



IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

**The Economic Value of Iowa State University
of Science and Technology**

EXECUTIVE SUMMARY



IOWA State University of Science and Technology (ISU) creates value in many ways. The university plays a key role in helping students increase their employability and achieve their individual potential. The university facilitates new research and company developments and draws visitors and students to the state, generating new dollars and opportunities for Iowa. ISU Extension and Outreach is actively engaged in providing research-based education and information to improve lives of Iowans in all 99 counties. ISU provides students with the education, experiential training, and skills they need to have fulfilling and prosperous careers. Furthermore, ISU is a place for students to meet new people from diverse backgrounds, increase their self-confidence, and promote their overall health and well-being.

*The value of ISU influences both the **lives of its students** and the **state economy**.*

ISU influences both the lives of its students and the state economy. The university supports a variety of industries in Iowa, serves state businesses, and benefits society as a whole in Iowa from an expanded economy and improved quality of life. The benefits created by ISU extend to the state government through increased tax revenues and public sector savings.

This study measures the economic impacts created by ISU on the business community and the benefits the university generates in return for the investments made by its key stakeholder groups—students, taxpayers, and society. The following two analyses are presented:



Economic impact analysis



Investment analysis

All results reflect employee, student, and financial data, provided by the university, for fiscal year (FY) 2017-18. Impacts on the Iowa economy are reported under the economic impact analysis and are measured in terms of added income. The returns on investment to students, taxpayers, and society in Iowa are reported under the investment analysis.



Economic impact analysis

IMPACTS CREATED
BY ISU IN FY 2017-18*

ISU promotes economic growth in Iowa through its direct expenditures and the resulting expenditures of students, state businesses, and visitors. The university serves as an employer and buyer of goods and services for its day-to-day, construction, and research operations. Numerous start-up and spin-off companies have formed as a result of programs and knowledge at ISU. Extension, Outreach, and volunteer activities contribute daily to people and to the communities in every county in Iowa. ISU is a primary source of higher education to Iowa residents and a supplier of trained workers to state industries, enhancing overall productivity in the state workforce. The university's reputation and activities attract visitors and students from outside Iowa, whose expenditures benefit state vendors.

Operations spending impact



ISU adds economic value to Iowa as an employer of state residents and a large-scale buyer of goods and services. In FY 2017-18, the university employed 7,210 full-time and part-time faculty and staff (excluding research employees), and almost all ISU employees lived in Iowa. Total payroll at ISU was \$573.9 million¹ (excluding payroll from research employees), much of which was spent in the state for household and living expenses, including groceries, mortgage and rent payments, and dining out. In addition, the university spent \$204.4 million on day-to-day expenses related to facilities, supplies, and professional services (excluding construction and research expenditures).

ISU's day-to-day operations spending added \$658.9 million in income to the state during the analysis year. This figure represents the university's payroll, the multiplier effects generated by the in-state spending of the university and its employees, and a downward adjustment to account for funding that the university received from state sources. The \$658.9 million in added income is equivalent to supporting 8,364 jobs in the state.

Construction spending impact



ISU commissioned contractors to build or renovate facilities in FY 2017-18. The infusion of income and jobs that occurred in the state economy as a result of this construction spending is considered short-term due to the one-time nature of such projects. Nonetheless, the university's construction spending had a substantial impact on the state

¹ Includes royalty payments to inventors related to ISU that still live in Iowa.



\$658.9 million
Operations Spending impact



\$39.4 million
Construction Spending Impact



\$310.2 million
Research Spending Impact



\$422.2 million
Economic Development Impact



\$17.4 million
Visitor Spending Impact



\$89.1 million
Student Spending Impact



\$1.8 billion
Alumni Impact



\$3.4 billion
TOTAL IMPACT

- OR -

42,640
JOBS SUPPORTED

* This table excludes the positive impacts of ISU Extension, Outreach, and volunteer activities.

economy in FY 2017-18, equal to \$39.4 million in added income and equivalent to supporting 595 jobs.

