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ANDERSON ECONOMIC GROUP

Empowering Michigan

Eighth Annual Economic Impact Report of Michigan's University Research Corridor

Commissioned by Michigan's University Research Corridor

Michigan State University
University of Michigan
Wayne State University

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Executive Summary

The University Research Corridor (URC) is an alliance of Michigan's three largest higher education institutions: Michigan State University, the University of Michigan, and Wayne State University. This report is the eighth in an annual benchmarking series the URC first commissioned in 2007. Since then, in the spirit of promoting statewide economic development, as well as accountability to the citizens of the state of Michigan, the presidents of the URC universities have hired Anderson Economic Group to perform annual independent analyses of the URC's economic impact, and to benchmark its performance against peer universities across the nation. This mission has continued annually for eight years since the series' initial launch, with the resulting report made publicly available.[1]

In this report, we estimate the impact of the URC's activities on Michigan's economy, and compare its performance to peer university innovation clusters nationwide. Using data from the universities and public sources, we quantify the universities' degrees awarded, research and development expenditures, and technology transfer activities, and analyze how the URC impacts jobs and income for residents, and state tax revenue.

KEY BENCHMARKS

The URC universities' performance is summarized in Table 1. The remainder of this executive summary lays out these results in greater detail.

TABLE 1. Key Benchmarks of the URC

	2007 Report (2006 benchmarks)[a]	2014 Report (2013 benchmarks)	Change Since 2007 Benchmark Year
Operational Expenditures[b]	$6.5 billion	$8.1 billion	+ $1.6 billion
Fall Enrollment[c]	124,586	138,508	+ 13,922 students
Net Economic Impact	$12.8 billion	$16.8 billion	+$8.0 billion
Tax Revenue Impact on State of Michigan	$343 million	$495 million	+152 million
Total R&D Expenditures	$1.369 billion	$2.123 billion	+ $754 million
Innovation Power Composite Rank[d] (1-8)	--	2	--

Sources: Bureau of Economic Analysis (BEA), U.S. Census Bureau, National Center for Education Statistics Integrated Postsecondary Education Data System (IPEDS), URC Universities, National Science Foundation (NSF)
Analysis: Anderson Economic Group, LLC

a. The net economic and tax revenue impacts reported here use the updated methodology, and are not the same numbers *reported* in 2007. Part of this year's increase is from the addition of construction spending. The rest of the values are the same as initially reported.

b. In previous years, we included depreciation in our analysis; our updated methodology uses construction expenditures. See "Methodology" on page A-1.

c. Headcount provided by URC universities.

d. The composite ranking provides a way to benchmark the URC's overall innovation activities to those of its peer clusters. It factors in the contribution that the university clusters make as a result of their research, talent, and technology transfer activities. We started calculating the composite ranking in 2013. No ranking is available for 2007.

SCALE OF THE URC

The URC universities are the largest research universities in Michigan, as well as the largest universities in the state. We summarize the size of the URC in 2013,

1. The URC has also commissioned several reports on its contribution to key economic sectors. For more on these reports see "Summary of Past URC Sector Reports" on page C-1.

including number of students, employees, alumni, and amount of operational expenditures in Table 2 below.

TABLE 2. Innovation, Talent and Operations of the URC in FY 2013

Category	Impact
Number of Enrolled Students	138,936
Known URC Alumni Living in Michigan	617,319
Wage and Salary Earnings of URC Alumni in Michigan	$43.3 billion
Number of Full-Time-Equivalent Employees	55,060
Operational Expenditures (e.g. supplies, payroll, equipment)	$8.1 billion
Construction Spending[a]	$887 million

Sources: IPEDS Finance, FY 2013; URC Universities
Analysis: Anderson Economic Group, LLC

a. Beginning in 2013, we measured spending on construction, which includes expenditures on capital, land acquisitions, and equipment associated with capital additions. See "Methodology" on page A-1.

ECONOMIC IMPACT

While generating economic impact is not their main goal, the URC universities make a significant contribution to Michigan's economy. The main drivers of this economic impact are university expenditures on both payroll and non-payroll items (such as supplies and equipment), spending by URC students, and incremental earnings by alumni. Crucially, much of this spending is funded by revenue sources that bring new funds to the state. Such sources include research grants and students who would have attended an out-of-state school.

The total impact includes both direct and indirect impacts. In FY 2013, the URC contributed $16.8 billion to the state economy, as shown in Table 3 below.

TABLE 3. Net Economic Impact of URC in Michigan, FY 2013 (in billions)

Impact Category	Net Economic Impact
Non-payroll Operating Expenditures	$3.7
Faculty & Staff Wages and Benefits	$5.6
URC Student Expenditures	$2.7
Incremental Alumni Earnings[a]	$4.8
TOTAL NET ECONOMIC IMPACT	**$16.8**

Source: Anderson Economic Group, LLC

a. We estimate that the $43.3 billion in wages and salaries earned by URC alumni in Michigan in 2013 resulted in $4.9 billion in new economic activity. See "URC Alumni in Michigan" on page 26.

The economic and jobs impact of the URC reaches every region in Michigan, as shown in Table 4 on page iii.[2]

2. See "Economic Impact of the URC in Michigan" on page 31 for further details.

TABLE 4. Net New Jobs of URC in Michigan, by Region, FY 2013

Economic Development Collaboratives	Net Economic Impact of URC Operations (millions)	Total Direct and Indirect Jobs Caused by URC (FTE)
Upper Peninsula Region	$55.7	90
Northwest Region	$152.8	165
Northeast Region	$51.4	91
West Michigan Region	$597.7	671
East Central Region	$208.3	236
East Michigan Region	$681.9	2,152
South Central Region	$3,170.8	10,701
Southwest Region	$218.9	279
Southeast Michigan Region	$5,453.7	35,864
Detroit Metro Region	$6,203.0	16,212
State of Michigan	$16,794.1	66,459

Note: May not add to total due to rounding.
Source: URC universities, BEA, AEG Estimates
Analysis: Anderson Economic Group, LLC

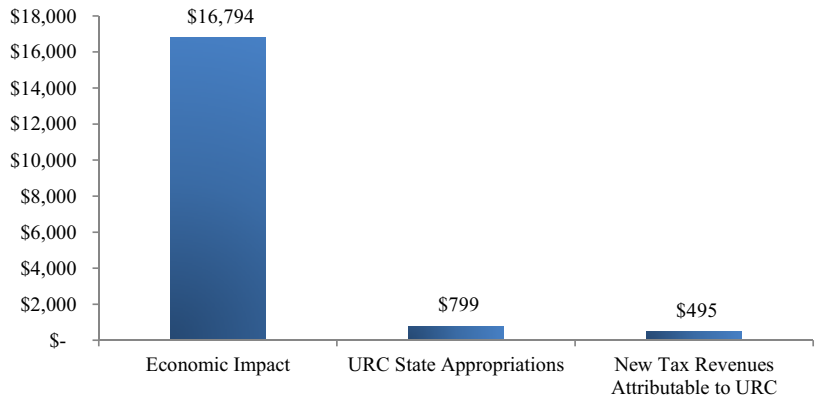
NEW STATE TAX REVENUE DUE TO URC

In 2013, we estimate that $2.98 billion in wages of URC employees and almost $5.5[3] billion of URC alumni earnings in Michigan were caused by the URC. We attribute this share of alumni earnings to the URC because these universities helped graduates earn more than they would have otherwise. We estimate that the tax revenue the state received in 2013 because of these additional earnings was $495 million. This includes tax revenue the state receives from personal income, sales and use, property, and gasoline taxes. Our complete analysis can be found in "URC Contributions to State Tax Revenue" on page 36.

Comparison of Economic Impact with State Appropriations. While the main goal of these universities is not to generate economic impact and tax revenues for the state, it is noteworthy that the $16.8 billion in net economic impact is 21 times the state's funding for URC universities.[4] Additionally, the State of Michigan receives $495 million in tax revenue from URC employees and alumni that it would otherwise not have received if the URC universities were not located in Michigan. Figure 1 on page iv shows the fiscal impact of the URC, as well as state appropriations.[5]

3. This figure is higher than the net economic impact because it is the untaxed amount and includes money that will be used on out of state spending. After factoring this in, we estimate the URC causes $3.87 billion of direct economic activity in Michigan due to alumni earnings.
4. Note that this is a comparison of the *total* impact vs. *total* appropriations; each additional dollar of appropriations would not necessarily generate a full $21 in economic impact.
5. State appropriations are the State of Michigan 2012-2013 fiscal year.appropriations.

FIGURE 1. Fiscal Impact of the URC in Michigan, 2013 (millions)



Source: AEG Estimates, Senate Fiscal Agency
Analysis: Anderson Economic Group, LLC

INNOVATION AND TECHNOLOGY

Innovation and technology are exhibited at the universities through spending on research and development, as well as technology transfer, patents and licensing, and the cultivation of start-ups. The URC has an increasing role in training researchers and entrepreneurs, and facilitating these types of new technology and business ideas; the contribution of URC schools, students, and alumni in terms of innovative technology, new business ideas, and fostering relationships with existing companies is a huge economic driver for Michigan, as well as across the globe.

More than19% of URC alumni have founded or co-founded a business, adding an estimated 380,000 businesses to the economy by URC alumni worldwide; nearly half of these businesses were started in Michigan, and continue to contribute to the economy, and spur further innovation throughout the state.[6]

R&D Spending

In 2013, the URC spent nearly $2.12 billion on research and development. This is a 1.9% increase from last year when the universities spent slightly more than $2.08 billion. Overall, the URC ranks 5th among the eight clusters for total R&D in 2013.[7] Table 5 on page v highlights the growth in R&D expenditures for the URC, which have increased by more than 51% since 2007. This growth far surpassed the growth for all U.S. institutions as well as the growth for the peer cluster average (30% and 41%, respectively).

6. The extent to which the URC universities, its students, and alumni, are engaged in innovative and entrepreneurial activities is discussed further in Erin A. Grover, Colby W. Spencer and Samantha Superstine, "Embracing Entrepreneurship: The URC's Growing Support for Entrepreneurs in Michigan and Throughout the World," Anderson Economic Group LLC, East Lansing, May 2013.
7. In 2013, we added Texas as an additional cluster to the benchmarking analysis. We also updated the Massachusetts cluster. See "Peer University Clusters" on page 3.

TABLE 5. R&D Spending for URC and Peer Clusters, 2007-2013 (thousands)

	2007 R&D Spending	2012 R&D Spending	2013 R&D Spending	Growth, 2012-2013	Growth, 2007-2013
URC	**$1,405**	**$2,083**	**$2,123**	**1.9%**	**51.1%**
Northern California	$2,083	$2,666	$2,715	1.8%	30.4%
Southern California	$2,130	$2,701	$2,688	-0.5%	26.2%
Illinois	$1,240	$1,634	$1,786	9.3%	44.1%
Massachusetts	$1,320	$1,957	$2,282	16.6%	72.9%
North Carolina	$1,591	$2,299	$2,383	3.7%	49.8%
Pennsylvania	$1,408	$1,929	$1,991	3.2%	41.4%
Texas	$1,141	$1,517	$1,588	4.6%	39.2%
All U.S. Universities	*$51,590*	*$65,920*	*$67,173*	*1.0%*	*30.2%*

Source: NSF HERD Survey, 2013
Analysis: Anderson Economic Group, LLC

See "Research and Commercialization Benchmarks" on page 16 for additional details about R&D spending by the URC and its peer university innovation clusters.

Technology Transfer

An important result of successful university R&D is transfer of technology to the private sector. University research and development expenditures often lead to the production and sale of new products and services in the private sector.

We highlight patent and licensing activity, as well as the number of cultivated start-ups in this report.

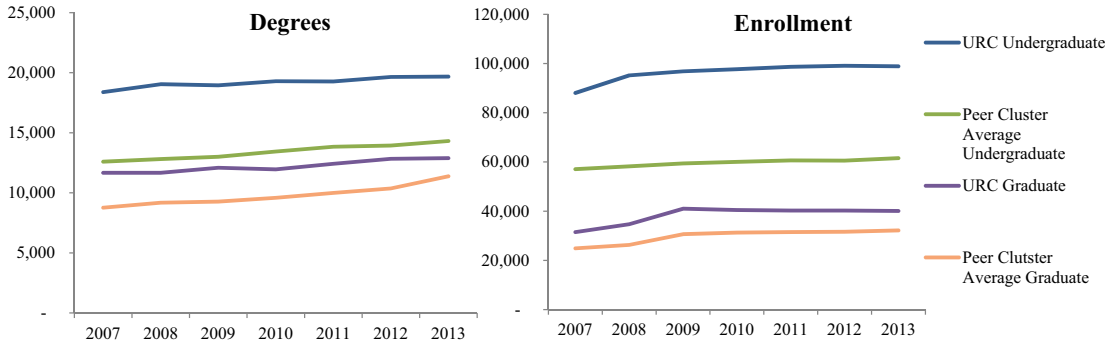
- **Patent and Licensing Activity:** In 2013, the URC surpassed its five-year averages for the number of patents issued, the number of licensing and options activity, as well as the number of invention disclosures for the second straight year.
- **The Number of Disclosures**: In 2013, URC researchers disclosed 611 new inventions. This is much higher than the five-year average of 519.

We describe the number of patents granted, inventions disclosed, number of licenses or options entered into, and the number of new start-ups in "Technology Transfer" on page 20.

EDUCATING TALENT

In 2013, the URC educated more than 138,000 students from across the state, the country, and the world, and awarded tens of thousands of degrees; these numbers have both grown over time, and have been higher than the peer cluster averages. Figure 2 on page vi shows the growth in student enrollment and degrees since 2006. See "Student Enrollment" on page 9 and "Total Degrees Granted" on page 10.

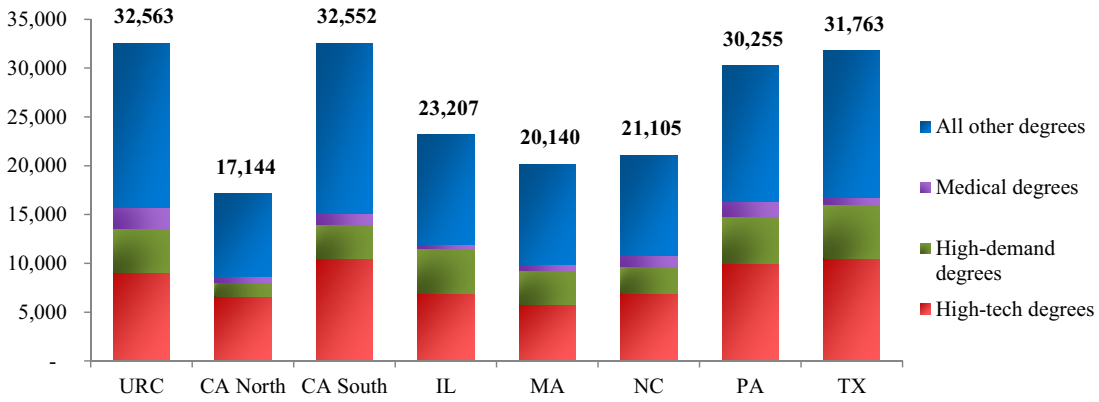
FIGURE 2. URC and Peer Cluster Degrees and Enrollment, 2007-2013



Source: IPEDS Completions and Enrollment, 2007-2013
Analysis: Anderson Economic Group, LLC

We also show the number of students earning high-tech, high demand or medical degrees in Figure 3 below. In 2013, the URC awarded the most degrees of any of its peer university innovation clusters, as well as the most medical degrees.

FIGURE 3. Degrees by Category, URC and Peer Clusters, 2013



Source: IPEDS Completions, 2013
Analysis: Anderson Economic Group, LLC

INNOVATION POWER RANKINGS

Last year, we have added innovation power rankings, a composite ranking system to benchmark the URC and its peer innovation clusters on their overall innovation activity. We define innovation activity as performance on the following three components:

1. Research spending;
2. Technology transfer activity; and
3. Talent.

We rank each of these components separately, and combine them to determine the overall composite ranking for innovation activity. These rankings capture how each cluster contributes to their communities, as well as to industrial activity, as a result of their innovation activities. Overall, the URC ranks second of the clusters for its innovation activity. We summarize the rankings by component, as well as the composite rankings for each cluster, in Table 6 below.

TABLE 6. URC and Peer Cluster Rankings for Innovation Activity by Category

	Research Spending	Technology Transfer	Talent	Composite Ranking
URC	**5**	**7**	**1**	**2**
Northern California	1	4	8	**3**
Southern California	2	2	3	**1**
Illinois	7	4	5	**7**
Massachusetts	4	1	7	**4**
North Carolina	3	6	5	**4**
Pennsylvania	6	3	6	**6**
Texas	8	8	4	**8**

Sources: NSF HERDS 2013, University Technology Transfer Annual Reports, AUTM U.S. Licensing Activity Survey 2013, and IPEDS 2013

Analysis: Anderson Economic Group, LLC

See “Innovation Power Rankings” on page 23.

ABOUT ANDERSON ECONOMIC GROUP

Anderson Economic Group, LLC is a consulting firm that specializes in economics, public policy, financial valuation, market research, and land use economics. AEG has completed economic impact studies for universities across the country. AEG has provided the URC with economic impact reports since 2007. See “About the Authors” for more information.

I. Introduction

WHAT IS MICHIGAN'S UNIVERSITY RESEARCH CORRIDOR?

Michigan's University Research Corridor (URC) is one of the nation's top academic research clusters and a leading engine for innovation in Michigan and the Great Lakes region. An alliance of Michigan's three largest academic institutions, Michigan State University (MSU), the University of Michigan (U-M), and Wayne State University (WSU), the URC is focused on increasing economic prosperity and connecting Michigan to the world. They do so by educating students, attracting talented workers to Michigan, supporting innovation, and encouraging the transfer of technology to the private sector. The URC universities have main campuses in East Lansing, Ann Arbor, Flint, Dearborn, and Detroit, and their reach extends to all areas of the state. Each URC university has research, teaching locations, and partner hospitals located throughout the state, as shown on Map 1 on page 4.

REPORT PURPOSE & METHODOLOGY

Michigan's University Research Corridor asked Anderson Economic Group (AEG) to undertake a comprehensive study that quantifies the economic impact of the URC's activities on the state of Michigan's economy. This report is the eighth in a series of annual reports intended to measure and benchmark the contributions of the URC universities to Michigan. The URC has also commissioned several reports on their contribution to specific economic sectors; for more on these reports, see "Summary of Past URC Sector Reports" on page C-1.

Last year we updated the methodology for several metrics in the benchmark series. While not all information in this report is directly comparable to reports in previous years, some of the metrics utilize the same methodology, and all of the reported metrics allow readers to track the URC's performance year-to-year and to understand how the URC universities spend their time and money.

In order to quantify the economic impact of the URC's activities, we asked ourselves the following questions:

1. What would the loss be to Michigan if the URC universities did not exist in the state?
2. What would be the loss to regions across the state if the URC universities were not here?

We then answered these questions in terms of the impact on jobs, earnings, tax revenue, and research. The following chapters of this report provide quantitative measures of how the URC is performing in these areas.[8]

SOURCES OF ECONOMIC IMPACT

We define *net economic impact* as new economic activity that occurs in a defined geographic region directly or indirectly caused by the URC. We present two geographies of economic impact in "Economic Impact of the URC in Michigan" on page

8. For more details about the report's methodology please see Appendix A: "Methodology" on page A-1.

31; the state of Michigan, as well as 10 economic regions in Michigan, as defined by the Michigan Economic Development Corporation (MEDC).[9] Our regional impact allocates the net economic impact on the state into regions based on where in Michigan the URC and its students spend their money, and where URC staff, faculty, and alumni reside in the state.

Our economic impact estimates come from several sources of activity:

1. University operations and spending;
2. Talent; and
3. Research and innovation.

Operations and Spending

The URC universities bring large amounts of spending into Michigan. Operational expenditures that cause economic activity reach every county in the state. These expenditures include salaries and wages for faculty and staff, public service expenditures, spending on goods and services, and many other categories of spending. Students that attend the universities pay for room and board; meals; books and supplies; and food, goods, entertainment and activities off campus.These expenditures also create economic activity across the state. See “Overview of URC Operations and Spending” on page 5.

Talent

The URC universities attract students to the state. Many of these students remain in the state after graduation, and many alumni become business owners and employees in Michigan. This attraction and retention of talent is important for the state’s economy; alumni who remain in the state contribute to Michigan’s direct employment and earnings in the state, and spur additional economic activity, as well. Information about the URC’s current students can be found in “Education and Talent Benchmarks” on page 9. The impact of URC alumni on the state’s economy is discussed in “URC Alumni in Michigan” on page 26.

Research and Innovation

Each of the URC universities engages in significant research and innovation activities each year. Categories of research and innovation include:

- Research and development (R&D) spending;
- Patents and licensing activity; and
- Start-ups and other entrepreneurial activity.

9. In March of 2011, Governor Snyder emphasized the importance of communities working together to promote their regional advantages. He asked the MEDC to develop strategies to engage in regional collaboration among economic and community development organizations. Together with local economic development partners, the MEDC defined 10 geographies to align economic development efforts. In 2013, the MEDC and Governor Snyder slightly changed the regions. These regions and their estimated economic impacts are shown in Map 5 on page 35.

The majority of the URC universities' R&D is funded by the federal government, which brings new economic activity into the state. Patents and licensing activity bring in money to the universities and the state, and attract further investment into new technologies. Start-ups that receive external funding also bring new economic activity to Michigan, and the successful start-ups that remain in the state may continue to do so for years. See "Research and Commercialization Benchmarks" on page 16 for details about the URC's research and innovation activity.

PEER UNIVERSITY CLUSTERS

In each of our annual reports, we compare the URC to peer university clusters in other states. We compare Michigan's URC with some of the best universities (public and private) in each of these states, as shown in Table 7 below, on a number of education and research metrics. This year, we have also added a composite ranking to benchmark the URC and peer clusters for overall performance on innovation activity. This ranking is discussed in "Innovation Power Rankings" on page 23.

In 2013, we added a Texas cluster that includes the University of Texas at Austin, Texas A&M University (including the campuses at College Station, Commerce, and the Health Science Center), and Rice University. We also replaced Tufts University in the Massachusetts cluster with Boston University. These changes were made to benchmark the URC with clusters that are also centers for research and talent, and ensure that we are always comparing the URC to other world-class research universities.

