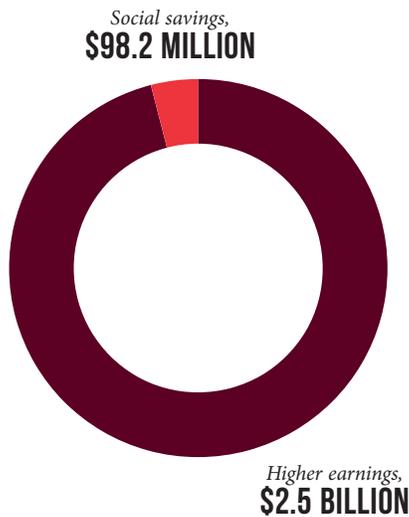
benefits, please contact Texas A&M Public Partnership and Outreach for a copy of the full technical report. All of these benefits will generate a present value of \$26.6 million in savings to state and local taxpayers.

Total benefits to taxpayers equal \$181 million, equal to the sum of the added taxes and public sector savings. Comparing this to the taxpayer costs of \$169 million—equal to the funding that Texas A&M HSC received from the state and local government during the analysis year—yields a benefit-cost ratio of 1.1. This means that for every \$1 of public money invested in Texas A&M HSC, taxpayers receive a cumulative value of \$1.10 over the course of the students' working lives. The average annual rate of return is 1.0%.

SOCIAL PERSPECTIVE

Society as a whole within Texas benefits from the presence of Texas A&M HSC in two major ways. The first and largest benefit that society receives is an increased state economic base. As discussed in the previous section, the higher student earnings and increased business output occurs across the state. This raises prosperity in Texas and expands the economic base for society as a whole.

FIGURE 4: Present value of higher earnings and social savings in Texas



Benefits to society also consist of the savings generated by the improved lifestyles of students. Similar to the taxpayer section above, education is statistically correlated with a variety of lifestyle changes that generate social savings. Note that these costs are avoided by the consumers, and are distinct from the costs avoided by taxpayers outlined above. Health savings include avoided medical costs associated with smoking, alcoholism, obesity, drug abuse, and mental disorders. Crime savings include reduced security expenditures and insurance administration, lower victim costs, and reduced criminal justice system expenditures. Unemployment savings include the reduced employer contributions towards unemployment claims. The model quantifies social savings by calculating the probability at each education level that individuals will have poor health, commit crimes, or claim welfare and unemployment benefits. Deriving the probabilities involves assembling data from a variety of studies and surveys analyzing the correlation between education and health, crime, welfare, and unemployment at the national and state level. This includes sources such as the Centers for Disease Control and Prevention and U.S. Department of Health and Human Services. For a list of study references to these statistical benefits, please contact Texas A&M Public Partnership and Outreach for a copy of the full technical report.

TABLE 3: Summary of investment analysis results

STUDENT PERSPECTIVE	
\$644,384	Benefits (thousands)
\$146,138	Costs (thousands)
\$498,246	Net present value (thousands)
4.4	Benefit-cost ratio
17.9%	Rate of return

TAXPAYER PERSPECTIVE	
\$181,034	Benefits (thousands)
\$169,048	Costs (thousands)
\$11,987	Net present value (thousands)
1.1	Benefit-cost ratio
1.0%	Rate of return

SOCIAL PERSPECTIVE	
\$2,638,993	Benefits (thousands)
\$413,092	Costs (thousands)
\$2,225,901	Net present value (thousands)
6.4	Benefit-cost ratio
NA	Rate of return*

* The rate of return is not reported for the social perspective because the beneficiaries of the investment are not necessarily the same as the original investors.

Figure 4 shows the present value of the higher earnings and social savings that will occur in Texas over the working lifetime of the FY 2017-18 student population at Texas A&M HSC. Higher wages amount to a present value of \$2.5 billion due to the increased lifetime wages of students and associated increases in business output. Social savings amount to \$98.2 million, the sum of health, crime, and unemployment savings in Texas. Altogether, total benefits to society equal \$2.6 billion (in present value terms).

Society invested a present value of \$413.1 million in educations obtained at Texas A&M HSC during the analysis year. This includes all expenditures by Texas A&M HSC, all student expenditures, and all student opportunity costs. For every dollar of this investment, society as a whole in Texas will receive a cumulative value of \$6.40 in benefits, equal to the \$2.6 billion in benefits divided by the \$413.1 million in costs. These

benefits will occur for as long as Texas A&M HSC's FY 2017-18 students remain employed in the state workforce.

SUMMARY OF INVESTMENT ANALYSIS RESULTS

Table 4 presents the results of the investment analysis for all three of Texas A&M HSC's major stakeholder groups—students, taxpayers, and society. As shown, students receive great value for their educational investment. At the same time, the investment made by state and local taxpayers to Texas A&M HSC creates a wide range of benefits to society and returns more to government budgets than it costs.





CONCLUSION

The results of this study demonstrate that Texas A&M HSC creates value from multiple perspectives. Texas A&M HSC benefits state businesses by increasing consumer spending in the state and supplying a steady flow of qualified, trained workers into the workforce. It enriches the lives of students by raising their lifetime earnings and helping them achieve their individual potential. It benefits state and local taxpayers through increased tax receipts across the state and students' reduced demand for government-supported social services. Finally, it benefits society as a whole in Texas by creating a more prosperous economy and generating a variety of savings through the improved lifestyles of students.

ABOUT THE STUDY

Data and assumptions used in the study are based on several sources, including the FY 2017-18 academic and financial reports from Texas A&M HSC, industry and employment data from the U.S. Bureau of Labor Statistics and U.S. Census Bureau, outputs of Emsi's Multi-Regional Social Accounting Matrix model, and a variety of studies and surveys relating education to social behavior. Emsi's methodology for this study adheres to the Association of American Universities (AAU) and the Association of Public and Land-grant Universities (APLU) guidelines, published in December 2014. The study applies a conservative methodology and follows standard practice using only the most recognized indicators of investment effectiveness and

economic impact. For a full description of the data and approach used in the study, please contact Texas A&M Public Partnership and Outreach (Dr. Suzanne Droleskey) for a copy of the full technical report.

ABOUT EMSI

Emsi is a leading provider of economic impact studies and labor market data to educational institutions, workforce planners, and regional developers in the U.S. and internationally. Since 2000, Emsi has completed over 1,800 economic impact studies for educational institutions in four countries. Visit www.economicmodeling.com for more information about Emsi's products and services.