Research spending impact



As a land grant institution, research is critically important to ISU and an integral part of the university's commitment to improving the lives of Iowans while also contributing to the betterment of our nation and the world around us. When assessing the overall value and impact of ISU's research it's important to consider both the direct and the indirect—or downstream—impact of this work. The direct impact in FY 2017-18 was more than \$361.2 million, which the university spent on payroll, equipment, services and supplies and external subcontracts. More than 63% of this total—\$228.5 million—was earned from external sponsors supporting competitive grant proposals submitted by Iowa State researchers and faculty.

ISU RESEARCH DEVELOPMENTS

	Inventions	Patents	Licenses
2014-15	130	67	108
2015-16	144	60	84
2016-17	130	71	85
2017-18	145	49	51
Total	549	247	328

Source: ISU.

The downstream impact of ISU research on the economy is equally, if not even more, important. Discovery that results in the transfer of technology to the marketplace, and the transfer of knowledge to the university's stakeholders and constituencies through Extension, begins with research. Over the past four years, Iowa State has received 549 invention disclosures, filed 247 new U.S. patent applications, and produced 328 licenses. Moving forward, the infrastructure and expertise ISU has amassed has positioned the university to play a critical leadership role in the Bioscience economic development initiative that Governor Kim Reynolds launched in 2017 as a key economic growth engine. The work done at facilities such as the Center for Biorenewable Chemicals, BioCentury Research Farm, Plant Sciences Institute and the Nanovaccine Institute hold the promise of creating new innovations, start-ups and public-private partnerships that will further help grow the state's economy.

Research at ISU is highly integrated with student education, as well as the delivery of science-based education and information through Extension and Outreach. Research activities impact the economy by employing people and requiring the purchase of equipment and other supplies and services.

Research Park supports Kent Feeds

The ISU Research Park is a growing technology community and incubator for new and expanding businesses. It provides access to the vast array of resources available at ISU, from talent pipeline management to specialized equipment to access to the research infrastructure. Kent Feeds recently extended its reach in Iowa, establishing a satellite office in the Research Park. Headed up by Jeff Underwood, the office serves a strategic purpose.

"We are all about innovation," Underwood says. "We are looking for science-based solutions that will help us better serve our customers. We want to work with world-class research universities and ISU fits that bill."

Conceived at ISU, Gross-Wen Technologies aims to revolutionize waste-water treatment

Martin Gross and Zhiyou Wen developed and patented the revolutionary revolving algal biofilm (RAB) system at ISU that launched Gross-Wen Technologies (GWT). The RAB system uses algae to capture nitrogen and phosphorus from waste water. This algae can then be used as feedstocks for high-value products including slow-release fertilizer, high-protein foods and supplements, livestock and aquaculture feeds and pharmaceutical products.

GWT's RAB system provides communities with a sustainable, effective, reliable and affordable option for meeting new, heightened water-quality standards. The system has been tested in pilot facilities in Chicago and Cresco, Iowa, and GWT sold its first installation to the community of Slater, Iowa, in 2018.

In FY 2017-18, ISU spent \$180.9 million on payroll to support research activities. This, along with \$180.4 million in other research spending, created a net total of \$310.2 million in added income for the state economy. This added income is equivalent to supporting 4,139 jobs.

Value of Extension and Outreach



ISU Extension and Outreach strengthens communities and their local economies by enhancing leadership structures, broadening engagement, teaching best practices, and providing hands-on assistance. ISU's Extension and Outreach has helped 9,084 companies, 1,290 organizations, and 15,794 Iowa farmers across the state. ISU has 100 Extension and Outreach locations across the state.

Almost 600 students and faculty work off campus delivering Extension and Outreach, with 437 of these employees being paid by the counties rather than on ISU payroll. Due to the specific nature of the majority of these activities, Emsi does not attempt to measure an impact. Overall, the private and public value Extension and Outreach offers on a daily basis for individuals and state and local communities is significant. It should be acknowledged that the data in this report represents only a small sampling of the organization's overall educational, environmental, and economic development activities.