TABLE 7. Comparison Peer University Clusters

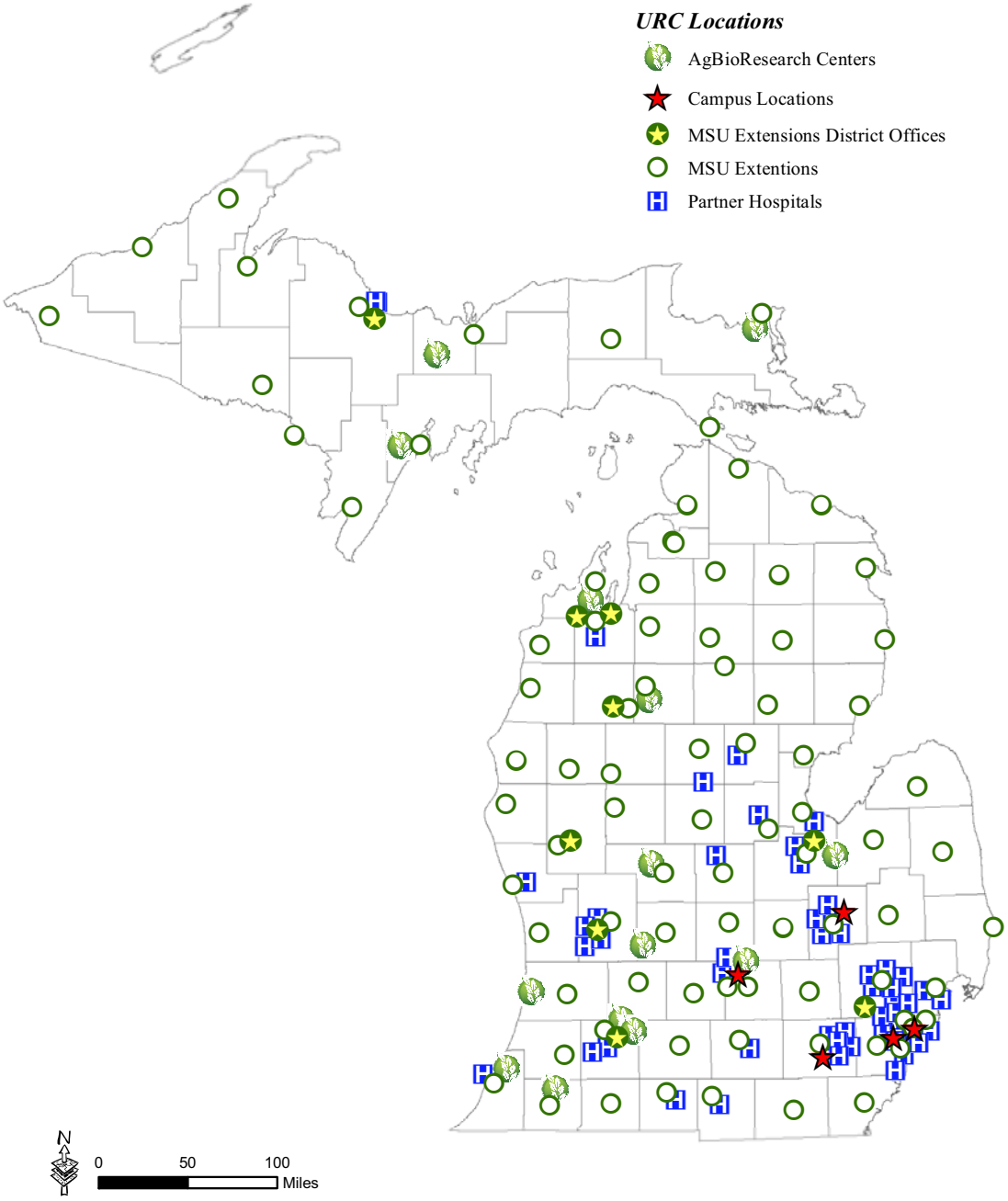
Michigan's URC	Michigan State University	University of Michigan (all campuses)	Wayne State University
Northern California	University of California, San Francisco	University of California, Berkeley	Stanford University
Southern California	University of California, Los Angeles	University of California, San Diego	University of Southern California
Illinois	University of Chicago	University of Illinois at Urbana-Champaign	Northwestern University
Massachusetts	Harvard University	Massachusetts Institute of Technology (MIT)	Boston University[a]
North Carolina	Duke University	University of North Carolina (Chapel Hill)	North Carolina State University
Pennsylvania	Penn State University (all campuses)	University of Pittsburgh (all campuses)	Carnegie Mellon University
Texas[b]	University of Texas (Austin)	Texas A&M University (College Station, and Commerce)	Rice University

Source: Anderson Economic Group, LLC

a. In previous reports we included Tufts in the Massachusetts cluster. Starting last year Boston University has replaced Tufts University in the Massachusetts cluster.

b. University of Texas, Texas A&M, and Rice comprise an additional, new cluster starting in 2013

Map 1. URC Presence in Michigan, 2013



Source: Esri, Inc.; MSU AgBioResearch Centers and Extension, MSU College of Osteopathic Medicine, WSU Physician Group, and U-M Hospital.
Analysis: Anderson Economic Group, LLC

II. Overview of URC Operations and Spending

In this section, we discuss the operations and spending of the URC universities, which impact jobs and income throughout Michigan. We start with a summary of the expenditures by URC universities in Michigan in 2013. We then provide a summary of student spending, which also impacts economic activity in the state. These expenditures will be used to estimate the URC's net economic impact on the state, which is detailed in "Economic Impact of the URC in Michigan" on page 31.

URC EXPENDITURES IN FY 2013

The URC makes significant contributions to Michigan's economy through its direct spending on goods and services in the state. URC institutions spent more than $8.1 billion on operations in FY 2013 and employed 55,060 full-time-equivalent faculty and staff throughout Michigan.[10] Almost a quarter (22%) of expenditures were for student instruction, while 15% of expenditures were for university research, as shown in Table 8 below.[11] A little more than a third (34.0%) of all expenditures paid for equipment, supplies, salaries, and maintaining the U-M Hospital facilities.

TABLE 8. Operational Expenditures by the URC, FY 2013[a]

	Expenditures (in millions)	% of Total
Instruction	$1,807	22%
Research	$1,235	15%
Public Services, Academic Support, Student Services, and Institutional Support	$1,362	17%
Athletics[b]	$139	2%
Operation and Maintenance of Plants, Auxiliary Enterprises, and Other Expenses	$811	10%
University of Michigan Hospital	$2,753	34%
Total Operational Expenditures	**$8,106**	**100%**
Construction Spending[c]	$887	

Sources: IPEDS, URC Universities, National Collegiate Athletics Association (NCAA)
Analysis: Anderson Economic Group, LLC

a. This report accounts for spending on capital differently than previous reports. Previous reports included depreciation in operational expenditures, which spreads spending on capital out over multiple years. This report uses actual construction expenditures for FY 2013, but does not include depreciation in operational expenditures. This change started in last year's report.

b. Athletics spending includes spending on salaries and wages, operating (game-day) expenses, recruiting expenses, and unallocated expenses.

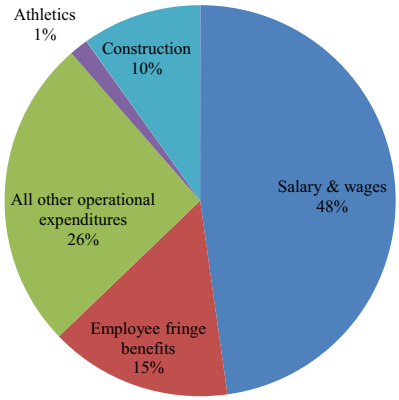
c. Construction spending is not included in operational expenditures.

10. Faculty and staff counts reflect full-time-equivalent (FTE) positions in Fall 2013, and include the U-M Hospital doctors and staff. FY 2013 data for U-M and MSU is from July 1, 2012 to June 30, 2013 and WSU's is from October 1, 2012 to September 30, 2013.

11. The data reported to the National Center for Education Statistics Integrated Postsecondary Education Data System (IPEDS) for research expenditures differ from the R&D expenditures reported to the National Science Foundation (NSF). See "R&D Expenditures" on page A-4.

We also examined URC expenditures by function, as shown in Figure 4 below. When including construction costs in addition to operating costs, nearly half of all expenditures paid for the salaries and wages of university faculty and staff. Fringe benefits made up 15% of expenditures. Athletics salaries and expenditures were 1% of spending. A quarter of all spending paid for supplies, equipment, maintenance of plant, and any other expenditure not included in the previous categories.

FIGURE 4. URC Expenditures by Function, FY 2013[12]



Source: URC Universities, NCAA
Analysis: Anderson Economic Group, LLC

STUDENT SPENDING IN FY 2013

The URC brings in students from every county in Michigan, every state in the U.S., and more than 100 countries from across the globe. These students spend money on and off campus, contributing significantly to the regional and state economies. Students spend money not only on tuition, but also on the following categories that we include in our economic impact estimates:

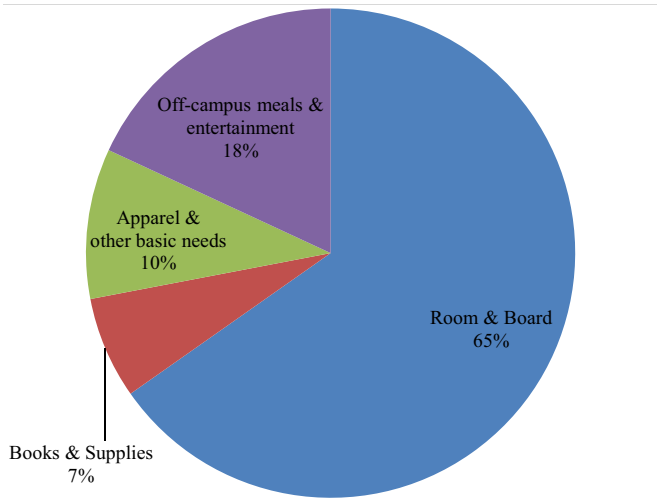
1. Room and board both on and off-campus;
2. Books and supplies;
3. Apparel and other basic needs; and
4. Off-campus meals and entertainment.

We estimate that in 2013, URC students spent nearly $2 billion on these categories of expenditures. The largest share of student spending was on room and board, at more than 65% of total spending. Figure 5 on page 7 shows the shares of student spending in the four different categories of analysis.[13]

A large portion of this student spending stays in the state of Michigan, and contributes to its economy; this portion is estimated in "Economic Impact of the URC in Michigan" on page 31.

12. Construction spending is not considered part of operational expenditures.
13. See "Methodology" on page A-1 for details on how we estimated student spending.

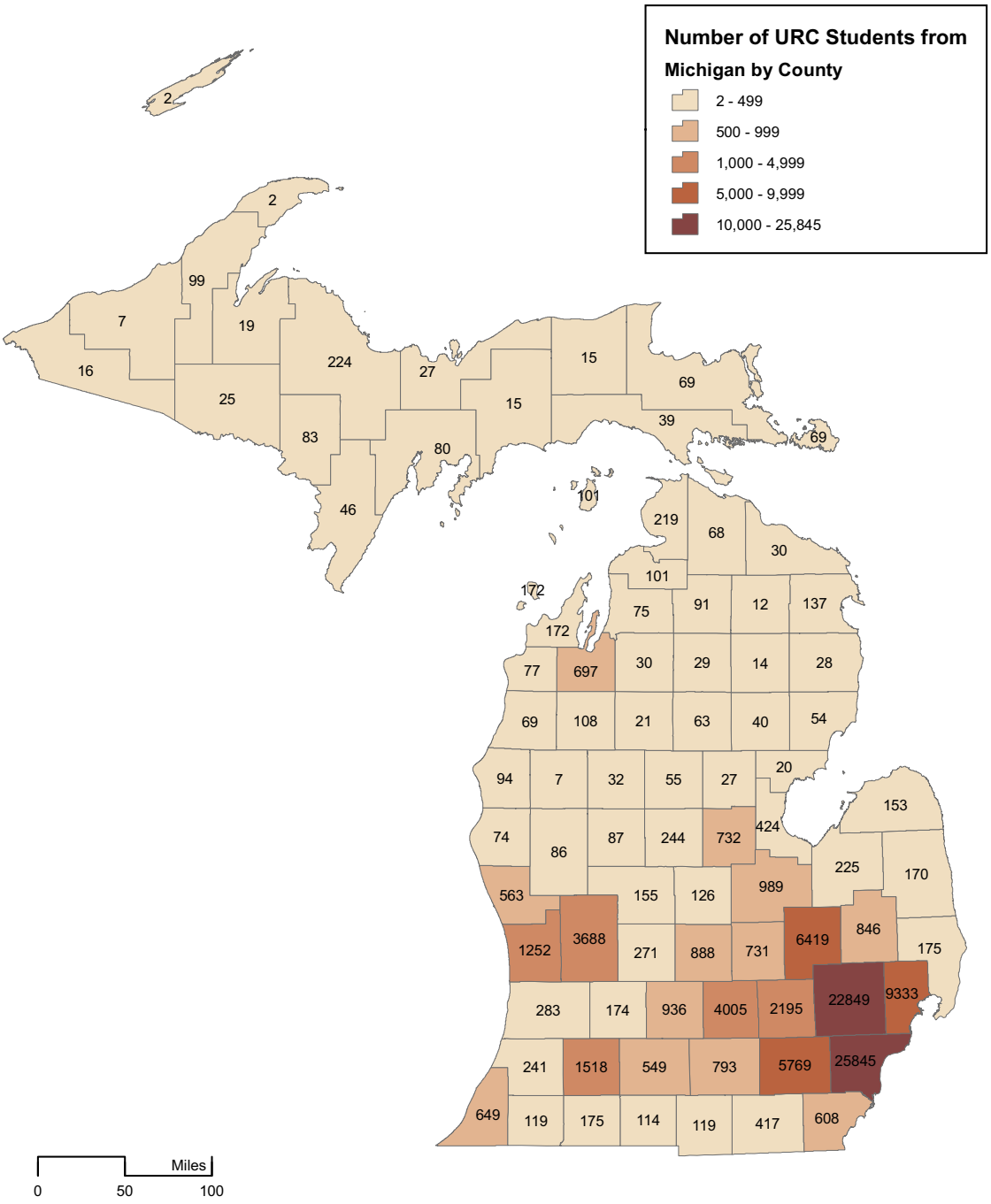
FIGURE 5. URC Student Expenditures, FY 2013



Source: URC Universities, BLS Consumer Expenditure Survey 2013, College InSight
Analysis: Anderson Economic Group, LLC

There are students from every county in Michigan who contribute to this spending, as shown in Map 2, "URC Students by County, 2013." The number of students enrolled in the URC, including the students included on the map, is discussed in the following section.

Map 2. URC Students by County, 2013



Note: See also "Methodology" in Appendix A for estimation methods.
Source: Esri, Inc.; URC Universities
Analysis: Anderson Economic Group, LLC

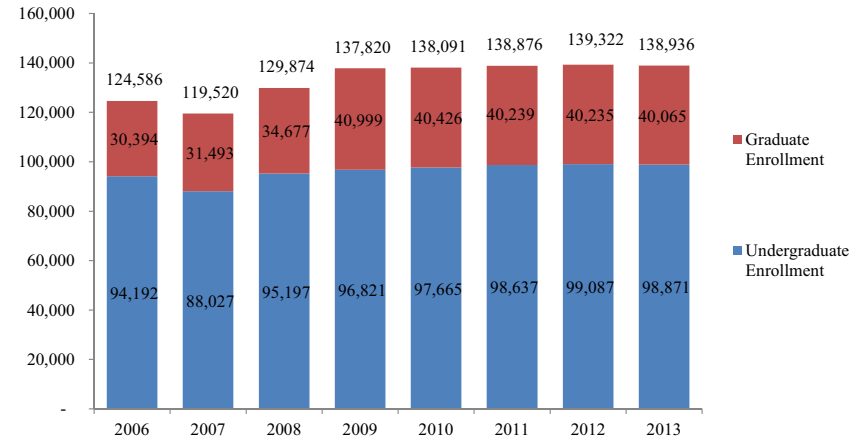
III. Education and Talent Benchmarks

Each year, we compare the URC to peer innovation clusters on metrics related to education, talent, research, and innovation.[14] In this section, we highlight the URC universities and compare them to seven peer clusters on education metrics including student enrollment and the degrees awarded at each cluster.

STUDENT ENROLLMENT

Student enrollment at the URC has risen by 11.5% since 2006, from just under 125,000 to nearly 139,000.[15] During that time period, graduate enrollment rose by almost 32%, and in 2013, the URC had more than 40,000 students enrolled in advanced degree programs. Figure 6 below shows enrollment by level from 2006 to 2013.

FIGURE 6. Student Enrollment at the URC, 2007-2013



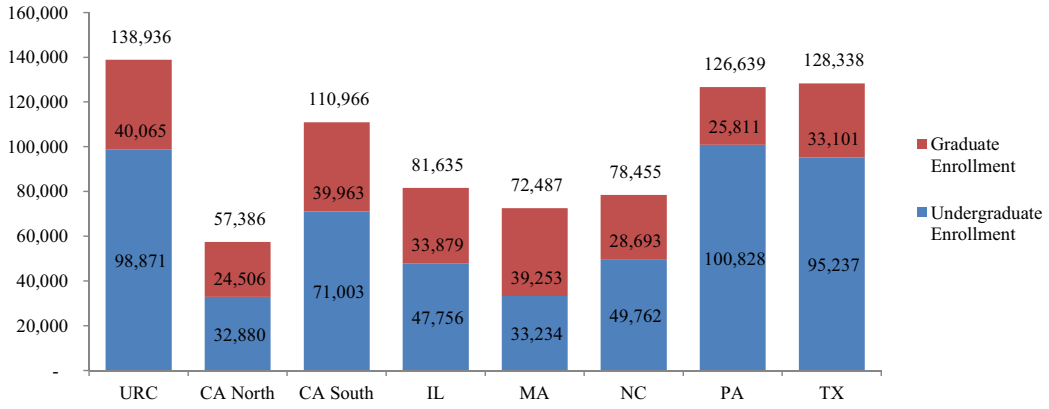
Note: Enrollment numbers are from the most recently available historical IPEDS data for "Estimated Enrollment," and may differ from historical data presented in earlier reports.

As shown in Figure 7 on page 10, the URC has the largest enrollment of any cluster in this analysis, as it has since 2006. Table B-1 on page B-1 details the historical attendance for each of the clusters by level of student.

14. The seven peer university innovation clusters are listed in Table 7 on page 3.

15. The enrollment number of 138,936 is reported by IPEDS, and differs from the number of degree-seeking students reported in "Executive Summary" on page i. We use the IPEDS number in this section for accurate benchmarking against other peer clusters.

FIGURE 7. Student Enrollment for the URC and Peer Clusters, 2013

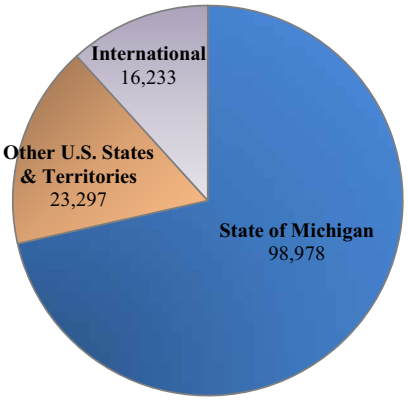


Source: IPEDS Enrollment, Fall 2013
Analysis: Anderson Economic Group, LLC

Origin of URC Students

As shown in Map 2, on page 8, the URC has students from across the state of Michigan. Students also come from across the country and the world to attend URC universities. In fall 2013, 71% of enrolled URC students were from Michigan. An additional 17% were from other U.S. states and territories, and the remaining 12% were international students. Figure 8 below shows the breakdown of the origins for enrolled students in fall 2013.

FIGURE 8. Origin of URC Students, Fall 2013

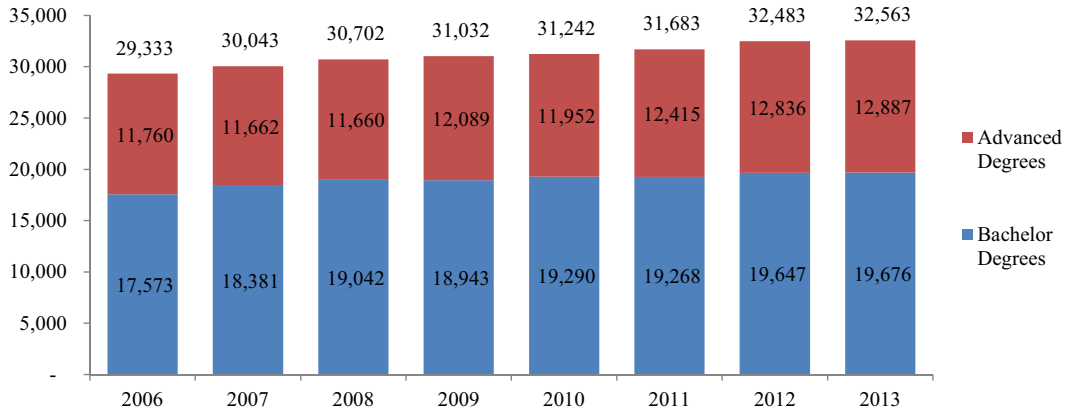


Source: URC Universities, 2013
Analysis: Anderson Economic Group, LLC

TOTAL DEGREES GRANTED

The number of total degrees awarded by the URC has been on the rise. Since 2006, the number of degrees conferred has increased by more than 11%, up from just greater than 29,000 to more than 32,500. Figure 9 on page 11 shows the history of degrees granted by type, showing that the URC has consistently increased completions for each year since 2006.

FIGURE 9. Completions by Level of Degree for the URC, 2006-2013

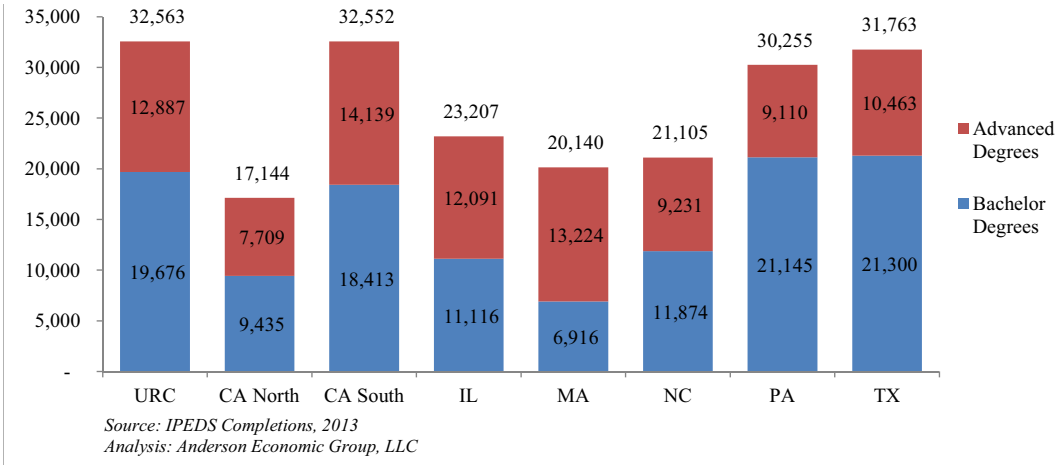


Source: IPEDS Completions, 2006-2013
Analysis: Anderson Economic Group, LLC

In 2013, the URC ranked first in total number of degrees (undergraduate and graduate) conferred. As shown in Figure 10 below, the URC issued nearly 20,000 bachelor degrees and almost 13,000 advanced degrees. Table B-2 on page B-1 details the number of degrees conferred for each cluster between 2006 and 2013.

The number of degrees awarded at the URC universities has been increasing since 2006.

FIGURE 10. Completions by Level of Degree for the URC and Peer Clusters, 2013



Source: IPEDS Completions, 2013
Analysis: Anderson Economic Group, LLC

DEGREES BY PROGRAM

The URC offers degrees in nearly every subject categorized by the U.S. Department of Education.

We benchmark the number of degrees granted by the URC and the peer university clusters by the following subject areas:

- *Physical Science, Agriculture, and Natural Resources*
- *Business, Management, and Law*

- *Engineering, Mathematics, and Computer Science*
- *Liberal Arts*
- *Medicine and Biological Science*
- *Other*

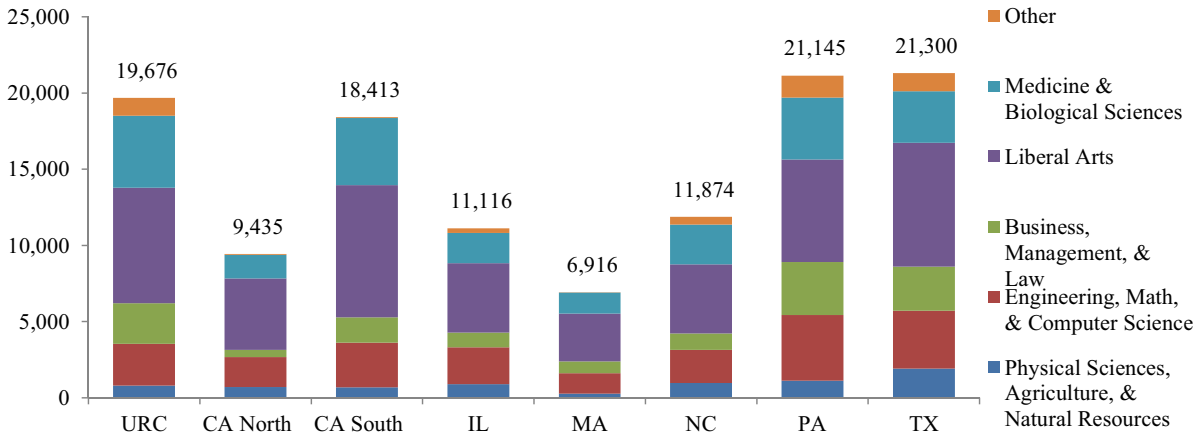
See "Academic Program Definitions" on page A-2 for the composition of each program area.

In 2013, the URC awarded the highest number of advanced degrees in the Medicine and Biological Science Fields of any peer university innovation cluster.

Undergraduate Degrees Conferred

The URC conferred the third largest number of bachelor degrees overall in 2013, behind the Texas cluster and the Pennsylvania cluster, as shown in Figure 11 below. For a detailed list of bachelor degrees conferred by field of study, see Table B-3 on page B-2.

FIGURE 11. Undergraduate Degrees Conferred by Area for the URC and Peer Clusters, 2013

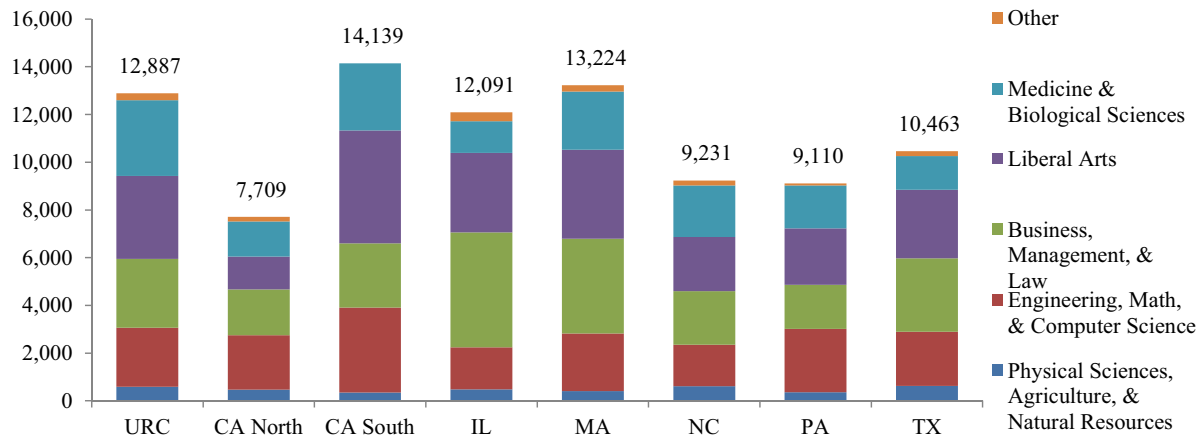


Source: IPEDS Completions, 2013
Analysis: Anderson Economic Group, LLC

Graduate Degrees Conferred

In 2013, the URC awarded the highest number of advanced degrees in *Medicine and Biological Science* fields, and the third-highest amount of advanced degrees overall. See Figure 12 on page 13. Table B-4 on page B-2 lists the amount of advanced degrees conferred by field of study.

FIGURE 12. Graduate Degrees Conferred by Area for the URC and Peer Clusters, 2013



Source: IPEDS Completions, 2013
Analysis: Anderson Economic Group, LLC

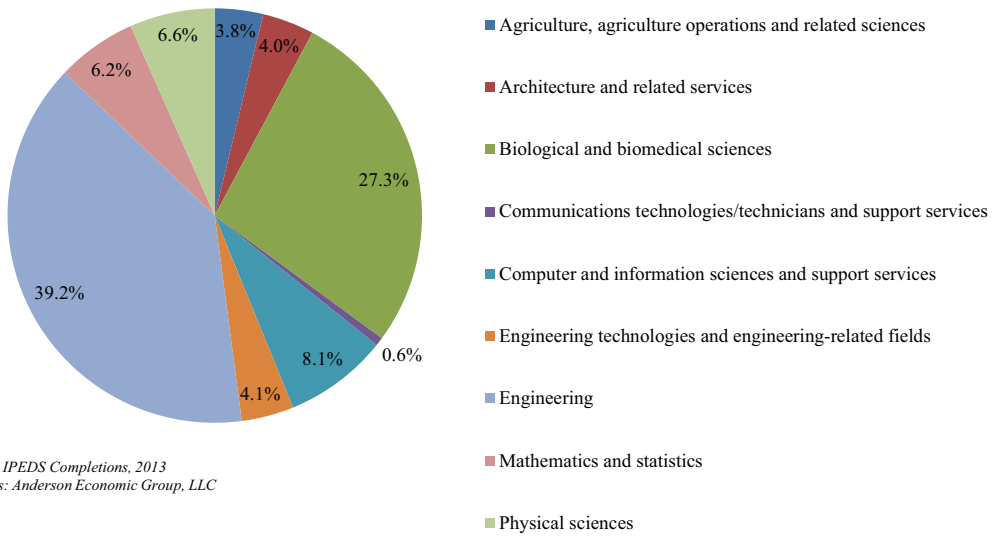
HIGH-TECH AND HIGH-DEMAND DEGREES

In this section we identify the number of degrees awarded by cluster that prepare students for jobs in the high-tech industry or that are in high demand by employers. See "High-Tech, High-Demand, and Medical Degrees" on page A-2 for further description of our methodology.

Benchmarking High-Tech Degrees

The URC awarded 9,054 high-tech degrees in 2013. As shown in Figure 13 below, the largest share of these degrees were awarded in engineering, with the second largest share being awarded in biological and biomedical sciences. A breakdown of high-tech degrees by cluster category can be found in Table B-5 on page B-3.

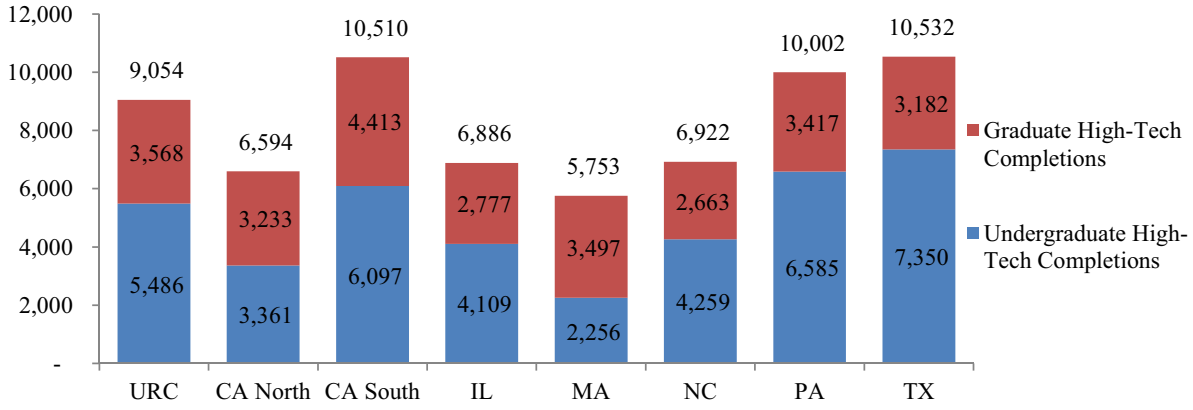
FIGURE 13. Completion of Undergraduate and Graduate High-Tech Degrees by Field of Study, 2013



Source: IPEDS Completions, 2013
Analysis: Anderson Economic Group, LLC

As shown in Figure 14 below, the URC awarded the fourth-highest number of undergraduate high-tech degrees, and the second-highest number of advanced high-tech degrees in the 2013 academic year.

FIGURE 14. Completion of High-Tech Degrees for the URC and Peer Clusters, 2013

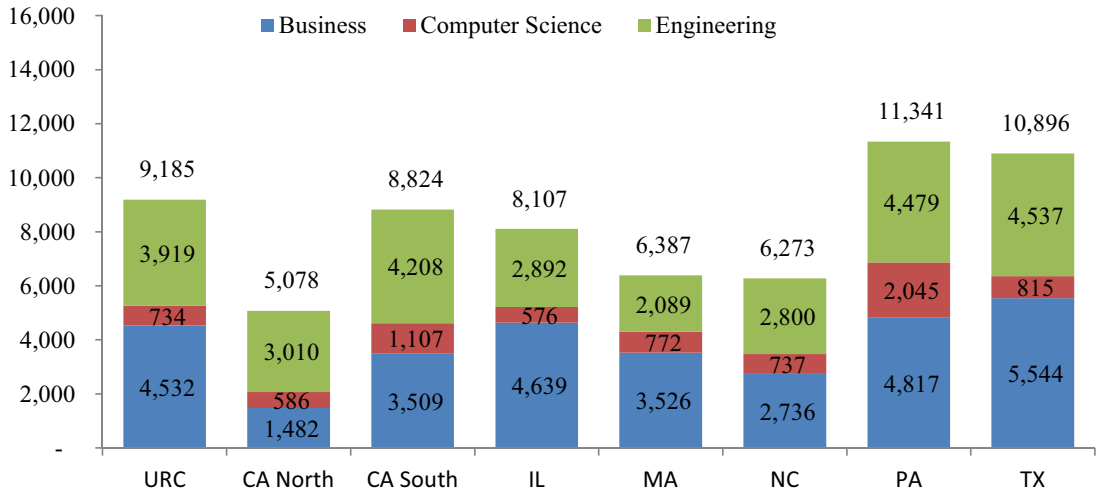


Source: IPEDS Completions, 2013
Analysis: Anderson Economic Group, LLC

Benchmarking High-Demand Degrees

High-demand degrees include those in computer science, engineering, and business. Figure 15 below shows the total number of high-demand degrees conferred by academic area for the URC and each peer cluster. The URC conferred the third-highest number of business and computer degrees, as well as the third-highest number of high-demand degrees overall in 2013.

FIGURE 15. Completion of High-Demand Degrees for the URC and Peer Clusters, 2013

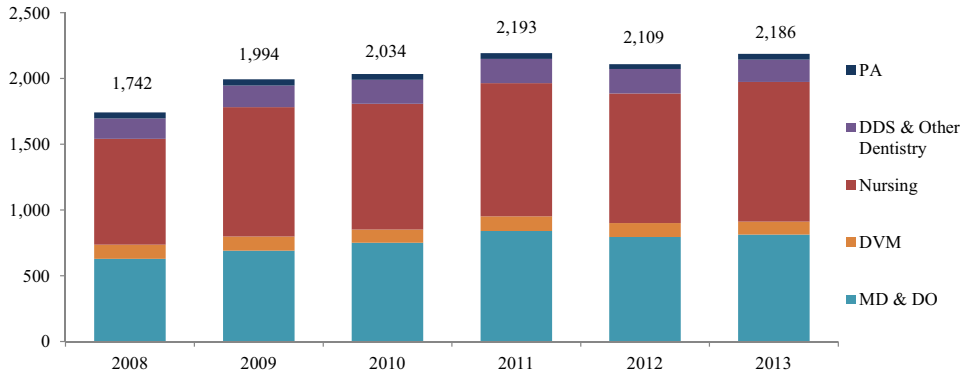


Source: IPEDS Completions, 2013
Analysis: Anderson Economic Group, LLC

Medical Education

The URC universities offer allopathic (MD) and osteopathic (DO) medical schools, along with schools of dentistry, veterinary medicine, and physician assistant programs. Figure 16 below shows medical graduates for the URC, which increased by 26% between 2008 and 2013. The number of graduates for other dentistry and DO degrees increased the most in that time, by 112.6% and 109.1%, respectively.[16]

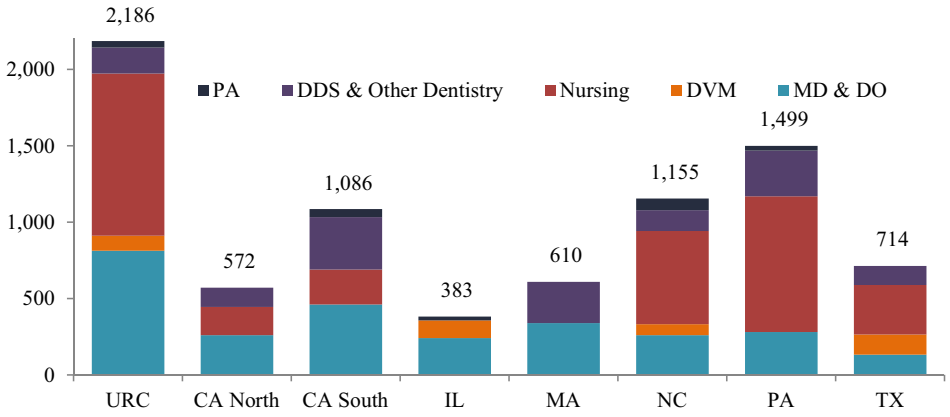
FIGURE 16. URC Medical Graduates by Field of Study, 2008-2013



Source: IPEDS Completions, 2008-2013
Analysis: Anderson Economic Group, LLC

As shown in Figure 17 below, the URC had the most medical graduates in 2013, far more than any other peer cluster. The URC is the only cluster among the peers that offers a DO program, and it was also the leader in the number of MD and nursing graduates in 2013. See Table B-7 on page B-4.

FIGURE 17. Medical Graduates by Field of Study for the URC and Peer Clusters, 2013



Source: IPEDS Completions, 2013
Analysis: Anderson Economic Group, LLC

16. For a list of degrees included in these categories, see "Benchmarking Metrics" on page A-1.

IV. Research and Commercialization Benchmarks

In the previous sections, we discussed the scope of the operations of the URC and highlighted how the URC universities educate students in all fields of study. The URC also plays a role in advancing economic prosperity by engaging in research and commercialization activity.

URC universities contribute to the economy and to technological innovation in notable ways. Universities across the country spend billions of dollars on research and development activities of faculty, staff, and students; this investment often leads to new inventions or startup companies. Universities provide assistance for these developments through programs within technology transfer offices. The support of tech transfer offices leads to transferring the technology from the university setting into the private sector, introducing the ideas to a larger audience, resulting in greater economic activity.

Nearly every university in the defined peer clusters is classified as an institution engaging in very high research activity.[17] This section highlights the URC's research and innovation, and benchmarks the URC against its peers in academic R&D expenditures, as well as technology transfer activity.[18]

ACADEMIC R&D EXPENDITURES

In FY 2013, academic institutions in the U.S. spent more than $67 billion on research and development.[19] Using the most recent data available from the National Science Foundation (NSF), we show the sources for R&D expenditures for each university cluster in Table B-8 on page B-4. Total R&D expenditures by the eight university clusters totaled more than $17 billion in 2013, making up about 25% of R&D expenditures by all U.S. universities. In 2013, the URC had the fifth-largest R&D expenditures of the eight university clusters at $2.1 billion.

Higher education institutions in Michigan spent $1.3 billion in R&D from federally-financed sources.[20] Ninety-four percent of the federally-funded R&D in Michigan was conducted at the URC. The majority of university funding for R&D comes from the federal government, as shown in Table 9 below. While the URC received 56% of its funding in 2013 from the federal government, the URC received less federal

The URC accounted for 94% of federally-funded R&D expenditures at higher education institutions in Michigan.

17. "Very high research activity" is a classification designated by the Carnegie Foundation for the Advancement of Teaching, assigned to doctorate-granting institutions with the highest level of research activity. Carnegie classifications have been the leading framework for recognizing and describing institutional diversity in U.S. higher education for the past four decades. The exceptions are UCSF, which is classified as a medical school and medical center, and some of Pennsylvania State University and the University of Pittsburgh campuses.
18. For a more in-depth discussion about research and commercialization at the URC universities, please see Erin A. Grover, Colby W. Spencer and Samantha Superstine, "Embracing Entrepreneurship: The URC's Growing Support for Entrepreneurs in Michigan and Throughout the World," Anderson Economic Group LLC, East Lansing, May 2013.
19. NSF National Center for Science and Engineering Statistics, Higher Education Research and Development (HERD) Survey, FY 2013.

funding as a percentage of total funding when compared to its peers, except for the Texas Cluster (48%) and is approximately equivalent to the Northern California Cluster (56%). Furthermore, the URC has the smallest proportion of industry funding (3% of total R&D expenditures) than any of the other clusters.

The URC relies on institution funds (which come from the universities themselves rather than outside entities) for a significantly higher proportion of its R&D spending than the other seven comparison clusters, as well as the average U.S. university. In 2013, the URC universities relied on their own funds for 33% of total R&D expenditures.

TABLE 9. Source of Funding for URC and Peer Clusters, 2013

	Federal Gov't	State & Local Gov't	Institution	Industry[a]	Non-Profits	All Other Sources
URC	**56%**	**2%**	**33%**	**3%**	**4%**	**1%**
Northern California	56%	5%	15%	8%	11%	4%
Southern California	58%	4%	15%	6%	10%	7%
Illinois	65%	2%	21%	4%	7%	1%
Massachusetts	59%	0%	19%	7%	9%	6%
North Carolina	58%	4%	20%	13%	6%	2%
Pennsylvania	70%	3%	15%	11%	3%	4%
Texas	48%	12%	24%	8%	7%	1%
All U.S. Universities	*59%*	*5%*	*22%*	*5%*	*6%*	*2%*

Source: NSF HERD Survey, 2013
Analysis: Anderson Economic Group, LLC

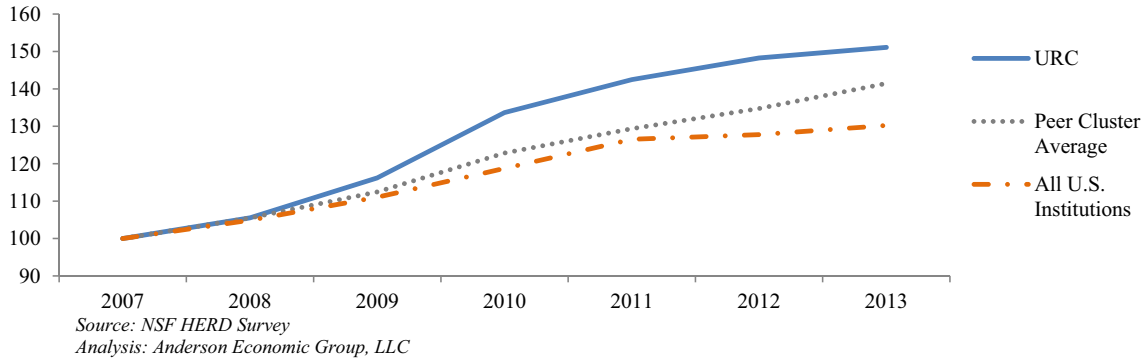
a. This category is labeled "business" in the NSF survey, but we have kept the category label "industry," as we have in prior reports.

From 2007 to 2013, the URC increased R&D expenditures by 51%.

From 2012 to 2013, the URC increased total R&D expenditures by 1.9%, which is the fourth-highest percentage increase among the clusters. As shown in Figure 18 on page 18, this growth rate was significantly higher than the average for all U.S. universities, as well as the peer cluster average. It is notable that in the last six years (2007 to 2013), the URC increased its R&D spending by 51.1%, which is the second-highest out of its peer clusters during that time, behind only Massachusetts (72.9%). It is worth noting, that this figure includes a large increase in institutional funding at Harvard University between 2012 and 2013. During this time Harvard almost tripled its institutional funding. This drove the Massachusetts cluster to have a 17% increase between 2012 to 2013. Figure 18 on page 18 compares the growth in URC R&D spending against the average spending of its peers between 2007 and 2013. See Table B-9 on page B-5 for detailed spending.

20. This data comes from the NSF HERD survey and includes respondents that only filled out the short-form survey. As a result this number includes both public and private colleges and universities receiving federal research funding.

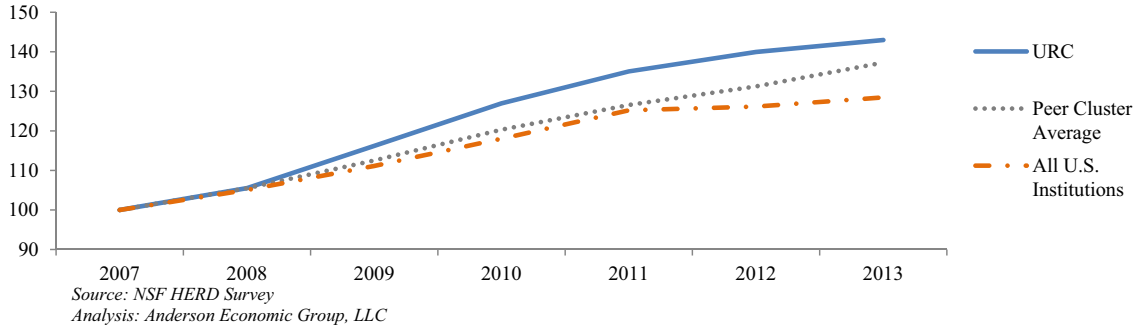
FIGURE 18. Growth in R&D Spending, 2007-2013 (2007 value=100)



Source: NSF HERD Survey
Analysis: Anderson Economic Group, LLC

Between 2012 and 2013, the URC increased its science and engineering (S&E) R&D expenditures by 2.2%, the sixth best amongst the clusters. In the past five years, the URC increased its S&E R&D by 35.5%, which is the third-highest of the clusters, and significantly greater than the increase for the peer cluster average as well as all U.S. institutions. Figure 19 below shows the growth in R&D spending on S&E for the URC, and the average of its peers. See Table B-10 on page B-5 for the detailed spending amounts for the past two years.