Economic development impact



ISU creates an exceptional environment that fosters innovation and entrepreneurship, evidenced by the number of ISU start-up and spin-off companies related to the university and companies that have grown in the state with support of ISU. Start-up companies, created specifically to license and commercialize ISU technology or knowledge, have a strong and clearly defined link to ISU. Spin-off companies, created and fostered through university programs or faculty and alumni, have a clear but weaker link to ISU. In addition, companies that benefited from ISU's Small Business Development Center (SBDC) and Center for Industrial Research and Service (CIRAS) are included under spin-off companies.²

In FY 2017-18, ISU start-up and spin-off companies added \$422.2 million³ in income to the Iowa economy, which is equivalent to supporting 8,011 jobs. The majority of this impact was due to spin-off companies, with the remainder due to start-up companies.

² The number of employees included is limited to the employees hired as a direct result of the spin-off companies and the growth in employees at companies supported by the SBDC and CIRAS.

³ To maintain an acceptable level of data reliability, this impact is limited to those companies that were created in the last five years. It is therefore conservative.

CIRAS enhances industry performance

ISU's Center for Industrial Research and Service (CIRAS) has been helping businesses and their communities prosper and grow since 1963. In FY 2017-18, 1,705 businesses from 95 Iowa counties received assistance on projects or had representatives attend educational workshops from CIRAS staff and partners.

ISU Extension advances the pork industry

Extension specialists with the Iowa Pork Industry Center partnered with the Iowa Pork Producers Association, and other allied industry leaders to develop and deliver hands-on ventilation training and education to pork producers throughout the state. A portable trailer demonstrating state-of-the-art technology was transported across the state to deliver seven training workshops. A total of 171 producers participated in the workshops. The number of animals influenced by those attending the workshop was over 63 million pigs and over 1.2 million sows.

Visitor spending impact



Thousands of visitors from outside the state were attracted to ISU during the analysis year to attend commencement, sports events, and other activities sponsored by the university. While in the state, visitors spent money for lodging, food, transportation, and other personal expenses. The off-campus expenditures of the university's out-of-state visitors generated a net impact of \$17.4 million in added income for the state economy in FY 2017-18. This \$17.4 million in added income is equivalent to supporting 473 jobs.

Value of volunteerism



Beyond positively impacting the state through the activities occurring at the university, such as research, ISU also directly impacts the state economy through its facilitation and support of student and employee volunteer activities. Volunteers are an important part of any society because they positively impact those less fortunate. Annually, more than 21,000 ISU student and employee volunteers supported non-profit organizations and causes across the state.⁴ These students and employees volunteered more than 650,000 hours of their time. Their volunteer activities added \$15.2 million in value for the state and local communities. The impact of volunteerism is not measured in this analysis; however, the value ISU offers for the volunteers as part of their education and future professional lives and for the recipient communities is significant and should not be overlooked.

Included in the hours above are the volunteer hours of ISU Extension and Outreach, which coordinates two large volunteer programs that benefit the state. In FY 2017-18, 6,967 adult volunteers worked directly with youth and, based on a survey, estimated spending 57 hours per year supporting the 4-H program. From this estimate, ISU volunteers provided 398,840 in hours to the 4-H program, valued at \$9.3 million for the state and local communities. Master Gardener volunteers are organized in 81 counties across the state and provide value by answering homeowner yard and garden questions, conducting community beautification projects, and growing fresh fruits and vegetables for local food pantries. In FY 2017-2018, 1,938 Master Gardeners recorded 114,224 volunteer hours in Iowa for a value of \$2.7 million to the state.

⁴ Due to data unavailability, the volunteer activities of employees are not considered in this analysis, meaning the value for ISU volunteerism is understated. In addition, FY 2015-16 volunteer data is used as a proxy for FY 2017-18 since the survey collecting volunteer information is only administered by ISU every three years. Value per volunteer hour per state provided by Independent Sector. See https://independentsector.org/resource/vovt_details/.

Nebullam, Inc, changing indoor farming

Clayton Mooney, Danen Pool, and Mahmoud Parto, owners of Nebullam Inc., have been invested in changing the way we farm indoors since 2016. Nebullam is using their indoor farm in Ames, Iowa to create and develop new, more efficient equipment to help not only farmers and operators become profitable quicker, but also help indoor farming grow as an industry. Currently, Nebullam has nine employees and provides fresh, organic produce to local grocery stores and restaurants. Their customer base has grown significantly by word of mouth, farmers markets and through the use of their social media channels.