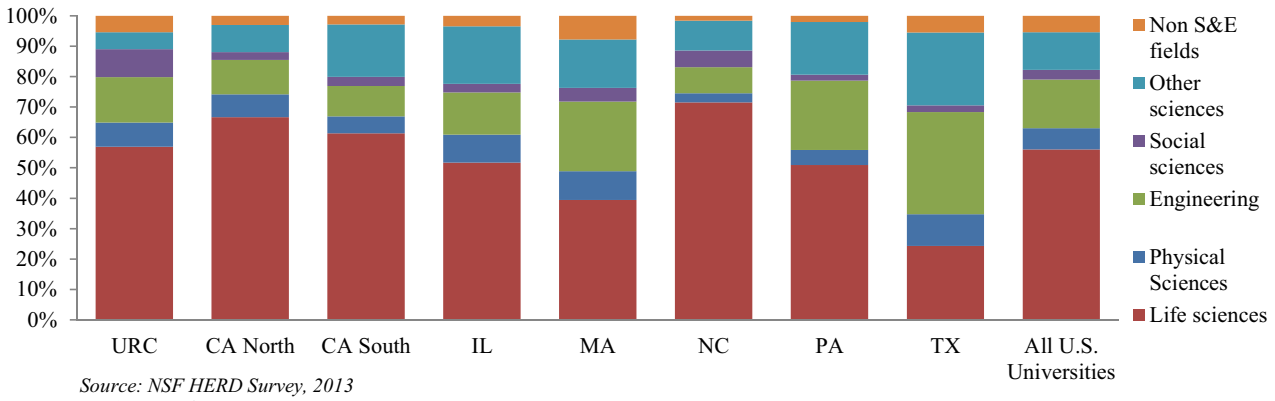
FIGURE 19. Growth in R&D Spending on Science and Engineering, 2007-2013 (2007 value=100)



Source: NSF HERD Survey
Analysis: Anderson Economic Group, LLC

Research priorities vary across the university clusters, resulting in variation in which fields receive higher amounts of R&D funding. By and large, universities focus the greatest amount of their spending on S&E fields, as shown in Figure 20 on page 19. Table B-11 on page B-6 details spending amounts by field.

FIGURE 20. R&D Expenditures by Field, 2013



Source: NSF HERD Survey, 2013
Analysis: Anderson Economic Group, LLC

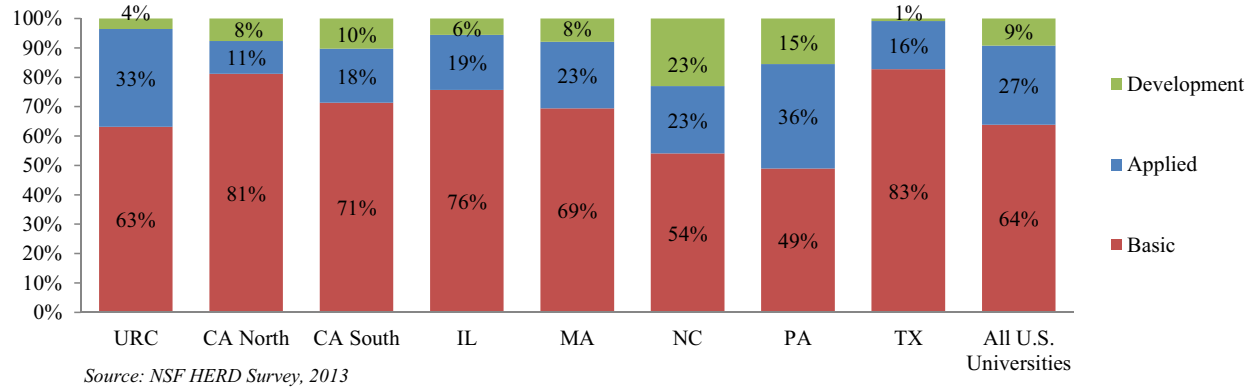
In 2013, the North Carolina and the North California clusters spent the largest shares on life sciences, while the Texas and Massachusetts clusters both spent significantly less than the national average on life sciences. The Texas, Illinois, and Massachusetts clusters spent higher shares on physical sciences, while the North Carolina cluster spent a lower percentage than the U.S. average. The Pennsylvania, Texas, and Massachusetts clusters also spent significant shares on engineering. The URC is mostly consistent with U.S. university averages for spending shares, but within the other sciences category spends a significantly lower share on environmental sciences, and a higher share on social sciences.

Expenditures by Research Type

There are three general categories of academic research: basic, applied, and development. The NSF defines *basic research* as research undertaken primarily to acquire knowledge without any particular application or use in mind, and *applied research* as research conducted to meet a specific, recognized need. *Development* is the systematic use of research towards the production of useful materials, devices, systems, or methods, including the design and development of prototypes and processes.

In Figure 21 on page 20, we show the percentage of R&D funds going towards basic research, applied research, and development. The URC spends the second-highest amount of their funding on applied research (33%), behind only the Pennsylvania cluster (36%).

FIGURE 21. Share of R&D Expenditures Spent on Basic, Applied, And Development Research by URC and Peer Clusters, 2013



Source: NSF HERD Survey, 2013
Analysis: Anderson Economic Group, LLC

TECHNOLOGY TRANSFER

An important function of successful university R&D is its transfer of technology to the private sector. University R&D expenditures provide support for the development and research of students, faculty, and staff at the university. Technology transfer (or technology commercialization) offices at universities provide support for moving these developments made in the university setting to the private sector. Tech transfer allows technology innovation and improvements to reach a larger audience, and therefore enable further innovation and economic activity.

Technology transfer offices at universities support students, faculty, and staff in transferring technology into the private sector by offering a variety of programs and assistance, depending on the need of the developer. Invention disclosures, patent applications, licensing, and entrepreneurial support are some of the available resources.

While the number of patent applications and invention disclosures in a year may show some level of success of the research and development at a university, it will not necessarily show the effectiveness of reaching the private sector. The statistics on other services provided by tech transfer offices, such as patents granted, number of licenses, royalty revenue, and the number of new start-ups, provide a more holistic depiction of how innovative efforts of the universities have impacted the private sector. Below we show each of these metrics for the URC, and we benchmark the URC's performance against peer clusters.

Patents and Licensing

Patent and licensing activity includes invention disclosures, patents issued, and licensing and options agreements. In 2013, the URC surpassed its longer-term five-year averages for the number of patents issued, licensing and options agreements, and invention disclosures. In particular, disclosures saw another significant increase, continuing the long-term upward trend. As a result, the URC leapfrogged Illinois on the disclosure ranking. If the trend continues, the URC can move further

up the rankings. The URC ranks in the lower half for the 2009-2013 average annual technology transfer activities of the peer university clusters, fourth in average annual number of patent grants, sixth in invention disclosures, fifth in licenses and options issued, and seventh in licensing revenue, as shown below in Table 10.

TABLE 10. Average Annual Patent and Licensing Activity for URC and Peer Clusters, 2009-2013

	Invention Disclosures	*Rank (1-8)*	U.S. Patent Grants	*Rank (1-8)*	Licenses/ Options	*Rank (1-8)*	Licensing Revenue (in millions)	*Rank (1-8)*
URC	**519**	***6***	**162**	***4***	**136**	***5***	**$27.3**	***7***
Northern California	812	*3*	283	*1*	166	*3*	$127.3	*2*
Southern California	895	*2*	200	*3*	100	*8*	$51.1	*4*
Illinois	484	*7*	148	*5*	115	*6*	$152.7	*1*
Massachusetts	1,010	*1*	275	*2*	153	*4*	$99.6	*3*
North Carolina	549	*5*	11	*7*	239	*2*	$31.8	*5*
Pennsylvania	553	*4*	105	*8*	250	*1*	$16.0	*8*
Texas	474	*8*	128	*6*	102	*7*	$28.7	*6*

Sources: Universities' websites and technology transfer offices, Association of Technology Managers (AUTM) Surveys. See "Methodology" on page A-1 for detailed sources by cluster.
Analysis: Anderson Economic Group, LLC

One measure of R&D expenditure success is the amount of licensing revenue generated by each dollar spent in the S&E fields. Since licensing revenue can have large year-to-year variations, we compared the average revenue to the S&E R&D expenditures over a five-year period (2009-2013). Table 11 below shows that the URC has performed better than the Pennsylvania cluster in terms of revenues earned per S&E R&D dollar spent.

TABLE 11. Average Annual Licensing Revenue as a Percentage of S&E R&D Expenditures at URC and Peer University Clusters, 2009-2013

	Average Licensing Revenue 2009-2013 (in millions)	Average S&E R&D Expenditures 2009-2013 (in millions)	Revenues per Expenditures	*Rank (1-8)*
URC	**$27.3**	**$1,857**	**1.5%**	***7***
Northern California	$127.3	$2,492	5.1%	*3*
Southern California	$51.1	$2,496	2.0%	*5*
Illinois	$152.7	$1,559	9.7%	*1*
Massachusetts	$99.6	$1,731	5.7%	*2*
North Carolina	$31.8	$2,137	1.5%	*6*
Pennsylvania	$16.0	$1,826	0.9%	*8*
Texas	$28.7	$1,356	2.1%	*4*

Sources: Universities' websites and technology transfer offices, Association of Technology Managers (AUTM) Surveys, NSF HERD Survey, 2013. See "Methodology" on page A-1 for detailed sources by cluster
Analysis: Anderson Economic Group, LLC

Start-ups

The number of start-ups is one indicator of the R&D process. Over the past several years, the URC has developed and expanded incubators, services to assist with entity formation, as well as grant programs for different stages of business development. These services, along with the relationships the URC has fostered with local communities and businesses, contribute to the success of start-ups at the URC universities for students, alumni, and the community.[21] The URC's reach spans farther than only those start-ups which use a URC-licensed technology. So although it is impossible to completely capture all the new companies assisted in some way by the URC, we have some data on the number we can directly attribute to the URC.

In 2013, the URC produced 10 start-ups, below its five-year annual average. Since 2002, the URC has cultivated 173 start-up companies, 64 of which have formed within the past five years. The URC has been actively involved in fostering and encouraging entrepreneurial activities, including the cultivation of start-ups.

Table 12 below shows the number of start-ups for the URC and peer clusters from 2009 through 2013. The URC ranks seventh among its peers in the number of start-ups cultivated in 2013, and eighth when looking at the five-year averages. On average, 13 new companies are started each year with licensed technology from a URC university.

TABLE 12. Number of Start-ups Cultivated at University Clusters, 2009-2013

	2009	2010	2011	2012	2013	Average, 2009-13	*Rank (1-8)*
URC	**8**	**14**	**18**	**14**	**10**	**13**	***8***
Northern California	18	23	16	34	25	23	*4*
Southern California	29	46	38	32	38	37	*1*
Illinois[a]	13	14	17	20	20	18	*5*
Massachusetts	30	25	27	30	29	30	*2*
North Carolina	9	14	18	19	31	18	*5*
Pennsylvania	16	21	17	24	42	24	*3*
Texas	21	24	16	6	8	15	*7*

Sources: Universities' websites and technology transfer offices, Association of Technology Managers (AUTM) Surveys. See "Methodology" on page A-1 for detailed sources by cluster
Analysis: Anderson Economic Group, LLC

a. The five-year average (2006-2010) for the University of Chicago's start-ups were used as the 2011 number because it was unavailable.

21. For a detailed discussion of the resources the URC offers to start-ups and other entrepreneurial endeavors, see Erin A. Grover, Colby W. Spencer and Samantha Superstine, "Embracing Entrepreneurship: The URC's Growing Support for Entrepreneurs in Michigan and Throughout the World," Anderson Economic Group LLC, East Lansing, May 2013.

V. Innovation Power Rankings

In the previous sections, we compared the URC to seven peer innovation clusters on students, degrees, research, and technology transfer activity. In this section, we introduce a composite ranking of the innovation activity for the URC and each of its peer innovation clusters. This composite ranking incorporates the performance of each cluster on many of the metrics discussed earlier in the report, and provide a way to benchmark the URC's overall innovation activity to that of its peer clusters. It is a way to capture the contribution that the university clusters make as a result of their research, talent, and technology transfer activities.

COMPONENTS OF INNOVATION COMPOSITE RANKING

The purpose of the composite ranking is to capture the URC and each peer innovation clusters' measurable contributions to innovation from its efforts in the following categories:

- Research spending;
- Technology transfer activity; and
- Talent.

Research Spending

Each peer university cluster engages in a high level of research activity, with nearly every school classified as a very high research university. We include research as a component of the composite rankings to assess the performances of research activity among the peer clusters.

We combine total research spending and research spending in S&E fields to determine the research ranking. We include research spending as a measure of innovation because it captures the gross research activity at the universities. We do not adjust research spending activity to measure spending per student, spending per research faculty, or any other ratio. Therefore, this particular component approximates the sheer volume of research at universities. This research provides a basis for many of the startup companies and new technologies for the universities, which is measured in the technology transfer activity component of the composite ranking.

Furthermore, while we do not measure economic impact for the URC's peer clusters, research spending gives an indication of how universities contribute to economic activity in their communities.[22] See "Research and Commercialization Benchmarks" on page 16 for a discussion of research activity at the URC and its peer clusters.

Technology Transfer Activity

As discussed in "Technology Transfer" on page 20, technology transfer and commercialization is an important aspect of a university's contribution to industry. By

22. A lot of research spending at the universities comes from external funding that would not otherwise occur in the universities' respective communities. Therefore, there is additional economic activity associated with high research activity since schools can hire more staff and faculty, and spend more money to conduct research.

ranking each cluster on technology transfer activity, we capture how its research and technology efforts are utilized in the private and also in the public sectors. We rank each university cluster on the five-year averages for the following metrics:

- Licensing revenue;
- Startup companies;
- Patent grants issued;
- Technology licenses issued; and
- Invention disclosures.

The combination of these measures provides an overview of the success of technology efforts in each cluster.

Talent

In "Education and Talent Benchmarks" on page 9, we benchmark the URC and its peer clusters on a number of education and talent benchmarks, including enrollment, the degrees awarded, and the degrees awarded by field of study. For the talent component of the composite ranking, we rank each university cluster on the total number of degrees awarded, as well as the number of high-technology degrees awarded.

We included a talent metric in the composite ranking to capture the number of graduates each university cluster contributes to the workforce each year. The number of degrees awarded approximates a university's contribution to an educated and productive workforce. High-technology degrees reflect graduates that may work in fields in which technology and innovation are key components of the industry.[23]

See Appendix A: "Methodology" on page A-1 for more details on how we measured the metrics in each component of the composite ranking.

RANKINGS BY CATEGORY

As mentioned above, we rank each cluster on research spending, technology transfer activities, and talent. We use the metrics from "Education and Talent Benchmarks" and "Research and Commercialization Benchmarks" in order to determine each rank. As shown in Table 13 on page 25, the URC ranks fifth in research, seventh in technology transfer, and first in talent.

We combine these rankings by weighting each cluster's performance in each category to determine the overall ranking for innovation activity. Research spending and talent each account for 40% of the overall ranking, and technology transfer activity accounts for 20%.

Overall, the URC ranks second when compared to its peer innovation clusters on measures of innovation. See "Methodology" on page A-1 for details on how we

23. "High-Tech, High-Demand, and Medical Degrees" on page A-2 provides a list of which fields of study of included in high-technology degrees.

determined rankings by category, as well as the composite ranking for innovation. A more detailed display of the URC and peer cluster rankings by metric can be found in Table A-1 on page A-7.

TABLE 13. Innovation Power Rankings for URC and Peer Clusters, 2013

	Research Spending	Technology Transfer	Talent	Composite Ranking
URC	**5**	**7**	**1**	**2**
Northern California	1	4	8	**3**
Southern California	2	2	3	**1**
Illinois	7	4	5	**7**
Massachusetts	4	1	7	**4**
North Carolina	3	6	5	**4**
Pennsylvania	6	3	6	**6**
Texas	8	8	4	**8**

Analysis: Anderson Economic Group, LLC

VI. URC Alumni in Michigan

An important way the URC institutions contribute to Michigan's economy is by educating and training the state's future workforce. Attending and graduating from a URC university increases the earning power for alumni, and many of these alumni live and work in Michigan. This section discusses the number of alumni in the state and the earnings in Michigan attributable to these alumni. These estimations will then be used as part of the economic impact analysis in the following section.

NUMBER OF URC ALUMNI

As of summer 2014, the URC had almost 1.2 million alums worldwide. The 617,319 URC alumni living in Michigan account for more than 9% of the state's population over the age of 24.[24] URC universities have alumni in every state in the U.S. (see Map 3, "URC Alumni by State, 2014,") and in every county in Michigan (see Map 4, "URC Alumni by ZIP Code, 2014,"). URC alumni also live in more than 180 countries across the world.

ALUMNI EARNINGS

Alumni of URC universities contribute to the state's economy, as university graduates with bachelors and graduate degrees produce and earn more than the average worker. In 2013, there were 617,319 URC alums living in Michigan. We estimated their earnings for that year were $43 billion, after accounting for wages of URC alumni and the alum's year of graduation.[25] This accounts for almost 23% of all wage and salary income in the state. While much of these earnings cannot be said to have been *caused* by the URC universities, this figure shows the scale of the URC's role in attracting and educating Michigan's workforce.[26]

Table 14 on page 27 shows our estimates of how URC alumni earnings are distributed across Michigan's 10 regions based on the current location of alumni. Since alumni are located all across the state, each region in Michigan benefits from alumni earnings. The Southeast, Central, East Central, and South Central regions have a larger share of URC alumni earnings than their respective shares of state population. The West Central region, which includes the Grand Rapids area, is notable for having a significantly lower share of URC alumni earnings than state population. Not coincidentally, the West Central region is the most populous region not to contain a URC university.

24. According to the U.S. Census Bureau, Michigan had 6,645,295 residents over the age of 24 years on July 1, 2013.

25. See "Impact of Alumni Earnings" on page A-12.

26. Wage data for Michigan taken from the Bureau of Labor Statistics Quarterly Census of Employment and Wages 2012 annual average.

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TABLE 14. Share of 2013 URC Alumni Earnings in Michigan by Economic Development Collaborative Region

Region number	Regions - Economic Development Collaboratives	Number of URC Alums		Share of URC Alumni Earnings (in millions)		*2013 Population*
		Total	% of Total	Total	% of Total	*% of Total MI Population*
1	Upper Peninsula Region	5,714	0.9%	$398.0	0.9%	*3.1%*
2	Northwest Region	17,075	2.8%	$1,187.7	2.7%	*3.0%*
3	Northeast Region	5,797	0.9%	$403.0	0.9%	*2.1%*
4	West Michigan Region	48,361	7.8%	$3,349.8	7.7%	*15.6%*
5	East Central Region	16,079	2.6%	$1,119.3	2.6%	*5.8%*
6	East Michigan Region	44,681	7.2%	$3,189.7	7.4%	*8.7%*
7	South Central Region	51,655	8.4%	$3,499.2	8.1%	*4.7%*
8	Southwest Region	20,283	3.3%	$1,409.2	3.3%	*7.9%*
9	Southeast Region	71,921	11.7%	$5,160.8	11.9%	*10.1%*
10	Detroit Metro Region	335,320	54.4%	$23,634.4	54.5%	*39.0%*
		616,886	100.0%	$43,351	100.0%	*100.0%*

Note: Sum of regions may not equal the total due to rounding, and excludes Michigan alumni with invalid zip codes.

Sources: URC university alumni offices, BLS, U.S. Census Bureau
Analysis: Anderson Economic Group, LLC

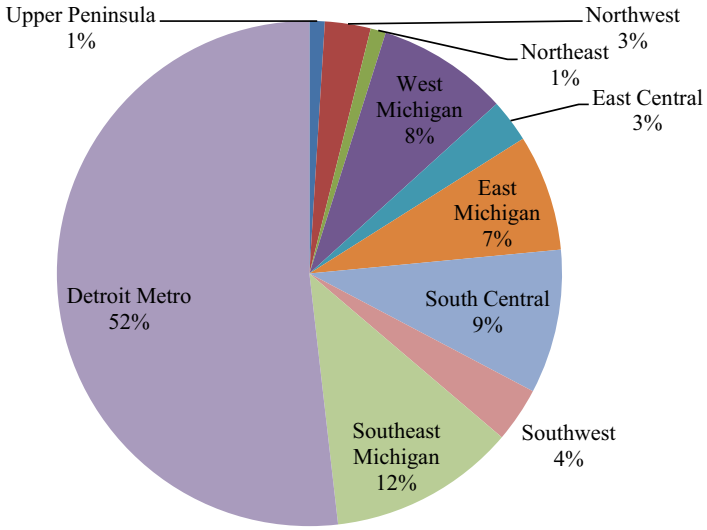
In addition to the gross earnings of URC alumni, we estimate the incremental earnings to URC graduates that are a result of their education at a URC university. The main components considered in estimating the additional earnings of URC graduates are: projections of the earnings of URC graduates, substitution of earnings that would have occurred even if the individual had not attended a URC university.

URC alumni in Michigan earned $5.5 billion more due to the URC.

We estimate that URC alums living in Michigan in 2013 earned $5.5 billion more due to the URC.[27] We show each region's share of alumni incremental earnings in the state in Figure 22 on page 28. The Detroit Metro, Southeast, and South Central regions lead the state in share of incremental URC alumni earnings, with other populous regions such as the West Michigan and East Michigan regions also benefitting from hundreds of millions of additional earnings. See Map 5 on page 35 for the economic impact by region, which includes alumni earnings.

27. Using this methodology assumes that most of the current earnings of URC alumni living in Michigan are earnings they would have had (even without the URC). These additional earnings contribute to the URC's economic impact, which we discuss in the following section.

FIGURE 22. Share of Incremental Alumni Earnings in Michigan by Region, FY2013

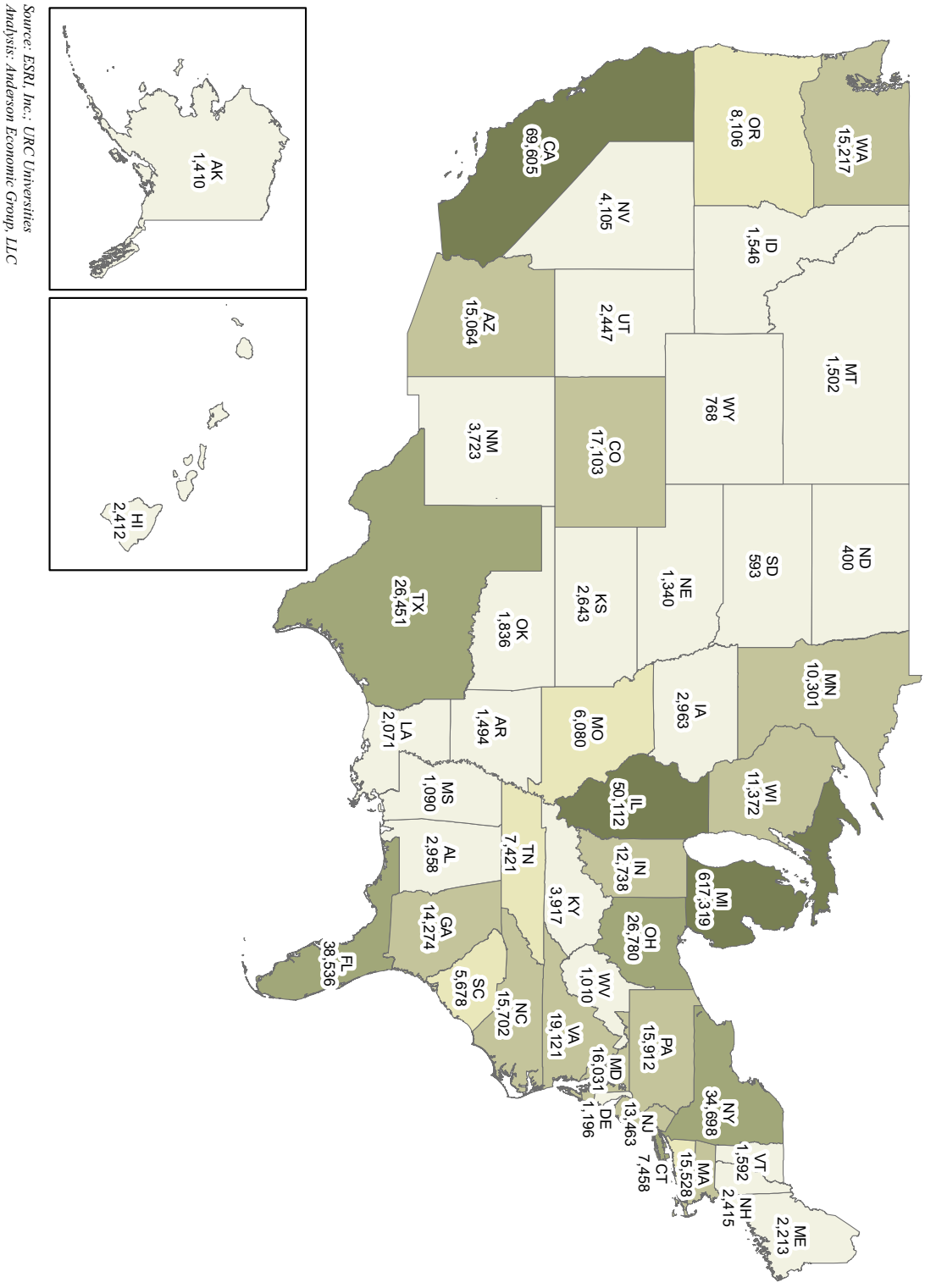


Source: URC university alumni offices, BLS, U.S. Census Bureau
Analysis: Anderson Economic Group, LLC

Once we account for taxes on these earnings, expenditures outside Michigan, and savings, we estimate that alumni spent $3.9 billion in Michigan last year. We estimate the economic impact of these additional earnings in the following section. Table A-7 on page A-18 shows how additional URC alumni earnings attributable to the URC is distributed across Michigan's 10 regions.

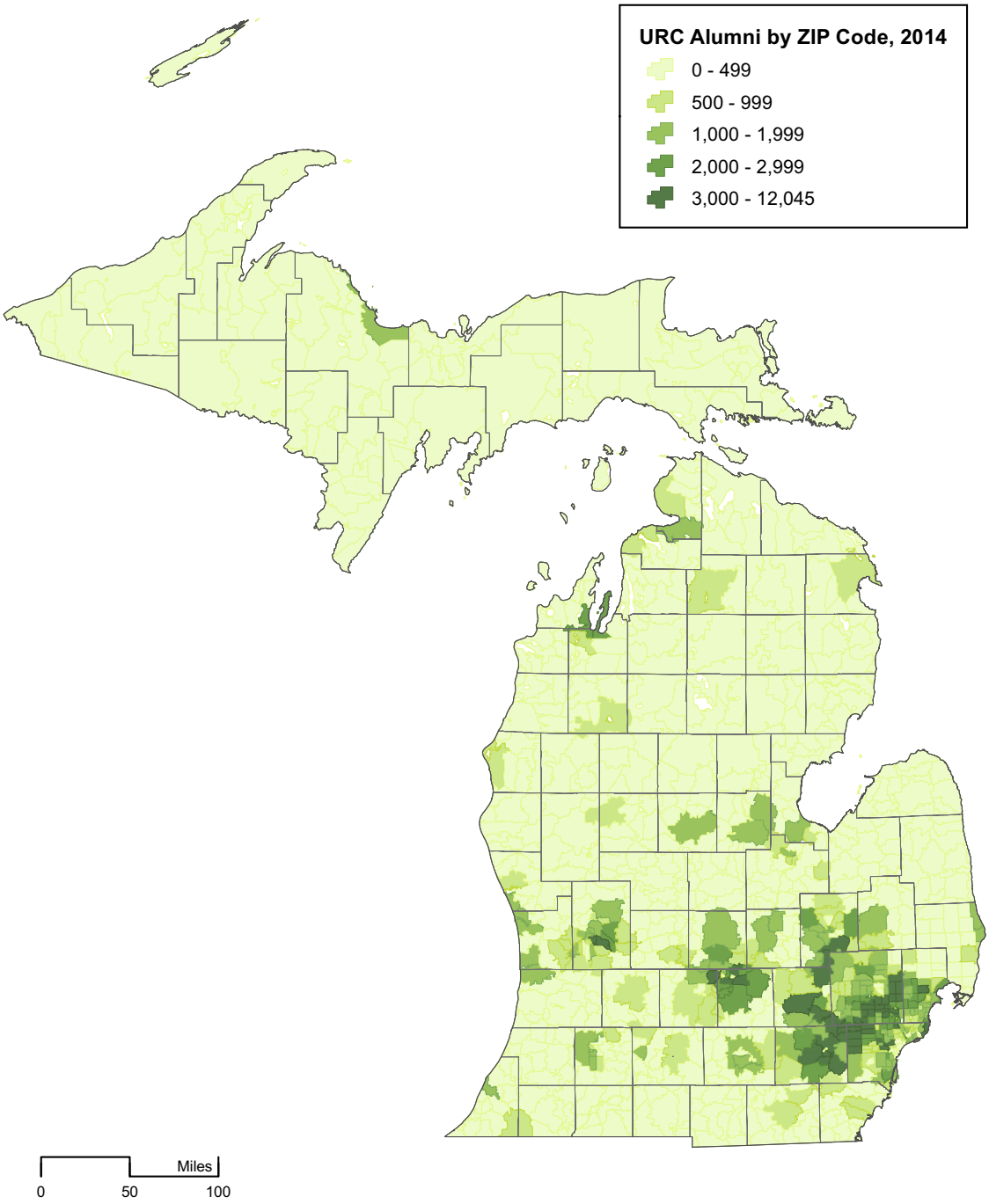
URC alumni spent $3.9 billion in Michigan in 2013.

Map 3. URC Alumni by State, 2014



Source: ESRI, Inc.; URC Universities
Analysis: Anderson Economic Group, LLC

Map 4. URC Alumni by ZIP Code, 2014



Note: Data include alumni with known ZIP codes.
Source: Esri, Inc.; URC Universities.
Analysis: Anderson Economic Group, LLC

VII. Economic Impact of the URC in Michigan

In the previous sections, we discussed the spending of the URC and its students, the extent of R&D spending and activity, as well as alumni earnings in Michigan. These components of the URC operations reach all regions and create economic impact in the state of Michigan that would not exist without the URC schools. Not only are the URC schools world-class education institutions, but their contributions to the Michigan economy are significant. In order to quantify the economic impact of the URC universities, we answer the following questions:

1. What would the loss be to Michigan if the URC universities did not exist in the state?
2. What would be the loss to regions across the state if the URC universities were not here?

In this section, we discuss the impact that the URC universities have on output and jobs throughout the state of Michigan. We begin with the definition of "economic impact" that we use to assess the state-level impacts, and summarize the results of the total statewide economic impact. We then summarize the statewide impact by region, estimating the economic impact and jobs for 10 separate regions in the state. The net economic impact of the URC includes the impacts of the following components:

- URC operations (payroll and non-payroll);
- Student expenditures; and
- Alumni earnings.

DEFINITION OF ECONOMIC IMPACT

We define the *net economic impact* of the URC as the *new* activity that occurs in a region directly and indirectly caused by the URC. Economic activity from URC operations, student expenditures, and URC alumni have direct impacts, as well as indirect impacts, generating more economic activity in Michigan as it recirculates throughout the state. Further details about our methodology for estimating the URC's economic impact are in "Estimating Net Economic Impact" on page A-8.

We present two measures of economic impact in this section:

- *New Economic Output*
  This is the total value of all economic activity generated by the URC's operational expenditures in Michigan. This measure includes all new expenditures by the URC in Michigan after taking into account the amount that is considered net new, plus indirectly-generated activity by both firms and households in the state.
- *New Jobs*
  The URC directly employs more than 55,000 people and indirectly generates more jobs in Michigan due to the multiplier effect of employee spending in the state.

SOURCES OF ECONOMIC IMPACT

We describe the components of the URC's economic impact on Michigan and its 10 regions below. Further detail by category of expenditures can be found in "Estimating Net Economic Impact" on page A-8.

Nonpayroll Operating Expenditures

The spending shown in Table 8, "Operational Expenditures by the URC, FY 2013," on page 5 includes expenditures on supplies, equipment, maintenance of university buildings, services, athletics, U-M's hospital services, as well as the salaries of professors, researchers, doctors, and administrative staff.[28] We estimate that in FY 2013, the URC's nonpayroll expenditures brought $1.2 billion in direct net new spending to businesses in Michigan, as shown onTable 15 on page 33.

As shown in Table 16 on page 34, the Detroit Metro and Southeast Michigan regions account for the greatest proportion of spending, representing 46% and 31%, respectively. We estimate the total economic impact of nonpayroll expenditures (including indirect activity) is $2.6 billion. Spending on construction results in an additional $1.1 billion in total new economic activity, $528 million of which is direct net new spending in the state.

Payroll Expenditures for Faculty and Staff

The URC universities spent $5.6 billion on salary, wages, and fringe benefits for their employees in FY 2013, and we estimate that $3.9 billion was net new directly in Michigan.[29] The Southeast Michigan and Detroit Metro Regions comprised the largest proportion of this spending, representing 55% and 24% of expenditures, respectively. This is unsurprising, as staff and faculty live in these regions, which are near to the URC universities and heavily populated. We estimate the total net economic impact of faculty and staff earnings in Michigan is $5.6 billion (including indirectly-generated output).

Student Spending in Michigan

The URC universities have students from every county in Michigan, every state in the U.S., and more than 100 countries. Some of these students would not have remained in or come to the state of Michigan for a college degree if it were not for the URC universities. We count expenditures by these students as new economic activity. We estimate that new student direct expenditures in Michigan due to the URC were $1.6 billion in FY 2013. Of these expenditures, the South Central and Southeast Regions account for the greatest proportions, with 36% and 34%, respectively.[30] We estimate the indirect impact from these expenditures was $1.1 billion for a total economic impact of $2.7 billion on the state.

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28. Starting in 2013, we estimate the economic impact of athletics as its own category of spending. In previous years, spending on athletics was included in operations spending.

29. "Estimating Net Economic Impact" on page A-8 details our calculations for this estimate.

30. We primarily allocated student expenditures to the region with the university that they attended in 2012. See "Estimates of URC Economic Impact in Michigan by Region" on page A-16.

Alumni Incremental Earnings

As discussed in "URC Alumni in Michigan" on page 26, the URC has more than 600,000 living alumni in Michigan, who earned $43 billion in 2013. After considering earnings that would otherwise have occurred in the state (e.g. if URC graduates had attended other Michigan universities instead of a URC university), these earnings contribute $5.5 billion in net new earnings to the state's economy, bringing in new economic activity year after year. We estimate that the direct expenditures caused by these earnings (after considering savings and out of state spending) is $3.9 billion, and the indirect economic impact is $0.90 billion, bringing the total impact to $4.8. The greatest impact occurs in Detroit Metro region, accounting for 52% of the state's economic impact.

TOTAL NET ECONOMIC IMPACT IN MICHIGAN

In FY 2013, we estimate that the value of the economic activity that the universities generated in the state, benefiting households and businesses, was $16.8 billion. See the components of the total net economic impact of the URC for the state below in Table 15. This net economic impact figure does not include any economic activity that would have occurred in Michigan even without the URC. See Map 5 on page 35 for the economic impact by region, which aggregates to the total economic impact in the state.

In 2013, the URC universities generated an additional $16.8 billion in economic activity in Michigan, and 66,459 direct and indirect jobs.

TABLE 15. Net Economic Impact of URC in Michigan, FY 2013 (in billions)

Impact Category	Direct Impact	Indirect Impact	Net Economic Impact
Non-payroll Operating Expenditures for Instruction, Research, and U-M Hospital	$1.2	$1.4	$2.6
Spending on Construction	$0.5	$0.6	$1.1
Faculty & Staff Wages and Benefits	$3.9	$1.7	$5.6
URC Student Expenditures	$1.6	$1.1	$2.7
Incremental Alumni Earnings	$3.9	$0.9	$4.8
TOTAL ECONOMIC IMPACT	**$11.1**	**$5.7**	**$16.8**

Note: Numbers may not sum to total due to rounding.
Source: URC Universities, Bureau of Economic Analysis (BEA) RIMS II Multipliers, IPEDS, U.S. Census Bureau, AEG Estimates
Analysis: Anderson Economic Group, LLC

Jobs Impact of URC Operations

We estimate that 66,459 jobs in Michigan in 2013 were directly or indirectly caused by the URC's operations in Michigan. This jobs figure includes 10,584 faculty members and 27,606 staff directly employed by the URC universities. It also includes indirectly-generated jobs in other industries in the state due to expenditures by the URC universities and their faculty, staff, and students.

ECONOMIC IMPACT BY MICHIGAN REGION

In addition to estimating the URC's net economic impact on the state of Michigan, we present its impact for the 10 economic regions in Michigan as defined by the MEDC, the significance of which is detailed on page 2. These regions and their estimated economic impacts are shown in Map 5 on page 35.

As mentioned in the section above, each region in Michigan is impacted by the URC, although this impact varies by region. We estimated the net economic and jobs impact for each of 10 Michigan regions. In general, the Detroit Metro, Southeast, and South Central Regions had the greatest additional economic activity from the URC, which are the regions in which the universities are located. This is also true for the jobs created by the URC university's activities, as shown below in Table 16.

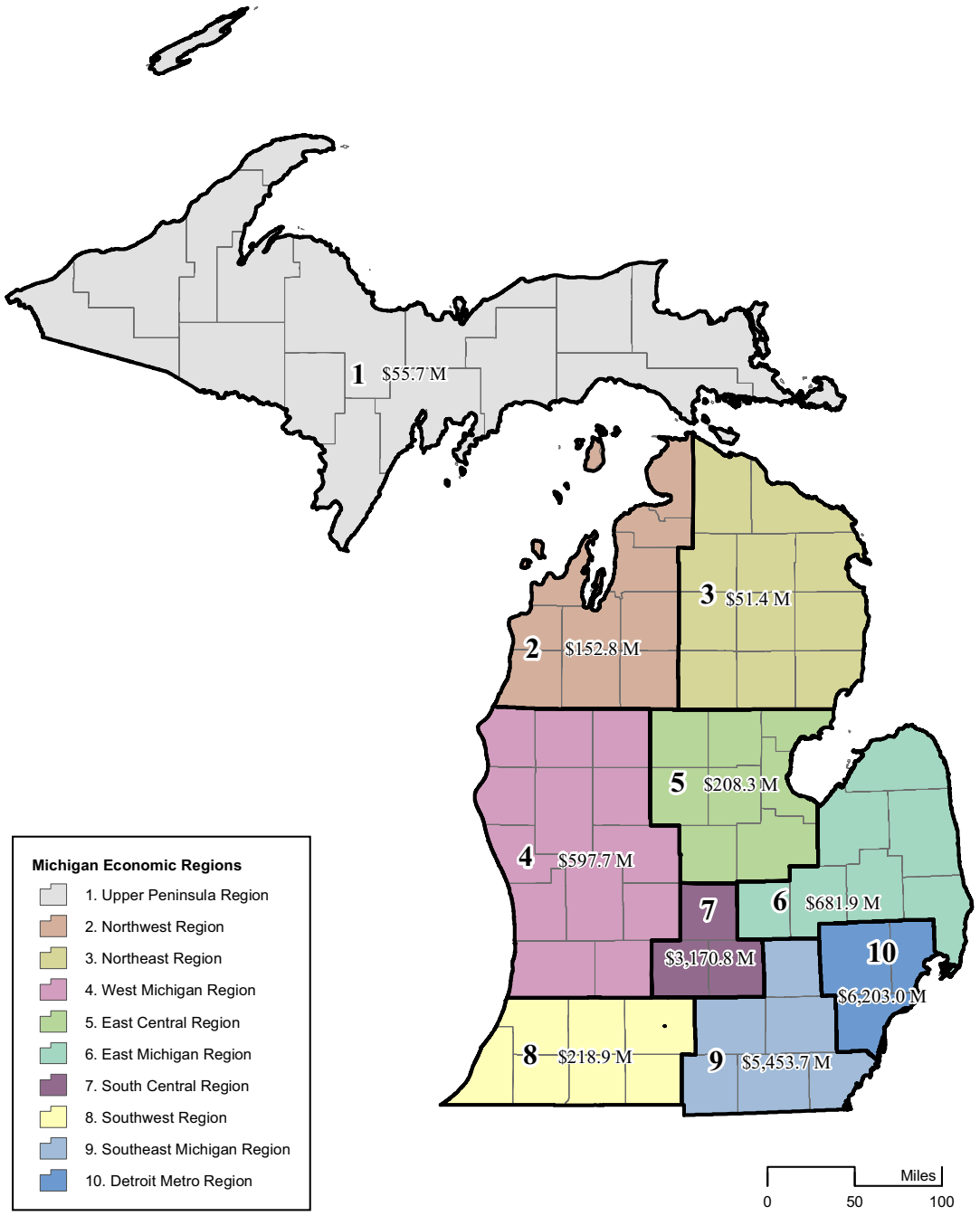
See "Regional Economic Impact" on page A-14 for our estimations for regional economic impact.

TABLE 16. Net Economic Impact of URC Operations and Employment Created by Region, FY 2013

Region number	Economic Development Collaboratives	Net Economic Impact of University Operations (in millions)	Total Direct and Indirect Jobs Caused by URC
1	Upper Peninsula Region	$55.7	90
2	Northwest Region	$152.8	165
3	Northeast Region	$51.4	91
4	West Michigan Region	$597.7	671
5	East Central Region	$208.3	236
6	East Michigan Region	$681.9	2,152
7	South Central Region (MSU)	$3,170.8	10,701
8	Southwest Region	$218.9	279
9	Southeast Michigan Region (U of M)	$5,453.7	35,864
10	Detroit Metro Region (WSU)	$6,203.0	16,212
	State of Michigan	**$16,794.1**	**66,459**

Note: Rounded numbers for each region do not add precisely to state totals.
Source: Anderson Economic Group, LLC

Map 5. Net Economic Impact of URC Universities' Operations and Employment by Region, FY 2013 (millions)



Note: See also "Methodology" in Appendix A for estimation methods.
Source: Esri, Inc.; Anderson Economic Group, URC Universities, BEA RIMS II multipliers
Analysis: Anderson Economic Group, LLC

VIII. URC Contributions to State Tax Revenue

This section provides an estimate of tax revenue the State of Michigan receives because of the URC's presence in Michigan. We estimate new tax revenue by first calculating the new wage and salary income that URC employees and alumni receive because of the URC. Then, we estimate the additional tax revenue to the state for several important state-level taxes: income, sales, property, and transportation taxes.

ADDITIONAL INCOME IN MICHIGAN DUE TO THE URC

We estimate that $2.98 billion in wages of URC employees in Michigan were *caused by* the URC in 2013. This figure accounts for the fact that at least some URC employees might earn wages in Michigan in the absence of the URC. We also estimate that URC alums living in Michigan in 2013 earned $5.5 billion more due to the URC, as shown in "Alumni Incremental Earnings" on page 33.

TOTAL ADDITIONAL STATE TAX REVENUES IN 2013

Of the additional income in Michigan, $2.98 billion from URC employees and $5.6 billion is from URC alumni. We estimate the additional taxes to the State of Michigan due to the URC universities by multiplying this income by the effective tax rates as described in "Methodology" on page A-1. Table 17 below shows the results of this analysis: $494.6 million in additional tax revenue to the State of Michigan paid by URC graduates and employees in FY 2013.

TABLE 17. Additional Tax Revenue to State of Michigan Due to URC, FY 2013 (millions)

Tax	Total Additional Paid
Personal Income	$239.8
Sales and Use Tax	$201.0
Property Tax	$37.7
Gasoline Tax	$16.1
Total Additional Tax Revenue	**$494.6**

Source: BLS
Analysis: Anderson Economic Group, LLC

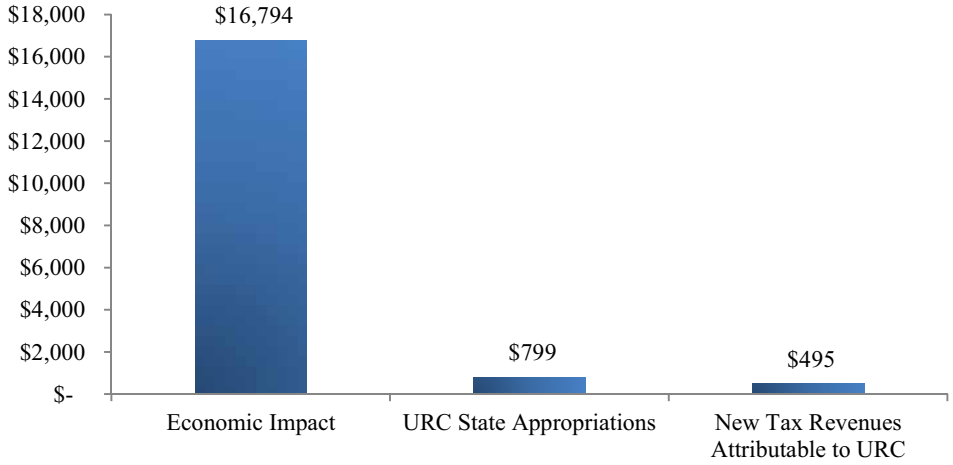
COMPARISON WITH ECONOMIC IMPACT AND URC APPROPRIATIONS

Clearly the main goal of the URC universities is not generating economic impact and tax revenue for the state. Nevertheless, since the state government provides funding for these universities, it is natural to compare the URC's net economic impact on the state to the state's appropriations for universities.

In 2013, the URC generated an additional $495 million in tax revenues for the State of Michigan.

As shown in Figure 23 on page 37, the $16.8 billion in net economic impact is almost 21 times[31] greater than the state's funding for the URC universities in FY 2013 of $799 million.[32] In addition, the State of Michigan received an estimated $495 million in tax revenue from URC employees and alumni that it would otherwise not have received if the URC did not exist in Michigan.

FIGURE 23. URC Net Economic Impact vs. State Appropriations (millions), 2013



Source: AEG Estimates, Senate Fiscal Agency
Analysis: Anderson Economic Group, LLC

31. Note that this is a comparison of the *total* impact vs. *total* appropriations; each additional dollar of appropriations would not necessarily generate a full $21 in economic impact. Analysis of the economic impact of a marginal change in state appropriations is beyond the scope of this report.

32. The FY 2012-2013 state appropriations figure includes state funding for both the URC universities and MSU extension services. Previous reports in this series reported state appropriations for the universities but excluded MSU extension services.

Appendix A. Methodology

This appendix describes the following:

- How data sources were used to create the maps included in this report;
- The methods used to benchmark the URC against its peer clusters in terms of education and research metrics; and
- The methodology AEG used to complete our economic impact analysis.

The methodology used this year has been updated from the past reports. These updates are detailed in "Comparability to Previous Benchmarking Reports" on page B-1.