Though Nebullam has humble roots in the farming industry, it is quickly establishing itself as an incredibly successful tech startup. They are among one of the first Iowa companies to be accepted into the Y Combinator and have been making valuable connections on a global scale. They have worked extensively with both the ISU Small Business Development Center (SBDC) and the ISU John Pappajohn Entrepreneurial Center (JPEC).

Student spending impact



Around 46% of ISU students earning credit originated from outside the state in FY 2017-18, and some of these students relocated to Iowa to attend ISU. These students may not have come to the state if not for the university. In addition, some in-state students, referred to as retained students, would have left Iowa if not for ISU. While attending the university, these relocated and retained students spent money on household and living expenses, including groceries, accommodation, transportation, and more. This spending generated \$89.1 million in added income for the state economy in FY 2017-18, which supported 2,116 jobs in Iowa.

Alumni impact



The education and training ISU provides has the greatest impact on the state of Iowa. Since its establishment, students have completed rigorous and robust academic programs at ISU, and entered the state workforce with greater knowledge and new skills. Today, tens of thousands of former ISU students are employed in Iowa. As a result of their ISU educations, the students receive higher earnings and increase the productivity of the businesses that employ them. In FY 2017-18, ISU alumni generated \$1.8 billion in added income for the state economy, which is equivalent to supporting 18,944 jobs.

Total impact

ISU added \$3.4 billion in income to the Iowa economy during the analysis year, equal to the sum of the operations, construction, and research spending impacts, economic development impact, the visitor and student spending impacts, and the alumni impact.

ISU's total impact can also be expressed in terms of jobs supported. The \$3.4 billion impact supported 42,640 state jobs, using the jobs-to-sales ratios specific to each industry in the state. This means that one out of every 49 jobs in Iowa is supported by the activities of ISU and its students.

In addition, the \$3.4 billion, or 42,640 supported jobs, stemmed from different industry sectors. Among non-education industry sectors, ISU's spending and alumni in the Professional & Technical Services industry sector supported 3,489 jobs in FY 2017-18. These are impacts that would not have been generated without the university's presence in Iowa.

For additional context, the \$3.4 billion impact was equal to approximately 1.8% of the total gross state product (GSP) of Iowa. This contribution that the university provided on its own is nearly as large as the entire Utilities industry in the state. Note that the \$3.4 billion impact does not include the value that ISU's Extension, Outreach, and volunteer activities are adding to the state and local communities.

ISU IMPACTS BY INDUSTRY (JOBS SUPPORTED)



**One out of every
49 jobs in Iowa is
supported by the
activities of ISU and
its students.**



Investment analysis

An investment analysis evaluates the costs associated with a proposed venture against its expected benefits. If the benefits outweigh the costs, then the investment is financially worthwhile. The analysis presented here considers ISU as an investment from the perspectives of students, taxpayers, and society in Iowa.

Student perspective



In Fall 2017, ISU served 35,993 students. Expanding to the entire FY 2017-18, ISU served more than 39,000 students. The students paid for tuition, fees, books, and supplies. Some students took out loans and will incur interest on those loans. Additionally, students gave up money they would have otherwise earned had they been working instead of attending college. The total investment made by ISU's students in FY 2017-18 amounted to a present value of \$767.6 million, equal to \$386.8 million in out-of-pocket expenses (including future principal and interest on student loans) and \$380.7 million in forgone time and money.

In return for their investment, ISU's students will receive a stream of higher future earnings that will continue to grow throughout their working lives. For example, the average ISU graduate with a bachelor's degree in FY 2017-18 will see an increase in earnings of \$23,200 annually compared to a person with a high school diploma or equivalent working in Iowa. Over a working lifetime, the benefits of the bachelor's degree over a high school diploma will amount to an undiscounted value of \$1 million in higher earnings per graduate. The present value of the cumulative higher future earnings that ISU's FY 2017-18 students will receive over their working careers is \$2.9 billion.