DATA AND ANALYSIS FOR MAPS

All of the maps in this report were created using Geographic Information Software (GIS). Using data provided by the URC universities, we created Maps 1 through 4. When data were incomplete or imperfect in terms of geographies, we used professional judgement and GIS to make estimations.

Map 2, "URC Students by County, 2013," on page 8 is based on data from the URC that details student enrollment by Michigan county for the cohorts entering the universities in Fall 2013. We took the number of URC students by county from the universities and calculated the share of students per county based on the total given to us.

Map 4, "URC Alumni by ZIP Code, 2014," on page 30 was created using zip code data from the URC alumni offices. Using this data, we estimated the number of alumni per county, which we used in our regional incremental alumni earnings analysis. This is discussed further in "Incremental Alumni Earnings in 2013 Caused by URC" on page A-12.

Map 5, "Net Economic Impact of URC Universities' Operations and Employment by Region, FY 2013 (millions)," in Appendix are based on the economic collaborative regions created by the MEDC. We display our economic impact estimates of output and employment for those regions in "Economic Impact by Michigan Region" on page 34.

BENCHMARKING METRICS

Below we include definitions of degree categories created by AEG and describe any changes to methodology compared to previous years' reports.

Total Degree Completions

The completions data contained in "Total Degrees Granted" on page 10 may not perfectly match the numbers in our previous reports. While we continued to use completion data from the Integrated Postsecondary Education Data System (IPEDS) for this analysis, we no longer include second majors. Including both first and second majors over-represented degrees awarded as it double-counts students who may have two majors, but only one degree.

Academic Program Definitions

The academic program areas used in "Degrees by Program" on page 11 are based on the National Center for Education Statistics' Classification of Instructional Programs (CIP) codes that they use in their Integrated Postsecondary Education Data System (IPEDS). The composition of each program area is as follows:

The *Physical Science, Agriculture, and Natural Resources* academic program area includes the following fields of study: agriculture, agriculture operations, and related sciences; natural resources and conservation; and physical sciences.

The *Business, Management, and Law* academic program area includes the following fields of study: legal professions and studies; and business, management, marketing, and related support services.

The *Engineering, Mathematics, and Computer Science* academic program area includes the following fields of study: architecture and related services; computer and information sciences and support services; engineering; and mathematics and statistics.

The *Liberal Arts* academic program area includes the following fields of study: area, ethnic, cultural, and gender studies; communication, journalism, and related programs; education; foreign languages, literatures, and linguistics; family and consumer sciences/human sciences; English language and literature/letters; liberal arts and sciences; general studies and humanities; library science; multi/interdisciplinary studies; philosophy and religious studies; theology and religious vocations; public administration and social service professions; social sciences; visual and performing arts; and history.

The *Medicine and Biological Science* academic program area includes the following fields of study: biological and biomedical sciences; psychology; and health professions and related clinical sciences.

The *Other* academic program area includes the following fields of study: personal and culinary services; parks, recreation, leisure, and fitness studies; security and protective services; construction trades; mechanic and repair technologies/technicians; precision production; transportation and materials moving; undesignated fields of study; communications technologies/technicians and support services; engineering technologies/technicians; military technologies; and science technologies/technicians.

High-Tech, High-Demand, and Medical Degrees

Below we define these categories of degrees and provide a basic reasoning for how they were created.

High-Tech Degree Definition. AEG's definition of high-tech degrees is one that we use regularly to assess Michigan's high-tech industry in Southeast Michigan.[33] As

with the academic definitions, we used the CIP codes in IPEDs to pull degrees that fit our definition of high-tech. These degrees include:

- agriculture, agriculture operations, and related sciences (we include only 10% of this field of study as most agriculture is not high-tech)
- architecture and related services
- biological and biomedical sciences
- communications technologies/technicians and support services
- computer and information sciences and support services
- engineering technologies/technicians
- engineering
- mathematics and statistics
- physical sciences

High-Demand Degree Definition. The three fields of study with the highest demand among employers are business, computer science and engineering, according to a survey done by the National Association of Colleges and Employers. Their 2011 *Job Outlook Report* surveyed approximately 200 employers from a variety of sectors and found that computer science, engineering, accounting, finance, and business administration were in the most demand by employers.

For the purposes of this analysis we combined the three business related majors (accounting, finance, and business administration) into one category due to substantial overlap between these degrees at the undergraduate level in many universities. Our data source (IPEDS) does not distinguish clearly between them.

Additionally, for engineering degrees awarded, we included "engineering" and "engineering technologies/technicians," because the IPEDS database presents highly related concentrations under each and they likely signal similar skill sets in the entry-level job market.

Medical Degrees. For this analysis, we used the following IPEDS categories to represent the medical field:

- Medicine Doctor's degree - professional practice
- Osteopathic Medicine/Osteopathy Doctor's degree - professional practice
- Veterinary Medicine Doctor's degree - professional practice
- Registered Nursing, Nursing Administration, Nursing Research, and Clinical Nursing (Bachelor's, Master's, and Doctor's degrees)
- Dentistry Doctor's degree - professional practice
- Advanced/Graduate Dentistry and Oral Sciences (Master's and Doctor's degrees)

33. See Scott D. Watkins, Cameron Van Wyngarden, and Lauren Hathaway, *Driving Southeast Michigan Forward*, prepared for Automation Alley (November 2008).

- Dental Support Services and Allied Professions (Bachelor's and Master's degrees)
- Physician Assistant (Master's degree)

R&D Expenditures

The data reported to IPEDS for research expenditures are lower than the research expenditures reported to the National Science Foundation because they include different things. Research expenditures reported to IPEDS only include direct research costs. Indirect costs, while included in NSF reporting, are counted in other spending categories when reported to IPEDS.

The science and engineering (S&E) fields used in "Academic R&D Expenditures" on page 16 are based on the NSF's survey of higher education institutions. The composition of each S&E field is as follows:

- Environmental sciences includes atmospheric and earth sciences, oceanography, and other miscellaneous sciences.
- Life sciences includes agricultural, biological, medical, and other miscellaneous life sciences.
- Physical sciences includes astronomy, chemistry, physics, and other miscellaneous physical sciences.
- Social sciences includes economics, political sciences, sociology, and other miscellaneous social sciences.
- Engineering includes aeronautical, biomedical, bioengineering, chemical, civil, electrical, mechanical, metallurgical, and other engineering fields.

Technology Transfer Information

For information on invention disclosures, patent grants, licenses and options, and licensing revenue, we relied on data provided by the URC universities, universities in each peer cluster, as well as the Association of University Technology Managers (AUTM) Surveys. For each cluster, we obtained the data from the following detailed sources:

- *URC*: Michigan State University, the University of Michigan, and Wayne State University information was obtained from the URC.
- *Northern California*: The University of California provided statistics for all their campuses through their Office of Technology and its Annual Reports for 2005-2013. Stanford University provided all statistics for 2005-2013 through their website and Office of Technology Licensing.
- *Southern California*: The University of California provided statistics for all their campuses through their Office of Technology and the office's Annual Reports for 2005-2013 USC data for 2006 and 2013 was collected from the AUTM survey and through USC's Stevens Institute for 2007-2012.
- *Illinois*: Northwestern University provided all statistics for 2006-2009 through their website. Northwestern data for 2010 was collected from the AUTM survey. Northwestern data for 2011 was collected from the Innovation and New Ventures Office, and data for 2012 and 2013 was found on page 61 of their

annual report entitled “Northwestern University Research: Creating New Knowledge, Annual Report 2012.” University of Chicago provided all statistics through their Office of Technology & Intellectual Property for 2005-2012 and the AUTM survey for 2013. University of Illinois, Urbana-Champaign provided all statistics through their Office of Technology Management website.

- *Massachusetts*: MIT reported 2004-2013 data on their website via downloadable reports; however, licensing revenue and patent numbers were obtained and/or verified through AUTM, as patent data was not made available and licensing revenue numbers were unreadable in said reports. Boston University data for 2005-2013 was obtained through AUTM. Harvard data was collected from the 2006 AUTM survey and through Harvard’s Office of Technology Development for 2007-2013.
- *North Carolina*: Data for UNC-Chapel Hill was collected from their Office of Technology Development, while North Carolina State University data were collected from their Office of Technology Transfer. Data for Duke University was provided by AUTM in 2006 and through their Office of Licensing & Ventures for 2007-2013.
- *Pennsylvania*: Pennsylvania cluster data from 2002-2013 was obtained from the University of Pittsburgh’s Office of Technology Management, Penn State’s Intellectual Property office, Carnegie Mellon’s Center for Technology Transfer and Enterprise Creation, and the 2006 AUTM surveys.
- *Texas*: Data for Texas A&M (2002-2013) was provided by their Technology Commercialization office. Data for The University of Texas at Austin from 2005-2013 was provided by their Office of Technology Commercialization, while data from 2002-2004 was provided by AUTM (with the exception of number of licenses/options, which had no data reported for the aforementioned years). Rice University also had no license/option numbers to report (via AUTM) for 2002-2004, however, the rest of the university data from 2002-2006 was reported to and obtained from AUTM. Rice University data from 2007-2013 was received from their Office of Technology Transfer.

INNOVATION POWER RANKINGS

In 2013, we included a new element: a composite ranking, which rates the URC’s performance relative to its peer clusters for research spending, talent, and technology transfer activity. We ranked the URC on each of those three components separately, and then combined the rankings for an overall, composite ranking.

Research

For the research component, the clusters are ranked on total research spending, as well as spending on science and engineering R&D. We weighted these ranks at 80% and 20%, respectively, to determine the ranking for research.

Talent

The talent component is based on the total number of degrees awarded, as well as the number of high-technology degrees awarded. High-tech degrees are listed in “High-Tech Degree Definition” on page A-2. We weighted these ranks at 80% and 20%, respectively, to determine the overall ranking for talent.

Technology Transfer

The technology transfer and commercialization rankings are composed of each cluster's ranks for the five-year averages (2008-2012) of the following five measures:

- Licensing revenue
- Startup companies
- Patent grants issued
- Technology licenses issued
- Invention disclosures

Licensing revenues and start-ups provide the strongest direct measures of how valuable university R&D efforts are to the private sector. Therefore, we weighted rankings for licensing revenues and startup companies as a half of the total technology transfer ranking, and the other three measures are equally weighted to make up the other half of the overall ranking.

Overall Composite Ranking

Once we determined the overall rankings for research, talent, and technology transfer activity, we use a weighted average to combine them into a single composite ranking for each cluster. We weight talent and research at 40% each, and weight tech transfer and commercialization at 20% of the final ranking. What metrics to include and how to weight them involves some subjective judgement. Our goal is to combine the metrics for which we have high-quality data (those included in this report) into the best possible overall measure of a cluster's contribution to innovation.

We weight research and talent more heavily than technology transfer for two reasons. First, for most universities, research and educating students are more closely related to the institution's core mission than technology transfer, even though the latter is important and becoming increasingly emphasized. Second, while we believe the technology transfer metrics we use are the best available, they do not capture the universities' impacts on technology and practices outside of the universities as well as the talent and research metrics in their respective areas. University R&D reaches practical application outside the universities through a variety of channels, including formal technology transfer, research partnerships, and the education of students who may take what they've learned in the lab with them to the outside world.

Table A-1 on page A-7 displays the detailed rankings by metric for the URC and peer clusters.

TABLE A-1. 2013 Innovation Power Rankings for URC and Peer Clusters, Detailed

Cluster		Research Spending Rank (40% of Composite)	Technology Transfer (20% of Composite)	Talent (40% of Composite)	Composite Ranking
URC	**Category Rank:**	**5**	**7**	**1**	**2**
	Subcategory Ranks:	***Total R&D (80%): 5*** ***Total R&D in S&E (20%): 5***	***Licensing Revenue (25%): 7*** ***Start-up Companies (25%): 8*** ***Patent Grants Issued (17%): 4*** ***Tech. Licenses Issued (17%): 5*** ***Invention Disclosures (17%): 6***	***#. Degrees (80%): 1*** ***#. High-tech Degrees (20%): 4***	
Northern Cal.	Category Rank:	1	2	8	**3**
	Subcategory Ranks:	***Total R&D (80%): 1*** ***Total R&D in S&E (20%): 1***	***Licensing Revenue (25%): 2*** ***Start-up Companies (25%): 4*** ***Patent Grants Issued (17%): 1*** ***Tech. Licenses Issued (17%): 3*** ***Invention Disclosures (17%): 3***	***#. Degrees (80%): 8*** ***#. High-tech Degrees (20%): 7***	
Southern Cal.	Category Rank:	2	3	2	**1**
	Subcategory Ranks:	***Total R&D (80%): 2*** ***Total R&D in S&E (20%): 2***	***Licensing Revenue (25%): 4*** ***Start-up Companies (25%): 1*** ***Patent Grants Issued (17%): 3*** ***Tech. Licenses Issued (17%): 8*** ***Invention Disclosures (17%): 2***	***#.Degrees (80%): 2*** ***#.High-tech Degrees (20%): 2***	
Illinois	Category Rank:	7	4	5	**7**
	Subcategory Ranks:	***Total R&D (80%): 7*** ***Total R&D in S&E (20%): 7***	***Licensing Revenue (25%): 1*** ***Start-up Companies (25%): 5*** ***Patent Grants Issued (17%): 5*** ***Tech. Licenses Issued (17%): 6*** ***Invention Disclosures (17%): 7***	***#.Degrees (80%): 5*** ***# High-tech Degrees (20%): 6***	
Mass.	Category Rank:	4	1	7	**4**
	Subcategory Ranks:	***Total R&D (80%): 4*** ***Total R&D in S&E (20%): 4***	***Licensing Revenue (25%): 3*** ***Start-up Companies (25%): 2*** ***Patent Grants Issued (17%): 2*** ***Tech. Licenses Issued (17%): 4*** ***Invention Disclosures (17%): 1***	***#. of Degrees (80%): 7*** ***#. of High-tech Degrees (20%): 8***	
N. Carolina	Category Rank:	3	6	6	**4**
	Subcategory Ranks:	***Total R&D (80%): 3*** ***Total R&D in S&E (20%): 3***	***Licensing Revenue (25%): 5*** ***Start-up Companies (25%): 5*** ***Patent Grants Issued (17%): 7*** ***Tech. Licenses Issued (17%): 2*** ***Invention Disclosures (17%): 5***	***#. Degrees (80%): 6*** ***#. High-tech Degrees (20%): 5***	
Penn.	Category Rank:	6	6	3	**6**
	Subcategory Ranks:	***Total R&D (80%): 6*** ***Total R&D in S&E (20%): 6***	***Licensing Revenue (25%): 8*** ***Start-up Companies (25%): 3*** ***Patent Grants Issued (17%): 8*** ***Tech. Licenses Issued (17%): 1*** ***Invention Disclosures (17%): 4***	***#. Degrees (80%): 3*** ***#. High-tech Degrees (20%): 3***	
Texas	Category Rank:	8	8	4	**8**
	Subcategory Ranks:	***Total R&D (80%): 8*** ***Total R&D in S&E (20%): 8***	***Licensing Revenue (25%): 6*** ***Start-up Companies (25%): 7*** ***Patent Grants Issued (17%): 6*** ***Tech. Licenses Issued (17%): 7*** ***Invention Disclosures (17%): 8***	***#. Degrees (80%): 4*** ***#. High-tech Degrees (20%): 1***	

Analysis: Anderson Economic Group, LLC

ESTIMATING NET ECONOMIC IMPACT

We define *net economic impact* as the new economic activity that occurs in a defined geographic region directly or indirectly caused by the URC. To quantify the economic impact of URC universities' operational expenditures, we asked, in effect, "What would be the loss to the state if the three University Research Corridor universities closed their doors?"

A direct impact stems from initial spending while indirect and induced impacts stem from the recirculation of dollars within the defined geographic region. URC expenditures are at the foundation of the URC's impact on the state economy, but the full impact goes further than simply summarizing spending, for two reasons.

First, an economic impact analysis should count only net new spending, which accounts for spending that would have occurred in the state even without the URC universities, as well as spending that is crowded out by URC spending. For example, we exclude expenditures by students who would have otherwise attended another college and spent money in the state. We also exclude all expenditures by URC universities that go to firms outside Michigan.

Second, as the URC makes these expenditures, the money is then re-spent throughout the Michigan economy, creating a "multiplier" effect. These indirect effects are also a significant contributor to Michigan's economy, and are thus included in the total net economic impact.

For each of the following categories, we estimate the *direct impact*, which accounts for what is net new spending, and *indirect impacts*, which take the multiplier effect into account to incorporate the additional economic activity caused by the URC. We calculated the *indirect* economic impact of URC's expenditures by multiplying the direct expenditures by final demand output multipliers based on those released by the U.S. Department of Commerce's Regional 2010 Multipliers (RIMS II). The multiplier categories we used are detailed in "Comparability to Previous Benchmarking Reports" on page B-1.

Operational Expenditures Methodology

We did the following to calculate the net economic impact of the URC:

Determined In-State Expenditures. The first step in estimating the net economic impact of the URC's operational expenditures was to determine the payroll and non-payroll expenditures by the URC that went to employees and vendors in the state. We did this in the following steps.

1. We obtained salary, fringe benefit, and non-payroll expenditures for the URC universities for FY 2013 from IPEDS.
2. We obtained spending on athletics from NCAA Equity in Athletics reports, and removed it from the proper IPEDS categories so as not to double-count the spending.
3. We relied on information provided by the universities to determine the percentage of expenditures that went to businesses located outside of Michigan.

4. We obtained the spending occurring between universities, and removed it from the proper IPEDS categories, so as not to double-count the spending. Based on the available data and university resources, we assumed that 75% of this type of spending was in research, while the other 25% was in categories such as student services and institutional support.
5. We used data from the universities and the 2013 Consumer Expenditure Survey from the U.S. Bureau of Labor Statistics to calculate URC student expenditures in Michigan, and to account for a percentage of expenditures that go to firms outside Michigan. We updated this information using room and board information for the 2013-2014 school year provided by the URC universities.[34]

Accounting for what is "Net New" in Michigan. After calculating the non-payroll and payroll expenditures by the URC and student expenditures, we accounted for the spending that was considered net new in Michigan, and therefore do not include spending that would have occurred even if the URC were not part of the state's economy. We show our estimates for the percentage of spending that stays in the state and is net new spending below in our calculations for the URC's net economic impact in the state in Table A-2 on page A-11.

We followed these steps for each of the categories detailed in the URC's economic impact. We used the following methods for these categories of spending:

- Salaries and Wages: We used URC data on employment to estimate that close to 100% of employee wages and benefits remain in the state, and that 66% of faculty and staff worked in Michigan because of the URC.
- Research: Most research dollars come from out-of-state sources. URC universities are responsible for 93% of academic R&D expenditures in the state, and receive 94% of all federal research dollars in Michigan. We estimate that 75% of spending remains in the state, and that 95% of that spending is net new in Michigan.
- Hospital spending: Using UMHS data, we assumed that less than half of spending remains in Michigan, and that around 70% of that spending is net new.
- Athletics: Since URC universities have extensive athletic programs that travel across the country to compete and recruit, we estimated that 44% of spending remained in Michigan, but that 100% of that spending was net new.
- Construction: We estimate that 70% of construction spending remained in Michigan, and that 85% of that is net new.
- Other spending: For student services, instruction and academic support, institutional support, and other expenses, we estimate that about 75% of spending remains in state, and that more than 85% of that spending is net new.

34. Student spending was based on the percentage of students who live on- and off-campus, and their estimated spending on room and board; books and supplies; apparel, food and grocery, and other basic needs; and meals and entertainment away from campus.

Student Spending Methodology

To calculate the net new students in Michigan, we obtained the number of students from in- and out-of-state at the URC universities, and estimated the percent of students who attend university in Michigan *because of the URC.* We assumed that overall, 80% of in-state students attend universities in Michigan because of the URC. We assume that 100% of out-of-state students are net new students in Michigan because of the URC.

One way to think about this is that 20% of URC students from Michigan would remain in Michigan for their college degree if the URC disappeared, and that the spending associated with their education would also remain in the state. Thus, this is not *new* economic activity caused by the URC. It is unlikely that most out-of-state students would come to Michigan for their bachelor's or advanced degree if the URC were not in operation. We counted the expenditures on the instruction of and spending by these students as new economic activity caused by the URC.

The impact of this spending is included in Table A-2 on page A-11.

TABLE A-2. Net Economic Impact of the URC; URC and Student Spending

Category	2013 Expenditures	% net new in Michigan	Net New $ in Michigan (Direct Impact)	Output Multiplier	Net Economic Impact (Direct and Indirect)	*Memo:Indirect Impact*
URC Payroll Expenditures						
Salaries and Wages	$ 4,327,103,047	69%	$ 2,978,094,449	1.23	$ 3,668,118,933	$ 690,024,484
Employee Benefits	$ 1,353,301,309	69%	$ 933,386,818	2.03	$ 1,893,841,854	$ 960,455,036
Subtotal: Econ Impact from Payroll Expenditures	*$ 5,680,404,356*		*$ 3,911,481,268*		*$ 5,561,960,787*	*$ 1,650,479,520*
URC Nonpayroll Expenditures						
Instruction & Academic Support	$ 286,390,560	57%	$ 161,824,602	2.03	$ 328,099,381	$ 166,274,779
Research	$ 402,014,344	68%	$ 272,769,848	2.15	$ 587,682,637	$ 314,912,789
Public Service, Student Services, Institutional Support, Auxiliary Enterprises, & Other Expenses	$ 364,308,715	68%	$ 248,497,500	2.16	$ 536,307,304	$ 287,809,804
Operation and Maintenance of Plant	$ 389,447,486	60%	$ 231,934,227	2.08	$ 483,211,768	$ 251,277,541
Hospital Services	$ 867,131,000	28%	$ 245,746,009	2.14	$ 525,650,713	$ 279,904,704
Athletics	$ 107,399,100	59%	$ 63,595,806	2.22	$ 141,259,004	$ 77,663,198
Construction	$ 887,096,076	60%	$ 527,822,165	2.17	$ 1,144,424,019	$ 616,601,853
Subtotal: Econ Impact from Institutional Expenditures	*$ 3,303,787,281*		*$ 1,752,190,156*		*$ 3,746,634,825*	*$ 1,994,444,669*
Student Spending						
Room and Board	$ 1,245,707,995	86%	$ 1,068,632,388	1.59	$ 1,702,651,984	$ 634,019,596
Books and Supplies	$ 136,822,293	60%	$ 82,180,242	1.88	$ 154,761,831	$ 72,581,589
Apparel, Food & Grocery, and other basic needs	$ 176,122,555	87%	$ 153,188,665	1.88	$ 288,484,893	$ 135,296,229
Meal & Entertainment-away from campus	$ 343,747,020	83%	$ 286,753,675	1.99	$ 569,292,070	$ 282,538,396
Subtotal: Econ Impact from Student Expenditures	*$ 1,902,399,862*		*$ 1,590,754,969*		*$ 2,715,190,779*	*$ 1,124,435,810*
Total Economic Impact						
	Output					
Direct Effects	$ 7,254,426,393					
Indirect Effects	$ 4,769,359,998					
Total Net New Impact of URC	***$ 12,023,786,391***					

Source: URC Universities, BEA RIMS II Multipliers, AEG Estimates
Analysis: Anderson Economic Group, LLC

Impact of Alumni Earnings

Below we describe the data used to estimate the final component of net economic impact of the URC: incremental alumni earnings attributable to the URC universities.

Alumni Data. We used data from the alumni offices of each of the URC universities. They provided us with aggregated data on the number of known alumni by country, by U.S. state and territory, and by Michigan zip code. We were given number of alumni by graduation year and highest degree earned at the university. We show the earnings of Michigan URC alumni by age and degree below in Table A-3.

TABLE A-3. Michigan Earnings of URC Alumni by Age and Degree, 2013 (in millions)

	21-24 Years	25-34 Years	35-44 Years	45-64 Years	Over 65 Years	Total
Bachelor Degree	$1,337	$5,153	$6,048	$9,383	$642	$22,563
Advanced Degree	$0	$5,174	$6,024	$8,670	$920	$20,788
Total Earnings	$1,337	$10,327	$12,073	$18,053	$1,562	$43,351
Memo: Earnings as a percentage of wages & salary income in Michigan						*22.9%*

Note: Numbers may not add up due to rounding.

Data: URC Universities, U.S. Census Bureau, BLS, BEA
Analysis: Anderson Economic Group, LLC

Incremental Alumni Earnings in 2013 Caused by URC

Like all educational institutions, URC universities strive to increase the knowledge and skills of the students they teach. How this knowledge impacts a student's lifetime earnings often depends on the student.[35]

Our estimate of the incremental earnings of URC alumni attributable to the URC universities is, at its heart, a comparison of what the alumni currently earn with an estimate of what they would have earned in the state if not for the URC. We used data on URC alumni, outputs from our human capital model simulation (regarding sorting graduates as detailed in Appendix B of our 2007 report), and using other data, such as wage and workforce participation data, which were part of our human capital simulation model used in our 2007 analysis.

We used the following methodology:

1. We estimated the current earnings of URC alumni living in Michigan using the methodology detailed in our 2007 URC economic impact report. In previous

35. For a small share of the URC's students, having access to a research university in Michigan is the difference between going to college and not. For others, it is the difference between remaining in the state for a college degree or pursuing an education outside Michigan. For the remainder of the students, the existence of URC universities means finding the right mix of features, location, and price, whatever their specific reasons for choosing MSU, U-M or WSU.

benchmarking reports we relied on wage data by education level for 2000, corrected for inflation. For this report, 2009 data is available, which was brought to 2013 dollars using BLS inflation figures.

2. We estimated the proportion of URC alumni in each counterfactual group. A "counterfactual group" is a group of students who would have exhibited the same labor market outcome without attending the URC, such as working outside the state, attaining less education, or attending another university in the state. (The methodology is detailed in our 2007 URC economic impact report, again using 2009 wage figures.) We further assumed that all past years' graduating classes exhibited the same behavior as our estimates for the current year's graduating class, so the current set of alumni in the state are all characterized by the same set of assumptions about their earnings without the URC.
3. We used census and workforce participation data to estimate each counterfactual group's total earnings.
4. We subtracted the current earnings from the counterfactual earnings to find the *additional* earnings of current URC alumni due to the URC.

See our first annual URC benchmarking study, released in 2007, for our detailed methodology in estimating certain parameters used in alumni earnings, as well as "Comparability to Previous Benchmarking Reports" on page B-1 for our updated parameters.

Jobs Impact

To estimate the jobs impact of the URC, we estimated the number of net new FTE employees that work for the URC universities, and UMHS. We then applied the direct-effect employment multipliers from the Bureau of Economic Analysis (BEA) to estimate the additional indirect impact the URC has on state-wide employment. The multipliers we used for school faculty and staff were for the junior colleges, colleges, universities, and professional schools category. For hospital faculty and staff, we used the hospitals multiplier. Table A-4 below shows the total net jobs impact for the URC.

TABLE A-4. Net Jobs Impact of the URC, FY 2013

Category	2013 Employment (FTE)	% Net New in Michigan	Direct Jobs Impact	Employment Multiplier	Total Net New Employment	*Memo: Indirect Jobs Impact*
URC Non-Hospital Faculty	11,818	89%	10,540	1.57	16,573	6,034
URC Non-Hospital Staff	27,652	63%	17,504	1.57	27,525	10,021
URC Hospital Faculty	49[a]	92%	45	2.20	99	54
URC Hospital Staff	15,541	65%	10,102	2.20	22,261	12,160
Total Faculty and Staff Jobs Impact	55,060	69%	38,191	1.77	66,459	28,689

Source: URC Universities, BEA RIMS II Multipliers, AEG Estimates
Analysis: Anderson Economic Group, LLC

a. U-M changed the way they count faculty. Many hospital faculty are accounted for in non-hospital faculty.

REGIONAL ECONOMIC IMPACT

Our regional economic impact analysis is meant to give the magnitude of economic impact on a more local level, and is a conservative estimate. To perform the regional economic impact analysis, we include the same expenditures as in the state economic impact, except at a county level. While the universities had county-by-county data, the expenditures were accounted for slightly differently than in IPEDS. We discuss how the direct economic impact by region was estimated below.

Operational Expenditures. Using data provided by the URC universities on wages and vendor payments by county, we calculated the percentage of payroll and non-payroll expenses in each county. We used the university expenditures (after substitution), which we used in the state economic impact, and allocated expenditures by county using these shares. This gives a rough estimate of university spending in each Michigan county.

Student Local Spending. We used our statewide estimates of URC student expenditures and after accounting for substitution, we attributed a portion of that spending to the counties in which the URC universities are located. We apportioned 100% of spending for students living on campus to the counties in which the schools are located. No data were available that directly report where off-campus students live and spend money. We apportioned spending by students who live off campus based on our knowledge of the campuses and our professional judgment. We distributed 70% of spending by MSU off-campus students to Ingham County, and 30% to Clinton County. We distributed U-M Ann Arbor student expenditures between Washtenaw (97%), Wayne (2%), and Jackson (1%). We apportioned spending from U-M Flint students to Genesee County, U-M Dearborn to Wayne (80%), and Oakland (20%), and for Wayne State, we assumed that 60% of spending was in Wayne County, and 40% was in Oakland.

Regional Alumni Earnings and Incremental Earnings Estimates. An analysis of where URC alumni currently live reveals that different regions of the state account for differing shares of this total. The largest driver of these differences comes from the number of URC alumni living in different parts of the state, but the distribution is also affected by whether the alums have bachelors or advanced degrees.

We apportioned alumni earnings based on where alumni were reported to reside. The best data of this at a local level was zip code data provided by each university's alumni office. We used GIS software to assist us in attributing alumni into a county when a zip code spanned more than one county.

Indirect Economic Impact. We then calculated the regional *indirect* economic impact of URC's expenditures by multiplying the direct expenditures by the U.S. Department of Commerce's Regional Multipliers (RIMS II). It would be a highly complex analysis (and prohibitively expensive) to use the individual set of multipliers for each of Michigan's 83 counties. Instead, we purchased only the county multipliers for the three counties that had the largest share of expenditures, which were also the counties in which the URC universities are located: Washtenaw, Wayne, and Ingham. For these counties, we used the multipliers provided by RIMS II. The remaining counties were put into categories of low, medium, or high population and

we estimated those multipliers accordingly. See Table A-5 below for the list of multipliers used in the regional economic impact analysis.

TABLE A-5. Multipliers Used in Regional and County by County Economic Impact, FY 2013

Spending Category	Multiplier Category	Ingham County	Washtenaw County	Wayne County	Low Pop. (<50k)	Medium Pop. (50k-120k)	High Pop. (>120k)
URC Spending							
Salaries and Wages	Households	0.812	0.738	0.900	0.568	0.590	0.738
Employee Benefits	Insurance Carriers*	1.641	1.407	1.528	1.149	1.125	1.407
Instruction & Academic Support	Educational Services	1.601	1.648	1.629	1.121	1.318	1.648
Research	Scientific research and development services	1.604	1.596	1.615	1.123	1.277	1.596
Public Service, Student Services, Inst. Support, Auxiliary Enterprises, & Other Expenses	Colleges*	1.606	1.659	1.669	1.124	1.327	1.659
Operation and Maintenance of Plant	Facilities support services*	1.000	1.564	1.669	0.700	1.252	1.564
Hospital Services	Hospitals*	1.595	1.552	1.615	1.116	1.242	1.552
Athletics	Spectator sports *	1.508	1.546	1.679	1.055	1.237	1.546
Construction	Construction	1.461	1.450	1.702	1.023	1.160	1.450
Student Spending							
Room and Board	Households	0.812	0.738	0.900	0.568	0.590	0.738
Books and Supplies	Retail trade	1.883	1.431	1.564	1.318	1.507	1.883
Apparel, Food & Grocery, and Other Basic Needs	Retail trade	1.883	1.431	1.564	1.318	1.507	1.883
Off-campus Meals & Entertainment	Food services and drinking places	1.555	1.453	1.667	1.089	1.163	1.453

** Industries using the multipliers for "detail" industries; the rest use multipliers for "aggregate" industries*

Source: BEA RIMS II Multipliers

Economic activity is not contained within the region it occurs. Spending in one region generates activity in nearby regions when that money is re-spent. Therefore, the state's indirect activity generated by the URC is larger than the sum of regional estimates. To correct for this and apportion all indirectly-generated activity to a region, we estimated a factor of economic activity that goes beyond each county's borders. This allows our analysis of indirect economic impact by region in Michigan to sum to the state's economic impact, providing the magnitude of the total impact in Michigan, by region. Each direct expenditure was multiplied by that spending factor, as well as the multiplier.

We show the full economic impact by region in Table A-6 on page A-16. We show our estimates of additional URC alumni earnings by region in Table A-7 on page A-18.

TABLE A-6. Estimates of URC Economic Impact in Michigan by Region

Direct Impact of Student and URC Expenditures & Employment in Michigan, by Region

	Net New Payroll Expenditures		Net New Nonpayroll Expenditures		Net New Student Spending		Net New Employm	
	Total	Share	Total	Share	Total	Share	Total	Sha
Upper Peninsula Region	$ 4,946,578	0.1%	$ 2,384,489	0.1%	$ -	0.0%	67	0.
Northwest Region	$ 7,272,401	0.2%	$ 2,989,866	0.2%	$ -	0.0%	121	0.
Northeast Region	$ 3,527,139	0.1%	$ 625,250	0.0%	$ -	0.0%	65	0.
West Michigan Region	$ 41,701,355	1.1%	$ 67,438,157	3.8%	$ -	0.0%	450	1.
East Central Region	$ 11,749,580	0.3%	$ 30,567,627	1.7%	$ -	0.0%	162	0.
East Michigan Region	$ 107,234,847	2.7%	$ 25,627,880	1.5%	$ 73,166,000	4.6%	1,324	3.
South Central Region	$ 765,675,429	19.6%	$ 339,731,301	19.4%	$ 527,608,764	33.2%	6,628	17.
Southwest Region	$ 15,154,128	0.4%	$ 14,500,211	0.8%	$ -	0.0%	173	0.
Southeast Michigan Region	$ 2,084,995,978	53.3%	$ 465,778,478	26.6%	$ 607,015,481	38.2%	19,768	51.
Detroit Metro Region	$ 869,223,833	22.2%	$ 802,546,896	45.8%	$ 382,964,723	24.1%	9,434	24.
State of Michigan	$ 3,911,481,268		$ 1,752,190,156		$ 1,590,754,969		38,191	

Indirect Impact of Student and URC Expenditures & Employment in Michigan, by Region

	Net New Payroll Expenditures		Net New Nonpayroll Expenditures		Net New Student Spending		Net New Employm	
	Total	Share	Total	Share	Total	Share	Total	Sha
Upper Peninsula Region	$ 446,134	0.0%	$ 1,386,719	0.1%	$ -	0.0%	23	0.
Northwest Region	$ 684,415	0.0%	$ 2,008,889	0.1%	$ -	0.0%	44	0.
Northeast Region	$ 318,435	0.0%	$ 274,772	0.0%	$ -	0.0%	26	0.
West Michigan Region	$ 11,312,172	0.7%	$ 76,566,151	3.8%	$ -	0.0%	220	0.
East Central Region	$ 2,265,420	0.1%	$ 32,215,597	1.6%	$ -	0.0%	74	0.
East Michigan Region	$ 31,194,844	1.9%	$ 27,856,433	1.4%	$ 61,366,698	5.5%	829	2.
South Central Region	$ 366,531,741	22.2%	$ 353,149,866	17.7%	$ 378,090,602	33.6%	4,073	14.
Southwest Region	$ 5,160,083	0.3%	$ 16,642,872	0.8%	$ -	0.0%	106	0.
Southeast Michigan Region	$ 806,210,604	48.8%	$ 517,845,188	26.0%	$ 401,062,438	35.7%	16,096	56.
Detroit Metro Region	$ 426,355,671	25.8%	$ 966,498,182	48.5%	$ 283,916,072	25.2%	6,779	24.
State of Michigan	$ 1,650,479,520		$ 1,994,444,669		$ 1,124,435,810		28,269	

Table A-6. Estimate of the URC Economic Impact in Michigan by Region, FY 2013 (cont.)

Total Impact of Student and URC Expenditures & Employment in Michigan, by Region

	Net New Payroll Expenditures		Net New Nonpayroll Expenditures		Net New Student Spending		Net New E
	Total	Share	Total	Share	Total	Share	Total
Upper Peninsula Region	$ 5,392,712	0.1%	$ 3,771,208	0.1%	$ -	0.0%	90
Northwest Region	$ 7,956,816	0.1%	$ 4,998,755	0.1%	$ -	0.0%	165
Northeast Region	$ 3,845,574	0.1%	$ 900,023	0.0%	$ -	0.0%	91
West Michigan Region	$ 53,013,527	1.0%	$ 144,004,308	3.8%	$ -	0.0%	671
East Central Region	$ 14,015,000	0.3%	$ 62,783,224	1.7%	$ -	0.0%	236
East Michigan Region	$ 138,429,692	2.5%	$ 53,484,313	1.4%	$ 134,532,698	5.0%	2,152
South Central Region	$ 1,132,207,170	20.4%	$ 692,881,167	18.5%	$ 905,699,366	33.4%	10,701
Southwest Region	$ 20,314,210	0.4%	$ 31,143,082	0.8%	$ -	0.0%	279
Southeast Michigan Region	$ 2,891,206,582	52.0%	$ 983,623,666	26.3%	$ 1,008,077,919	37.1%	35,864
Detroit Metro Region	$ 1,295,579,504	23.3%	$ 1,769,045,078	47.2%	$ 666,880,795	24.6%	16,212
State of Michigan	$ 5,561,960,787		$ 3,746,634,825		$ 2,715,190,779		66,459

Source: URC Universities, BEA RIMS II Multipliers, AEG Estimates

Analysis: Anderson Economic Group, LLC

TABLE A-7. Estimate of Additional URC Alumni Earnings in Michigan by Region.[36]

Impact of URC Alumni in Michigan, by Region

	URC Alumni		Share of URC Alumni Earnings		Share of Incremental URC Alumni Earnings		2012 Michigan Population	
	Total	Share	Total	Share	Total	Share	Total	Share
Upper Peninsula Region	5,714	0.9%	$ 398,012,447	0.9%	$ 53,502,327	1.0%	309,387	3.1%
Northwest Region	17,075	2.8%	$ 1,187,735,493	2.7%	$ 160,919,579	2.9%	301,143	3.0%
Northeast Region	5,797	0.9%	$ 402,992,919	0.9%	$ 53,680,614	1.0%	204,896	2.1%
West Michigan Region	48,361	7.8%	$ 3,349,756,520	7.7%	$ 461,054,289	8.4%	1,544,819	15.6%
East Central Region	16,079	2.6%	$ 1,119,272,664	2.6%	$ 151,324,237	2.8%	571,246	5.8%
East Michigan Region	44,681	7.2%	$ 3,189,726,929	7.4%	$ 409,090,715	7.5%	861,444	8.7%
South Central Region	51,655	8.4%	$ 3,499,184,633	8.1%	$ 506,349,373	9.2%	467,321	4.7%
Southwest Region	20,283	3.3%	$ 1,409,195,034	3.3%	$ 192,668,666	3.5%	778,967	7.9%
Southeast Michigan Region	71,921	11.7%	$ 5,160,832,211	11.9%	$ 656,828,536	12.0%	994,717	10.1%
Detroit Metro Region	335,320	54.4%	$ 23,634,431,230	54.5%	$ 2,844,224,257	51.8%	3,861,682	39.0%
State of Michigan	616,886		$ 43,351,140,079		$ 5,489,642,592		9,895,622	

Total Impact of URC Alumni in Michigan, by Region

	Earnings-Direct Impact		Total Impact	
	Total	Share	Total	Share
Upper Peninsula Region	$ 37,745,891	1.0%	$ 46,491,614	1.0%
Northwest Region	$ 113,528,763	2.9%	$ 139,833,377	2.9%
Northeast Region	$ 37,871,673	1.0%	$ 46,646,540	1.0%
West Michigan Region	$ 325,273,801	8.4%	$ 400,639,740	8.4%
East Central Region	$ 106,759,249	2.8%	$ 131,495,367	2.8%
East Michigan Region	$ 288,613,499	7.5%	$ 355,485,247	7.5%
South Central Region	$ 357,229,482	9.2%	$ 439,999,553	9.2%
Southwest Region	$ 135,927,744	3.5%	$ 167,422,202	3.5%
Southeast Michigan Region	$ 463,392,532	12.0%	$ 570,760,582	12.0%
Detroit Metro Region	$ 2,006,600,214	51.8%	$ 2,471,529,483	51.8%
State of Michigan	$ 3,872,942,849		$ 4,770,303,707	

Source: URC Universities, BEA RIMS II Multipliers, AEG Estimates

Analysis: Anderson Economic Group, LLC

36. Alumni population includes those with valid zip codes only.

TABLE A-8. Estimate of the URC and Alumni Economic Impact in Michigan by Region.

Total Impact of URC in Michigan, by Region				
	Net New Economic Impact		Total Jobs Impact	
	Total	Share	Total	Share
Upper Peninsula Region	$ 55,655,534	0.3%	90	0.1%
Northwest Region	$ 152,788,948	0.9%	165	0.2%
Northeast Region	$ 51,392,137	0.3%	91	0.1%
West Michigan Region	$ 597,657,575	3.6%	671	1.0%
East Central Region	$ 208,293,592	1.2%	236	0.4%
East Michigan Region	$ 681,931,950	4.1%	2,152	3.2%
South Central Region	$ 3,170,787,256	18.9%	10,701	16.1%
Southwest Region	$ 218,879,495	1.3%	279	0.4%
Southeast Michigan Region	$ 5,453,668,750	32.5%	35,864	54.0%
Detroit Metro Region	$ 6,203,034,860	36.9%	16,212	24.4%
State of Michigan	**$ 16,794,090,098**		**66,459**	
Source: URC Universities, BEA RIMS II Multipliers, AEG Estimates				

ALUMNI EARNINGS

Alumni Earnings Methodology

We used individual and aggregate alumni data provided by Michigan State, University of Michigan, and Wayne State to estimate alumni earnings. We excluded from our analysis recipients of honorary degrees and certificates.

We estimated the 2013 earnings by URC alums in three steps:

1) Estimate Age Distribution. We divided the existing alums into seven age brackets using data from each school on the number of graduates by year in their current alumni databases.[37] We used the alumni's year of graduation to approximate the age of the graduates. We used average age by graduation year for each school using survey data collected in the course of writing our URC-commissioned 2013 report "Michigan's University Research Corridor: Embracing Entrepreneurship." Based on this data, we assumed the following average age of graduates:

TABLE 18. Average Age of URC Graduates Used in Analysis

	Bachelors	Advanced Degree
Michigan State University	22	27
University of Michigan	22	26
Wayne State University	24	28

Source: URC university alumni offices; Alumni survey cited in "Michigan's University Research Corridor: Embracing Entrepreneurship."

2) Estimate Workforce Participation and Wage. We estimated the workforce participation rate and average wage of URC alums in each age bracket using data from the 2010 Decennial Census. This data provides separate, age-bracketed estimates for Michigan workers with bachelor's degrees and with advanced degrees. We used the following assumptions in conjunction with this data:

- We assumed that wages grew in Michigan at the rate of inflation between 2010 and 2013. We used the U.S. Bureau of Labor Statistics' Detroit-Ann Arbor-Flint Consumer Price Index (CPI).
- We assumed that alums that are not in the labor force have no personal income.
- We assumed that some URC alums earned a higher wage than the average wage for Michigan workers with bachelor's and advanced degrees for each age bracket. This assumption is a professional estimate based on these universities' reputations for higher-than-average admissions standards within Michigan (improving their graduates' reputation among potential employers), and the fact that URC students' choice to attend a URC university reveals that they believe it will improve their employment prospects more than their next-favorite school. Our assumption implies that the higher admissions standards of these schools translates to higher earning power throughout the graduates' careers.

37. The age brackets are 21-24 years, 25-34 years, 35-44 years, 45-54 years, 55-64 years, 65-74 years, and 75 years and over.

3) Estimate Total Earnings. The final step consisted of multiplying the number of alums for each school in each age bracket by the estimated workforce participation rate and estimated wage, then summing the earnings across schools and ages as necessary to estimate total earnings.

Sorting Graduates into Types

In order to estimate what portion of URC alumni earnings were caused by the URC, we must consider what the graduates' earnings would have been without the URC. To do this we place all MSU graduates in one of three categories that allows us to compare their lifetime earnings with their URC education to their likely lifetime earnings without their URC education.

1. Graduates Earning Lower Wages Without the URC.

This includes:

- In-state students who otherwise would have gone to another college or university in Michigan. If not for the URC universities, these graduates would earn the average wage for a person of their age and the same level of education. These college- and graduate-school-bound students chose their school because it fit their educational needs and goals better than other schools. Without it, they would attain the same level of education, but would earn slightly less throughout their careers.
- In-state URC students who otherwise would not have completed the degree they are currently seeking (i.e. a bachelor's degree for undergraduates, an advanced degree for graduate students). If not for their URC university, these graduates would earn the average wage for a person of their age with one level less education: a high school graduate's wage for undergraduates, and a bachelor's degree wage for graduate students.

2. Graduates Earning Identical Wages Without the URC.

This includes:

- In-state URC students who otherwise would have gone to an out-of-state college similar to a URC university, and returned to Michigan to work, earning the same wage in either case. The school therefore has no impact on their lifetime wages earned in Michigan.
- Out-of-state URC students who will work outside Michigan when they graduate whether or not they would attend another Michigan college if the URC universities did not exist. The URC universities therefore has no impact on their lifetime wages earned in Michigan.

3. Graduates Earning No Wages in Michigan Without the URC.

- In-state URC students who otherwise would have gone to a college outside Michigan and would have stayed outside of Michigan to work as a result. Without the URC universities, these graduates would have earned no wages in Michigan.

- Out-of-state URC students who will work in Michigan when they graduate, but would not work in Michigan if they did not attend a URC university. If not for the URC universities, these students would earn no lifetime wages in Michigan.