STUDENTS SEE A HIGH RATE OF RETURN FOR THEIR INVESTMENT IN ISU



14.2%

Average annual return for ISU's students



9.9%

Stock market 30-year average annual return

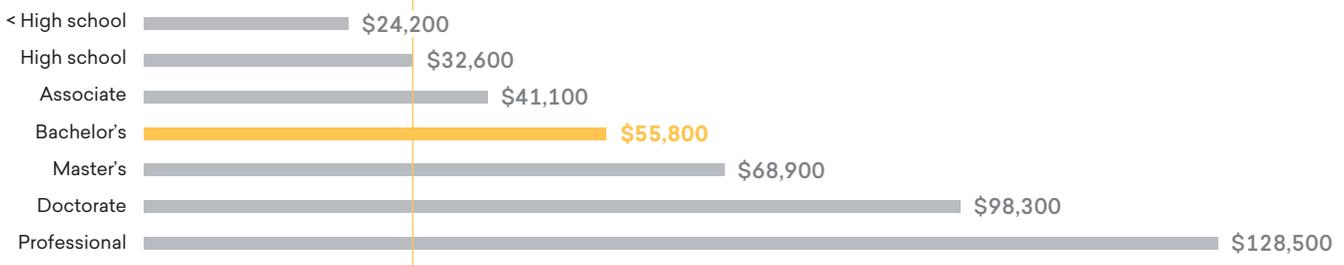


0.8%

Interest earned on savings account (National Rate Cap)

Source: Forbes' S&P 500, 1989-2018. FDIC.gov, 6-2019.

The average bachelor's degree graduate from ISU will see an increase in earnings of **\$23,200** each year compared to a person with a high school diploma or equivalent working in Iowa.



Source: Emsi employment data.

The students' benefit-cost ratio is 3.8. In other words, for every dollar students invest in ISU, in the form of out-of-pocket expenses and forgone time and money, they will receive a cumulative value of \$3.80 in higher future earnings. Annually, the students' investment in ISU has an average annual internal rate of return of 14.2%, which is impressive compared to the U.S. stock market's 30-year average rate of return of 9.9%.

Taxpayer perspective



ISU generates more in tax revenue than it takes. These benefits to taxpayers consist primarily of taxes that the state government will collect from the added revenue created in the state. As ISU students earn more, they will make higher tax payments throughout their working lives. Students' employers will also make higher tax payments as they increase their output and purchases of goods and services. By the end of the FY 2017-18 students' working lives, the state government will have collected a present value of \$652.9 million in added taxes.

Benefits to taxpayers will also consist of savings generated by the improved lifestyles of ISU students and the corresponding reduced government services. Education is statistically correlated with a variety of lifestyle changes. Students' ISU educations will generate savings in three main categories: 1) healthcare, 2) crime, and 3) income assistance. Improved health will lower students' demand for national health care services. In addition, students will be less likely to interact with the criminal justice system, resulting in a reduced demand for law enforcement and victim costs. ISU students will be more employable, so their reduced demand for income assistance such as welfare and unemployment benefits will benefit taxpayers. For a list of study references, contact the university for a copy of the main report. Altogether, the present value of the benefits associated with an ISU education will generate \$100 million in savings to state taxpayers.

Total taxpayer benefits amount to \$753 million, the present value sum of the added taxes and public sector savings. Taxpayer costs are \$285.7 million, equal to the amount of state government funding ISU received in FY 2017-18. These benefits and costs yield a benefit-cost ratio of 2.6. This means that for every dollar of public money invested in ISU in FY 2017-18, taxpayers will receive a cumulative value of \$2.60 over the course of the students' working lives. The average annual internal rate of return for taxpayers is 6.8%, which compares favorably to other long-term investments in the public and private sectors.

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STUDENT PERSPECTIVE

\$2.9 billion
Present value benefits

\$767.6 million
Present value costs

\$2.1 billion
Net present value

Benefit-cost ratio	Rate of return
3.8	14.2%



TAXPAYER PERSPECTIVE

\$753 million
Present value benefits

\$285.7 million
Present value costs

\$467.3 million
Net present value

Benefit-cost ratio	Rate of return
2.6	6.8%



SOCIAL PERSPECTIVE

\$7.9 billion
Present value benefits

\$1.7 billion
Present value costs

\$6.1 billion
Net present value

Benefit-cost ratio	Rate of return
4.5	n/a*

* 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.