Alumni Earnings in 2013 Caused by URC

We estimated the additional 2013 earnings of the existing URC alumni using the following methodology:

1. Estimate the current earnings of Michigan-based URC alumni as detailed in "Alumni Earnings" on page 20 of this appendix.
2. Estimate the proportion of URC alumni in each counterfactual group (types 1 through 6, as detailed in "Sorting Graduates into Types" on page 21 of this appendix) by assuming that all past years' graduating classes exhibited the same behavior as our estimates for the current year's graduating class.
3. Use census and workforce participation data to calculate each counterfactual category's total earnings.
4. Subtract the current earnings from the counterfactual earnings to find the *additional* earnings of current URC alumni due to the URC.

ESTIMATING ADDITIONAL TAX REVENUE

We estimate new tax revenue by first calculating the new wage and salary income that URC employees and alumni receive because of the URC. Then, we estimate the additional taxes revenue to the state for several important state-level taxes: income, sales, property, and transportation taxes.

We estimate that $5.5 billion in wages of URC employees in Michigan were *caused by* the URC in 2013. This figure accounts for substitution of URC employees for other Michigan wages that would have been paid in the absence of the URC. After taxes and savings, we estimate the new alumni earnings in Michigan to be $3.87 billion in the state due to the URC.

We categorize the earnings of employees and alumni caused by the URC into *marginal* and *average* income. The portion of alumni earnings that is earned *in addition to* what would have been earned without the URC is treated as "marginal income."

We treat entire new salary and wage income for an employee or alum that is earned only because of the URC as "average income." This matters because people spend their first $1,000 of income differently than their last, and the state government taxes this income differently because of exemptions. Our methodology for this analysis is detailed in "Methodology" on page A-1. The assumptions for this methodology have been updated from those we have used since our first annual benchmarking study, released in 2007; these updates are detailed in "Comparability to Previous Benchmarking Reports" on page B-1.

Employee Earnings

The income of URC employees is treated as average income. The earnings of URC employees come largely from out-of-state income sources, so it is reasonable as a first approximation to treat URC employee jobs as jobs that would not exist without

the URC, meaning each employee's entire income generates net new tax revenue.[38] While it is possible that some of the income of URC employees could be treated as marginal income, treating it as average income is more conservative because average income is taxed at a lower average rate than is marginal income, as shown below in Table A-9.

URC Alumni

For some graduates, attending a URC university likely had no impact on their annual Michigan earnings (and therefore to the taxes they pay to the State of Michigan). Other graduates will earn extra income due to the URC, and therefore will pay additional taxes to the state. The proportion of their additional income that goes to Michigan taxes depends on whether their additional income due to the URC represents a pay boost (for graduates who would still be working in Michigan without the URC) or if their entire Michigan income is due to the URC (for graduates who otherwise would not be working in Michigan). As described below, we apply different effective tax rates to "average" and "marginal" income.

EFFECTIVE TAX RATES ON INCOME

This analysis recognizes that average and marginal income are taxed and spent differently. To account for this difference, we estimate an "effective rate" for each type of income that is taxed, which is the amount we anticipate people will pay in taxes divided by their income.[39]

Table 9 below shows the percentage of income we assume is paid to the State of Michigan. Note that our analysis includes major taxes such as income, sales, state-level property, and gasoline taxes, but does not consider additional, non-sales taxes on alcohol and tobacco, or other state taxes and fees.

TABLE A-9. Percentage of Income Paid to the State of Michigan

Tax	On Additional Marginal Income	On Additional Average Income
Personal Income Tax	4.35%	2.32%
Sales and Use Tax	1.70%	2.62%
Property Tax	0.38%	0.47%
Transportation Tax	0.10%	0.22%

Source: Anderson Economic Group, LLC

38. The out-of-state income sources we refer to as supporting instruction and research expenses for URC employees includes tuition from out-of-state students and R&D funding (60% of which comes from the federal government).

39. For example, if someone makes $10,000 and spends $7,000 of that on items subject to the 6% state sales and use tax, he or she will pay 6% of $7,000, or $420 in taxes. His or her effective sales tax rate is $420 divided by $10,000, or 4.2%.

Income Tax

In October 2012, the personal income tax rate changed from 4.35% to 4.25%. For our analysis, we used the income tax rate of 4.25%. We do not attempt to estimate the proportion of marginal income going toward tax exempt expenditures. To calculate the 2.3% income tax rate on average income, we divided the state's revenue from the income tax in FY 2012-13 by the state's personal income.[40]

Sales and Use Tax

We calculate the sales and use tax burden using data from the U.S. Bureau of Labor Statistics' Consumer Expenditure Survey.[41] First, we identified spending categories subject to the sales and use tax.[42] We estimate that consumers in the middle 20% of earners spend approximately 43.6% of their income on goods subject to the sales and use tax, yielding an effective rate on *income* of 43.6% times the 6% sales tax rate, or 2.62% of their entire income. This is the effective sales tax rate on additional average income.

To calculate the effective rate on marginal income, we calculated the proportion subject to sales tax of the additional spending done by people in the middle 20% of earners and the second-highest 20% of earners. We estimate that 28.4% of this additional income is spent in sales-taxable categories, resulting in an effective sales tax on marginal income of 28.4% times the 6% sales tax, or 1.70%.

Property Tax

We estimate the proportion of expenditures that goes toward property taxes on average using the 2005 Consumer Expenditure Survey.[43] We find that, on average, people in the middle 20% of income spend 2.8% of their income on property taxes. We multiply 2.8% by the ratio of state property taxes to all state and local property taxes (16.7%) to arrive at an effective rate on income of 0.47%.[44] We also find that 2.3% of the additional income earned by earners in the second-highest quintile goes toward property taxes. Again multiplying by 16.7% of taxes going to the state gov-

40. Base data source for the income tax in FY 2012-2013 was the Michigan Senate Fiscal Agency. Revenue from income tax in 2012 was $8.96 billion. According to the U.S. Bureau of Economic Analysis, personal income was $386.8 billion in 2013.

41. We use the proportions of spending in the 2005 consumer expenditures as an indicator of typical spending by consumers, as this was during the middle of a moderate economic expansion. This is an attempt to maintain continuity with our previous benchmarking reports and not over-count any temporary behavior from an economy operating below its long-term trend.

42. We identified 15 such spending categories, including travel; alcoholic beverages; housing maintenance; repairs, and other household expenses; postage and stationery; clothing; vehicles and vehicle maintenance; entertainment; personal care products, and others. Although we are aware that some expenditures currently are subject to the state's sales and use tax, but are not reported, we did not account for evasion or avoidance in this analysis.

43. See footnote 41 for explanation of why 2005 data was used here.

44. U.S. Census of Governments State and Local Finance data.

ernment, we estimate the effective property tax rate on marginal income to be 0.38%.

Transportation Taxes

We estimate the proportion of expenditures that goes toward gasoline using the Consumer Expenditure Survey.[45] We find that, on average, people in the middle 20% of income spend 4.7% of their income on gasoline. We multiply this rate by 4.75%, the effective rate of the gasoline tax,[46] resulting in an effective rate on income of 0.22%. We also find that 2.1% of the additional income earned by earners in the second-highest quintile goes toward fuel. Again multiplying by the 4.75% effective gas tax rate, we estimate the effective gas tax rate on marginal income to be 0.10%.

45. See footnote 41 for explanation of why 2005 data was used here.

46. Gasoline is not taxed as a percentage of its price, but rather at a per-unit rate of $0.19 per gallon. The gasoline tax of $0.19 per gallon is divided by $4 per gallon of gasoline to yield a 4.75% effective rate.

Appendix B. Additional Data and Tables

This appendix contains additional detailed data for some of the numbers, tables, and figures presented throughout the report.

EDUCATION AND TALENT BENCHMARKS

The following tables present additional data for students and degrees for the URC and its peer clusters.

Enrollment

TABLE B-1. Student Enrollment for the URC and Peer Clusters, 2007-2013

	2007	2008	2009	2010	2011	2012	2013
URC	119,520	129,874	137,820	138,091	138,876	139,322	138,936
Northern Cal.	51,672	54,527	56,665	57,827	58,154	57,530	57,386
Southern Cal.	89,660	93,486	104,331	106,484	107,180	109,373	110,966
Illinois	72,467	73,984	79,502	79,463	80,504	81,101	81,635
Mass.	62,961	62,645	68,383	70,631	71,275	66,985	72,487
N. Carolina	69,234	70,920	77,099	78,074	78,860	79,407	78,455
Penn.	118,741	123,299	127,088	128,279	128,561	127,855	126,639
Texas	109,074	112,794	117,111	118,100	120,132	122,866	128,338

Source: IPEDS Enrollment, Fall 2007-Fall 2013
Analysis: Anderson Economic Group, LLC

Degrees

TABLE B-2. Number of Degrees Conferred for the URC and Peer Clusters, 2007-2013

	2007	2008	2009	2010	2011	2012	2013
URC	30,043	30,702	31,032	31,242	31,683	32,483	32,563
Northern Cal.	15,420	15,592	15,833	15,946	16,599	16,856	17,050
Southern Cal.	27,147	28,392	28,599	29,582	31,401	32,180	32,552
Illinois	20,497	21,256	21,340	22,129	22,618	23,061	23,207
Mass.	18,317	19,167	19,115	19,420	19,676	20,008	20,140
N. Carolina	17,062	17,370	18,000	18,524	19,381	20,727	21,105
Penn.	26,409	26,695	27,240	29,642	30,458	30,286	30,255
Texas	24,638	25,378	25,689	25,913	26,705	26,951	31,763

Source: IPEDS Completions, 2007-2013
Analysis: Anderson Economic Group, LLC

TABLE B-3. Number of Undergraduate Degrees Conferred by Field of Study, 2013

	Phys. Sci. Agriculture, & Natural Resources	Engineering, Math. & Comp. Sci.	Business, Manag-ement, & Law	Liberal Arts	Medicine & Biological Sci.	Other	Total
URC	808	2,735	2,654	7,585	4,722	1,172	19,676
Northern Cal.	708	1,967	464	4,692	1,550	54	9.435
Southern Cal.	693	2,928	1,655	8,684	4,393	60	18,413
Illinois	890	2,416	972	4,551	1,983	304	11,116
Mass.	280	1,336	780	3,128	1,983	14	6,916
N. Carolina	969	2,172	1,082	4,525	2,625	501	11,874
Penn.	1,114	4,312	3,487	6,732	4,059	1,441	21,145
Texas	1,907	3,800	2,904	8,123	3,389	1,177	21,300

Source: IPEDS Completions, 2013
Analysis: Anderson Economic Group, LLC

TABLE B-4. Number of Advanced Degrees Conferred by Field of Study, 2013

	Phys. Sci., Agriculture, & Natural Resources	Engineering, Mathematics, & Comp. Sci.	Business, Manage-ment, & Law	Liberal Arts	Medicine & Biological Sci.	Other	Total
URC	589	2,480	2,874	3,476	3,180	288	12,887
Northern Cal.	463	2,289	1,915	1,378	1,478	186	7,709
Southern Cal.	354	3,557	2,694	4,729	2,805	0	14,139
Illinois	475	1,766	4,818	3,333	1,332	367	12,091
Mass.	406	2,413	3,977	3,730	2,439	259	13,224
N. Carolina	612	1,738	2,242	2,274	2,157	208	9,231
Penn.	358	2,659	1,848	2,367	1,793	85	9,110
Texas	631	2,267	3,070	2,880	1,407	208	10,463

Source: IPEDS Completions, 2013
Analysis: Anderson Economic Group, LLC

TABLE B-5. Number of High-Tech Degrees Conferred by Cluster, 2013

	Ag. & Related Sci.	Arch. & Related Services	Bio. & Biomed. Sci.	Comm. Tech., Comp. & Info. Sci. & Support Serv.	Eng., Eng. Tech. & Eng.-related Fields	Math. & Stat.	Phys. Sci.
URC	341	366	2,470	792	3,919	565	601
Northern Cal.	25	308	1,389	586	3,010	592	684
Southern Cal.	0	473	3,178	1,107	4,208	697	847
Illinois	570	284	1,237	576	2,892	644	683
Mass.	0	524	1,412	772	2,089	364	592
N. Carolina	507	157	1,731	737	2,800	432	558
Penn.	356	159	1,546	2,045	4,479	477	940
Texas	1,268	466	1,940	815	4,537	628	878

Source: IPEDS Completions, 2012
Analysis: Anderson Economic Group, LLC

TABLE B-6. Medical Degrees Conferred by Cluster, 2013[a]

	MD	DO	DDS	DVM	Other Dentistry	Nursing	Physician Assistant
URC	526	387	108	99	62	1,061	43
Northern Cal.	261	0	107	0	20	184	0
Southern Cal.	462	0	281	0	62	228	53
Illinois	242	0	0	116	0	0	25
Mass.	340	0	230	0	40	0	0
N. Carolina	261	0	78	72	59	609	76
Penn.	282	0	281	0	18	887	31
Texas	134	0	97	131	28	324	0

Source: IPEDS Completions 2013
Analysis: Anderson Economic Group, LLC

a. For a list of degrees included in these categories, see “Benchmarking Metrics” on page A-1.

TABLE B-7. Number of Medical Degrees Conferred for the URC and Peer Clusters, 2008-2013[a]

	2008	2009	2010	2011	2012	2013	% Change, 2008-2013
URC	1,742	1,994	2,034	2,193	2,109	2,186	25.5%
Northern Cal.	564	525	610	621	609	572	1.4%
Southern Cal.	1,123	1,073	1,075	1,054	1,107	1,086	-3.3%
Illinois	361	384	377	401	408	383	6.1%
Mass.	584	578	608	573	609	610	4.5%
N. Carolina	898	954	948	749	1,177	1,115	28.6%
Penn.	940	931	946	1,069	1,147	1,499	59.5%
Texas	549	545	605	648	698	714	30.1%

Source: IPEDS Completions 2008 - 2013
Analysis: Anderson Economic Group, LLC

a. For a list of degrees included in these categories, see "Benchmarking Metrics" on page A-1

RESEARCH AND DEVELOPMENT

The following tables present additional data for research and development funding and expenditures for the URC and its peer clusters.

TABLE B-8. R&D Funding by Source, FY 2013 (thousands)

	Total R&D Expenditures	Federal Gov't	State & Local Gov't	Industry[a]	Non-Profits	Institution	All Other Sources
URC	$2,122,712	56%	2%	3%	4%	33%	1%
Northern Cal.	$2,715,293	56%	5%	8%	11%	15%	4%
Southern Cal.	$2,687,849	58%	4%	6%	10%	15%	7%
Illinois	$1,785,889	65%	2%	4%	7%	21%	1%
Mass.	$2,281,571	59%	0%	7%	9%	19%	6%
N. Carolina	$2,383,296	58%	4%	11%	6%	20%	2%
Penn.	$1,991,166	70%	3%	4%	3%	15%	4%
Texas	$1,587,691	48%	12%	8%	7%	24%	1%
All U.S. Universities	$67,173,419	59%	5%	5%	6%	22%	2%

Source: NSF HERD Survey, 2013
Analysis: Anderson Economic Group, LLC

a. This category is labeled "business" in the NSF survey, but we have kept the category label "industry," as we have in prior reports.

TABLE B-9. Growth in Total Academic R&D Expenditures for URC and Peer Clusters, FY 2012-2013

	R&D Expenditures (millions)			
	FY 2012	FY 2013	Growth 2012-2013	Rank Growth 2012-2013
URC	$2,083	$2,123	1.9%	6
Northern Cal.	$2,666	$2,715	1.8%	7
Southern Cal.	$2,701	$2,688	-0.5%	8
Illinois	$1,634	$1,786	9.3%	2
Mass.	$1,957	$2,282	16.6%	1
N. Carolina	$2,299	$2,383	3.7%	4
Penn.	$1,927	$1,991	3.2%	5
Texas	$1,432	$1,588	4.6%	3
All U.S. Universities	$65,920	$67,173	1.0%	

Source: NSF HERD Survey, 2012-2013
Analysis: Anderson Economic Group, LLC

TABLE B-10. Growth in Science and Engineering R&D Expenditures for URC and Peer Clusters, FY 2012-FY 2013

	S&E R&D Expenditures (millions)			
	FY 2012	FY 2013	Growth 2012-2013	Rank Growth 2012-2013
URC	$1,965	$2,008	2.2%	6
Northern Cal.	$2,584	$2,634	1.9%	7
Southern Cal.	$2,628	$2,611	-0.6%	8
Illinois	$1,572	$1,723	9.6%	2
Mass.	$1,853	$2,104	13.5%	1
N. Carolina	$2,270	$2,343	3.3%	4
Penn.	$1,885	$1,949	3.4%	3
Texas	$1,418	$1,499	5.7%	5
All U.S. Universities	$62,349	$63,503	4.7%	

Source: NSF HERD Survey, 2012-2013
Analysis: Anderson Economic Group, LLC

TABLE B-11. R&D Spending by Field, FY 2013 (thousands)

	Env. Sci.	Life Sci.	Math & Comp. Sci.	Phys. Sci.	Psycho -logy	Social Sci.	Other Sci.	Engin.	All Non-S&E Fields
URC	$19,882	$1,208,988	$47,418	$168,506	$38,317	$196,364	$12,726	$316,124	$114,387
Northern Cal.	$41,027	$1,809,443	$43,810	$203,326	$18,880	$69,829	$138,516	$308,856	$81,606
Southern Cal.	$202,247	$1,648,916	$179,027	$149,320	$42,094	$80,708	$39,527	$269,657	$76,353
Illinois	$17,219	$923,722	$255,774	$163,390	$34,155	$49,786	$30,597	$248,853	$62,393
Mass.	$89,915	$898,955	$99,132	$216,063	$21,240	$103,372	$153,500	$521,588	$177,806
N. Carolina	$75,948	$1,703,308	$80,424	$71,504	$72,692	$129,965	$3,719	$205,824	$39,912
Penn.	$63,994	$1,013,235	$211,161	$99,794	$49,664	$39,462	$18,964	$452,786	$42,106
Texas	$205,122	$386,062	$146,954	$165,534	$12,629	$34,276	$15,419	$533,443	$88,252

Note: Fields determined by NSF. See "R&D Expenditures" on page A-15 for further description of S&E fields.

Source: NSF HERD Survey, 2013
Analysis: Anderson Economic Group, LLC

Appendix C. Summary of Past URC Sector Reports

In 2013 the URC commissioned a study exploring the impact alumni entrepreneurs of MSU, U-M, and WSU have on the Michigan, U.S. and global economies. The URC has also commissioned annual industry sector reports. Key findings from those reports include:

BLUE ECONOMY (2014)

- One in five Michigan jobs (718,700) are associated with water-enabled or water-related industries.
- From 2009-2013, the three URC universities received 2,100 awards for water-related research and outreach, totaling nearly $300 million, supporting 341 researchers from dozens of departments.
- Each year, the URC universities produce more than 3,400 graduates prepared to analyze and find solutions to water-related issues in academia, government, and the private sector.

ALUMNI ENTREPRENEURSHIP (2013)

- URC alumni entrepreneurs started or acquired businesses at double the national average rate among college graduates since 1996.
- Fifty percent of the companies created by URC entrepreneurs are located in Michigan with the rest in every other state and more than 100 different countries.
- Compared to the most recently available five-year success rate for U.S. firms, URC alumni-started firms were nearly 1.5 times more likely to remain in operation.
- Most URC entrepreneurs start a business in an area outside their major areas of study.

AUTOMOTIVE INNOVATION (2012)

- The URC universities supply talented workers to the auto industry, conferring more than 3,600 degrees annually in auto-ready disciplines.
- URC universities play a direct role in auto industry innovation by spending $60 million annually of their R&D dollars on auto-related research and development.
- Between FY 2007 and 2011, the URC universities spent $300 million on more than 1,400 auto projects. Nearly two-thirds of this research was funded by federal and state governmental agencies.
- Private industry funded 28% of all auto research at the URC universities in the past five years, which is nine times the average share of industry funding for all university R&D at these institutions.
- URC researchers have helped automakers improve vehicle quality and safety, improve engine efficiency and performance, and reduce fossil fuel use through new auto approaches. Specific examples include:

- The 2mm project that involved U-M and WSU that limited and controlled the gaps between auto components;
- The connected vehicle research at U-M and WSU that promises improved safety by allowing vehicles to "talk" to one another and the infrastructure;
- Biofuels research that is currently being done by MSU on new types of feedstock that can be grown more economically to lower fuel costs and improve fuel efficiency.

INFORMATION AND COMMUNICATION TECHNOLOGY (2011)

- The URC universities spent nearly $74 million on research projects with a strong IT focus in FY2010.
- Of the nearly 150 start-ups the URC has assisted in creating since 2001, approximately 40% have had a distinct ICT component.
- Information technology employs about 3.5% of the state's workforce, or about 135,000 workers, and is significant not only as its own sector but as the underpinning for much of the major industry activity and growth represented in previous sector reports.
- The industry pays high wages, with employees earning about $20,000 more than other workers in the private sector.

ADVANCED MANUFACTURING (2010)

- Michigan's advanced manufacturing industry employs 381,351 workers, accounting for 10.3% of all employment (2007 data). Fully one-third of advanced manufacturing jobs in the Midwest are in Michigan.
- The average wage in the advanced manufacturing industry was $64,122.
- URC universities spent $101 million on advanced manufacturing R&D in 2009.
- URC universities are educating more than 14,000 students in engineering.

LIFE SCIENCES (2009)

- Michigan's life sciences industry employed more than 79,000 workers, accounting for 2.1% of all employment (2006 data).
- Between 1999 and 2006, life sciences industry employment grew by 10.7% while during that same time period manufacturing employment dropped by 24%.
- Life sciences wages averaged $83,494 in 2006.
- In 2008, URC universities spent $887 million on life sciences research and development.
- R&D expenditures grew 69% since the founding of the Life Sciences Corridor in 1999.

ALTERNATIVE ENERGY RESEARCH AND DEVELOPMENT (2008)

- Michigan has a comparative advantage in biomass and wind compared to the energy potential in the other 49 states.
- URC universities spent more than $79.5 million on R&D related to alternative energy in 2007.
- Federal funding provided 71% ($56.8 million) of total R&D funding in alternative energy.
- More than 50% of all alternative energy R&D supported the auto industry.

Appendix D. About the Authors

ANDERSON ECONOMIC GROUP

Anderson Economic Group, LLC is a research and consulting firm specializing in economics, public policy, finance and business valuation, and market and industry analysis. The firm has offices in Chicago, Illinois and East Lansing, Michigan. AEG has conducted economic and fiscal impact studies for private, public, and non-profit clients across the United States.

Since 2007, AEG has completed two annual studies for the University Research Corridor. The first report is an assessment of the URC's economic impact on the state of Michigan, which is released every fall or winter. The second report is an assessment of how the URC universities contribute to an important economic sector in the state, which is released every spring. For past reports and more information on AEG, visit www.AndersonEconomicGroup.com.

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Prior to joining Anderson Economic Group, Mr. Rosaen worked as a mechanical engineer for Williams International in Walled Lake, Michigan. Mr. Rosaen holds a Masters in Public Policy from the Gerald R. Ford School of Public Policy at the University of Michigan. He also has a Masters of Science and a Bachelors of Science in mechanical engineering from the University of Michigan.

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Prior to working at AEG, Mr. El-Kilani worked at the Michigan Veterans Affairs Agency in the Strategy Division. In addition, Mr. El-Kilani completed a fellowship with the Economics Staff at the Center for Drug Evaluation and Research of the US Food and Drug Administration.

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