Social perspective



Society as a whole in Iowa benefits from the presence of ISU in many ways through education, research, and Extension and Outreach. Iowa is a more attractive place to live, work, and play because of Extension and Outreach programs focused on improving quality of life in every Iowa county. Society benefits in two major ways in terms of investment analysis. Primarily, society benefits from an increased economic base in the state. This is attributed to higher student earnings and increased business output, which raise economic prosperity in Iowa.

Benefits to society also consist of the savings generated by the improved lifestyles of ISU students. As discussed in the previous section, education is statistically correlated with a variety of lifestyle changes that generate social savings. Note that these costs are avoided by the consumers but are distinct from the costs avoided by the taxpayers outlined above. Healthcare savings include avoided medical costs associated with smoking, alcohol dependence, obesity, drug abuse, and depression. Savings related to crime include reduced security expenditures and insurance administration, lower victim costs, and reduced expenditures by the criminal justice system. Income assistance savings include reduced welfare and unemployment claims. All Iowans benefit when young people are prepared for college and careers, and are ready to become Iowa's future workforce and successful, contributing members of society. Society also benefits when families, and communities become more resilient and are better able to handle any challenges they may face. For a list of study references, contact the university for a copy of the main report.

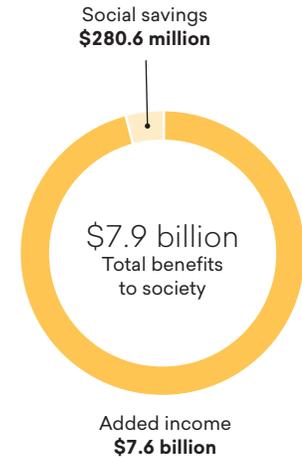
Altogether, the social benefits of ISU equal a present value of \$7.9 billion. These benefits include \$7.6 billion in added income through students' increased lifetime earnings and increased business output, as well as \$280.6 million in social savings related to health, crime, and income assistance in Iowa. People in Iowa invested a present value total of \$1.7 billion in ISU in FY 2017-18. The cost includes all the university and student costs.

The benefit-cost ratio for society is 4.5, equal to the \$7.9 billion in benefits divided by the \$1.7 billion in costs. In other words, for every dollar invested in ISU, people in Iowa will receive a cumulative value of \$4.50 in benefits. The benefits of this investment will occur for as long as ISU's FY 2017-18 students remain employed in the state workforce.

Summary of investment analysis results

The results of the analysis demonstrate that ISU is a strong investment for all three major stakeholder groups—students, taxpayers, and society. As shown, students receive a great return for their investments in an ISU education. At the same time, taxpayers' investment in ISU returns more to government budgets than it costs and creates a wide range of social benefits throughout Iowa.

SOCIAL BENEFITS IN IOWA FROM ISU



Social benefits of Extension and Outreach

All Iowans benefit when local people join together to make their communities better places to live and work.

All Iowans benefit from efforts to improve water quality, produce crops and livestock sustainably, and strengthen rural economies.

All Iowans benefit when young people are prepared for college and careers, and are ready to become Iowa's future workforce and successful, contributing members of society.

All Iowans benefit when individuals, families, and communities become more resilient and are better able to handle any challenges they may face.

Conclusion

The results of this study demonstrate that ISU creates value from multiple perspectives. The university benefits state businesses by increasing consumer spending in the state and supplying a steady flow of qualified, trained workers to the workforce. ISU enriches the lives of students by raising their lifetime earnings and helping them achieve their individual potential. The university benefits state taxpayers through increased tax receipts and a reduced demand for government-supported social services. Finally, ISU benefits society as a whole in Iowa by creating a more prosperous economy, making Iowa a more attractive place to live, work, and play by improving quality of life 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 ISU, 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. The study applies a conservative methodology and follows standard practice using only the most recognized indicators of economic impact and investment effectiveness. For a full description of the data and approach used in the study, please contact the university for a copy of the main report.

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multiple perspectives.



Emsi is a labor market analytics firm that integrates data from a wide variety of sources to serve professionals in higher education, economic development, workforce development, talent acquisition, and site selection. Emsi is a leading provider of economic impact studies and labor market data to educational institutions in the U.S. and internationally. Since 2000, Emsi has completed over 2,000 economic impact studies for institutions across three countries. For more information about Emsi's products and services, visit www.economicmodeling.com.